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EVALUATION OF SITE REMEDIATION BY IN-SITU OXIDATION

WORK ASSIGNMENT D003825-09.1

NORTH FRANKLIN STREET SITE
WATKINS GLEN (V)

SITE NO. 8-49-002
SCHUYLER (C), NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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EVALUATION OF SITE REMEDIATION
BY
IN-SITU CHEMICAL OXIDATION
AT
NORTH FRANKLIN STREET SITE
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1.0 INTRODUCTION

Work Assignment D003825-09.1, under the Superfund Standby Contract between the New York State Department of Environmental Conservation (NYSDEC) and URS, is for the performance of an In-Situ Oxidation Pilot Study at the North Franklin Street Site. This report was prepared as required by Task 7C: *Confirmatory Sampling* and Task 9: *Reporting* of the approved work plan, prepared by URS in March 2000. As outlined in the work plan, the objectives for this report are as follows:

1. Summarize the remedial activities at the site
2. Summarize the soil and groundwater analytical data
3. Evaluate the contaminant removal efficiency of the in-situ oxidation process
4. Estimate the volume and mass of soil contamination remaining
5. Provide recommendations for any additional remedial work at the site

1.1 Site Background and History

The North Franklin Street Class 2 inactive hazardous waste site is an approximately 0.3-acre parcel of land situated in the Village of Watkins Glen, Schuyler County, New York. The site is located in an urban area approximately 400 feet south of Seneca Lake, as shown on Figure 1-1. Two structures currently exist on site (shown on Figure 1-2). The building referred to as the "Former Auto Museum" is a single-story metal building on a concrete slab. At the present time, this building is apparently being used for storage. The second structure is referred to as the "Former Dry Cleaning Building." This is a two-story brick building that also includes two unoccupied single-story brick sheds to the east. Over the past season, this building housed a gift store and an adjacent antique store. Both of these structures have housed a variety of businesses in the past, including a machine shop and dry cleaning operations.

1.2 Previous Investigations and Remedial Activities

URS completed a state funded Remedial Investigation (RI) in April 1993, concluding that both groundwater and soil in the vicinity of the site had been contaminated by volatile organic compounds associated with the former dry cleaning operations. Dumping of tetrachloroethylene

(PCE) contaminated water in an alley between the auto museum and the dry cleaners was identified as the major source of contamination.

After URS completed a Feasibility Study (FS) in November 1993, the NYSDEC prepared and signed a Record of Decision (ROD) on January 18, 1994. In accordance with the requirements of the ROD, URS designed a Soil Vapor Extraction (SVE) system to treat shallow soil (above the clay layer) and a groundwater treatment system (GWET) to extract and treat groundwater. The ROD called for the SVET system to operate until soil cleanup objectives were achieved, and for the GWET system to operate for five years or until asymptotic contaminant concentrations were detected in monitoring wells.

URS completed the remedial design and preparation of contract documents for the site in June 1995. The contract to construct and operate the SVE and groundwater treatment systems was subsequently awarded to Terra Vac, Inc. Terra Vac completed construction of the treatment systems and began operations in the fall of 1996. Figure 1-3 shows the SVE well locations both inside and between the two buildings. Additionally, a stone filled trench was constructed first for air inlet, and then later for soil vapor extraction. Figure 1-3 also shows the locations of the three groundwater extraction wells that were installed for the collection of contaminated groundwater by the GWET system.

Confirmatory soil samples collected during the remediation contract indicated that SVE had effectively cleaned up the soil near the extraction wells, underneath the auto museum, and to the rear of the antique shop. However, in the process of collecting the confirmatory samples, it was discovered that the contaminant concentrations in the immediate vicinity of the dry cleaning building were much higher than previously thought. SVE did not clean up this area of highly contaminated soil, despite subsequent modifications to, and extended operation of, the SVE system. Operation of the SVE system was suspended in March 1998 and operation of the groundwater treatment system was suspended at the end of April 1998, pending the results of further investigations.

Between January and September 1998, URS performed several sampling events at the site. During these events, URS collected samples in the alleyway adjacent to the building, from test pits directly at the building foundation, and underneath the floor of the dry cleaning building.

In February 1999, URS prepared and issued the *Evaluation and Conceptual Design for Additional Remedial Action*. In this report, URS summarized the data from previous sampling events to determine the extent and quantity of contamination remaining on site, and then evaluated remedial technologies for soil and groundwater remediation based on the data. The conclusion of this report was that an estimated 370 pounds of contamination remained at the site, the majority of which was located in a small area directly adjacent to and outside the former dry cleaning building. Contamination also was located beneath the dry cleaners and at depths greater than 16 feet.

1.3 Selection and Description of In-Situ Chemical Oxidation

In the February 1999 report, URS evaluated remedial technologies for soil and groundwater, and recommended an appropriate technology capable of achieving the desired remedial goals. Technologies evaluated for the soil included: monitored natural attenuation, excavation, soil vapor extraction, dual phase extraction and passive venting. Technologies evaluated for remediating the groundwater included: pump and treat, monitored natural attenuation, barrier walls and treatment walls.

Each of the alternatives was evaluated for application at the site. Advantages and disadvantages of each were identified. Based on this evaluation, further remediation of the site was recommended to include the following components:

- Excavation of soil outside the building to a depth of seven feet below ground surface
- Installation of a passive groundwater treatment wall
- Deed restrictions on the property
- Installation of a passive venting system beneath the floor of the former dry cleaning building

There were several potential constraints associated with the recommended alternative. Excavation of the soil in close proximity to the building, although possible, presented difficult logistical problems. The integrity of the building was a major consideration due to its age and its foundation consisting only of stacked stone. There was no guarantee that excavation activities would not damage or destroy the building. Additionally, excavation could not remove the soil immediately adjacent to the building, which is the most highly contaminated, due to limitations of conventional bracing and shoring systems. Contaminated soil underneath the building also could not be addressed. Finally, because significant sources of contamination would remain in-place, the time to achieve restoration of the site would be many years.

An additional alternative that was evaluated, but not included in the report, was the demolition of the dry cleaning building followed by excavation of all contaminated soil. Demolition of the building would eliminate the disadvantages to the recommended alternative and still meet all of the remedial objectives for the site. However, since the building owner indicated a preference to continue using the building as a gift shop, the NYSDEC elected not to pursue this option.

Subsequent to the preparation of the *Evaluation and Conceptual Design for Additional Remedial Action*, URS and the NYSDEC identified in-situ oxidation using Fenton's Reagent as an innovative technology with potential benefit for the North Franklin Street site. In-situ oxidation involves injecting powerful oxidizing agents into the soil to destroy organic compounds, ultimately breaking them down into carbon dioxide and water. Fenton's reagent is an extremely reactive hydroxyl radical ($\cdot OH$) generated from a mixture of ferrous iron (Fe^{+2}) and hydrogen peroxide. Because the treatment reagents are administered via a series of injection wells, and these wells could be constructed both inside and in close proximity to the building, the NYSDEC proposed a full-scale pilot study of in-situ oxidation at the site.

Since the use of Fenton's reagent is a relatively new and innovative process, only a limited number of vendors with the expertise and experience to do this work are available. Of these vendors, the process offered by In-Situ Oxidative Technologies, Inc. (ISOTEC) is distinctly different than those offered by other vendors. ISOTEC is the only vendor to conduct remediation at near-neutral pH and with low-pressure injection wells, using a patented process and reagents. Other vendors require extremely acidic conditions or high-pressures that are not only a potential safety hazard, but that might also damage the utilities and other structures in the vicinity of the area to be treated. On this basis, on January 5, 2000 the NYSDEC approved the use of ISOTEC as a sole-source vendor to perform the full-scale pilot study at the site.

2.0 IN-SITU CHEMICAL OXIDATION ACTIVITIES AT THE NORTH FRANKLIN STREET SITE

Following the decision of the NYSDEC to attempt in-situ oxidation as a means of remediating the site, URS prepared the March 2000 *Project Management Work Plan / Budget Estimate*. This work plan outlines the remedial activities at the site for the in-situ oxidation pilot study.

2.1 **Laboratory Study**

Before any actual fieldwork was conducted, a laboratory or "bench-scale" study was performed. The *Laboratory Bench-Scale Study Report* (ISOTEC, May 2000) has been included within Appendix A and is summarized below. The purpose of the study was to:

- Evaluate the effectiveness of oxidation on actual site groundwater samples
- Evaluate the effectiveness of oxidation on actual site soil samples
- Determine the most effective combination of reagents
- Determine the quantity of reagent required to achieve oxidation
- Demonstrate that the oxidative process is capable of achieving significant contaminant destruction

On March 16, 2000, URS collected representative soil and groundwater samples from areas known to contain high concentrations of contamination. URS collected the soil sample from a depth of 5-6½ feet below ground surface. This sample was collected in the alleyway, just outside the side door of the former dry cleaning building (see Figure 2-1). URS collected the groundwater sample from monitoring well MW-5S, historically the most highly contaminated well (Figure 2-1). URS shipped the collected samples to ISOTEC for processing and analysis.

The first step in the study process was to analyze the initial conditions of the soil, groundwater, and a 1:1 slurry of the soil and groundwater. ISOTEC utilizes a soil slurry because they have reportedly found it to be more representative of in-situ conditions than a pure soil sample.

After analysis of the initial conditions, the reagent tests were performed. ISOTEC evaluated several different catalysts and reagent dosages. Three different catalysts were evaluated for use at this site. Each of the tests was conducted in individual 140-mL sealed batch reactors for groundwater, and 120-mL sealed batch reactors for the soil slurry. Control samples also were prepared, in which only distilled water in a volume equal to the reagent used in the tests was added. Following the last application of reagent, all of the tests were undisturbed for a minimum of 24 hours. After completion of the tests, all samples were sent to an analytical laboratory for analysis.

Results of the groundwater tests showed that ISOTEC's 4260 catalyst achieved greater than 99.9% destruction for all VOC contaminants. The results of the soil slurry test also were encouraging, indicating up to a 92.8% reduction in total VOC concentrations, and 88.2% reduction of tetrachloroethylene, also using ISOTEC's catalyst 4260.

Based on the results of the laboratory study, ISOTEC concluded that their process would be effective in significantly reducing the concentrations of organic contaminants in the site soil and groundwater. No site-specific factors that could negatively impact the process were identified. Following a review of the study, URS and the NYSDEC concluded that in-situ oxidation was an appropriate remedial technology at the site, and decided to proceed with the full-scale pilot study.

2.2 Injection Well Installation

Successful application of in-situ oxidation requires an injection system that will deliver the treatment reagent throughout the extent of the contaminated area. Based on an analysis of previous geological information collected from the study area, ISOTEC concluded that 4-inch diameter injection points would have a radial effect of 10-15 feet, and that 2-inch diameter injection points would have a radial effect of 6-8 feet. Using this information and the extent of contamination, URS installed an array of injection wells between April 25 and May 2, 2000. The injection wells were intended to target the entire extent of contaminated soil and groundwater. Figure 2-1 shows the actual installed locations of the injection wells. Table 2-1 summarizes the construction of the wells. Three types of wells were installed:

- IW-01 through IW-03: 4-inch diameter injection wells installed outside the building, all to depths in the range of 21 to 23 feet below ground surface (bgs). These wells are PVC construction, screened in the lower 10-feet within the silty sand and gravel aquifer, below the clayey silt unit. These wells were installed in boreholes advanced using 6¼-inch inner diameter hollow stem augers. The purpose of the wells was direct treatment of contaminated groundwater.

- IW-04 through IW-08: 4-inch diameter injection wells installed outside the building, all to a depth of approximately 10 feet. These wells are PVC construction, screened from approximately 2 feet through 9 feet bgs, installed in boreholes advanced using 6¼-inch inner diameter hollow stem augers. These wells were intended to treat the contaminated soil fill, and potentially the upper portion or interface zone between the fill and underlying clayey silt unit.

- I2W-01 through I2W-03: 2-inch diameter wells installed inside the former dry cleaning building and completed to depths ranging from 7½ to 10 feet. These wells were intended to treat the soil contamination within the fill and fill/clay interface zone underneath the building. The wells are all PVC construction, installed in boreholes advanced using a mobile solid-stem 8-inch diameter auger. Since most of these wells were installed in the portion of the building with a concrete slab floor, it was necessary to first core these locations.

  It was originally intended that five wells be installed inside the building. However, at numerous locations, rocks, debris, or other large objects were encountered that could not be penetrated or removed by the drilling equipment, thus preventing well installation. Field records indicate a large quantity of fill material beneath the concrete floor (east) section of the building. The number of wells in the front (western) section of the building was also limited by the fact that the floor in that area is wood construction, and cannot support the weight of the drilling equipment.

  Prior to the construction of wells inside the building, it was necessary for URS to pack and remove most of a gift shop that is presently operating in the building. The contents of the shop were unpacked and restored following the installation of the wells.

Following installation, all of the injection wells were developed by bailing up to 30 gallons from each well to increase its efficiency. All of the wells were then sampled to document the conditions prior to any injection activities. All development and purge water from the injection wells was staged in 55-gallon drums prior to sampling for offsite disposal.

In addition to the wells installed specifically for the study, existing monitoring wells MW-3 and MW-5S, and five test pit piezometers (TP-1 through TP-5) were also used as injection locations. These wells are shown on Figure 2-1. The test pit piezometers were installed in July 1998 to provide access points for collecting groundwater samples and monitoring groundwater levels after the test pits had been closed. They consist of one-inch outside diameter PVC pipes, screened over the bottom five feet of each test pit.

2.3 Reagent Injection

A full-scale pilot study was initiated at the site following successful completion of the laboratory study and installation of the injection wells. The purpose of the pilot study was to evaluate the effectiveness of the in-situ chemical oxidation process, while concurrently reducing the overall quantity of VOC contaminants at the site. Due to the relatively small area of contamination, the pilot study was designed to address the full extent of contamination, and therefore, if successful, to also serve as the full-scale remediation.

Two oxidation injection events were conducted as part of the pilot study. For each injection event, ISOTEC mobilized its equipment to the site, including drums, pumps, hoses, tanks, mixers, generators, etc. Reagents delivered to the site included 35% hydrogen peroxide, and other proprietary chemicals. ISOTEC transferred reagents from the storage/mixing containers to the point of injection via either a pneumatic diaphragm pump or an electric drum pump, connected to the well through reinforced PVC tubing. Bolted well seals, including an assemblage of valves and fittings were attached to each of the injection points. The injection apparatus was used to control the flow of oxidizer and catalyst into the subsurface. Figures 2-2 through 2-5 are photographs depicting the injection equipment and the wells during the pilot-test.

ISOTEC determined the volume and concentration of the oxidation reagents based on the results of the laboratory study, as well as the reported contaminant concentrations, volume of the area to be treated, and the subsurface characteristics. The first injection event took place from May 15 through 18, 2000. During this event, approximately 1062 gallons of reagent were injected into the subsurface. The second injection event occurred from June 26 through 29, 2000. During this event, 2035 gallons of reagent were injected.

During the injection events, minor surface eruptions from the oxidant reaction were noted at several of the test pit piezometer (TP-) locations. This is most likely due to the fact that the piezometers are located in a highly contaminated area, are shallow, and were backfilled with permeable stone.

Following each of the injection events, ISOTEC demobilized its equipment, and removed excess reagent, waste and debris from the site. A time interval between injection events was necessary to allow time for all of the reagent to be expended. Additional information regarding the reagent injections is included in Appendix A, *Pilot Program Report* (ISOTEC, March 2001).

2.4 Indoor Air Monitoring

At the request of the NYSDOH, two air samples were collected from inside the former dry cleaning building during the pilot study. (The shop was closed during the injection events for the pilot study.) These air samples were intended to determine whether the oxidation events led to an increase in the volatilization of contamination from the soil. These samples, collected directly at an injection well during the application of oxidant, were used to indicate the "worst case" conditions that could be expected inside the building. The first sample was collected at well I2W-2 during the first injection event on May 16, 2000. Using a Summa canister, an air sample was collected over the period during which hydrogen peroxide was being injected into the well. The second sample was similarly collected on June 30, 2000 during the second injection event.

Both of the air samples were analyzed for TCL volatiles, the results of which are summarized on Table 2-2. As indicated by these indoor air monitoring data, the number and concentration of VOCs were generally higher during the first injection event. For example, a total of 12 VOCs were detected during the first event versus 6 during the second event. PCE occurred at a concentration of 130 parts per billion by volume (ppbv) during the first event, and 1.3 ppbv during the second event. These results are indicative of "worst case" conditions, and do not represent air quality within the building during normal operations. The samples were collected from an open well, installed through a concrete floor, during the injection of an oxidizer (hydrogen peroxide) that causes an effervescent reaction with the contaminants, and subsequently promotes the volatilization of vapors from the well. There have been no detectable levels of indoor air contaminants during any of the previous monitoring with a photoionization detector inside the building.

2.5 Groundwater Sampling

Three groundwater sampling events were conducted in conjunction with the oxidation activities at the site. All of the groundwater samples were analyzed for Target Compound List (TCL) VOCs, Total Petroleum Hydrocarbons (TPH), Total Organic Carbon (TOC), Total Dissolved Solids (TDS), and total Iron (Fe). All samples were analyzed following the NYSDEC's 1995 Analytical Services Protocol (ASP). VOC samples were collected because these are the contaminants of concern at the site. All other parameters were collected at the recommendation of ISOTEC, for their use in determining the effectiveness of the remedy.

Table 2-3 summarizes the wells sampled during each of the three events. Figure 2-6 shows the locations of all wells that were sampled. Actual results of the groundwater analyses, and their implications related to the effectiveness of site remediation, are discussed in Section 3.3 of this report.

URS collected the first round of groundwater samples to characterize site conditions and contaminant concentrations prior to the implementation of the remediation activities. Eight (8) existing monitoring wells were sampled on March 16, 2000, and 11 newly installed injection wells were sampled on May 11 and 12, 2000, just prior to the beginning of the first injection.

The second round of samples was collected from June 23 through 26, 2000, immediately prior to the beginning of the second oxidation injection event. Ten (10) samples were collected during this event, all from the existing monitoring wells as listed on Table 2-3. Only the samples from wells MW-3, MW-5S, and MW-5D were located in the area directly affected by the oxidation activities. The other locations sampled were intended to document conditions downgradient of the site.

The third round of groundwater samples was collected from October 18 through 20, 2000, nearly four months following the second injection event. Collection of the groundwater samples was delayed to coincide with collection of the confirmatory soil samples (discussed in the following section). A total of 14 monitoring and injection wells across the site were sampled during this event.

2.6 Confirmatory Soil Sampling

Following completion of the second injection event of the pilot study, confirmatory soil borings were performed and samples collected. All soil samples were analyzed for TCL VOCs, following NYSDEC's 1995 ASP.

The purpose of the soil samples was to determine the contaminant concentrations remaining in the soil following the in-situ chemical oxidation. Although the work plan called for up to 20 samples to be collected, based on discussion with the NYSDEC it was determined that additional samples should be collected for more complete characterization of the study area. The quantity and distribution of samples collected was sufficient to permit a reasonable comparison with the pre-remediation soil samples. A total of 29 soil samples were collected, from a total of 17 locations both inside and outside the building. Nine samples were collected from the 0-4 foot depth interval (fill), 13 from the 4-6 foot interval (interface zone between fill and clayey silt), and 7 from the 6-15 foot interval (clayey silt). Soil samples were collected from inside the areas determined to be contaminated based on previous sampling events. All confirmatory soil sample locations are shown on Figure 2-7. The injection well locations are also shown on this figure. Further discussion and analysis of the confirmatory soil samples, and their implications regarding the effectiveness of the treatment process, are presented in Section 3.4 of this report.

URS collected the confirmatory soil samples from October 17 through 19, 2000. Although it was initially planned to collect soil samples four weeks after the final injection event, sample collection was delayed by the operation of the gift shop in the former dry cleaning building. Because the business only operates during the tourist season, URS delayed the collection of samples until fall to accommodate the schedule of the owner.

Samples outside the building were collected using a Geoprobe with a Macro-Core sampler. Samples were collected in acetate liners in four-foot long intervals, at depths up to 16 feet bgs. The acetate liners were cut open, and the soil screened with a PID. Samples were collected at the desired depth interval from the portion of soil with the highest PID reading. All completed boreholes were backfilled with bentonite and surrounding soils.

2.7 Miscellaneous Site Activities

Several miscellaneous site activities were conducted in conjunction with the pilot study for oxidation. Each of these is briefly described below:

Fence Removal: To gain access to the site for installation of the injection wells and other activities, it was necessary to remove the chain link fence installed during the previous remedial activities. The fence was dismantled by Roger's Fence Company, rolled up and left on the site in April 2000, prior to the installation of the injection wells. All of the fence poles were cut to the ground surface. NYSDEC representatives later removed the fence materials from the site on April 26 and 28.

GWET Removal: The trailer housing the GWET system was removed from the site. Since the system was housed in a storage trailer that was not equipped with wheels, a special container rental company (A-Verdi) was subcontracted for the relocation. Using a truck specially equipped for moving such trailers, on May 17, 2000 A-Verdi transported the trailer to a NYSDEC office located in Sonora, New York. All subsurface piping for the GWET system (and the SVET system) have been left onsite.

<u>Soil Dumpster Removal</u>: As part of a test pit soil sampling event conducted by URS in June 1998, a large disposal rolloff was brought onsite for the storage of excavated soil. During subsequent sampling events, additional soil and drill cuttings were added to the rolloff. On May 12, 2000, URS collected a composite soil sample from the dumpster for toxicity characteristic leaching procedure (TCLP) analysis for volatiles. Based on the results of this sample, the soil was determined to be non-hazardous, and acceptable for disposal at a solid waste landfill. On July 17, 2000, the dumpster was removed from the site and its contents disposed of at the Ontario County Solid Waste facility.

Additional site activities, such as decommissioning of the injection wells and repair of the flooring in the former dry cleaning building, will be completed upon determination by URS and the NYSDEC that those areas will not be impacted by future remediation activities.

3.0 RESULTS

3.1 Site Hydrogeology Summary

The site hydrogeology is discussed in detail in the Final Remedial Investigation Report (URS, 1993). Information from the RI report is summarized in the remainder of this section.

Figure 3-1 shows the location of a north-south geologic cross-section (A-A') extending through the treatment area, which includes the former dry cleaner building and the area immediately to its north. The cross-section itself is shown on Figure 3-2. As indicated, there are three stratigraphic units of interest in the treatment area:

> Fill: Fill occurs across the surface of the site to depths ranging typically from 4-5 feet below ground surface (bgs). The fill consists primarily of gravel, sand and silt. However, under the concrete-floored (east) part of the building, the fill extends to deeper depths (up to approximately 10 feet below the top of floor), and includes large stones, cobbles, wood, broken glass, and other debris. There are indications that a basement may have existed at one time beneath this section of the building, and that it may have been backfilled with the above miscellaneous debris before being covered by the present concrete floor. Perched water has been observed occasionally within this fill material at depths of up to 2 feet above the top of the underlying clayey silt.
>
> Clayey Silt: Clayey silt occurs beneath the fill material throughout the treatment area of the site. This unit consists of gray to brownish gray, soft to stiff, moist to wet, slightly plastic clayey silt with trace amounts of fine sand and/or gravel. It has a maximum thickness of approximately 10 feet in the area immediately north of the former dry cleaner building, but thins to several feet in the areas further to the north and beneath the concrete-floor section of the building, where it appears to have been excavated and replaced by fill. The unit has a low permeability and acts as an aquitard.

Silty Sand and Gravel: This unit underlies the clayey silt aquitard and consists of brown, loose to very dense, wet, silty sand and gravel, which is locally stratified. The base of the unit is relatively flat and lies approximately 18 to 23 feet below grade. The unit is relatively permeable. Although it is locally overlain by the semi-confining clayey silt, the silty sand and gravel unit is considered to be the water table aquifer at the site.

Groundwater flows in the uppermost (silty sand and gravel) aquifer in a north to northeast direction toward Seneca Lake, which is located approximately 400 feet north of the site treatment area. The typical hydraulic gradient within this aquifer is approximately 0.0015 feet/foot. Its hydraulic conductivity, as determined by slug tests performed during the RI, varies from approximately 3E-03 centimeters per second (cm/sec) to 3E-02 cm/sec (8.5 ft/day to 85 ft/day). Assuming a typical porosity (n) of 0.3 for this unit, the average particle flow velocity in the aquifer ranges from approximately 0.04 ft/day to 0.4 ft/day.

Based upon the previous RI slug test results for the only monitoring well screened entirely within the clayey silt unit (MW-6S), the hydraulic conductivity of this aquitard is approximately 4E-05 cm/sec.

In summary, the site stratigraphy and hydrogeology are non-homogeneous, especially in the treatment area underneath and north of the former dry cleaner building. Soil samples collected prior to and following in-situ chemical oxidation have been obtained from three representative depth ranges: (i) 0-4 feet bgs, representing unsaturated fill material; (ii) 4-6 feet bgs, representing the seasonally saturated (by perched water) interface zone between fill and the clayey silt aquitard; and (iii) greater than 6 feet, representing the clayey silt aquitard.

3.2 Confirmatory Soil Sampling Results

Confirmatory soil samples were collected during the period October 17-19, 2000. The results are presented on Table 3-1. As indicated, a total of 29 samples were collected and analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), including:

- 9 samples from 0-4 feet bgs (7 outside plus 2 underneath the former dry cleaning building)

- 13 samples from 4-6 feet bgs (10 outside plus 3 underneath the building)

- 7 samples from greater than 6 feet bgs (6 outside plus 1 underneath the building)

Table 3-1 provides the concentration of all detected VOCs, and also indicates (by circling) those compounds that occurred at concentrations exceeding their respective NYSDEC TAGM 4046 criteria. All data presented in Table 3-1 have been reviewed for usability, with the results presented in Appendix B.

As indicated by Table 3-1, the soil contaminants of concern remaining at the site as residual contamination are chlorinated organic compounds, specifically: tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene (total) (1,2-DCE), and vinyl chloride (VC). With the exception of a minor acetone exceedance in CB-8 (5-5.5 feet bgs), the above four compounds were the only ones that exceeded TAGM 4046 criteria in any of the soil samples. This result was expected, based on the site history and previous investigation results.

Figure 3-3 indicates the occurrence of residual (i.e., post-treatment) soil contamination by chlorinated organic compounds in the 0-4 foot depth range. Only 1 of the 9 samples from this depth range (CB-12, 1-4') indicated any exceedances. However, the concentration of PCE in this sample (430 milligrams per kilogram (mg/kg)) was over 100 times greater than the NYSDEC TAGM 4046 cleanup criterion. The sample location is outside the former dry cleaner building, approximately 5 feet east of a side doorway on the north side of the building. The sample is also located near three injection points used for the delivery of chemical reagents: IW-5, located approximately 7 feet to the west; IW-4, located approximately 4 feet to the east; and TP-5, approximately 5 feet to the south (Figure 2-7). The estimated area of residual contamination shown on Figure 3-3 is based upon confirmatory soil sampling results from this study, as well as soil sampling results from previous investigations that were used to delineate the extent of contamination prior to in-situ chemical oxidation.

Figure 3-4 indicates the occurrence of residual soil contamination in the 4-6 foot depth range, i.e., in the transition zone between fill and underlying clayey silt. Five (5) of the 13 soil samples from this depth range showed exceedances of TAGM 4046 criteria by one or more chlorinated VOCs. The highest levels of contamination occurred at CB-H, where PCE was detected at 3,400 mg/kg, TCE at 4.6 mg/kg, and 1,2-DCE at 3.5 mg/kg. This sample is located underneath the building and, like CB-12, approximately 5 feet east of the side entrance door. The nearest injection points to this location are I2W-3, approximately 10 feet to the east, I2W-2, approximately 6 feet to the south, and TP-5, approximately 5 feet to the north. The only other sample location at which chlorinated VOC concentrations exceeded 1 mg/kg was CB-5, where PCE was detected at 47 mg/kg and both TCE and 1,2-DCE were detected at 13 mg/kg. As indicated by Figure 3-4, the confirmatory soil sampling results at the 4-6 foot depth range indicate three discrete areas where concentrations exceed TAGM 4046 criteria.

Figure 3-5 indicates the occurrence of residual soil contamination at depths greater than 6 feet bgs. Five (5) of the 7 deeper soil samples showed one or more exceedances by chlorinated VOCs. All of these samples were collected from within the clayey silt unit. Contamination of these deeper soil samples generally occurred at lower concentrations but was more widely dispersed than at the 0-4' or 4-6' depth ranges. The maximum concentration of any single compound was 24 mg/kg (PCE at CB-6); but at least one compound exceeded 1 mg/kg at 4 separate locations. For this reason, the estimated extent of soil contamination above TAGM 4046 criteria shown on Figure 3-5 is larger than in the shallower depth zones. At the same time, however, the low permeability of the clayey silt would be expected to result in contamination patterns that are heterogeneous and difficult to treat, since the effective treatment radius around any injection well is very limited.

3.3 Groundwater Sampling Results

Groundwater samples were collected prior to, between and after the two in-situ chemical oxidation injection events. Table 3-2 presents the results for the pre-injection sampling; Table 3-3 for the between-injection sampling; and Table 3-4 for the post-injection sampling. For each round, chemical analyses were performed for VOCs, iron, total petroleum hydrocarbons (TPH), total dissolved solids (TDS) and total organic carbon (TOC). Results from each of the three-groundwater sampling rounds are discussed below.

During the pre-injection groundwater sampling round, performed during March 2000, groundwater samples were collected from 19 wells, including all of the 3 inside injection wells (I2W-1 through I2W-3), 8 outside injection wells (IW-1 through IW-8), and 2 existing monitoring wells used for injection (MW-3 and MW-5S). Based upon the results presented in Table 3-2, the following conclusions may be drawn regarding groundwater quality at the site prior to in-situ chemical oxidation:

- As during the 1993 RI groundwater sampling events, groundwater was contaminated above NYSDEC Class GA groundwater quality criteria, especially underneath and just north of the former dry cleaning building. (This area, where chemical oxidation reagents were injected, is referred to hereafter as the "treatment area.") Class GA criteria were exceeded for one or more VOCs in 15 of the 19 wells.

- Although iron also exceeded its Class GA criterion (300 µg/L) in 18 of the 19 samples, its frequency of occurrence and concentration were similar to those observed in 1993 background and onsite wells, indicating that this metal is probably not a site-related contaminant.

- The primary groundwater contaminants of concern were chlorinated VOCs, particularly PCE, TCE, 1,2-DCE and VC. The most contaminated well was IW-6, in which these compounds were detected at concentrations of 46,000 µg/L (PCE), 9,000 µg/L (TCE), 45,000 µg/L (1,2-DCE) and 5,000 µg/L (VC). This well is located outside the former dry cleaning building and approximately 2 feet west of the side door to the building (Figure 2-6). The concentration of chlorinated VOCs in other wells was much lower, typically less than 1,000 µg/L.

- Benzene, toluene, ethylbenzene and/or xylenes (BTEX) were also detected at concentrations exceeding their Class GA criteria in several wells. The occurrence of these compounds was sporadic and their concentrations were generally low except in MW-8S, where all four of the compounds exceeded criteria and were detected at their maximum concentrations. This well, located on the east side of the former bus garage, has historically been impacted by BTEX, which may be related to the underground petroleum storage tanks formerly located in this area.

- Monitoring wells to the north of (downgradient from) the treatment area (MW-2, MW-4, MW-7S, MW-9S) showed non-detect to very low levels of organic contamination, with the only exceedances of groundwater quality criteria being 1,2-DCE (at 6 µg/L) and benzene (at 7 µg/L) in MW-7S. These concentrations are generally lower than those measured in the same wells during the 1993 RI. This is best illustrated by MW-4, where three chlorinated VOCs (PCE, TCE and 1,2-DCE) exceeded Class GA criteria in both the January 1993 and April 1993 sampling events, but no chlorinated VOCs were detected in the pre-injection (March 2000) sampling round.

As part of the between-injection sampling, performed during June 2000, groundwater samples were collected from 10 monitoring wells: 3 within the treatment area (MW-3, MW-5S, MW-5D), and the rest downgradient from the treatment area (MW-7S, MW-8S, MW-9S, MW-11S, MW-11D, MW-12S, MW-20S). The results are presented in Table 3-3 and summarized below:

- Compared to the pre-injection sampling results, the 3 wells within the treatment area each showed a significant increase in both the number and concentration of organic contaminants detected, and also an increase in the concentration of iron, TDS and TOC. (The only exceptions were MW-5S, where the iron concentration decreased, and MW-5D, where the TOC concentration increased.) The cause for these increases is discussed in Appendix A. Briefly, during in-situ chemical oxidation, organic mass is desorbed from the soil phase into the aqueous phase as part of the overall treatment process. When desorption predominates over oxidation, incomplete oxidation may occur and result in increased concentrations of organics in groundwater. Also, increased iron and TDS concentrations in groundwater result due to their presence in the chemical oxidation reagents introduced through injection wells as part of the treatment process.

- The concentration of chlorinated VOCs also increased after the initial injection event in downgradient wells MW-7S, MW-8S and MW-9S. These wells, all located within 150 feet of the treatment area, appear to have been influenced by the oxidation process in the same way, but to a lesser degree, than the wells within the treatment area itself. It is noteworthy that, in MW-8S, the concentration of chlorinated organic compounds increased after the initial injection, but the concentration of BTEX did not. Since chlorinated organics (but not BTEX) are the contaminants of concern in the treatment area, this observation supports the previously stated conclusion that these chlorinated compounds may have been desorbed at a faster rate than they were oxidized during the initial injection, and resulted in increased groundwater concentrations of chlorinated VOCs.

- The remaining monitoring wells (MW-11S, MW-11D, MW-12S, MW-20S), which were not sampled prior to the initial injection event, each showed exceedances of Class GA groundwater criteria for at least one chlorinated organic compound. However, the concentrations of these compounds were generally similar to those observed during the 1993 groundwater sampling rounds. Also, contaminant concentrations in MW-12S were very low. This is the farthest downgradient well, located approximately 40 feet from Seneca Lake.

During the post-injection sampling round, performed in October 2000, 14 groundwater samples were collected, including 9 from within the treatment area and 5 from downgradient wells (MW-2, MW-4, MW-7S, MW-9S, MW-12S). The results are presented on Table 3-4 and discussed below:

- Comparing pre-injection versus post-injection concentrations of chlorinated VOCs within the treatment area, it appears that the increases noted in sample results between the two injection events (i.e., during the second groundwater sampling event) were short-lived, and that by the time of the post-injection sampling the concentrations had returned to approximately their pre-treatment levels. In 2 injection wells (IW-4, IW-6), the total chlorinated VOC concentrations decreased significantly from March 2000 to October 2000; in 1 injection well (IW-5) and 1 monitoring well (MW-5D), they increased significantly; and in the remaining 5 injection and monitoring wells, the pre- and post-injection concentrations were similar.

- Applying the same type of pre- versus post-injection comparison to downgradient wells, the concentration of chlorinated VOCs increased in MW-4 and MW-9S, and remained approximately the same in MW-2 and MW-7S. However, even in the two wells that showed an increase, the concentration of groundwater contaminants was relatively low, especially in comparison with groundwater concentrations within the treatment area. In the sample from MW-12S, the farthest downgradient well, no chlorinated or other VOCs were detected.

Overall, it is concluded that the desorption of organic mass within the treatment area during in-situ chemical oxidation caused a short-term increase in groundwater contaminant concentrations within the treatment area, and a lesser, but still significant, increase downgradient from the site. This effect has dissipated within the treatment area, and the concentration of groundwater contaminants after treatment has stabilized at levels similar to those occurring before treatment. Although post-injection contaminant levels in some of the downgradient wells still appear to be elevated relative to pre-injection conditions, the concentrations are generally low. At the furthest downgradient well (MW-12S), no organic compounds were detected during the post-injection sampling.

3.4 Evaluation of Contaminant Mass Removal in Soil

The effectiveness of in-situ chemical oxidation at the North Franklin Street site can be evaluated on the basis of contaminant mass removal from soil within the treatment area. As previously defined, the treatment area consists of the area beneath and immediately to the north of the former dry cleaner building. Although the treatment process has also influenced groundwater at and downgradient from the site, as discussed in the previous section, its primary impact has been the reduction of source area soil contamination. The following tables and figure illustrate the effect of treatment upon the mass of chlorinated organic compounds in onsite soils:

- Table 3-5 provides a detailed estimate of contaminant mass in onsite soils prior to in-situ chemical oxidation. The estimate is broken down by location (underneath the building versus outside), depth range (0-4' bgs, 4-6' bgs, >6' bgs), and specific contaminant (PCE, TCE, 1,2-DCE, VC). This table is essentially the same as Table 2 in *Evaluation and Conceptual Design for Additional Remedial Action* (URS, February 1999).

- Table 3-6 is a mirror image of Table 3-5, except that it indicates estimated contaminant mass in onsite soils following in-situ chemical oxidation.

- Table 3-7 combines the information in Tables 3-5 and 3-6 to show the contaminant mass reduction following treatment.

- Figure 3-6 presents the information from Table 3-7 in graphical form.

Comparison of Tables 3-5 and 3-6 demonstrates that the total mass of chlorinated organic compounds in onsite soils was reduced by approximately 79 percent following in-situ chemical oxidation, from approximately 367 pounds to 78 pounds. Most onsite soil contamination occurs as PCE, for which the total estimated mass was reduced from approximately 360 pounds to 76 pounds (79 percent).

3.5 Residual Soil Contamination

As discussed in the previous section, in-situ chemical oxidation has effectively removed most of the contaminant mass in onsite soils. The calculated residual soil contamination (78 pounds) occurs primarily beneath the former dry cleaning building at the 4-6 foot depth range (61 pounds), and outside the building at the 0-4 foot depth range (9 pounds).

As indicated by Table 3-7, the treatment process was effective in removing contaminant mass both outside and underneath the building at all depth intervals, with one exception. That exception is underneath the building in the 4-6 foot depth range, where the total mass of chlorinated organic compounds apparently *increased* from approximately 6 to 61 pounds. However, since the chemical oxidation process cannot create contamination, this apparent increase is actually the result of the limited number of soil samples collected from this depth interval beneath the building (3 samples) and the occurrence of very high contaminant concentrations in one of these samples. Specifically, the calculated mass increase at the 4-6 foot depth interval is driven by the results from confirmatory soil sample CB-H (4-6'), in which PCE was detected, at a concentration of 3,400 mg/kg.

The preceding discussion indicates the highly variable nature of subsurface contamination at the site, as reflected by the highly variable concentration of soil contaminants both before and after treatment. This variability decreases the precision with which soil contaminant mass reductions can be computed on a "before" versus "after" basis. Nevertheless, considering the number of samples on which these computations are based, and the weighted average computational method itself, it is clear that chemical oxidation has resulted in a significant soil contaminant mass reduction within the source area. At the same time, however, it is also clear that there do remain some areas with high levels of residual soil contamination. While in-situ chemical oxidation has proven effective at reducing contaminant mass on a sitewide basis, its ability to treat such discrete, high-concentration areas is doubtful, as discussed in the following section.

4.0 CONCLUSIONS AND RECOMMENDATIONS

In-situ chemical oxidation at the North Franklin Street site has significantly reduced the mass of chlorinated organic contaminants in onsite soils. The two injection events have reduced the total mass of chlorinated organic compounds by approximately 79 percent, from an estimated 367 pounds to 78 pounds. Despite this reduction, residual contaminant concentrations exceed NYSDEC TAGM 4046 criteria at many confirmatory sampling locations and depths. Also, there remain some localized areas where soil contamination levels are very high. Two such areas exist just to the east of the side (north) door of the former dry cleaning building: one outside the building at a depth of 0-4 feet bgs, and the other beneath the building at a depth of 4-6 feet bgs. In light of the site hydrogeology, we consider it likely that other small pockets with high levels of contamination may exist elsewhere beneath and outside the building. The ability to remediate these pockets of contamination by additional chemical oxidation injections is limited by the following factors:

- The depth of fill beneath the east (concrete floor) section of the building is greater than elsewhere on the site, and the fill includes large stones, cobbles, wood and other debris. This material is very heterogeneous and permeable, making it difficult to distribute in-situ treatment reagents effectively and uniformly throughout the contaminated zone. It is noteworthy that CB-H, from which the most highly contaminated confirmatory soil sample was collected, is located within 10 feet of three separate injection points.

- The very high concentrations of chlorinated organic compounds observed at CB-H may indicate the presence of pockets of dense non-aqueous phase liquid (DNAPL). In-situ chemical oxidation is generally not effective for the treatment of DNAPL, and many injection events might be required to reduce contaminant levels in DNAPL-impacted or other high-concentration areas to acceptable levels.

- The nature of the fill material under the east section of the building also makes it difficult to install a sufficient injection well network to provide uniform reagent distribution throughout the treatment zone. Two inside wells (I2W-2 and I2W-3) were installed through the concrete floor of the building. However, at five other drilling locations, refusal was encountered due to obstructions within the underlying fill material, and the holes had to be abandoned prior to well installation.

- Outside the building, the fill is shallower and less permeable. However, a significant mass of contamination (9 pounds) is estimated to remain in the shallow (0-4 foot) depth interval, including some locations such as CB-12 with high residual contaminant concentrations. Because this zone is unsaturated, a large volume of reagent would be necessary to provide artificial saturation over a sufficient area and for a sufficient time to insure uniform and effective reagent distribution.

Four different options have been considered to address residual soil contamination at the North Franklin Street site. They are discussed below.

<u>Option 1 – No Action:</u> The "no action" option, as well as Options 2 through 4, includes the following two passive measures: (a) deed restrictions; and (b) long-term groundwater monitoring.

- *Deed restrictions*: The presence of residual soil contamination at the site, including localized areas with relatively high contaminant concentrations, makes unrestricted future use of the site impractical without additional active remediation measures. Without such additional measures, deed restrictions will be required to prevent contact with and disturbance of residual soil contamination, which is concentrated in the upper 4 to 6 feet of the soil column. In addition, since contamination also occurs at greater depths (albeit it at generally lower concentrations), extending downward through the clay confining unit, restrictions will be necessary to prevent the installation of potable water supply wells at the site.

- *Groundwater monitoring*: Natural attenuation of groundwater contamination is occurring at the North Franklin Street site. In general, chlorinated organic solvent plumes have been documented to attenuate, to varying degrees, as a result of physical, chemical and biological processes occurring within the subsurface. On a site-specific basis, the occurrence of natural attenuation is indicated by: (a) the absence of contamination in the farthest downgradient monitoring well (MW-12S), and (b) the occurrence of PCE breakdown (daughter) products, specifically TCE, 1,2-DCE and vinyl chloride, in monitoring wells located at and downgradient from the site.

In addition to natural attenuation, the treatment measures that have been implemented at the site will reduce groundwater contaminant concentrations over time. The groundwater extraction and treatment system (GWET) that operated from 1996 to 1998, and the more recent (2000) in-situ chemical oxidation or source area soil contamination, have removed the majority of soil contaminant mass from within the source area. Nevertheless, at the present time, the concentration of chlorinated VOCs remain elevated above NYSDEC Class GA criteria in a number of wells at and downgradient from the site. Therefore, to insure that residual onsite contamination does not cause groundwater contamination at levels high enough to significantly impact Seneca Lake or other downgradient receptors, groundwater monitoring will be required.

<u>Option 2 – Continued In-Situ Chemical Oxidation:</u> In addition to deed restrictions and groundwater monitoring, Option 2 includes the continuation of in-situ treatment by chemical oxidation. The two in-situ chemical oxidation injections performed to date have effectively removed most of the contaminated soil mass from the site. In addition, although the short-term effects of chemical oxidation upon groundwater quality are not clearly evident, the source reduction will undoubtedly lead to improved groundwater quality over the long term. Among in-situ treatment technologies, chemical oxidation has been successful in terms of sitewide mass removal, and would be the recommended alternative if additional treatment were required. However, for the reasons discussed above, we consider it unlikely that additional treatment applications using chemical oxidation or any other in-situ technology will, within a practical time frame and cost, achieve sitewide compliance with TAGM criteria or assure that pockets with relatively high levels of contamination do not occur. For this reason, we consider it likely that, if institutional controls and/or measures to protect building occupants are found to be necessary now (i.e., given the residual contaminant levels occurring on the site at present), they will also be necessary after the performance of additional chemical oxidation injections.

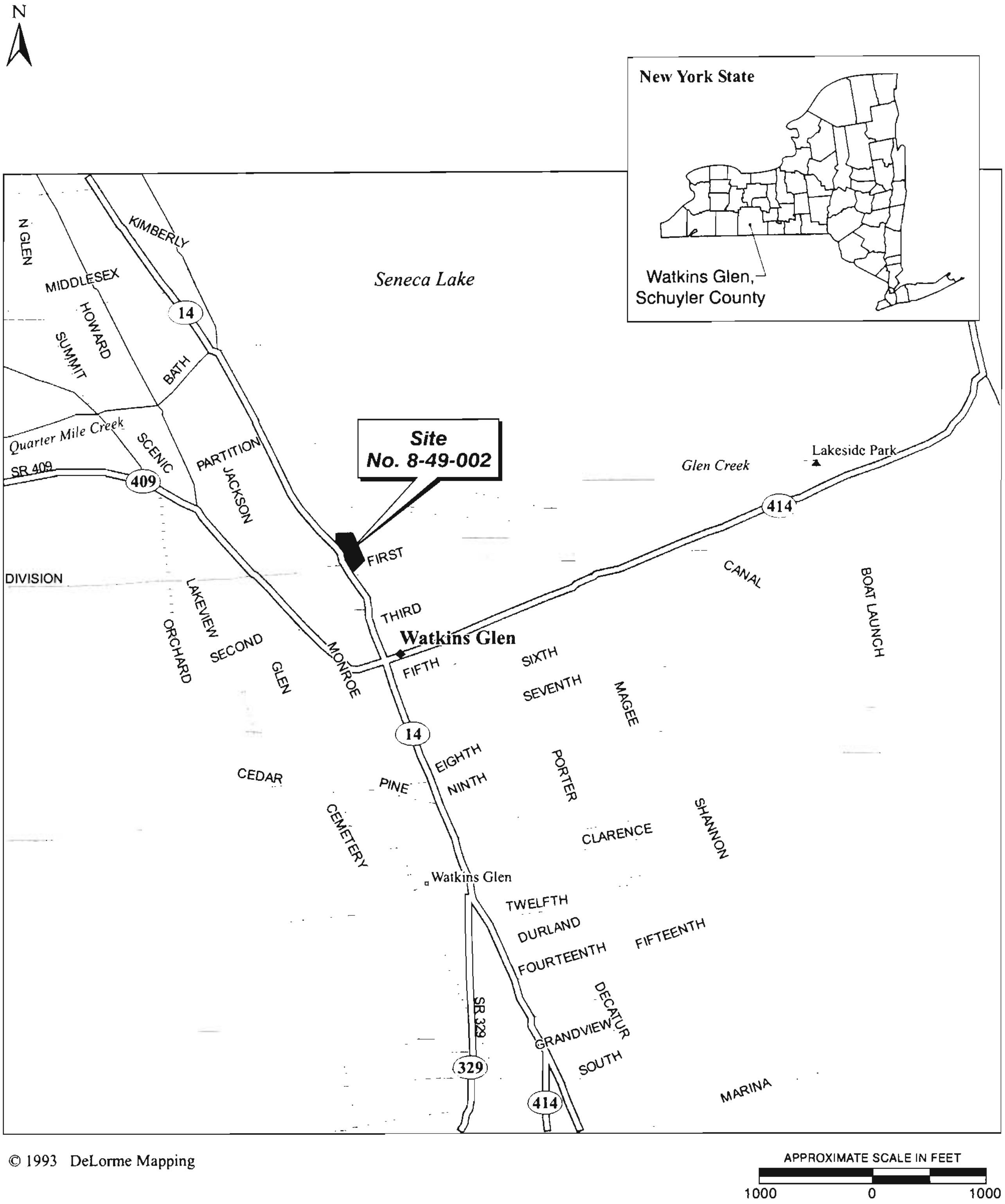
Option 3 – Building Demolition and Soil Excavation (As Required): In addition to deed restrictions and groundwater monitoring, Option 3 includes the demolition or partial demolition of the existing onsite building, and the excavation and offsite disposal of shallow contaminated soil adjacent to and beneath the building, as required. Almost 95 percent of the estimated residual onsite soil contaminant mass occurs within the 0-4 foot and 4-6 foot depth ranges (Table 3-6). The combined area in which soil contamination from these depth ranges exceeds TAGM 4046 criteria is only approximately 25 feet by 35 feet (Figures 3-3 and 3-4). Although excavation and offsite disposal of this contaminated soil is not practical with the former dry cleaning building in place, it would be the most complete, dependable and permanent remedy for the site if the building could be removed. However, if the existing building were removed, the need for and depth of contaminated soil excavation would depend upon the future use of the site. The deed restrictions associated with this option are intended in part to prevent future disturbance of and contact with residual soil contamination. If future use of the site does not require soil excavation (e.g., a paved parking lot), then excavation and removal of contaminated soil may not be necessary. On the other hand, if excavation for utilities and/or shallow foundations is a possibility, then removal of contamination from the shallow soil zone may be required. In any case, it is not considered practical to remove all soil contamination from the site, specifically the deeper contamination that permeates the clay layer. Therefore, a deed restriction prohibiting deep excavations and/or the construction of onsite potable water supply wells will be necessary in any case.

Option 4 – Passive Venting: In addition to deed restrictions and groundwater monitoring, Option 4 includes the installation of a passive venting system within the existing building, assuming that it remains at the site. A passive venting system could be constructed by installing slotted pipe beneath the floor of the former dry cleaning building, with discharge to the atmosphere via a roof vent. The preliminary layout and cost for such a system were provided in Evaluation and Conceptual Design for Additional Remedial Action (URS, February 1999).

Based upon the above discussion, and considering both the physical characteristics of the site and the occurrence of residual contamination, it is recommended that Option 3 (Building Demolition and Soil Excavation (As Required)) be implemented if practical, given the future use plans for the site. Otherwise, it is recommended that Option 4 (Passive Venting) be implemented. Both of these recommended options include deed restrictions and groundwater monitoring.

Although additional contaminant mass removals could undoubtedly be achieved by further treatment using chemical oxidation (Option 2), we do not see a clear and achievable end for such treatment, and feel that Option 4 would likely need to be implemented after additional treatment by chemical oxidation was completed. Furthermore, we do not recommend "no action" (Option 1) because of doubts concerning its long-term protectiveness.

FIGURES



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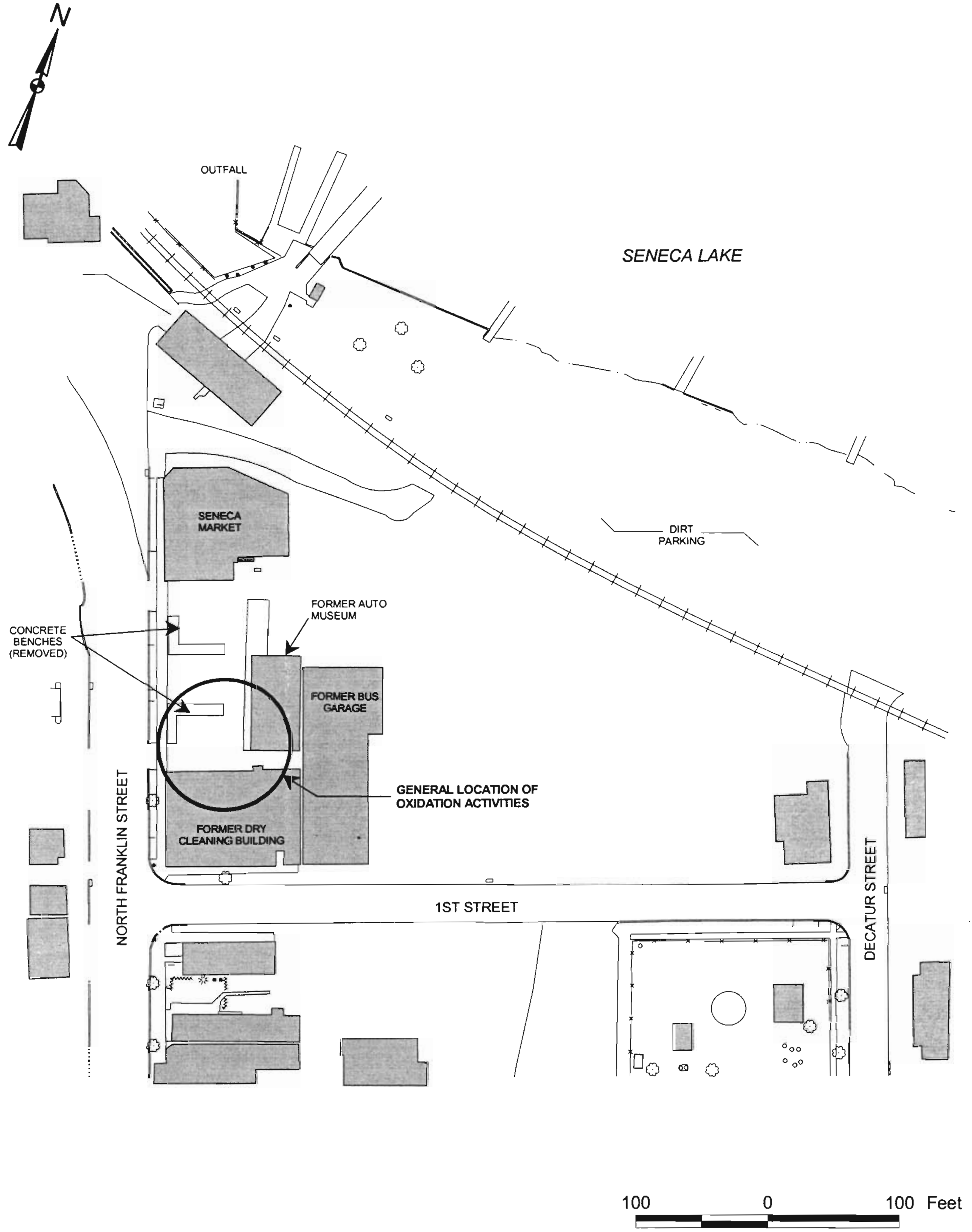
NORTH FRANKLIN STREET
SITE LOCATION MAP

FIGURE 1-1

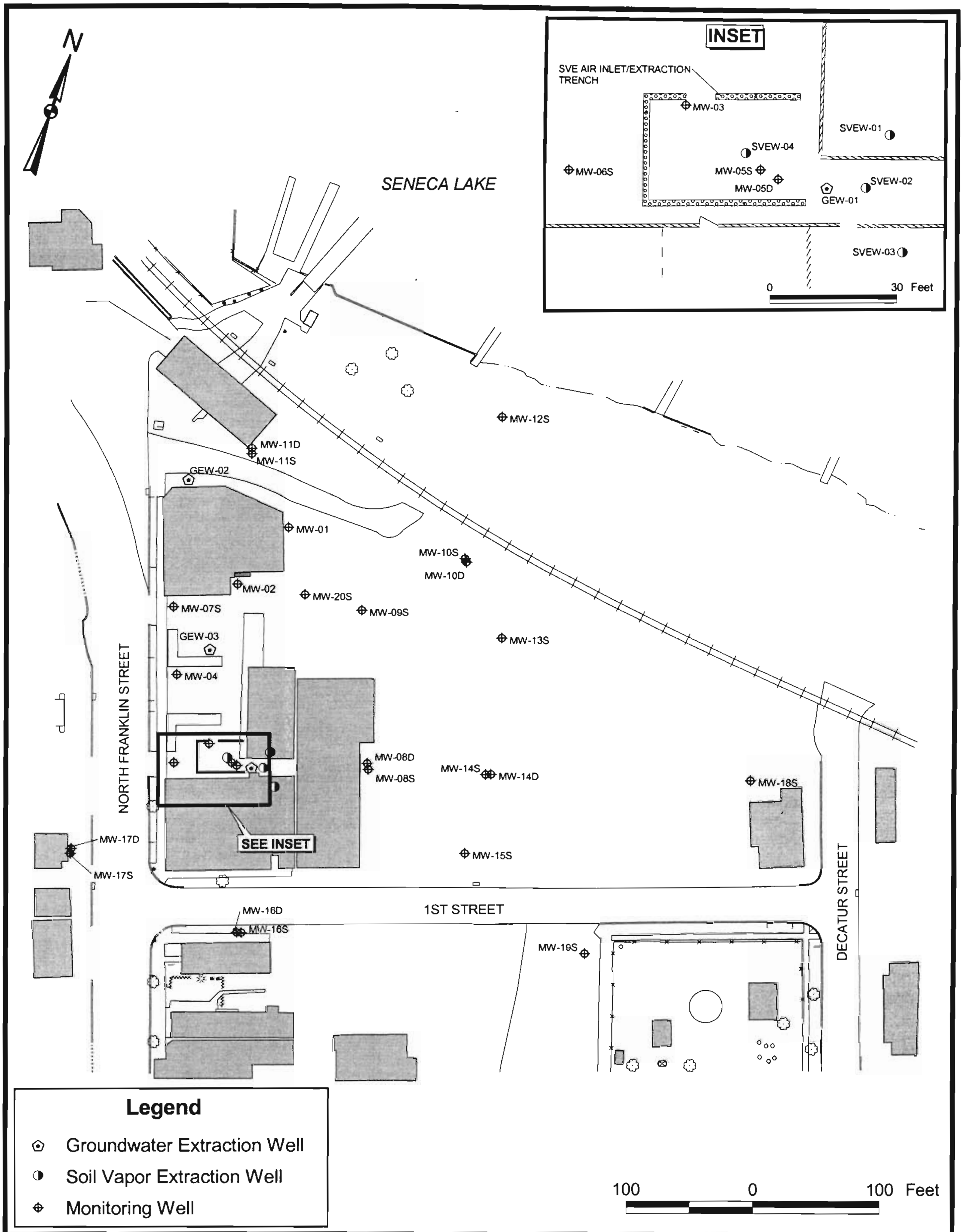


URS

NORTH FRANKLIN STREET
SITE PLAN

FIGURE 1-2

J:\35388\GIS\DEC2000\n_franklin.apr SITEPLAN
2/12/2001



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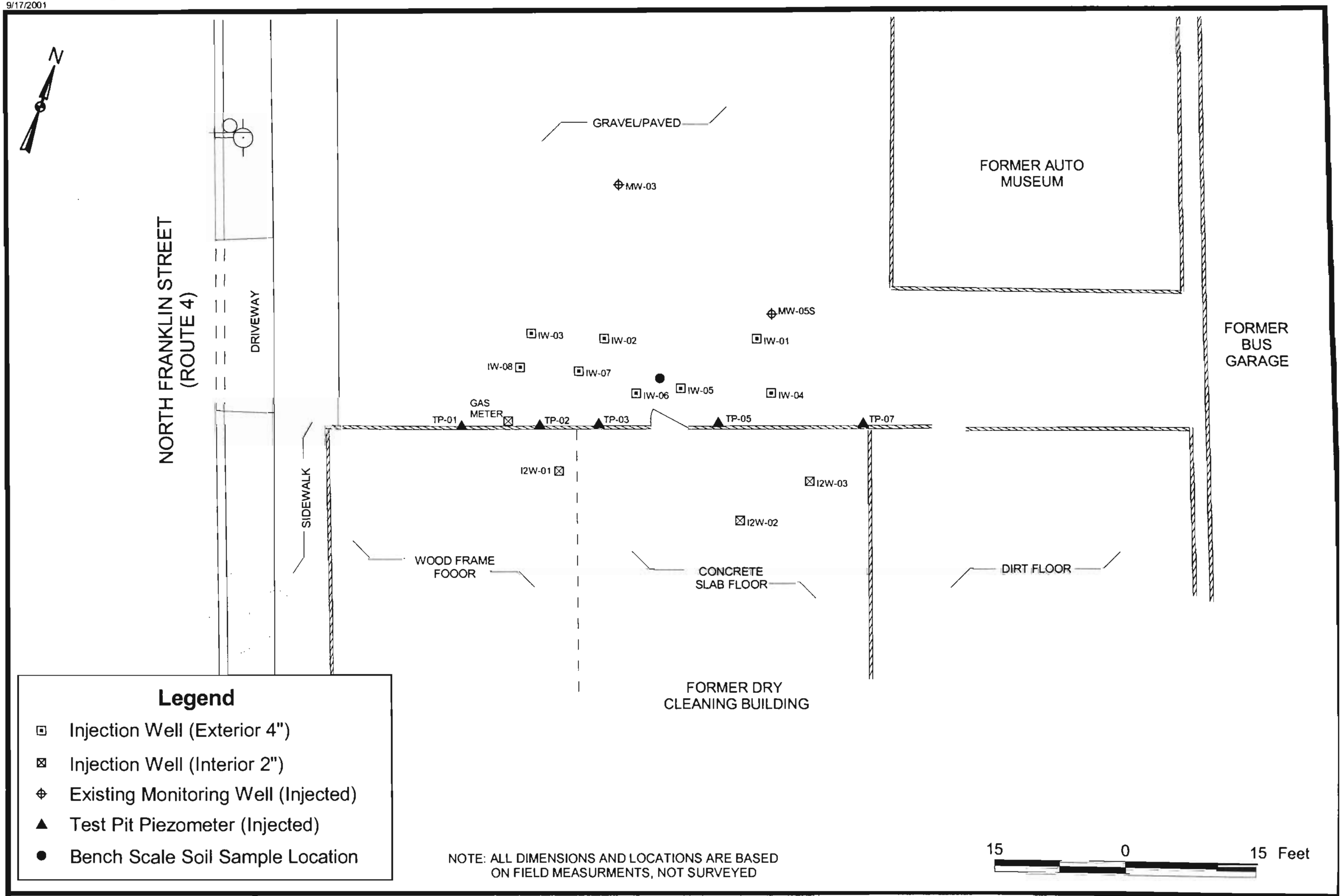
NORTH FRANKLIN STREET
PREVIOUS SITE REMEDIAL ACTIVITIES

FIGURE 1-3

J:\35388\GIS\DEC2000\n_franklin.apr PREVIOUS REMEDIAL ACTIVITIES
2/22/2001

J:\35388\GIS\DEC2000\n_franklin.apr INJECTION WELL LOCATIONS
9/17/2001



NOTE: ALL DIMENSIONS AND LOCATIONS ARE BASED ON FIELD MEASURMENTS, NOT SURVEYED

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NORTH FRANKLIN STREET
INJECTION WELL LOCATIONS

FIGURE 2-1

URS

NORTH FRANKLIN STREET
FIRST INJECTION EVENT - PHOTOGRAPH #1

FIGURE 2-2

URS

NORTH FRANKLIN STREET
FIRST INJECTION EVENT - PHOTOGRAPH #2

FIGURE 2-3

URS

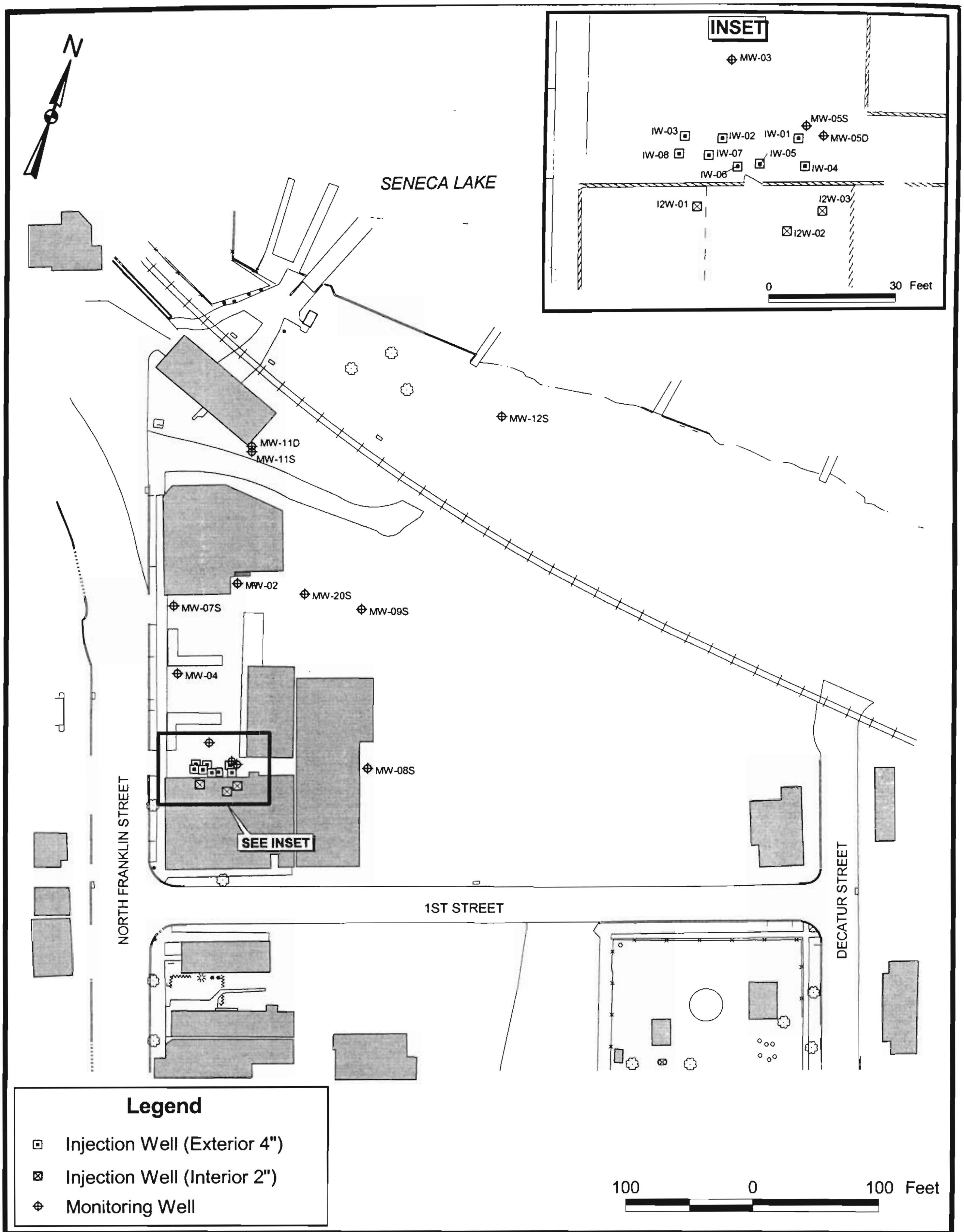
NORTH FRANKLIN STREET
FIRST INJECTION EVENT - PHOTOGRAPH #3

FIGURE 2-4

URS

NORTH FRANKLIN STREET
FIRST INJECTION EVENT - PHOTOGRAPH #4

FIGURE 2-5



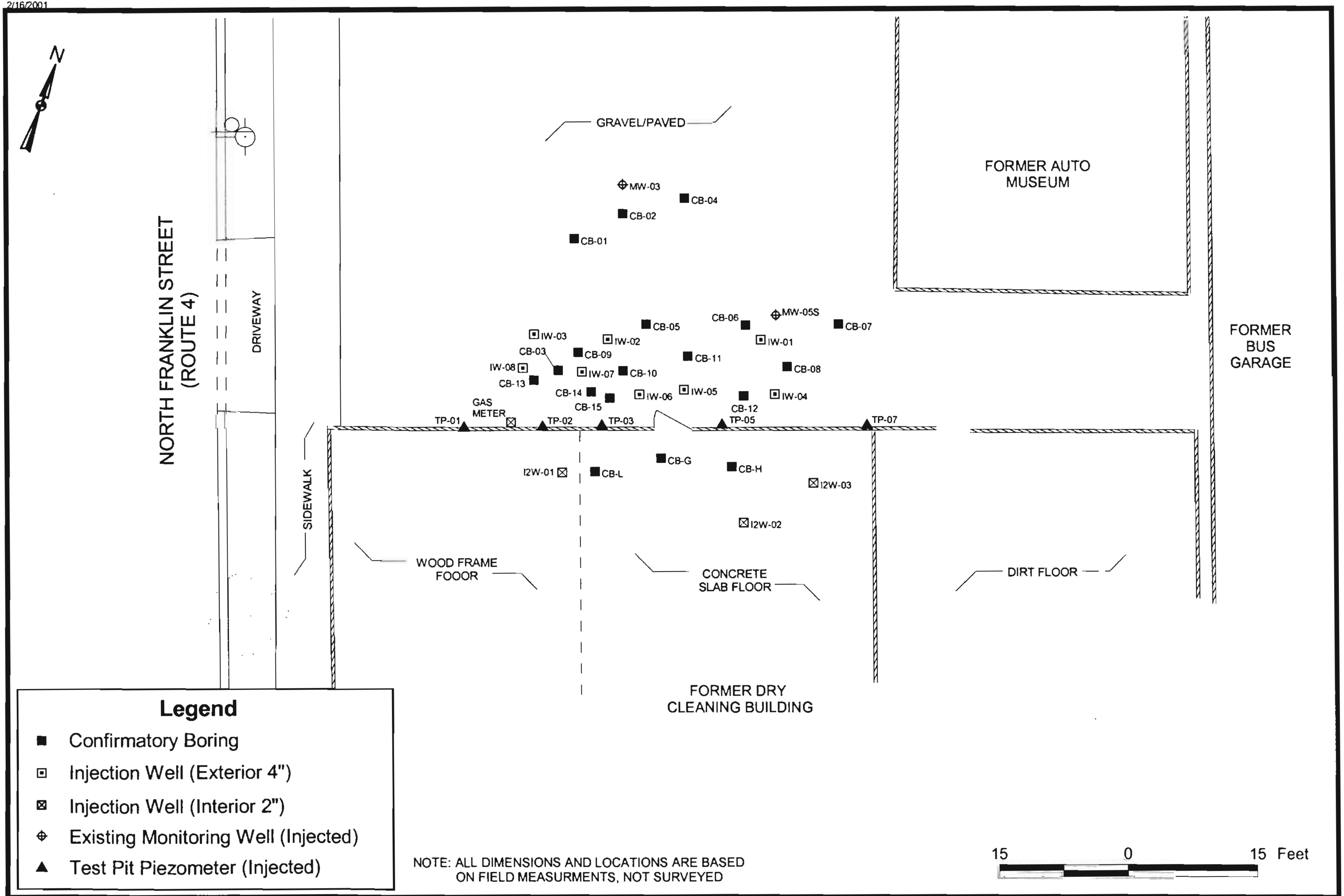
URS

NORTH FRANKLIN STREET
GROUNDWATER SAMPLING LOCATIONS

FIGURE 2-6

J:\35388\GIS\DEC2000\n_franklin.apr GROUNDWATER SAMPLING LOCATIONS
2/12/2001

J:\35388\GIS\DEC2000\n_franklin.apr CONFIRMATORY SAMPLING LOCATIONS
2/16/2001

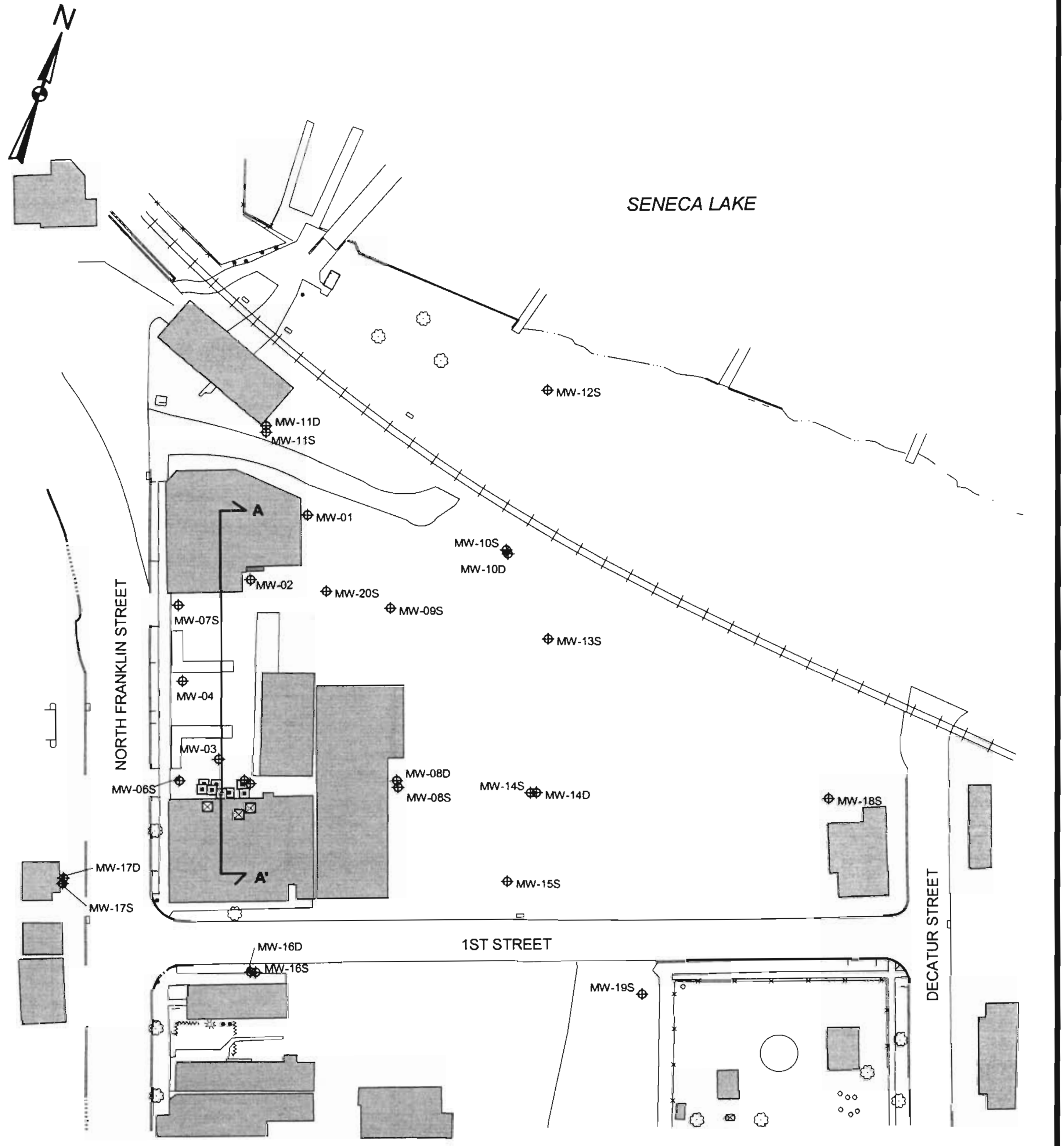


NOTE: ALL DIMENSIONS AND LOCATIONS ARE BASED ON FIELD MEASURMENTS, NOT SURVEYED

URS

NORTH FRANKLIN STREET
CONFIRMATORY SOIL SAMPLING LOCATIONS (2000)

FIGURE 2-7



Legend

⊡ Injection Well (Exterior 4")

☒ Injection Well (Interior 2")

⊕ Monitoring Well

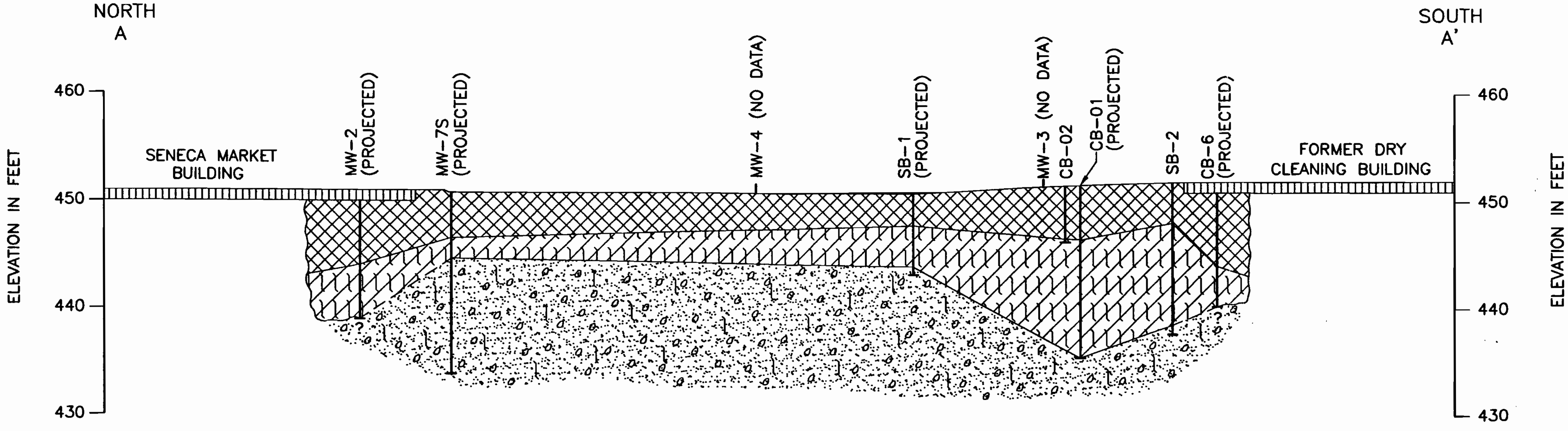
100 0 100 Feet

URS

NORTH FRANKLIN STREET
GEOLOGIC CROSS-SECTION LOCATION

FIGURE 3-1

J:\35388\GIS\DEC2000\n_franklin apr CROSS SECTION LOCATION
2/21/2001



LEGEND:

▨ FILL

▨ CLAYEY SILT

▨ SILTY SAND AND GRAVEL

10' 0 10'

VERTICAL SCALE: 1"= 10'

20' 0 20'

HORIZONTAL SCALE: 1"= 20'

GEOLOGIC CROSS-SECTION A-A'

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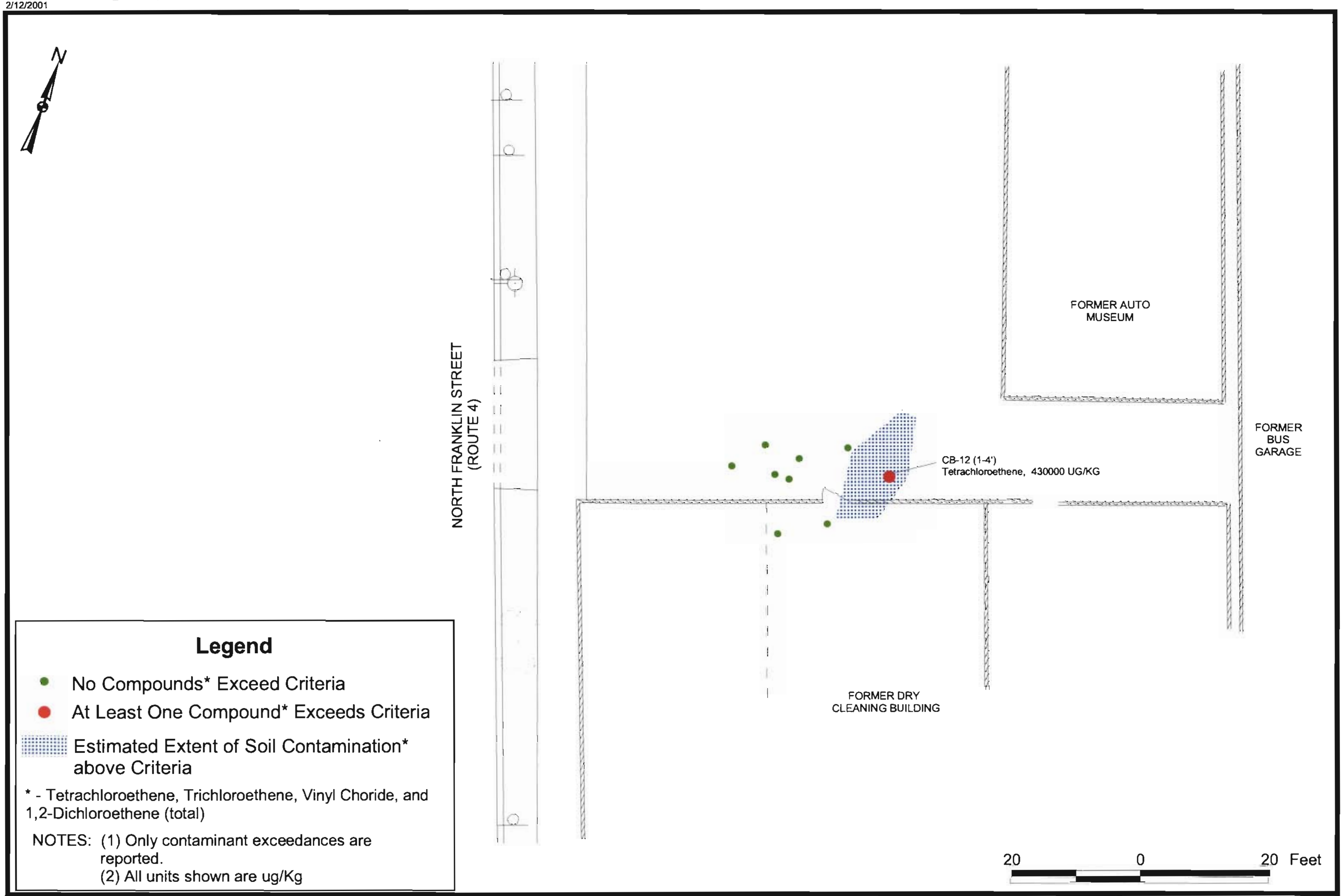
FIGURE 3-2

J:\35388\GIS\DEC2000\n_franklin.apr 0-4 SOIL EXCEEDANCES
2/12/2001



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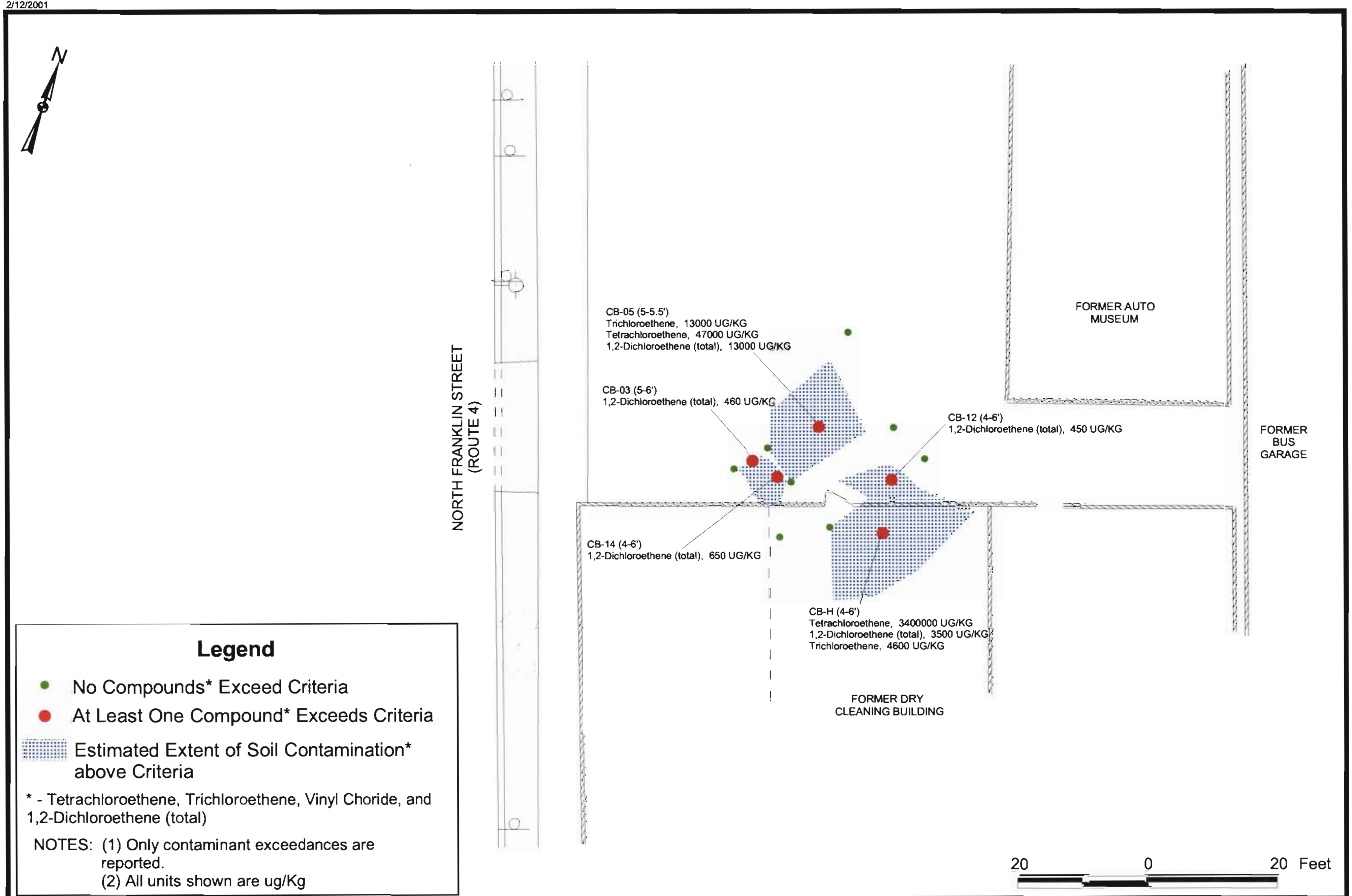
NORTH FRANKLIN STREET
RESIDUAL SOIL CONTAMINATION BY CHLORINATED ORGANIC COMPOUNDS (DEPTH: 0 - 4 FEET)

FIGURE 3-3

J:\35388\GIS\DEC2000\n_franklin.apr 4-6 SOIL EXCEEDANCES
2/12/2001



Legend

- ● No Compounds* Exceed Criteria
- 🟥 At Least One Compound* Exceeds Criteria
- ▨ Estimated Extent of Soil Contamination* above Criteria

* - Tetrachloroethene, Trichloroethene, Vinyl Choride, and 1,2-Dichloroethene (total)

NOTES: (1) Only contaminant exceedances are reported.
(2) All units shown are ug/Kg

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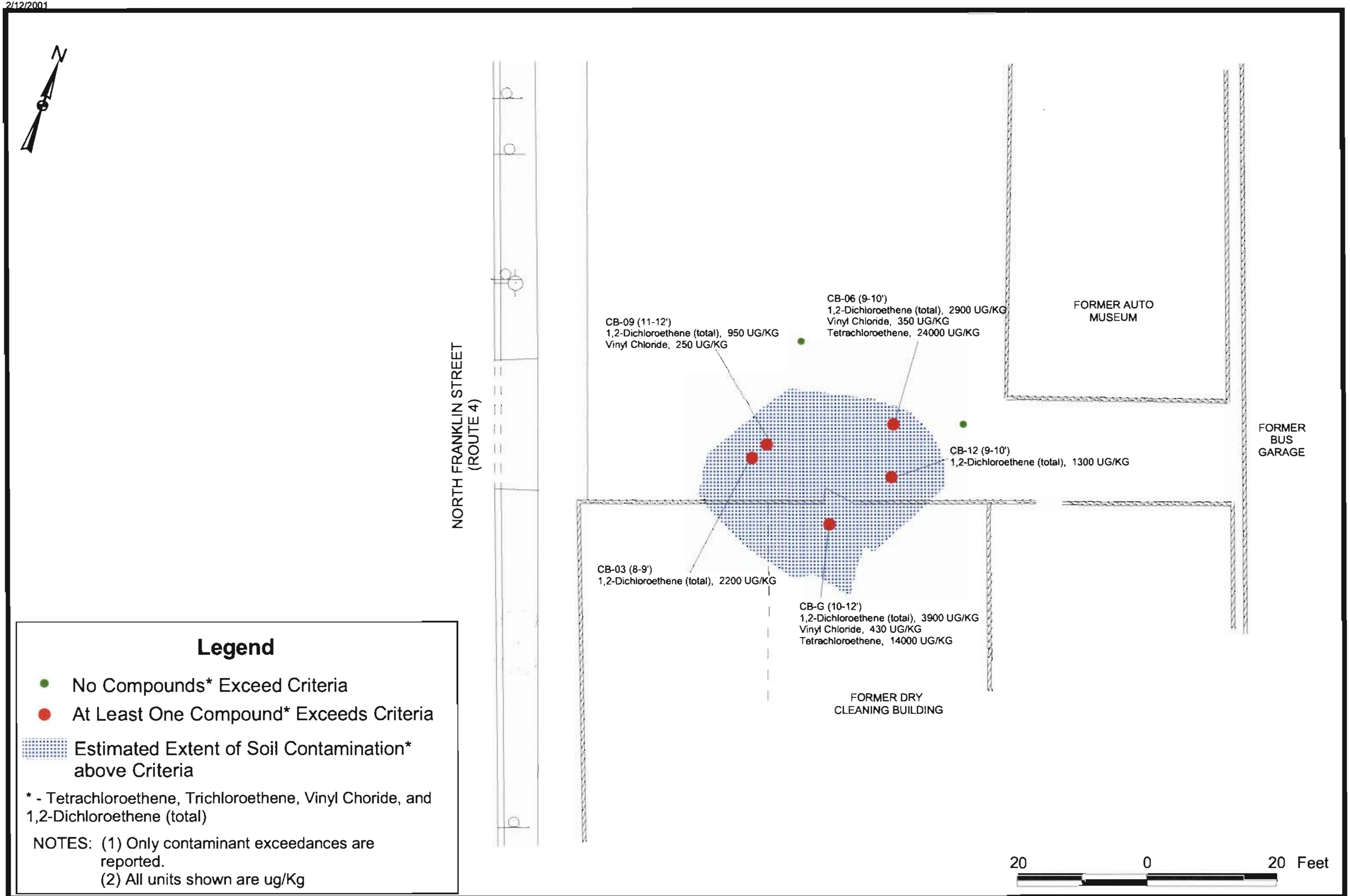
NORTH FRANKLIN STREET
RESIDUAL SOIL CONTAMINATION BY CHLORINATED ORGANIC
COMPOUNDS (DEPTH: 4 - 6 FEET)

FIGURE 3-4

J:\35388\GIS\DEC2000\n_franklin.apr > 6 SOIL EXCEEDANCES
2/12/2001



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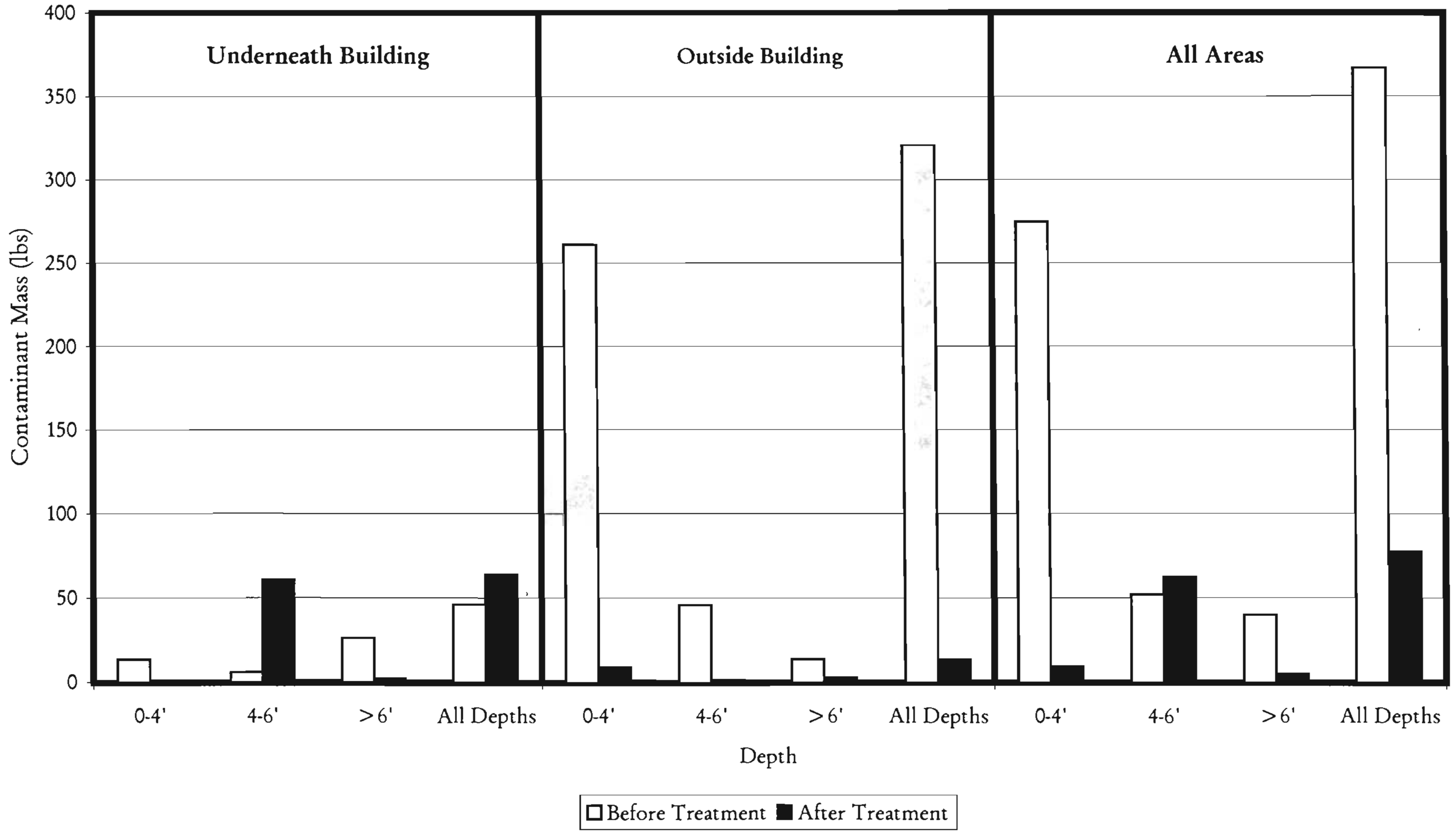
NORTH FRANKLIN STREET
RESIDUAL SOIL CONTAMINATION BY CHLORINATED ORGANIC
COMPOUNDS (DEPTH: > 6 FEET)

FIGURE 3-5

Figure 3-6

Contaminant Mass Reduction by Area and Depth Following In-Situ Chemical Oxidation



TABLES

Table 2-1

North Franklin Street Site
Injection Well Construction

Well Number	Diameter (inches)	Total Depth (feet)	Screen Range (ft)		Stratigraphy	Depth to Water (ft)	Date Measured
			From	To			
I2W-01	2	9	2.5	6	FILL: Sand, rocks, trash, rubber	3.34 TOC	10/19/00
I2W-02	2	7.5	1.5	6.5	FILL: Sand., rocks, trash	3.64 TOC	10/19/00
I2W-03	2	10	2.3	9.8	0-4: FIILL; 4-10: CLAY	3.66 TOC	10/19/00
IW-01	4	21	10.82	20.82	0-4: SAND; 4-21: Interbedded SAND and CLAY	5.96 TOC	10/19/00
IW-02	4	21.5	11.39	21.39	0-4: SAND; 4-21: Interbedded SAND and CLAY	5.85 TOC	10/19/00
IW-03	4	23.5	13.48	23.48	0-4: SAND; 4-23: Interbedded SAND and CLAY	5.51 TOC	10/19/00
IW-04	4	10	1.9	9.4	0-4: SAND; 4-10: CLAY	3.35 TOC	10/19/00
IW-05	4	10	1.46	9.06	0-4: SAND; 4-10: CLAY	3.11 TOC	10/19/00
IW-06	4	10	1.77	9.27	0-4: SAND; 4-10: CLAY	3.74 TOC	10/19/00
IW-07	4	10	1.48	9.08	0-4: SAND; 4-10: CLAY	3.38 TOC	10/19/00
IW-08	4	10	2.1	9.6	0-4: SAND; 4-10: CLAY	5.17 TOC	10/19/00
MW-03	2	15	4.3	14.3	0-4: SAND; 4-21: Interbedded SAND and CLAY	6.20 TOC	10/19/00
MW-05S	2	12.5	2.47	12.74	0-4: SAND; 4-21: Interbedded SAND and CLAY	6.43 TOC	10/19/00
TP-01	-	5.5	-	-	FILL: sand, some brick	4.8 BGS	06/24/98
TP-02	-	5.5	-	-	0-5 SAND, some silt; 5-5.5: CLAY	4.8 BGS	06/24/98
TP-03	-	5.5	-	-	SAND, some gravel	4.3 BGS	06/24/98
TP-04	-	4.2	-	-	FILL: Sand, some debris	4.3 BGS	06/24/98
TP-05	-	5	-	-	0-4: SAND, some silt, gravel; 4-5: CLAY	4.8 BGS	06/24/98

J:\35388\EXCEL\[NORTH FRANKLIN WELL DATA.xls]Sheet1

TABLE 2-2
SUMMARY OF INDOOR AIR MONITORING RESULTS
NORTH FRANKLIN ST. SITE

Location ID		**8 HR AIR**	**INDOOR-AIR#1**
Sample ID		**8 HR AIR**	**INDOOR-AIR#1**
Matrix		**Ambient Air**	**Ambient Air**
Depth Interval (ft.)		**-**	**-**
Date Sampled		**06/30/00**	**05/16/00**
Parameter	**Units**		
Volatiles			
Vinyl Chloride	PPBV	1.8	
Methylene Chloride	PPBV	1.3	
Acetone	PPBV	24	11
2-Butanone	PPBV		8.4
Trichloroethene	PPBV	1.8	
Tetrachloroethene	PPBV	130	1.3
Toluene	PPBV	5.3	1.0
m,p-Xylene	PPBV	0.98	
cis-1,2-Dichloroethene	PPBV	2.1	
2-Propanol	PPBV	16	
Ethanol	PPBV	8.3	5.4
Propylene	PPBV	22	
Tetrahydrofuran	PPBV		4.2
Freon 12	PPBV	0.89	

Only Detected Results Reported.

Table 2-3

North Franklin Street
In-Situ Oxidation Pilot Study
Summary of Groundwater Monitoring Data Collected

Well Identification	Sampling Event		
	Pre-Injection	Between Injections	Post-Injection
I2W-1	X		X
I2W-2	X		X
I2W-3	X		X
IW-1	X		
IW-2	X		
IW-3	X		
IW-4	X		X
IW-5	X		X
IW-6	X		X
IW-7	X		
IW-8	X		
MW-2	X		X
MW-3	X	X	X
MW-4	X		X
MW-5S	X	X	X
MW-5D	X	X	X
MW-7S	X	X	X
MW-8S	X	X	
MW-9S	X	X	X
MW-11S		X	
MW-11D		X	
MW-12S		X	X
MW-20S		X	

Notes:

(1) Pre-injection samples collected on 3/16/00 (monitoring wells) and 5/11/00 through 5/12/00 (injection wells).

(2) Between injection samples collected on 6/23/00 through 6/26/00.

(3) Post-injection samples collected on 10/18/00 through 10/20/00.

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			**CB-02**	**CB-03**	**CB-03**	**CB-04**	**CB-05**
Sample ID			**CB-2 (7-8)**	**CB-3 (5-6)**	**CB-3 (8-9)**	**CB-4 (5-5.5)**	**CB-5 (5-5.5)**
Matrix			**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Depth Interval (ft.)			**7.0-8.0**	**5.0-6.0**	**8.0-9.0**	**5.0-5.5**	**5.0-5.5**
Date Sampled			**10/17/00**	**10/17/00**	**10/17/00**	**10/17/00**	**10/17/00**
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/KG	200	7	8	43		25
Methylene Chloride	UG/KG	100					
Acetone	UG/KG	200	27	150	100		110
Carbon Disulfide	UG/KG	2700		2	2		7
1,1-Dichloroethene	UG/KG	400			5		5
2-Butanone	UG/KG	300					
Chloroform	UG/KG	300				3	
1,2-Dichloroethene (total)	UG/KG	300 *	17	460	2200	22	13000
Bromodichloromethane	UG/KG	-				3	
Trichloroethene	UG/KG	700	4		4	10	13000
Benzene	UG/KG	60					3
Dibromochloromethane	UG/KG	-					
Tetrachloroethene	UG/KG	1400			76	45	47000
Toluene	UG/KG	1500					5
Ethylbenzene	UG/KG	5500			35		4
Xylene (Total)	UG/KG	1200	51	23	180		52

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			**CB-06**	**CB-06**	**CB-07**	**CB-08**	**CB-09**
Sample ID			**CB-6 (5-5.5)**	**CB-6 (9-10)**	**CB-7 (8-9)**	**CB-8 (5-5.5)**	**CB-9 (2-4)**
Matrix			**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Depth Interval (ft.)			**5.0-5.5**	**9.0-10.0**	**8.0-9.0**	**5.0-5.5**	**2.0-4.0**
Date Sampled			**10/17/00**	**10/17/00**	**10/17/00**	**10/17/00**	**10/18/00**
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/KG	200	150	350		5	
Methylene Chloride	UG/KG	100					
Acetone	UG/KG	200	92	31	29	260	15
Carbon Disulfide	UG/KG	2700	3		2	5	
1,1-Dichloroethene	UG/KG	400					
2-Butanone	UG/KG	300	32		7	81	
Chloroform	UG/KG	300					
1,2-Dichloroethene (total)	UG/KG	300 *	82	2900		8	13
Bromodichloromethane	UG/KG	-					
Trichloroethene	UG/KG	700	58	120			3
Benzene	UG/KG	60					
Dibromochloromethane	UG/KG	-					
Tetrachloroethene	UG/KG	1400	170	24000			
Toluene	UG/KG	1500		54			
Ethylbenzene	UG/KG	5500		4			
Xylene (Total)	UG/KG	1200	22	440		7	

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			CB-09	CB-09	CB-10	CB-11	CB-12
Sample ID			CB-9 (4-6)	CB-9 (11-12)	CB-10 (0-4)	CB-11 (1-4)	CB-12 (1-4)
Matrix			Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)			4.0-6.0	11.0-12.0	0.0-4.0	1.0-4.0	1.0-4.0
Date Sampled			10/18/00	10/18/00	10/18/00	10/18/00	10/18/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/KG	200		250			
Methylene Chloride	UG/KG	100			98	63	48
Acetone	UG/KG	200	30	140			3
Carbon Disulfide	UG/KG	2700					
1,1-Dichloroethene	UG/KG	400					
2-Butanone	UG/KG	300	6				
Chloroform	UG/KG	300					
1,2-Dichloroethene (total)	UG/KG	300 *	3	950	28	38	4
Bromodichloromethane	UG/KG	-					
Trichloroethene	UG/KG	700			14	19	3
Benzene	UG/KG	60		5			
Dibromochloromethane	UG/KG	-					
Tetrachloroethene	UG/KG	1400			720	670	430000
Toluene	UG/KG	1500		5			
Ethylbenzene	UG/KG	5500		26			
Xylene (Total)	UG/KG	1200		670			

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

Advanced Selection: SO_OCT-00
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[MATRIX] = 'SO' AND [LOGDATE] >= #10/17/00#

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			CB-12	CB-12	CB-13	CB-13	CB-14
Sample ID			CB-12 (4-6)	CB-12 (9-10)	CB-13 (0-4)	CB-13 (4-6)	CB-14 (0-4)
Matrix			Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)			4.0-6.0	9.0-10.0	0.0-4.0	4.0-6.0	0.0-4.0
Date Sampled			10/18/00	10/18/00	10/19/00	10/19/00	10/19/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/KG	200	3	65		6	
Methylene Chloride	UG/KG	100	46				
Acetone	UG/KG	200	24	31		63	
Carbon Disulfide	UG/KG	2700		1			
1,1-Dichloroethene	UG/KG	400		7			
2-Butanone	UG/KG	300	7	10			
Chloroform	UG/KG	300					
1,2-Dichloroethene (total)	UG/KG	300 *	450	1300	9	250	6
Bromodichloromethane	UG/KG	-					
Trichloroethene	UG/KG	700	60		4	3	4
Benzene	UG/KG	60					
Dibromochloromethane	UG/KG	-					
Tetrachloroethene	UG/KG	1400	1400	18	160	39	150
Toluene	UG/KG	1500		3			
Ethylbenzene	UG/KG	5500		8		2	
Xylene (Total)	UG/KG	1200	16	310		10	

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			CB-14	CB-15	CB-15	CB-G	CB-G
Sample ID			CB-14 (4-6)	CB-15 (0-4)	CB-15 (4-6)	CB-G (0-4)	CB-G (4-6)
Matrix			Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)			4.0-6.0	0.0-4.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled			10/19/00	10/19/00	10/19/00	10/18/00	10/18/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/KG	200	4		5		3
Methylene Chloride	UG/KG	100					
Acetone	UG/KG	200	70	5	5	5	4
Carbon Disulfide	UG/KG	2700	2				2
1,1-Dichloroethene	UG/KG	400					
2-Butanone	UG/KG	300				1	
Chloroform	UG/KG	300				3	
1,2-Dichloroethene (total)	UG/KG	300 *	650	9	160		31
Bromodichloromethane	UG/KG	-				3	
Trichloroethene	UG/KG	700	51	6	86		4
Benzene	UG/KG	60	3				
Dibromochloromethane	UG/KG	-				2	
Tetrachloroethene	UG/KG	1400	250	220	450	28	160
Toluene	UG/KG	1500	2				
Ethylbenzene	UG/KG	5500	4				
Xylene (Total)	UG/KG	1200	14				

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

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[MATRIX] = 'SO' AND [LOGDATE] >= #10/17/00#

TABLE 3-1
CONFIRMATORY SOIL SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			CB-G	CB-H	CB-L	CB-L
Sample ID			CB-G (10-12)	CB-H (4-6)	CB-L (0-4)	CB-L (4-6)
Matrix			Soil	Soil	Soil	Soil
Depth Interval (ft.)			10.0-12.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled			10/18/00	10/18/00	10/18/00	10/18/00
Parameter	Units	Criteria*				
Volatiles						
Vinyl Chloride	UG/KG	200	430	120		
Methylene Chloride	UG/KG	100				
Acetone	UG/KG	200	19	59		6
Carbon Disulfide	UG/KG	2700	5	3		
1,1-Dichloroethene	UG/KG	400	4	23		
2-Butanone	UG/KG	300	5	17		
Chloroform	UG/KG	300				
1,2-Dichloroethene (total)	UG/KG	300 *	3900	3500	45	
Bromodichloromethane	UG/KG	-				
Trichloroethene	UG/KG	700	190	4600	31	
Benzene	UG/KG	60				
Dibromochloromethane	UG/KG	-				
Tetrachloroethene	UG/KG	1400	14000	3400000	320	
Toluene	UG/KG	1500		20		
Ethylbenzene	UG/KG	5500		8		
Xylene (Total)	UG/KG	1200	9	56		

Criteria- NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994 (Revised).

⬭ Concentration Exceeds Criteria.

*- Criteria is for 1,2-Dichloroethene (trans).

Only Detected Results Reported.

TABLE 3-2
PRE-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			I2W-01	I2W-02	I2W-03	IW-01	IW-02
Sample ID			I2W-1	I2W-2	I2W-3	IW-1	IW-2
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			05/12/00	05/12/00	05/12/00	05/11/00	05/11/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2	48	25		25	19
Methylene Chloride	UG/L	5					
Acetone	UG/L	50		4	13		
1,1-Dichloroethene	UG/L	5					
2-Butanone	UG/L	50			3		
1,2-Dichloroethane	UG/L	0.6					
1,2-Dichloroethene (total)	UG/L	5	130	39	2	140	110
Trichloroethene	UG/L	5	25	8	5	61	110
Benzene	UG/L	1					
4-Methyl-2-Pentanone	UG/L	-					
Tetrachloroethene	UG/L	5	200			270	730
Toluene	UG/L	5					
Ethylbenzene	UG/L	5			4		
Xylene (total)	UG/L	5			79	1	3
Metals							
Iron	UG/L	300	14500	14300	24100	1340	820
Miscellaneous Parameters							
Petroleum Hydrocarbons	MG/L	-		NA	10.0		
Total Dissolved Solids	MG/L	-	420	651	618	1180	963
Total Organic Carbon	MG/L	-	12.4	8.5	49.4	2.2	2.5

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP*' AND [LOGDATE] <= #5/12/00#

TABLE 3-2
PRE-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			IW-03	IW-04	IW-05	IW-06	IW-07
Sample ID			IW-3	IW-4	IW-5	IW-6	IW-7
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			05/11/00	05/11/00	05/11/00	05/11/00	05/11/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2		730	2	5000	8
Methylene Chloride	UG/L	5				3	
Acetone	UG/L	50		2		4	2
1,1-Dichloroethene	UG/L	5		3		110	
2-Butanone	UG/L	50					
1,2-Dichloroethane	UG/L	0.6				1	
1,2-Dichloroethene (total)	UG/L	5	1	1400	270	45000	400
Trichloroethene	UG/L	5		4	140	9000	44
Benzene	UG/L	1				2	
4-Methyl-2-Pentanone	UG/L	-				2	
Tetrachloroethene	UG/L	5		32	1000	46000	600
Toluene	UG/L	5				3	
Ethylbenzene	UG/L	5				4	
Xylene (total)	UG/L	5		10		39	
Metals							
Iron	UG/L	300	1080	25300	92.2	2200	4480
Miscellaneous Parameters							
Petroleum Hydrocarbons	MG/L	-					
Total Dissolved Solids	MG/L	-	723	362	252	638	257
Total Organic Carbon	MG/L	-	4.0	4.5	4.2	13.9	5.6

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-2
PRE-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			IW-08	MW-02	MW-03	MW-04	MW-05D
Sample ID			IW-8	MW-2S	MW-3	MW-4S	MW-5D
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			05/11/00	03/16/00	03/16/00	03/16/00	03/16/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2	24		17		
Methylene Chloride	UG/L	5					
Acetone	UG/L	50	2			3	2
1,1-Dichloroethene	UG/L	5			1		
2-Butanone	UG/L	50	1				
1,2-Dichloroethane	UG/L	0.6					
1,2-Dichloroethene (total)	UG/L	5	150		1900		16
Trichloroethene	UG/L	5	16		83		
Benzene	UG/L	1	1				
4-Methyl-2-Pentanone	UG/L	-					
Tetrachloroethene	UG/L	5	400		77		
Toluene	UG/L	5					
Ethylbenzene	UG/L	5	7				
Xylene (total)	UG/L	5	42				
Metals							
Iron	UG/L	300	3600	1420	5990	12400	1450
Miscellaneous Parameters							
Petroleum Hydrocarbons	MG/L	-					
Total Dissolved Solids	MG/L	-	705	440	521	1000	1670
Total Organic Carbon	MG/L	-	7.9	3.7	6.0	12.5	7.5

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-2
PRE-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			MW-05S	MW-07S	MW-08S	MW-09S
Sample ID			MW-5S	MW-7S	MW-8S	MW-9S
Matrix			Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-
Date Sampled			03/16/00	03/16/00	03/16/00	03/16/00
Parameter	**Units**	**Criteria***				
Volatiles						
Vinyl Chloride	UG/L	2	560	1		
Methylene Chloride	UG/L	5				
Acetone	UG/L	50				
1,1-Dichloroethene	UG/L	5	2			
2-Butanone	UG/L	50				
1,2-Dichloroethane	UG/L	0.6				
1,2-Dichloroethene (total)	UG/L	5	1400	6		
Trichloroethene	UG/L	5	33			
Benzene	UG/L	1		7	33	
4-Methyl-2-Pentanone	UG/L	-				
Tetrachloroethene	UG/L	5	120			1
Toluene	UG/L	5			6	
Ethylbenzene	UG/L	5			260	
Xylene (total)	UG/L	5			660	
Metals						
Iron	UG/L	300	12300	13700	31500	7990
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	-			4.4	
Total Dissolved Solids	MG/L	-	536	1180	996	917
Total Organic Carbon	MG/L	-	7.3	9.5	20.8	1.6

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-3
BETWEEN INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			MW-03	MW-05D	MW-05S	MW-07S	MW-08S
Sample ID			MW-3	MW-5D	MW-5S	MW-7S	MW-8S
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			06/23/00	06/23/00	06/23/00	06/23/00	06/23/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2	420	110	740	3	
Acetone	UG/L	50	24				
Carbon Disulfide	UG/L	60	29		8		
1,1-Dichloroethene	UG/L	5	13	4	11		
1,2-Dichloroethane	UG/L	0.6					
1,2-Dichloroethene (total)	UG/L	5	5500	680	4700	36	47
Trichloroethene	UG/L	5	200	1200	580	4	7
Benzene	UG/L	1	2			11	10
Tetrachloroethene	UG/L	5	83	3900	4500	5	20
Toluene	UG/L	5		1		2	3
Ethylbenzene	UG/L	5					140
Xylene (total)	UG/L	5	6		6		320
Metals							
Iron	UG/L	300	24200	3350	8930	15600	38200
Miscellaneous Parameters							
Total Dissolved Solids	MG/L	-	852	7460	1130	903	1930
Total Organic Carbon	MG/L	-	36.6	4.2	18.6	8.0	7.7

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-3
BETWEEN INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			MW-09S	MW-11D	MW-11S	MW-12S	MW-20S
Sample ID			MW-9S	MW-11D	MW-11S	MW-12S	MW-20S
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			06/26/00	06/26/00	06/26/00	06/26/00	06/26/00
Parameter	Units	Criteria*					
Volatiles							
Vinyl Chloride	UG/L	2			14		41
Acetone	UG/L	50					
Carbon Disulfide	UG/L	60					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethane	UG/L	0.6				10	
1,2-Dichloroethene (total)	UG/L	5	4	2	150	1	370
Trichloroethene	UG/L	5	2	1	26		52
Benzene	UG/L	1					
Tetrachloroethene	UG/L	5	8	6	200	3	150
Toluene	UG/L	5	2			2	2
Ethylbenzene	UG/L	5					
Xylene (total)	UG/L	5					
Metals							
Iron	UG/L	300	73300	31800	20500	14000	8190
Miscellaneous Parameters							
Total Dissolved Solids	MG/L	-	920	10500	1220	1910	747
Total Organic Carbon	MG/L	-	2.1	5.5	2.2	1.3	3.8

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

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[MATRIX] = 'WG' AND [LOCID] NOT LIKE "DUMP*" AND [LOGDATE] BETWEEN #06/01/00# AND #07/01/00#

TABLE 3-4
POST-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			I2W-01	I2W-02	I2W-03	IW-04	IW-05
Sample ID			I2W-1	I2W-2	I2W-3	IW-4	IW-5
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			10/18/00	10/18/00	10/18/00	10/19/00	10/19/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2	130	10	3	14	17
Acetone	UG/L	50	9	2	18		
1,1-Dichloroethene	UG/L	5					2
2-Butanone	UG/L	50			4		
1,2-Dichloroethene (total)	UG/L	5	230	36	16	48	2500
Trichloroethene	UG/L	5	19	11	2	30	220
Benzene	UG/L	1			2		
Tetrachloroethene	UG/L	5	67	19		1000	2200
Toluene	UG/L	5					
Ethylbenzene	UG/L	5					
Xylene (Total)	UG/L	5			21		
Metals							
Iron	UG/L	300	24400	14800	71900	8570	43100
Miscellaneous Parameters							
Total Dissolved Solids	MG/L	-	1080	2370	2240	961	499
Total Organic Carbon	MG/L	-	94.7	207	212	34.9	19.4

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-4
POST-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			IW-06	MW-02	MW-03	MW-04	MW-05D
Sample ID			IW-6	MW-2	MW-3S	MW-4	MW-5D
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)			-	-	-	-	-
Date Sampled			10/20/00	10/20/00	10/19/00	10/20/00	10/19/00
Parameter	**Units**	**Criteria***					
Volatiles							
Vinyl Chloride	UG/L	2	1200		390	3	31
Acetone	UG/L	50	23			10	
1,1-Dichloroethene	UG/L	5	36		4		3
2-Butanone	UG/L	50	6				
1,2-Dichloroethene (total)	UG/L	5	13000		2200	31	650
Trichloroethene	UG/L	5	2900		14	24	230
Benzene	UG/L	1	2				
Tetrachloroethene	UG/L	5	7500			75	900
Toluene	UG/L	5	3				
Ethylbenzene	UG/L	5	2				
Xylene (Total)	UG/L	5	16				
Metals							
Iron	UG/L	300	170000	314	25800	4960	1380
Miscellaneous Parameters							
Total Dissolved Solids	MG/L	-	665	612	1110	1390	3270
Total Organic Carbon	MG/L	-	41.8	5.2	23.9	7.2	5.4

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

TABLE 3-4
POST-INJECTION GROUNDWATER SAMPLING RESULTS
NORTH FRANKLIN ST. SITE

Location ID			**MW-05S**	**MW-07S**	**MW-09S**	**MW-12S**
Sample ID			**MW-5S**	**MW-7S**	**MW-9S**	**MW-12S**
Matrix			**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**
Depth Interval (ft.)			-	-	-	-
Date Sampled			**10/19/00**	**10/20/00**	**10/20/00**	**10/20/00**
Parameter	**Units**	**Criteria***				
Volatiles						
Vinyl Chloride	UG/L	2	180			
Acetone	UG/L	50				
1,1-Dichloroethene	UG/L	5	3			
2-Butanone	UG/L	50				
1,2-Dichloroethene (total)	UG/L	5	970	6	4	
Trichloroethene	UG/L	5	71	2	2	
Benzene	UG/L	1				
Tetrachloroethene	UG/L	5	420	6	6	
Toluene	UG/L	5				
Ethylbenzene	UG/L	5				
Xylene (Total)	UG/L	5				
Metals						
Iron	UG/L	300	11700	4640	2360	2130
Miscellaneous Parameters						
Total Dissolved Solids	MG/L	-	812	1090	972	752
Total Organic Carbon	MG/L	-	10.0	12.4	2.7	2.4

Criteria- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.Revised April 2000, Class GA.

⬭ Concentration Exceeds Criteria.

Only Detected Results Reported.

Table 3-5

North Franklin Street Site

Estimated Masses of Contaminated Soil Prior to In-Situ Chemical Oxidation

Depth Interval	Location (Total # of Samples Collected)	Area Contaminated Above SCGs (ft^2)	Volume Contaminated Soil (ft^3)	Contaminant	Average Concentration[1] ($\mu g/Kg$)	Total Mass of Contamination[2] (lbs)
0-4' Fill	Underneath Building (2)	116	464	Tetrachloroethene	294,266	13.6540
				Trichloroethene	35	0.0016
				1,2-Dichoroethene	19	0.0009
				Vinyl Chloride	0	0.0000
	Outside Building (12)	468	1,872	Tetrachloroethene	1,393,768	260.9134
				Trichloroethene	369	0.0691
				1,2-Dichoroethene	623	0.1166
				Vinyl Chloride	0	0.0000
4-6' Fill / Clay Interface	Underneath Building (5)	486	972	Tetrachloroethene	59,389	5.7727
				Trichloroethene	1,991	0.1936
				1,2-Dichoroethene	1,148	0.1116
				Vinyl Chloride	17	0.0016
	Outside Building (17)	495	990	Tetrachloroethene	459,106	45.4515
				Trichloroethene	3,234	0.3202
				1,2-Dichoroethene	1,794	0.1776
				Vinyl Chloride	120	0.0119
6-15' Clay	Underneath Building (10)	265	2,385	Tetrachloroethene	101,516	24.2115
				Trichloroethene	2,226	0.5309
				1,2-Dichoroethene	6,136	1.4634
				Vinyl Chloride	240	0.0572
	Outside Building (29)	481	4,329	Tetrachloroethene	23,601	10.2167
				Trichloroethene	5,236	2.2666
				1,2-Dichoroethene	2,839	1.2288
				Vinyl Chloride	107	0.0464
Subtotals	Underneath Building (17)		3,821	Tetrachloroethene		43.6
				Trichloroethene		0.7
				1,2-Dichoroethene		1.6
				Vinyl Chloride		0.1
				Subtotal		**46.0**
	Outside Building (58)		7,191	Tetrachloroethene		316.6
				Trichloroethene		2.7
				1,2-Dichoroethene		1.5
				Vinyl Chloride		0.1
				Subtotal		**320.8**
Total	All Areas (75)		11,012	Tetrachloroethene		360.2
				Trichloroethene		3.4
				1,2-Dichoroethene		3.1
				Vinyl Chloride		0.1
				Total		**366.8**

1. Average concentration based on weighted average of contaminant detections within the contaminated soil area.
2. Assumed soil density is 100 lb/ft^3

J:\35388\EXCEL\[before soil volumes.xls]A

Table 3-6

North Franklin Street Site

Estimated Masses of Contaminated Soil Following In-Situ Chemical Oxidation

Depth Interval	Location (Total # of Samples Collected)	Area Contaminated Above SCGs (ft^2)	Volume Contaminated Soil (ft^3)	Contaminant	Average Concentration[1] (µg/Kg)	Total Mass of Contamination[2] (lbs)
0-4'	Underneath Building	19	76	Tetrachloroethene	109,907	0.8397
				Trichloroethene	0	0.0000
Fill	(2)			1,2-Dichoroethene	0	0.0000
				Vinyl Chloride	0	0.0000
	Outside Building	108	433	Tetrachloroethene	208,878	9.0486
				Trichloroethene	0	0.0000
	(7)			1,2-Dichoroethene	0	0.0000
				Vinyl Chloride	0	0.0000
4-6'	Underneath Building	221	442	Tetrachloroethene	1,368,428	60.4845
				Trichloroethene	1,118	0.0494
Fill / Clay	(3)			1,2-Dichoroethene	1,492	0.0659
Interface				Vinyl Chloride	0	0.0000
	Outside Building (Area 1)	35	70	Tetrachloroethene	0	0.0000
				Trichloroethene	0	0.0000
	(10 total for all outside)			1,2-Dichoroethene	123	0.0014
				Vinyl Chloride	0	0.0000
	Outside Building (Area 2)	161	322	Tetrachloroethene	131,221	1.5222
				Trichloroethene	12,080	0.1401
				1,2-Dichoroethene	13,154	0.1526
				Vinyl Chloride	0	0.0000
	Outside Building (Area 3)	58	116	Tetrachloroethene	0	0.0000
				Trichloroethene	0	0.0000
				1,2-Dichoroethene	655	0.0076
				Vinyl Chloride	0	0.0000
6-15'	Underneath Building	269	2,421	Tetrachloroethene	6,988	1.6919
				Trichloroethene	0	0.0000
Clay	(1)			1,2-Dichoroethene	2,421	0.5861
				Vinyl Chloride	86	0.0209
	Outside Building	529	4,758	Tetrachloroethene	4,618	2.1973
				Trichloroethene	0	0.0000
	(6)			1,2-Dichoroethene	1,528	0.7269
				Vinyl Chloride	17	0.0079
Subtotals	Underneath Building		2,939	Tetrachloroethene		63.0
				Trichloroethene		0.0
	(6)			1,2-Dichoroethene		0.7
				Vinyl Chloride		0.0
				Subtotal		**63.7**
	Outside Building		5,700	Tetrachloroethene		12.8
				Trichloroethene		0.1
	(23)			1,2-Dichoroethene		0.9
				Vinyl Chloride		0.0
				Subtotal		**13.8**
Total	All Areas		8,639	Tetrachloroethene		75.8
				Trichloroethene		0.2
	(29)			1,2-Dichoroethene		1.5
				Vinyl Chloride		0.0
				Total		77.5

1. Average concentration based on weighted average of contaminant detections within the contaminated soil area.
2. Assumed soil density is 100 lb/ft^3

J:\35388\EXCEL\[cont soil volumes.xls]A

Table 3-7

North Franklin Street Site
Contaminant Mass Reduction Following In-Situ Chemical Oxidation

Location	Depth Range	Total Contaminant Mass (lbs)[a] Before Treatment	Total Contaminant Mass (lbs)[a] After Treatment	% Reduction
Underneath Building	0-4'	13.66	0.84	94%
	4-6'	6.08	60.60	-897%
	>6'	26.26	2.30	91%
	Subtotal	**46.00**	**63.74**	**-39%**
Outside Building	0-4'	261.10	9.05	97%
	4-6'	45.96	1.82	96%
	>6'	13.76	2.93	79%
	Subtotal	**320.82**	**13.80**	**96%**
All Areas	0-4'	274.76	9.89	96%
	4-6'	52.04	62.42	-20%
	>6'	40.02	5.23	87%
	Subtotal	**366.82**	**77.54**	**79%**

a. Includes Tetrachloroethene, Trichloroethylene, 1,2-Dichloroethylene, and Vinyl Chloride

J:\35388\EXCEL\[mass comparison.xls]Sheet1

APPENDIX “A”

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Suite A-10
West Windsor, New Jersey 08550
(609) 275-8500 phone
(609) 275-9608 fax

5200 DTC Parkway
Suite 150
Englewood, Colorado 80111
(303) 843-9079 phone
(303) 843-9094 fax

ISOTEC

Sent via E-mail and Federal Express

February 8, 2001

Mr. Don McCall
URS GREINER WOODWARD CLYDE
282 Delaware Avenue
Buffalo, New York 14202-1805

RE: ***Draft Pilot Study Report***
North Franklin Street Site, Site # 8-49-002
ISOTEC Proposal #800179

Dear Mr. McCall:

Enclosed please find one copy of the Draft Pilot Study Report associated with the North Franklin Street Project. Please review and forward your comments to me to finalize the report.

If you have any questions or need additional information, please feel free to contact me at (609) 275-8500, ext. 111.

Very truly yours,
In-Situ Oxidative Technologies, Inc.

Prasad Kakarla, P.E.
Technical Manager

attachments

DRAFT

PILOT PROGRAM REPORT

NORTH FRANKLIN STREET SITE # 8-49-002
10 NORTH FRANKLIN STREET
WATKINS GLEN, NEW YORK

FEBRUARY 8, 2001

PREPARED FOR

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
BUREAU OF CONSTRUCTION SERVICES
DIVISION OF ENVIRONMENTAL REMEDIATION
ROOM 267, 50 WOLF ROAD
ALBANY, NEW YORK 12233-7010

AND

URS CORPORATION
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202-1805

PREPARED BY

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
51 EVERETT DRIVE, SUITE A-10
WEST WINDSOR, NEW JERSEY 08550

ISOTEC CASE NO. 800179

DRAFT

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FIGURES

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ACRONYMS

1,2-DCE	1,2-Dichloroethene
bgs	Below ground surface
Cis-DCE	Cis-1,2-Dichloroethene
COC	Contaminant of concern
ft	Feet
H_2O_2	Hydrogen Peroxide
ISOTEC	In-Situ Oxidative Technologies, Inc.
lbs	Pounds
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
NYSDEC	New York State Department of Environmental Conservation
PCE	Tetrachloroethene
PVC	Polyvinyl chloride
TCE	Trichloroethene
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
URS	URS Corporation
VC	Vinyl Chloride
VOC	Volatile organic compound
µg/kg	Micrograms per kilogram
µg/l	Micrograms per liter

Section 1 Executive Summary

In-Situ Oxidative Technologies, Inc. (ISOTEC^{SM}) has been retained by the New York State Department of Environmental Conservation (NYSDEC) through URS Corporation (URS) to conduct an in-situ chemical oxidation pilot treatability study on impacted soil and groundwater at the 10 North Franklin Street site located in Watkins Glen, New York (site). Site contaminants of concern noted at the site include volatile organic compounds (VOCs) primarily consisting of trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (Cis-DCE), and vinyl chloride (VC). Permitting for the pilot program injection activities was governed by NYSDEC within the Bureau of Construction Services, Division of Environmental Remediation.

In-situ chemical oxidation (chem-ox) via the ISOTEC^{SM} Process was chosen as the preferred remedial method. The ISOTEC^{SM} Process is based on Fenton's chemistry using a proprietary catalyst/oxidizer (reagent) mix to produce hydroxyl radicals that oxidize chemical bonds. Treatment reagents are injected into or around the areas of known contamination within the subsurface to promote oxidation of the COCs *in-situ.*

A laboratory bench-scale study was initially performed to evaluate whether the ISOTEC Process would successfully treat the site-specific contaminants and, if the process was successful, to determine the optimum oxidation quantities based on contaminant type and concentration. Based on the successful laboratory study results, a field pilot program utilizing the ISOTEC^{SM} Process was performed following NYSDEC approval. The ISOTEC pilot program was performed to evaluate the site-specific efficiency and extent of treatment of subsurface organic contaminants at the site using the ISOTEC process.

Pilot program results indicate significant reduction in the concentration of VOCs throughout the pilot study area. Overall site-wide contamination of VOCs in the injection and monitoring wells reduced by nearly 63% following two treatment applications. Conservative mass calculations indicated an estimated 229-pound destruction of VOC contamination in site soils and groundwater within the treated areas. Recommendations for continued treatment are provided within this report.

1.1 Pilot Study Objectives

The primary purpose of the pilot study is to evaluate the effectiveness of ISOTEC's proprietary *in situ* chemical oxidation process to oxidize contaminants of concern (i.e. chlorinated VOCs) in soil and groundwater at the site, and to obtain data for the implementation of continued remediation using in situ chemical oxidation. The objectives of the study are as follows:

- Evaluate the effectiveness of ISOTEC^{SM} Process to oxidize VOC contamination in the subsurface soil and groundwater; and
- Reduce the overall VOC contamination in site soils and groundwater.

Section 2 Site Background

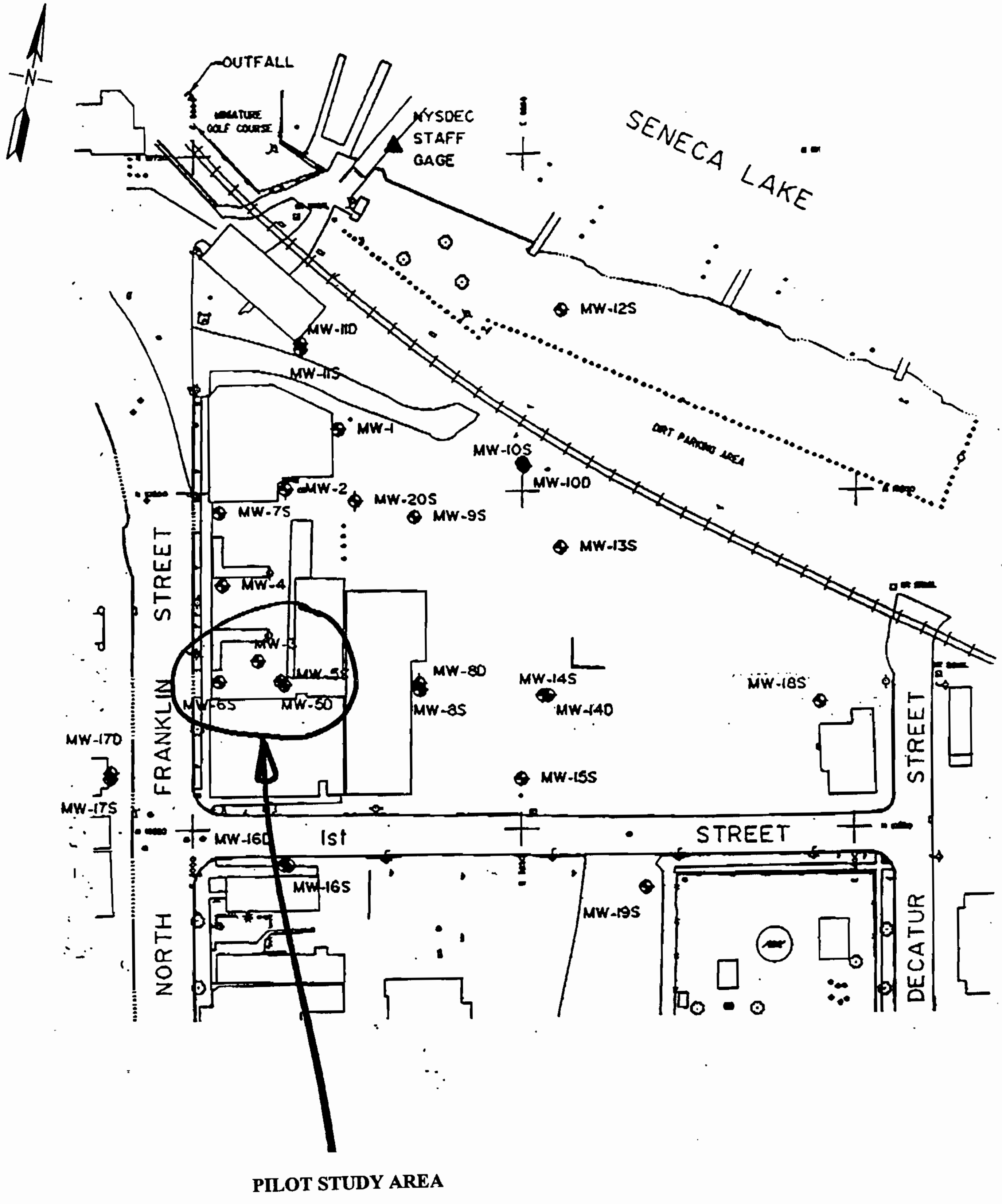
2.1 Site Background

The 10 North Franklin Street site in Watkins Glen, NY was formerly occupied by a dry cleaning business. Activities associated with the operation of the business are believed to have resulted in the incidental release of dry cleaning-related chemicals (e.g. PCE and TCE) into the site subsurface over an undetermined period of time. A subsequent investigation by NYSDEC confirmed the presence of chlorinated VOCs in the site subsurface necessitating remedial action. The site is currently a seasonal souvenir store operating from late spring to fall. A site map is included as Figure 2-1.

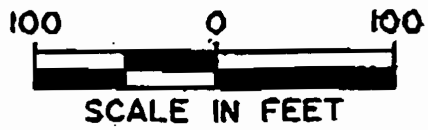
The contaminants of concern identified at the site are chlorinated VOCs primarily consisting of trichloroethene (TCE), cis-1,2-dichloroethene (Cis-DCE), vinyl chloride (VC) and tetrachloroethene (PCE). Groundwater concentrations of up to 770 μg/l and soil concentrations of up to 18,000 mg/kg have been measured at the site.

2.2 Site Geology

Depth to groundwater is approximately 2-3' below grade with the contaminant zone extending to approximately 23' below grade. The saturated soils within the target portion of the aquifer are composed of fill at the 2-5' interval, a mixture of clayey silts at the 5-13' interval and sandy silts and gravel at the 13-23' interval. Fill at the 2-5' soil interval is highly contaminated.



Map taken from a drawing prepared by URS Corporation



IN – SITU OXIDATIVE TECHNOLOGIES, INC. 51 A Everett Drive, Suite 100 West Windsor, N.J. 08550 Tel: (609)275–8500	SCALE: AS SHOWN DATE: 02/08/01	PROJECT# 800179
	DRAWN BY: T A CHECKED BY: P K	
SITE MAP 10 North Franklin Street Watkins Glen, New York		FIGURE# 2–1

Section 3 Technology Overview

3.1 ISOTEC^{SM} Process

In-Situ Oxidative Technologies, Inc. specializes in environmental remediation with its proprietary in-situ chemical oxidation treatment techniques for soil and groundwater contamination. ISOTEC^{SM} Process combines proprietary catalysts, mobility control agents, oxidizers, and stabilizers in an optimal, chemical formulation, and employs site-specific delivery systems to ensure complete destruction of the targeted contaminants.

The ISOTEC^{SM} Process is an in-situ remedial treatment technology that destroys organic contamination through a chemical oxidation process derived from Fenton's chemistry. The treatment consists of injecting proprietary catalysts, mobility control agents, oxidizers and stabilizers (reagents) into the impacted subsurface over a short period of time. Hydroxyl radicals are generated by the subsurface reaction and oxidize organic contaminants with carbon / carbon double bonds (e.g. TCE) and single-bonded contaminants with extractable hydrogen (e.g. TCA). As compared to conventional Fenton's chemistry which requires acidic conditions ($pH \leq 3$), the ISOTEC^{SM} Process is effective at neutral conditions ($pH \cong 7$). Treatment by-products are carbon dioxide and water, and chloride ions when chlorinated compounds are treated.

A specific stoichiometry of the reagent mix is first determined through a laboratory study performed on site-specific samples, with preliminary reagent quantities estimated based on the target soil/groundwater volume tested. Application is tested in the field during a pilot program to determine process efficiency and extent of treatment, which varies depending on the site's subsurface characteristics and the concentration of organics.

Section 4 ISOTEC^{SM} Treatment Program

4.1 Bench-Scale Study

Soil and groundwater samples were collected from the site by URS personnel and shipped to the ISOTEC facility for use in the lab study. Soil samples were collected and composited from a location identified as ISO-SB-1 on March 16, 2000 at a depth of 5-6.5 feet below ground surface (bgs). The soil was collected in three (3) 1-gallon zip lock bags and stored at 4 degrees Celsius (°C) until mixed at the laboratory with the site groundwater sample to form the soil-slurry mix used during the study.

The groundwater was collected on March 16, 2000 from a location identified as MW-5S in five unpreserved 1-liter glass containers and two 40-milliliter (ml) vials preserved in hydrochloric acid (HCl). The groundwater containers were filled completely with zero headspace. ISOTEC decanted a portion of the unpreserved groundwater sample into a 250-ml jar for dissolved iron analysis. The preserved volumes were used to analyze the initial VOC content in the site groundwater. The groundwater samples were stored at 4°C until used during the study.

Experiments were conducted on samples of site groundwater and on a mixture of site soil and groundwater (slurry) prepared by ISOTEC at their facility to represent the site subsurface conditions. The samples were subjected to a series of experiments to evaluate the effectiveness of the oxidation process to treat the VOC contamination and to determine the optimum reagent type and quantities based on the contaminants detected. The ISOTEC reagents used in the study were selected based on the historical chlorinated VOC concentration data obtained from the site. The samples were analyzed by a New Jersey State certified laboratory to determine the effects of the ISOTEC oxidation process on the contaminants of concern.

Results of the laboratory study indicated greater than 99% destruction of the targeted VOCs in site groundwater and up to 96% destruction in slurry samples. The data further indicate that Catalyst 4260 achieved maximum contaminant reduction under close to natural subsurface pH conditions (i.e. pH = 5-7), with one treatment determined to be adequate to achieve over 99% targeted VOC destruction in groundwater and over 92.8% targeted VOC destruction in soil-slurry. The study results were used to design a pilot-scale application of the ISOTEC^{SM} Process for the 10 North Franklin Street Site. A copy of ISOTEC bench-scale treatability report is enclosed as Appendix 5.

4.2 Pilot-Scale Study

Based on the ISOTEC laboratory study results, the NYSDEC approved URS's request to proceed with an ISOTEC chem-ox field pilot program at the site. A field pilot program was performed: (1) to gather additional data to evaluate the effectiveness of this remedial alternative under in-situ conditions; (2) as an initial step toward remediating the site, and (3) to substantially reduce the organic loading in the areas treated. The treatment program consisted of two separate chem-ox events, introducing ISOTEC's proprietary reagents into the subsurface over a short time period.

4.2.1 Pilot Program Design

ISOTEC typically designs its pilot program to target the source area at the outer/upper edges of a plume and avoids conducting pilot programs in down-gradient plume areas. The rationale for this type of design is to avoid re-contamination of a treated area and to concentrate on initial source area reduction.

For the North Franklin site, ISOTEC focused the pilot program treatment on a highly contaminated area believed to be the source of the existing groundwater plume based on historical data from site monitoring wells and soil samples. The location of the selected pilot study area is shown in Figure 2-1.

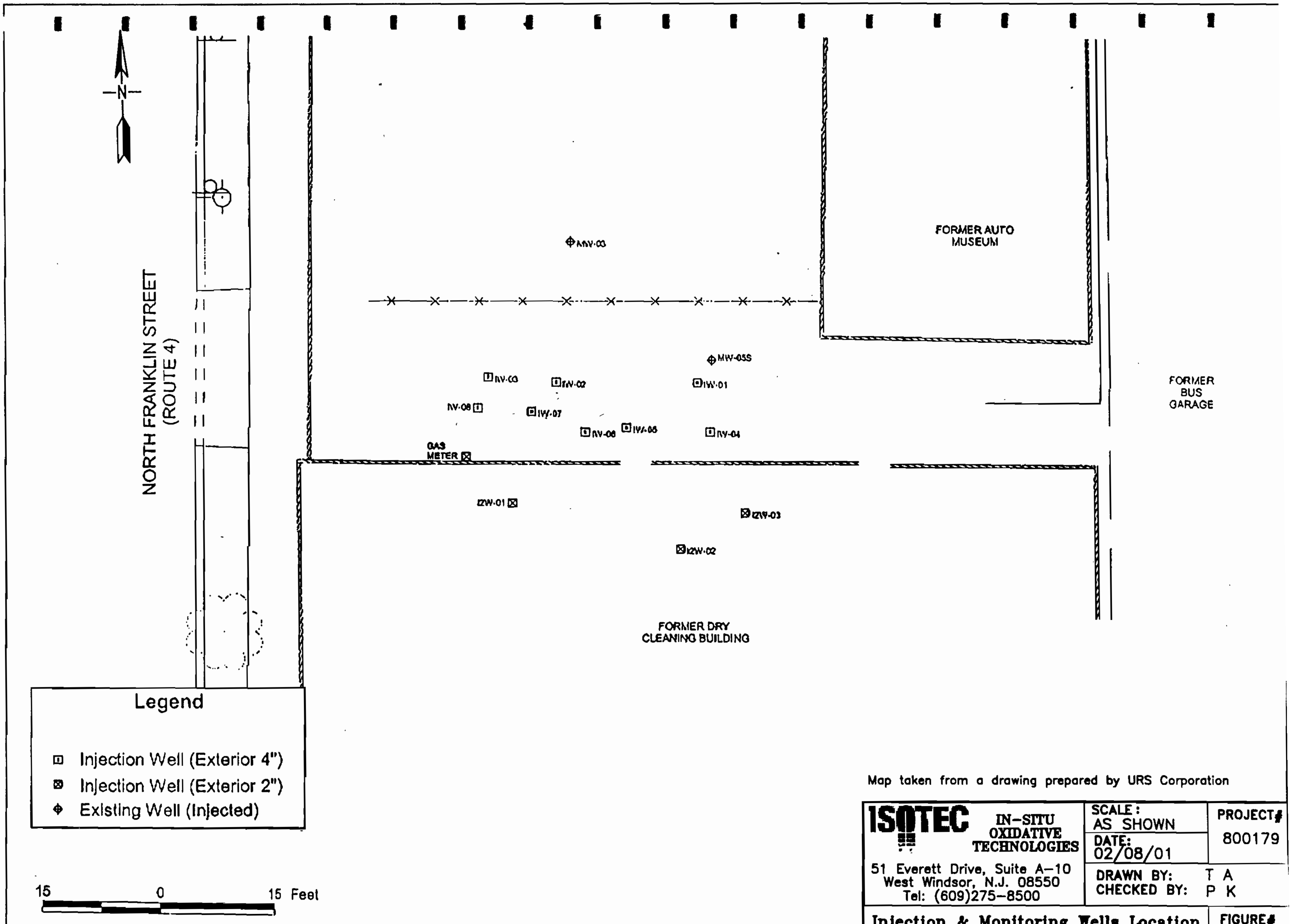
4.2.2 Field Activities

URS installed a total of eleven injection points to facilitate application of ISOTEC reagents (see Figure 4-1). Three injection points are of 2-inch diameter (I2W-1 to I2W-3) installed inside the existing building and eight injection points are of 4-inch diameter (IW-1 to IW-8) installed outside the building. In addition, five ¾-inch diameter piezometers installed along the building foundation for monitoring purposes and two existing monitoring wells (MW-3 and MW-5S) outside the building were also used for injection.

The three 2-inch diameter injection points (I2W-1 to I2W-3) inside the building were installed to a depth of 5.8 to 9.8 feet with a 3.5 to 7.5 feet screen interval at the bottom of the wells. Three of the eight 4-inch diameter injection wells were installed at depths ranging from 20 to 23.5 feet bgs, with a 10-foot screen interval while the remaining five wells were installed to a depth of 9 to 9.5 feet with a 5 to 7.5 feet screen interval. All 4-inch diameter wells were located outside the building. The five piezometers along the building foundation extended to a depth of 5 feet bgs. ISOTEC retrofitted the injection points with 4-inch bolt-down well seals attached to PVC pipe extending to a depth of 5 to 7.5 feet bgs for the shallow wells and 20-feet bgs for the deep wells. The locations of all injection and monitoring points are depicted in Figure 4-1.

4.2.2.1 Mobilization and Demobilization

Mobilization activities included transportation and staging of ISOTEC equipment, materials, instruments, personnel, and services required for implementing the field pilot program in the area. Items transported to the site included miscellaneous equipment such as hoses, pumps, pipes, drums, tanks, mixers, generator, etc. Equipment was transported



Map taken from a drawing prepared by URS Corporation

ISOTEC IN-SITU OXIDATIVE TECHNOLOGIES

51 Everett Drive, Suite A-10
West Windsor, N.J. 08550
Tel: (609)275-8500

SCALE: AS SHOWN		PROJECT# 800179
DATE: 02/08/01		
DRAWN BY:	T A	
CHECKED BY:	P K	

Injection & Monitoring Wells Location
10 North Franklin Street
Watkins Glen, New York

FIGURE# 4-1

and stored in a 16-foot box truck that also served as a reagent preparation station during the injection event. The materials that were transported to the site included 35% hydrogen peroxide and other proprietary chemical mixes required for reagent preparation.

Demobilization activities included removal of all staged equipment, materials, instruments, personnel, and services from the site at the conclusion of each injection event. In addition, the activities included decontamination of all equipment, drums, tanks and instruments. All waste materials and debris generated during demobilization activities were removed. Any unused chemicals were transported from the site.

4.2.2.2 ISOTEC^{SM} Reagent Preparation/ Injection

The reagents used and demonstrated to be effective during the laboratory bench-scale study (Section 4.1) were also used during the initial pilot program. ISOTEC Catalyst 4260 consists of a site-specific chelated iron complex, while stabilized 12% hydrogen peroxide (H_2O_2) solution was used as the oxidizer. 35% hydrogen peroxide was shipped directly to the site prior to field injection activities in DOT-approved HDPE 55-gallon drums. All reagent additives were prepared on-site and added during dilution activities. The catalyst was shipped to the site in dry form and mixed with water on-site in small bulk tanks prior to injection.

Chemical application assembly used at the site consisted of varying size storage containers, electric transfer and diaphragm pumps, air compressor, reinforced PVC tubing (rated for working pressure), valves and cam-lock connectors. Transfer of the reagents from the storage and/or mixing containers to the point of injection was performed using either a pneumatic diaphragm pump or electric drum pump. Reagents were conveyed through reinforced PVC tubing, connected to 4-inch bolt down well seals attached to the injection points with an assemblage of valves and fittings.

4.2.2.3 Phase-I and Phase-II Field Activities

Field activities associated with the pilot program were performed over two separate events (hereinafter referred to as Phase-I and Phase-II). Phase-I injection activities were performed over four days during the period May 15-18, 2000 and included application of ISOTEC reagents into each of the eleven injection points (I2W-1 through I2W-3 and IW-1 through IW-8), two monitoring points (MW-3 and MW-5S) and five piezometers (TP-1 through TP-5). Phase-II activities were performed over four days during the period June 26-29, 2000 and utilized the same injection points for distribution of the treatment reagents as in Phase I.

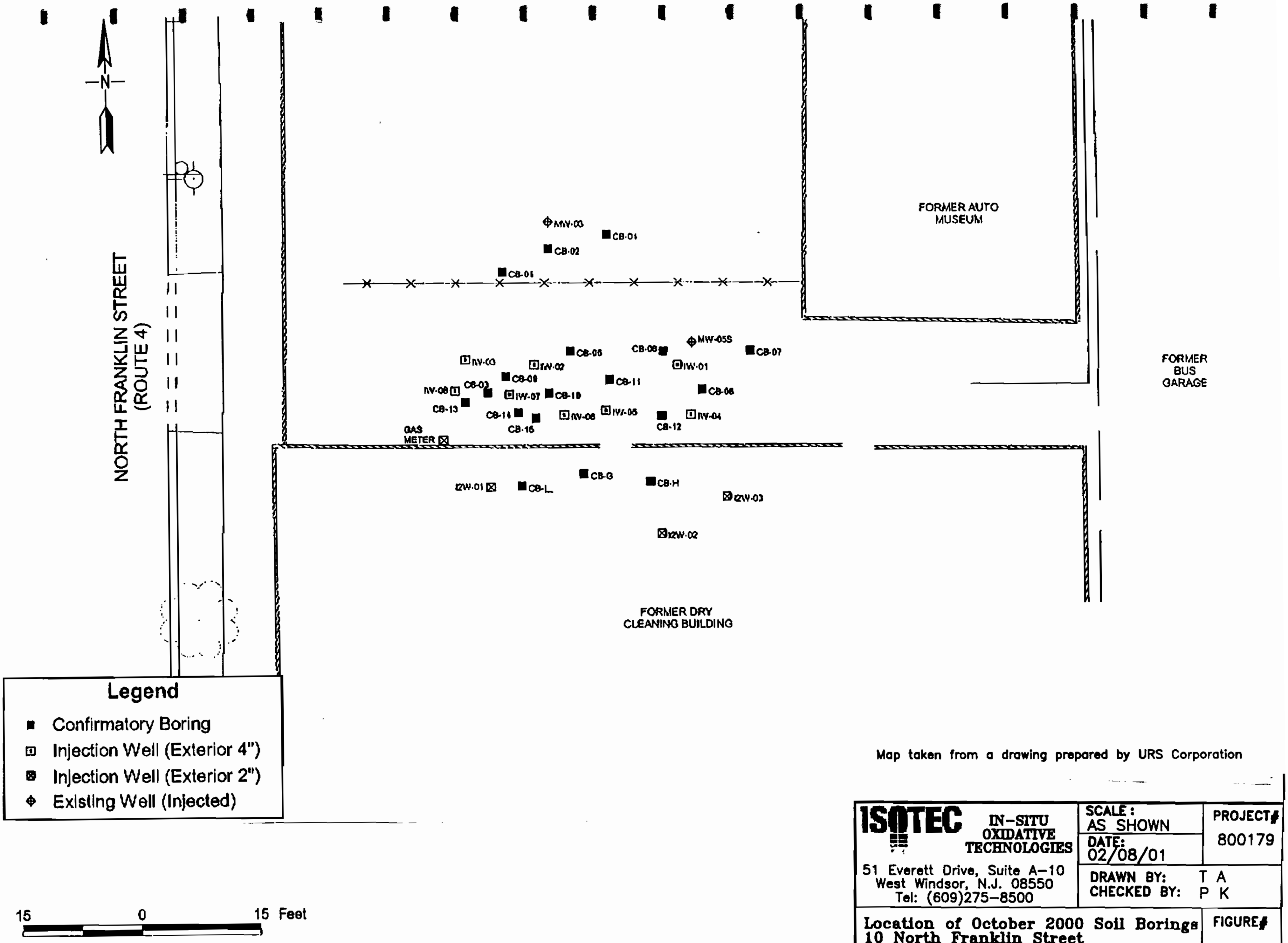
The initial volume and chemical composition of treatment injections were based on a specific stoichiometry determined during the laboratory study as well as contaminant levels, volume of area to be treated, and subsurface characteristics. A site-engineered injection apparatus was used to control flow of oxidizer and proprietary ISOTEC catalyst into the subsurface. Approximately 1,062 gallons of ISOTEC reagents were injected into the designated points during Phase-I field activities with associated average catalyst and oxidizer injection flow rates of 3.23 gal/min. and 1.28 gal/min., respectively. Likewise, approximately 2,035 gallons of ISOTEC reagents were injected into the designated points during Phase-II field activities with associated average catalyst and oxidizer injection flow rates of 4.4 gal/min. and 5.0 gal/min., respectively.

4.2.2.4 Site Monitoring

Site monitoring data was collected during the pilot program to obtain information related to the treatment process and subsurface characteristics. Pre and post-treatment sampling data was collected by URS. A pre-treatment groundwater sampling and laboratory testing event was performed in May 2000 to provide a baseline groundwater condition in injection wells IW-1 through IW-8 and I2W-1 through I2W-3. Sampling data from March 2000 was used as baseline condition for monitoring wells MW-2S, MW-3, MW-4S, MW-5D, MW-5S, MW-7S, MW-8S, and MW-9S. Post-treatment sampling for Phase-I injections was performed in June 2000 at sampling locations MW-3, MW-5S, MW-7S, MW-8S, and MW-9S. Additional wells that were sampled in June 2000 included MW-11D, MW-11S, MW-12S, and MW-20S. No baseline data was collected for these wells. Moreover, no injection wells were sampled during this event. Post Phase II sampling activities were conducted in October 2000, nearly four months after the pilot program field activities were terminated. The wells sampled during this event included injection wells I2W-1, I2W-2, IW-4, IW-5, IW-6; and monitoring wells MW-2, MW-3, MW-4, MW-5D, MW-5S, MW-7S, MW-9S, and MW-12S.

Post-treatment soil samples were also collected in October 2000 from three locations underneath the building and at fourteen locations outside the building. The locations of the post-treatment soil borings are shown in Figure 4-2. Soil samples were collected at three depth intervals ranging from 0-4 feet bgs, 4-6 feet bgs, and 6-15 feet bgs. Since no baseline soil samples were collected for the pilot program, samples collected by URS from March 1998 through September 1998 was used as the baseline condition. The sample results have been summarized in *Evaluation and Conceptual Design For Additional Remedial Action* report dated February 1999 submitted to NYSDEC by URS. Samples collected by Terra Vac have not been used for baseline data as all of their sampling locations were outside the ISOTEC target treatment area. Excerpts of mass calculations performed by URS in the *Evaluation and Conceptual Design For Additional Remedial Action* report along with maps showing baseline soil sample locations have been included in Appendices 2 and 3. URS collected samples at depth intervals ranging from 0-4 feet bgs, 4-6 feet bgs, and 6-15 feet bgs similar to October 2000 data.

Pre and post-treatment groundwater samples collected by URS were analyzed for total volatile organic compounds using EPA Method 624/ 8260, Total Dissolved Solids (TDS) using EPA Method xx, Total Organic Carbon (TOC) using EPA Method 9060, Petroleum Hydrocarbons using EPA Method 418.1, and Total Iron using EPA Method 6010. Field



Map taken from a drawing prepared by URS Corporation

ISOTEC IN-SITU OXIDATIVE TECHNOLOGIES

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SCALE: AS SHOWN
DATE: 02/08/01
PROJECT# 800179
DRAWN BY: T A
CHECKED BY: P K

Location of October 2000 Soil Borings
10 North Franklin Street
Watkins Glen, New York

FIGURE# 4-2

monitoring parameters collected by ISOTEC during the injection activity included: pH, TDS, iron, and hydrogen peroxide. Pre and post-treatment analytical results are summarized in Section 4.3 of this report.

4.3 Pre-Treatment vs. Post-Treatment Monitoring Results

A discussion of the pre-treatment versus post-treatment analytical results for the subject site is presented below. Where applicable, the NYSDEC groundwater standards (Criteria) are presented with the pre/post treatment analytical results. URS conducted all field sampling and xLabs, Inc. performed the laboratory analyses. A summary of the pre and post-treatment VOC results for all the injection and monitoring points is presented as Table 4-1. In addition, a summary of the pre and post-treatment petroleum hydrocarbons, TDS, TOC and iron levels for all the injection and monitoring points is presented as Table 4-2. Mass calculations were performed by URS to estimate the baseline contaminant mass within the soil matrix as detailed in URS's *Evaluation and Conceptual Design For Additional Remedial Action* report dated February 1999 submitted to NYSDEC. Summary of mass calculations performed by URS in the *Evaluation and Conceptual Design For Additional Remedial Action* report along with maps showing baseline soil sample locations have been included in Appendices 2 and 3. Similar conservative mass calculations were performed by ISOTEC to estimate the post-treatment (October 2000) contaminant mass and were compared to baseline mass for VOC destruction. Summarized results of mass calculations performed by both URS (baseline) and ISOTEC (post-treatment October 2000) are presented in Table 4-3. Details of the mass calculations are presented in Section 4.2 and Appendix 1. Pre versus post-treatment results have been discussed below for each targeted treated area.

4.3.1 Inside Building

A total of three injection wells and three soil boring locations inside the building were sampled to evaluate the pilot study effectiveness.

4.3.1.1 Groundwater Samples - Injection Wells

Three injection wells (I2W-1, I2W-2, and I2W-3) were installed inside the existing building to treat shallow contamination underneath the building. Based on baseline versus post-treatment (i.e. October 2000) groundwater results, I2W-2 and I2W-3 indicated VOC decreases of 14% and 59% respectively with I2W-1 showing a slight increase.

Pre versus post-treatment monitoring results have been presented in Table 4-2. It is clear from these results that iron and TDS concentrations in I2W-1 through I2W-3 indicated an increase from baseline values due to their presence within the ISOTEC reagents introduced at these locations. An increase was also noted for TOC concentrations indicating that a substantial organic mass may have been desorbed into the groundwater phase during the injection activities. A portion of this organic mass could consist of the soil-based contamination that transfers to groundwater during post oxidation equilibration.

4.3.1.2 Groundwater Samples – Monitoring Wells

No monitoring wells from inside the building were sampled for the pilot study.

4.3.1.3 Soil Boring Samples

Post-treatment soil samples were collected from three different locations inside the building at three depth intervals i.e. 0-4 ft bgs, 4-6 ft bgs, and 6-15 ft bgs. Conservative mass calculations (Table 4-3 and Appendix 1) estimated a significant mass reduction of PCE, TCE, 1,2-DCE (total), and VC within the shallow zone soils (i.e. 0-4 ft bgs). For example, PCE concentration decreased from an estimated 13.6 pounds to 0.008 pounds (or 99.9% decrease) at this depth. However, at the 4-6 ft bgs interval, a slug of PCE mass was encountered resulting in a substantial increase in post-treatment soil concentrations underneath the building (from 5.8 lbs to 109.7 lbs). At the 6-15 ft bgs depth interval, VOC contamination indicated a considerable decrease (from 26.3 lbs to 4.3 lbs or 84% decrease).

4.3.2 Outside Building

A total of eight injection wells and eleven monitoring wells were sampled by URS to evaluate the effectiveness of the ISOTEC pilot program towards chlorinated VOC remediation. In addition, soil samples were collected from a total of fourteen different locations majority of which were sampled at three depths ranging from 0-4 ft bgs, 4-6 ft bgs, and 6-15 ft bgs.

4.3.2.1 Groundwater Samples - Injection Wells

Of the eight injection wells, both pre and post-treatment groundwater samples were collected only from IW-4, IW-5 and IW-6. Based on the results, substantial VOC decreases were noted in IW-4 and IW-6 with IW-5 indicating a VOC rebounding effect. A contaminant rebounding effect in an injection well is indicative of the presence of significant soil based contamination in the vicinity that was desorbed and transferred to the injection well during the pilot study. Most notable VOC decreases occurred for PCE and Cis-DCE in IW-6. Among the monitoring parameters, iron concentrations in IW-5 and IW-6, and TDS concentrations in IW-4 and IW-5 showed substantial increases as expected. The concentrations of iron will stabilize over time due to dilution, eventual precipitation and adsorption to soil. Once again, TOC mass showed increases indicating desorption of soil-based organic mass.

4.3.2.2 Groundwater Samples - Monitoring Wells

A total of eleven monitoring wells were sampled of which only seven wells were sampled for both baseline and post-treatment data. Majority of monitoring wells indicated a VOC rebounding effect influenced by desorption and transfer of soil-based contamination into groundwater. Chemical oxidation occurs via desorption of soil-based organics into the aqueous phase where hydroxyl radicals oxidize the VOCs to innocuous products such as CO_2, H_2O, and HCl. When desorption is more predominant compared to oxidation such as when a significant residual source of contamination exists in the vicinity that recontaminates treated groundwater, incomplete oxidation could result in increasing the groundwater VOC's. However, such groundwater VOC increases often occur with a concurrent decrease in soil-based VOC concentrations. Based on results of soil boring samples (Next Section), it is evident that a significant soil-based contaminant mass has been destroyed.

Selected monitoring wells (e.g. MW-3, MW-5D, and MW-9S) have shown baseline to post Phase-I increases in iron concentrations. However, the concentrations have stabilized to lower values especially in MW-5D and MW-9S. The iron concentration in MW-3 is expected to stabilize over time due to gradual iron precipitation and soil fixation.

4.3.2.3 Soil Boring Samples

A total of fourteen locations were sampled during October 2000 at three depths of 0-4 ft bgs, 4-6 ft bgs, and 6-15 ft bgs. Soil based contamination was estimated for each depth through conservative mass calculations presented in Table 4-3 and Appendix 1. A substantial mass destruction of VOCs was noted during the pilot program. It is clear from Table 4-3 that the cumulative mass of PCE, TCE, 1,2-DCE (total), and VC outside the building decreased from a baseline value of 321 pounds (estimated by URS) to a October 2000 mass of 24 pounds resulting in a 297 pound removal.

4.4 Pilot Program Results

Summary results of pre versus post-treatment groundwater samples collected from the site injection and monitoring wells are presented in Tables 4-1 and 4-2. In addition, summary results of estimated contaminant mass in soils are presented in Table 4-3. The data indicate that the pilot program achieved significant reduction in the mass of organic contamination in site soil and groundwater from pre-treatment levels.

Groundwater sampling results (Table 4-1) show a 68% reduction of total dissolved-phase VOCs following the Pilot Program Treatment. Contaminants of concern i.e. Cis-DCE and PCE, which comprised the majority of the contaminants detected, were reduced 61.4% and 75.3%, respectively. IW-06, located in the source area showed the most significant reduction from 46,000 µg/L to 7,500 µg/L (84%) in groundwater.

The treatment efficiency at the site was evaluated based on the calculated mass of VOCs remaining versus the established pre-treatment conditions. Details of ISOTEC's mass calculations are provided within Appendix 1 of this report. Summary of URS's mass calculations for baseline data is included in Appendix 2. VOCs selected for mass calculations include PCE, TCE, 1,2-DCE (total), and VC. The contribution of other VOCs towards contaminant mass was found to be negligible. The calculations were performed using available site soil and groundwater VOC data collected by URS. Soil contaminant mass data obtained from Table 2 in the *Evaluation and Conceptual Design For Additional Remedial Action* report (prepared by URS, February 1999; see Appendices 2 and 3) provided baseline treatment data. Data from Terra Vac samples were not included in the mass calculations because there are no matching post-treatment results and the sampling locations were outside of the pilot test area. The post-treatment sampling event performed by URS in October 2000 provided data for the mass of VOCs remaining in site soil. ISOTEC utilized the same site information and formula (as URS) for the post-treatment mass calculation to ensure consistent results. Groundwater data from pre and post-treatment sampling events (by URS) were used to establish the removal efficiency for dissolved-phase contamination within the test area. Groundwater VOC data were not included in contaminant mass calculations because it constituted a very small fraction of the cumulative soil mass.

Table 4-3 details the estimated mass of soil contamination throughout the target area for pre and post-treatment conditions. Appendix 1 details the mass calculations performed by ISOTEC. Soil samples were collected from three depth intervals (0-4', 4-6', and 6-15' bgs) at various locations underneath the site building and outside the building. The total pre-treatment mass of VOCs estimated by URS at the site is 366.8 lbs excluding Terra Vac samples (46 lbs. underneath the building and 320.8 lbs. outside the building). PCE constitutes 98.2% of the contaminant mass. Post-treatment estimates by ISOTEC indicate the total contaminant mass was reduced 62.4% to 138 lbs. (114.4 lbs. beneath the building and 23.6 lbs. outside the building). A comparison of pre and post-treatment data shows a 2.5 times increase in the contaminant mass beneath the building and a 64.3% decrease in the area outside the building. It is clear that the slug of contamination encountered at the 4-6 ft sampling interval underneath the building was the major contributor towards the increase noted. Furthermore, sampling data from October 2000 (Appendix 4) show the highest contaminant levels immediately outside the side door (north side) of the building in the shallow fill zone (1-4 ft bgs) and underneath the building floor at 4-10 ft bgs. Post-treatment soil samples CB-05 and CB-06, collected approximately 11 feet from the building side door in the 5-10' depth range, also have elevated concentrations of total VOCs of 73,204 μg/L and 27,899 μg/L, respectively.

4.5 Conclusions

Pilot Program results demonstrated that the ISOTEC process was effective in reducing substantial mass of contaminants of concern at the site. Mass calculations show a 62.4% decrease in PCE, TCE, 1,2-DCE (total), and VC from pre-treatment levels following two applications of the chemical oxidation treatment.

The test treatment area was separated into two zones, beneath the north side of the site building and adjacent to the north side of the building. Treatment results for the area beneath the building indicate an increase in the mass of soil-phase contamination. Since contamination cannot be created from chemical oxidation treatment, such an increase is attributed to sample heterogeneity. Soil sample contaminant concentrations in the shallow subsurface (4-6') of the building were measured at 1,300,000 μg/kg (pre-treatment) and 3,400,000 μg/kg (post-treatment) indicating the presence of residual product. Because of heterogeneous soil conditions and the likely presence of residual product, collecting samples representing uniform contaminant distribution is not possible. Furthermore, free-phase organic contaminants are difficult to treat because they require substantially more chemical oxidation reagents for effective treatment as compared to those in dissolved phase. Within the deeper clay zone under the building (10-12 ft bgs), there were significant decreases in the mass of PCE (86.3%), TCE (91.5%), and Cis-DCE (36.6%). The combined mass reduction at this depth interval was 83.3%.

The test area outside of the site building showed the most significant contaminant mass reduction from 320.8 lbs. to 23.6 lbs. (92.7%) of the treatment program. Contaminant concentrations of soil samples collected throughout this portion of the test area do not reflect free-phase organic contamination. The majority of the contaminant destruction occurred in the shallow fill zone (0-4' bgs) where the pre-treatment contaminant mass of 261.1 lbs. was reduced to 11.51 lbs. (95.6%). Within the clay zone (6-15' bgs), the levels of PCE remained relatively unchanged, however, there were significant decreases in the masses of TCE, Cis-DCE, and VC ranging from 61% to 99%.

It is concluded that the ISOTEC In-situ Treatment Process was effective at the North Franklin Street site in Watkins Glen, NY achieving overall contaminant mass reduction from 366.8 lbs. to 138.0 lbs (i.e. 229-lb destruction). The shallow zone beneath the site building is suspected to contain pockets of free-phase organic contaminants, which require additional treatments. A continued treatment program is discussed in Section 5 of this report.

Table 4-1: Pre Vs Post-Treatment VOC Results
10 N. Franklin St.
Watkins Glen, NY
Job# 800179

Monitoring Location	Vinyl Chloride	Methylene Chloride	Acetone	1,1-Dichloroethene	Cis-1,2-Dichloroethene	Methyl ethyl ketone	1,2-Dichloroethane	Trichloroethene	Benzene	4-Methyl-2-pentanone	Tetrachloroethene	Toluene	Ethylbenzene	Total Xylenes	Total VOC's
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
12W-1	48	ND	ND	ND	130	ND	ND	25	ND	ND	200	ND	ND	ND	403
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	130	ND	9	ND	230	ND	ND	19	ND	ND	67	ND	ND	ND	455
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	0%	-	-	-	inc.	-	-	24%	-	-	67%	-	-	-	inc.
12W-2	25	ND	4	ND	39	ND	ND	8	ND	ND	15	ND	ND	ND	91
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	10	ND	2	ND	36	ND	ND	11	ND	ND	19	ND	ND	ND	78
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	60%	-	50%	-	8%	-	-	inc.	-	-	inc.	-	-	0%	14%
12W-3	ND	ND	13	ND	2	3	ND	5	ND	ND	7	ND	4	79	113
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	3	ND	18	ND	ND	ND	ND	2	2	ND	ND	ND	ND	21	46
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	inc.	-	inc.	-	100%	100%	-	60%	inc.	-	100%	-	100%	73%	59%
1W-1	25	ND	ND	ND	140	ND	ND	61	ND	ND	270	ND	ND	1	497
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1W-2	19	ND	ND	ND	110	ND	ND	110	ND	ND	730	ND	ND	3	972
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1W-3	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	3	ND	ND	ND	4
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1W-4	730	ND	2	3	1400	ND	ND	4	ND	ND	32	ND	ND	10	2,181
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	14	ND	ND	ND	48	ND	ND	30	ND	ND	1,000	ND	ND	ND	1,092
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	98%	-	100%	100%	97%	-	-	inc.	-	-	inc.	-	-	0%	50%
1W-5	2	ND	ND	ND	270	ND	ND	140	ND	ND	1,000	ND	ND	ND	1,412
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	17	ND	ND	2	2500	ND	ND	220	ND	ND	2,200	ND	ND	ND	4,939
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	inc.	-	-	inc.	inc.	-	-	inc.	-	-	inc.	-	-	-	inc.
1W-6	5,000	3	4	110	45,000	ND	1	9,000	2	2	46,000	3	4	39	105,168
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	1,200	ND	23	36	13,000	ND	ND	2,900	2	ND	7,500	3	2	16	24,682
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	76%	100%	inc.	67%	71%	-	100%	68%	0%	100%	84%	0%	50%	59%	77%
1W-7	8	ND	2	ND	400	ND	ND	44	ND	ND	600	ND	ND	ND	1,054
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1W-8	24	ND	2	ND	150	1	ND	16	1	ND	400	ND	7	42	643
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-1: Pre Vs Post-Treatment VOC Results
10 N. Franklin St.
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Monitoring Location	Vinyl Chloride	Methylene Chloride	Acetone	1,1-Dichloroethene	Cis-1,2-Dichloroethene	Methyl ethyl ketone	1,2-Dichloroethane	Trichloroethene	Benzene	4-Methyl-2-pentanone	Tetrachloroethene	Toluene	Ethylbenzene	Total Xylenes	Total VOC's
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MW-3	17	ND	ND	1	1,900	ND	ND	83	ND	ND	77	ND	ND	ND	2,078
Post-1	330	ND	24	13	5,500	ND	ND	160	ND	ND	83	ND	ND	6	6,116
Post-2	390	ND	ND	4	2,200	ND	ND	14	ND	ND	ND	ND	ND	ND	2,608
% Reduction-1	inc.	-	-	inc.	inc.	-	-	inc.	-	-	inc.	-	-	-	inc.
% Reduction-2	inc.	-	-	inc.	inc.	-	-	83%	-	-	100%	-	-	-	inc.
MW-4S	ND	ND	3	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
Post-1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-2	3	ND	10	ND	31	ND	ND	24	ND	ND	75	ND	ND	ND	143
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	inc.	-	inc.	-	inc.	-	-	inc.	-	-	inc.	-	-	-	inc.
MW-5D	ND	ND	2	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	18
Post-1	110	ND	ND	4	680	ND	ND	1,200	ND	ND	3,900	1	ND	ND	5,895
Post-2	31	ND	ND	3	650	ND	ND	230	ND	ND	900	ND	ND	ND	1,814
% Reduction-1	inc.	-	100%	inc.	inc.	-	-	inc.	-	-	inc.	inc.	-	-	inc.
% Reduction-2	inc.	-	100%	inc.	inc.	-	-	inc.	-	-	inc.	-	-	-	inc.
MW-5S	560	ND	ND	2	1,400	ND	ND	33	ND	ND	120	ND	ND	ND	2,115
Post-1	480	ND	ND	11	4,700	ND	ND	580	ND	ND	4,500	ND	ND	6	10,277
Post-2	180	ND	ND	3	970	ND	ND	71	ND	ND	420	ND	ND	ND	1,644
% Reduction-1	14%	-	-	inc.	inc.	-	-	inc.	-	-	65%	-	-	inc.	inc.
% Reduction-2	68%	-	-	inc.	inc.	-	-	inc.	-	-	inc.	-	-	-	22%
MW-7S	1	ND	ND	ND	6	ND	ND	ND	7	ND	ND	ND	ND	ND	14
Post-1	3	ND	ND	ND	36	ND	ND	4	11	ND	5	2	ND	ND	61
Post-2	ND	ND	ND	ND	6	ND	ND	2	ND	ND	6	ND	ND	ND	14
% Reduction-1	inc.	-	-	-	inc.	-	-	inc.	inc.	-	inc.	inc.	-	-	inc.
% Reduction-2	100%	-	-	-	0%	-	-	inc.	100%	-	inc.	-	-	-	0%
MW-8S	ND	ND	ND	ND	ND	ND	ND	ND	33	ND	ND	6	260	660	959
Post-1	ND	ND	ND	ND	47	ND	ND	7	ND	ND	20	3	140	320	537
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	0%	-	-	-	inc.	-	-	inc.	100%	-	inc.	50%	46%	52%	44%
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-9S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	1
Post-1	ND	ND	ND	ND	4	ND	ND	2	ND	ND	8	2	ND	ND	16
Post-2	ND	ND	ND	ND	4	ND	ND	2	ND	ND	6	ND	ND	ND	12
% Reduction-1	-	-	-	-	inc.	-	-	inc.	-	-	inc.	inc.	-	-	inc.
% Reduction-2	-	-	-	-	inc.	-	-	inc.	-	-	inc.	-	-	-	inc.
MW-11D	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-1	ND	ND	ND	ND	2	ND	ND	1	ND	ND	6	ND	ND	ND	9
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-11S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-1	14	ND	ND	ND	150	ND	ND	26	ND	ND	200	ND	ND	ND	390
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-12S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-1	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	3	2	ND	ND	6
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-20S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Post-1	41	ND	ND	ND	370	ND	ND	52	ND	ND	150	2	ND	ND	615
Post-2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
% Reduction-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Reduction-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Pre	6,459	3	32	116	50,965	4	1	9,529	43	2	49,455	9	275	834	117,727
Total Post-1	978	0	24	28	11,490	0	0	2,032	11	0	8,875	12	140	332	23,922
Total Post-2	1,978	0	62	48	19,675	0	0	3,525	4	0	12,193	3	2	37	37,527
% Reduction-1	84.9%	inc.	inc.	75.9%	77.5%	inc.	inc.	78.7%	74.4%	inc.	82.1%	inc.	49.1%	60.2%	79.7%
% Reduction-2	69.4%	100.0%	inc.	58.6%	61.4%	100.0%	100.0%	63.0%	90.7%	100.0%	75.3%	66.7%	99.3%	95.6%	68%

ND=Not detected at method detection limit
NS=Not sampled
inc.=Increase in concentration

Table 4-2: Pre Vs Post-Treatment Monitoring Results

10 N. Franklin St.
Watkins Glen, NY
Job# 800179

Monitoring Location	Iron	Petroleum Hydrocarbons	Total Dissolved Solids (TDS)	Total Organic Carbon (TOC)
	mg/L	mg/L	mg/L	mg/L
12W-1	14,500	ND	420	12
Post-1	NS	NS	NS	NS
Post-2	24,400	ND	1,080	95
12W-2	14300	ND	651	9
Post-1	NS	NS	NS	NS
Post-2	14800	ND	2370	207
12W-3	24100	10	618	49
Post-1	NS	NS	NS	NS
Post-2	71900	ND	2240	212
IW-1	1,340	ND	1,180	2
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
IW-2	820	ND	963	3
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
IW-3	1080	ND	723	5
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
IW-4	25300	ND	362	5
Post-1	NS	NS	NS	NS
Post-2	8570	ND	961	35
IW-5	92.2	ND	252	4.2
Post-1	NS	NS	NS	NS
Post-2	43100	ND	499	19.4
IW-6	2,200	ND	638	14
Post-1	NS	NS	NS	NS
Post-2	170,000	ND	665	41.8
IW-7	4480	ND	257	6
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
IW-8	3600	ND	705	8
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
MW-2S	1420	ND	440	4
Post-1	NS	NS	NS	NS
Post-2	NS	NS	NS	NS
MW-3	5,990	ND	521	6
Post-1	24,200	ND	852	37
Post-2	25,800	NA	1,110	23.9
MW-4S	12,400	ND	1,000	13
Post-1	NS	NS	NS	NS
Post-2	4,960	ND	1,390	7.2
MW-5D	1,450	ND	1,670	8
Post-1	3,350	3	7,460	4
Post-2	1,380	ND	3,270	5.4
MW-5S	12,300	ND	536	7
Post-1	8,930	3	1,130	19
Post-2	11,700	ND	812	10
MW-7S	13,700	ND	1,180	9.5
Post-1	15,600	ND	903	8
Post-2	4,640	ND	1,090	12.4
MW-8S	31,500	4	996	21
Post-1	38200	3	1,930	8
Post-2	NS	NS	NS	NS

Table 4-2: Pre Vs Post-Treatment Monitoring Results
10 N. Franklin St.
Watkins Glen, NY
Job# 800179

Monitoring Location	Iron	Petroleum Hydrocarbons	Total Dissolved Solids (TDS)	Total Organic Carbon (TOC)
	mg/L	mg/L	mg/L	mg/L
MW-9S	7,990	ND	917	1.6
Post-1	73,300	ND	920	2.1
Post-2	2,360	ND	972	2.7
MW-11D	NS	NS	NS	NS
Post-1	31,800	ND	10,500	6
Post-2	NS	NS	NS	NS
MW-11S	NS	NS	NS	NS
Post-1	20500	3	1,220	2.2
Post-2	NS	NS	NS	NS
MW-12S	NS	NS	NS	NS
Post-1	1400	3	1,910	1
Post-2	NS	NS	NS	NS
MW-20S	NS	NS	NS	NS
Post-1	8190	3	747	4
Post-2	NS	NS	NS	NS

Table 4-3: Summary of Mass Calculation Results

Depth Interval	Treatment Location	Contaminant	*Mass (lbs.) Pre-treatment (March-September 1998)	Mass (lbs.) Post-treatment (October 2000)	% Reduction
0-4’	Underneath Building	PCE	13.654	0.008	99.90%
		TCE	0.002	0.001	50.00%
		1,2-DCE	0.001	0.001	0%
		VC	0	0	-
	Outside Building	PCE	260.913	11.506	95.60%
		TCE	0.069	0.001	98.60%
		1,2-DCE	0.117	0.003	97.40%
		VC	0	0	-
4-6’	Underneath Building	PCE	5.773	109.742	Increase
		TCE	0.194	0.149	23.20%
		1,2-DCE	0.112	0.114	Increase
		VC	0.002	0.004	Increase
	Outside Building	PCE	45.452	0.541	99.00%
		TCE	0.32	0.145	54.70%
		1,2-DCE	0.178	0.165	7.30%
		VC	0.012	0.002	83.30%
6-15’	Underneath Building	PCE	24.211	3.326	86.30%
		TCE	0.531	0.045	91.50%
		1,2-DCE	1.463	0.927	36.60%
		VC	0.057	0.102	Increase
	Outside Building	PCE	10.217	10.976	Increase
		TCE	2.267	0.009	99.60%
		1,2-DCE	1.229	0.215	82.50%
		VC	0.046	0.018	60.90%
Combined Depths (0-15')	Underneath Building	PCE	43.64	113.076	Increase
		TCE	0.73	0.195	73.30%
		1,2-DCE	1.58	1.042	34.10%
		VC	0.06	0.106	Increase
		Total	46	114.42	Increase
	Outside Building	PCE	316.58	23.023	92.70%
		TCE	2.66	0.155	94.20%
		1,2-DCE	1.52	0.383	74.80%
		VC	0.06	0.02	66.70%
		Total	320.82	23.58	92.70%
Total	Both areas	PCE	360.22	136.1	62.20%
		TCE	3.38	0.35	90.00%
		1,2-DCE	3.1	1.43	53.90%
		VC	0.12	0.13	Increase
		Total	**366.82**	**138**	**62.40%**

Note

* = Results from *Evaluation and Conceptual Design For Additional Remedial Action* report (URS, February 1999)

Section 5 Continued Treatment Program

Review of ISOTEC remedial treatment program has shown that the process is effective towards remediating the contaminants of concern (PCE, TCE, DCE, and VC). Based on post-treatment analytical data, soil and groundwater contaminant concentrations have reduced considerably and have shown a decreasing trend throughout the pilot study area. Although the pilot program was successful, data indicate contaminant levels still remain above the applicable NYDEC standards. Therefore, ISOTEC recommends continuing the treatment program to reduce the remaining mass of contamination to the desired level.

5.1 Continued Treatment Program Work Plan

The continued treatment program will consist of introducing ISOTEC chemical oxidation reagents into the subsurface utilizing the same injection points as in Phase-I and Phase-II. The treatment will target the "hot spot" area in the vicinity of IW-6 (outside building) and I2W-02 and I2W-03 (underneath building) where the contaminant plume is suspected to have originated.

ISOTEC believes the selected injection systems will provide sufficient distribution of our proprietary blend of catalysts, oxidizers and mobility control reagents into the subsurface.

5.2 Treatment Program Monitoring Plan

Specific site monitoring will be performed similar to Phases I and II of the pilot program. For the North Franklin Street site, soil and groundwater samples will be collected and analyzed for VOCs via EPA Method 624/ 8260. In addition, samples will be analyzed for total dissolved solids (TDS), total organic carbon (TOC), and total iron as part of the continued treatment program. Monitor locations include all existing locations consistent with the expanded scope of the treatment program (See Section 4.2.2.4). In addition, trip and field blanks will also be collected during sampling events. Field parameters monitored during the pilot program include field tests for iron and hydrogen peroxide (using Hach Test Kits or equivalent).

5.3 Project Schedule

Based on previous work at the site, field activities for the former North Franklin Street site are estimated at 4-5 days per event or until the pre-determined quantity of reagents has been injected. ISOTEC proposes to complete the continued treatment program in an effort to reach cleanup objectives. Standard daily working hours on-site will be from 8:00 AM to 5:00 PM.

ISOTEC will perform the continued treatment program upon approval from the Client. It is currently contemplated treatment will continue during the spring of 2001. ISOTEC will request an extension of the existing permit-by-rule waiver to discharge to a Class V UIC system under NPDES regulations. A remedial action schedule will be submitted under separate cover pending approval to proceed.

APPENDIX #1

POST-TREATMENT MASS CALCULATIONS
(BY ISOTEC)

Appendix 1: Pilot Study Results - Mass Calculations
10 North Franklin St., Watkins Glen, NY
ISOTEC Job #800179

Outside Building Post-Treatment Data
(October-2000)

Contaminant of Concern (COC)			Vinyl Chloride VC	1,2 Dichloroeth [illegible] DCE	[illegible]	[illegible]
SOIL DATA [illegible]						
Average Depth of Contamination	ft	4				
Treatment Area	Sq. ft	468				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-09	ug/kg	2.0-4.0	ND	13	3	ND
CB-10	ug/kg	0.0-4.0	ND	28	14	720
CB-11	ug/kg	1.0-4.0	ND	38	19	670
CB-12	ug/kg	1.0-4.0	ND	4	3	430000
CB-13	ug/kg	0.0-4.0	ND	9	4	160
CB-14	ug/kg	0.0-4.0	ND	6	4	150
CB-15	ug/kg	0.0-4.0	ND	9	6	220
Average Concentration	ug/kg		0	15.28571	7.571429	61702.86
Average COC Mass in Soils	lbs		0.000	0.003	0.001	11.506
Total COC Mass in Soils (0-4 ft bgs)	lbs		11.511			
SOIL DATA [illegible]						
Average Depth of Contamination	ft	2				
Treatment Area	Sq. ft	495				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-03	ug/kg	5.0-6.0	8	460	ND	ND
CB-04	ug/kg	5.0-5.5	ND	22	10	45
CB-05	ug/kg	5.0-5.5	25	13000	13000	47000
CB-06	ug/kg	5.0-5.5	150	82	58	170
CB-08	ug/kg	5.0-5.5	5	8	ND	ND
CB-12	ug/kg	4.0-6.0	3	450	60	1400
CB-13	ug/kg	4.0-6.0	6	250	3	39
CB-14	ug/kg	4.0-6.0	4	650	51	250
CB-15	ug/kg	4.0-6.0	5	160	86	450
Average Concentration	ug/kg		22.88889	1675.778	1474.222	5483.778
Average COC Mass in Soils	lbs		0.002	0.165	0.145	0.541
Total COC Mass in Soils (4-6 ft bgs)	lbs		0.854			
SOIL DATA [illegible]						
Average Depth of Contamination	ft	9				
Treatment Area	Sq. ft	481				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-02	ug/kg	7.0-8.0	7	17	4	ND
CB-03	ug/kg	8.0-9.0	43	2200	4	76
CB-06	ug/kg	9.0-10.0	350	2900	120	24000
CB-07	ug/kg	8.0-9.0	ND	ND	ND	ND
CB-08	ug/kg	5.0-5.5	5	8	ND	ND
CB-09	ug/kg	2.0-4.0	ND	13	3	ND
CB-09	ug/kg	11.0-12.0	250	950	ND	ND
CB-10	ug/kg	0.0-4.0	ND	28	14	720
CB-11	ug/kg	1.0-4.0	ND	38	19	670
CB-12	ug/kg	1.0-4.0	ND	4	3	430000
CB-12	ug/kg	4.0-6.0	3	450	60	1400
CB-12	ug/kg	9.0-10.0	65	1300	ND	18
CB-13	ug/kg	0.0-4.0	ND	9	4	160
CB-13	ug/kg	4.0-6.0	6	250	3	39
CB-14	ug/kg	0.0-4.0	ND	6	4	150
CB-14	ug/kg	4.0-6.0	4	650	51	250
CB-15	ug/kg	0.0-4.0	ND	9	6	220
CB-15	ug/kg	4.0-6.0	5	160	86	450
Average Concentration	ug/kg		41	499.5556	21.16667	25452.94
Average COC Mass in Soils	lbs		0.018	0.215	0.009	10.976
Total COC Mass in Soils (6-15 ft bgs)	lbs		11.219			
Total COC Mass in Soils (All Depths)	lbs		24			

Appendix 1: Pilot Study Results - Mass Calculations
10 North Franklin St., Watkins Glen, NY
ISOTEC Job #800179

Underneath Building Post-Treatment Data
(October-2000)

Contaminant of Concern (COC)			Vinyl Chloride VC	1,2-Dichloroethene DCE	Trichloro ethylene TCE	Perchloroethylene PCE
SOIL DATA (0-4 ft bgs)						
Average Depth of Contamination	ft	4				
Treatment Area	Sq. ft	116				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	0.0-4.0	ND	ND	ND	28
CB-L	ug/kg	0.0-4.0	ND	45	31	320
Average Concentration	ug/kg		0	22.5	15.5	174
Average COC Mass in Soils	lbs		0.000	0.001	0.001	0.008
Total COC Mass in Soils (0-4 ft bgs)	lbs		0.010			
SOIL DATA (4-6 ft bgs)						
Average Depth of Contamination	ft	2				
Treatment Area	Sq. ft	486				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	4.0-6.0	3	31	4	160
CB-H	ug/kg	4.0-6.0	120	3500	4600	3400000
CB-L	ug/kg	4.0-6.0	ND	ND	ND	ND
Average Concentration	ug/kg		41	1177	1534.667	1133387
Average COC Mass in Soils	lbs		0.004	0.114	0.149	109.742
Total COC Mass in Soils (4-6 ft bgs)	lbs		110.009			
SOIL DATA (6-15 ft bgs)						
Average Depth of Contamination	ft	9				
Treatment Area	Sq. ft	265				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	10.0-12.0	430	3900	190	14000
Average Concentration	ug/kg		430	3900	190	14000
Average COC Mass in Soils	lbs		0.102	0.927	0.045	3.326
Total COC Mass in Soils (6-15 ft bgs)	lbs		4.400			
Total COC Mass in Soils (All Depths)	lbs		114			

APPENDIX #2

BASELINE MASS CALCULATIONS SUMMARY
(BY URS)

Table 2

North Franklin Street Site
Estimated Volumes of Contaminated Soil

Depth Interval	Location	Area (ft²)	Volume (ft³)	Contams.	Avg. Conc. (µg/Kg)	Total Cont. (lbs)
0-4' Fill	Underneath Building	116	464	PCE	294,266	13.654
				TCE	35	0.002
				1,2-DCE	19	0.001
				VC	0	0.000
	Outside Building (URS Samples)	468	1,872	PCE	1,393,768	260.913
				TCE	369	0.069
				1,2-DCE	623	0.117
				VC	0	0.000
	Outside Building (Terra Vac Samples)	1,020	4,080	PCE	3,900	1.591
				TCE	308	0.126
				1,2-DCE	292	0.119
				VC	0	0.000
4-6' Fill / Clay Interface	Underneath Building	486	972	PCE	59,389	5.773
				TCE	1,991	0.194
				1,2-DCE	1,148	0.112
				VC	17	0.002
	Outside Building (URS Samples)	495	990	PCE	459,106	45.452
				TCE	3,234	0.320
				1,2-DCE	1,794	0.178
				VC	120	0.012
	Outside Building (Terra Vac Samples)	253	506	PCE	183	0.009
				TCE	297	0.015
				1,2-DCE	746	0.038
				VC	9	0.000
6-15' Clay	Underneath Building	265	2,385	PCE	101,516	24.211
				TCE	2,226	0.531
				1,2-DCE	6,136	1.463
				VC	240	0.057
	Outside Building (URS Samples) - No Terra Vac samples collected	481	4,329	PCE	23,601	10.217
				TCE	5,236	2.267
				1,2-DCE	2,839	1.229
				VC	107	0.046
Subtotals	Underneath Building		3,821	PCE		43.64
				TCE		0.73
				1,2-DCE		1.58
				VC		0.06
				Subtotal		**46.00**
	Outside Building (URS Samples)		7,191	PCE		316.58
				TCE		2.66
				1,2-DCE		1.52
				VC		0.06
				Subtotal		**320.82**
	Outside Building (Terra Vac Samples)		4,586	PCE		1.60
				TCE		0.14
				1,2-DCE		0.16
				VC		0.00
				Subtotal		**1.90**
Total	All Areas		15,598	PCE		361.82
				TCE		3.52
				1,2-DCE		3.26
				VC		0.12
				Total		**368.72**

Assumed soil density is 100 lb/ft³

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APPENDIX #3

SELECTED SOIL BORING LOCATIONS FOR BASELINE MASS CALCULATIONS

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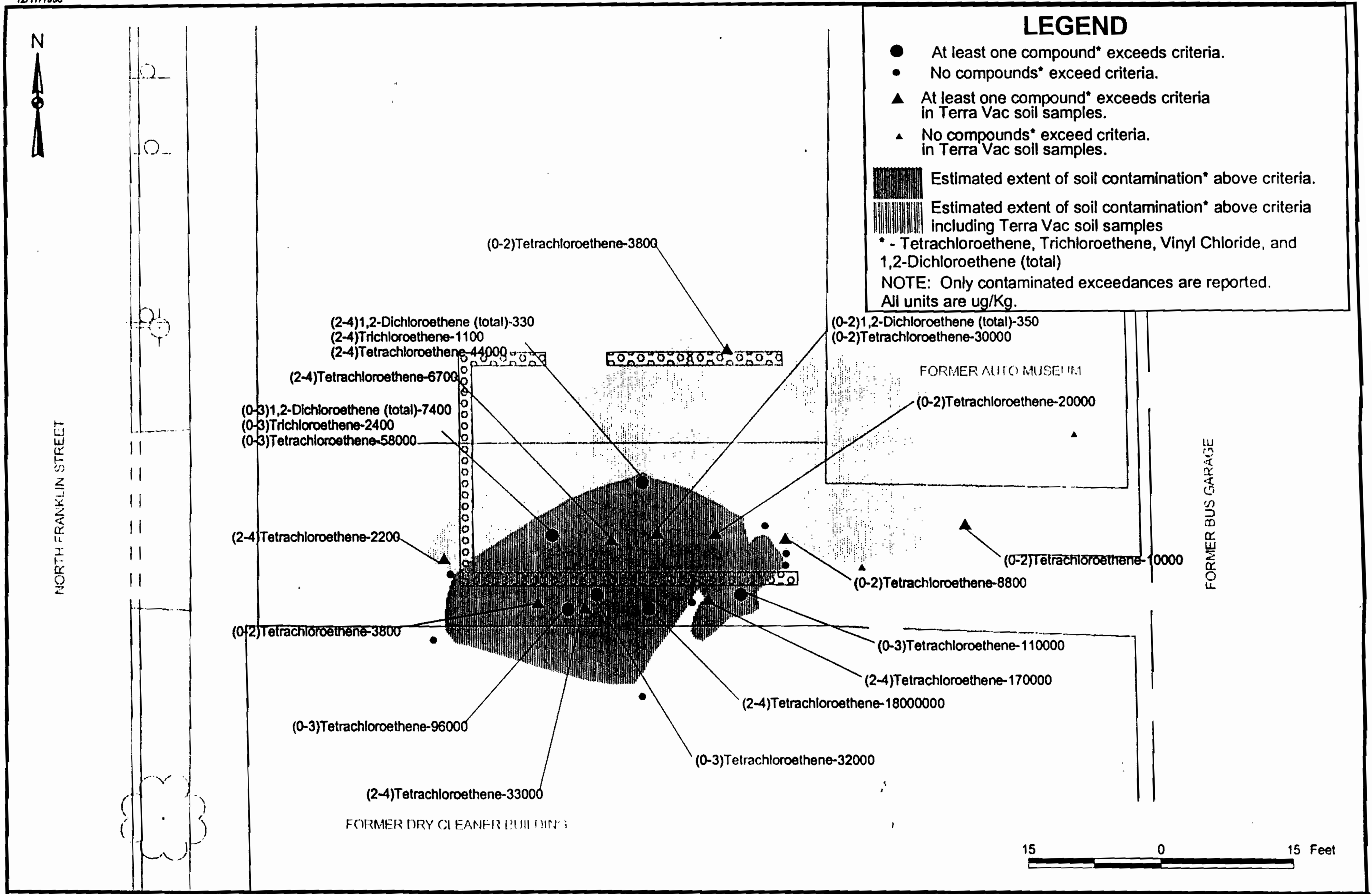
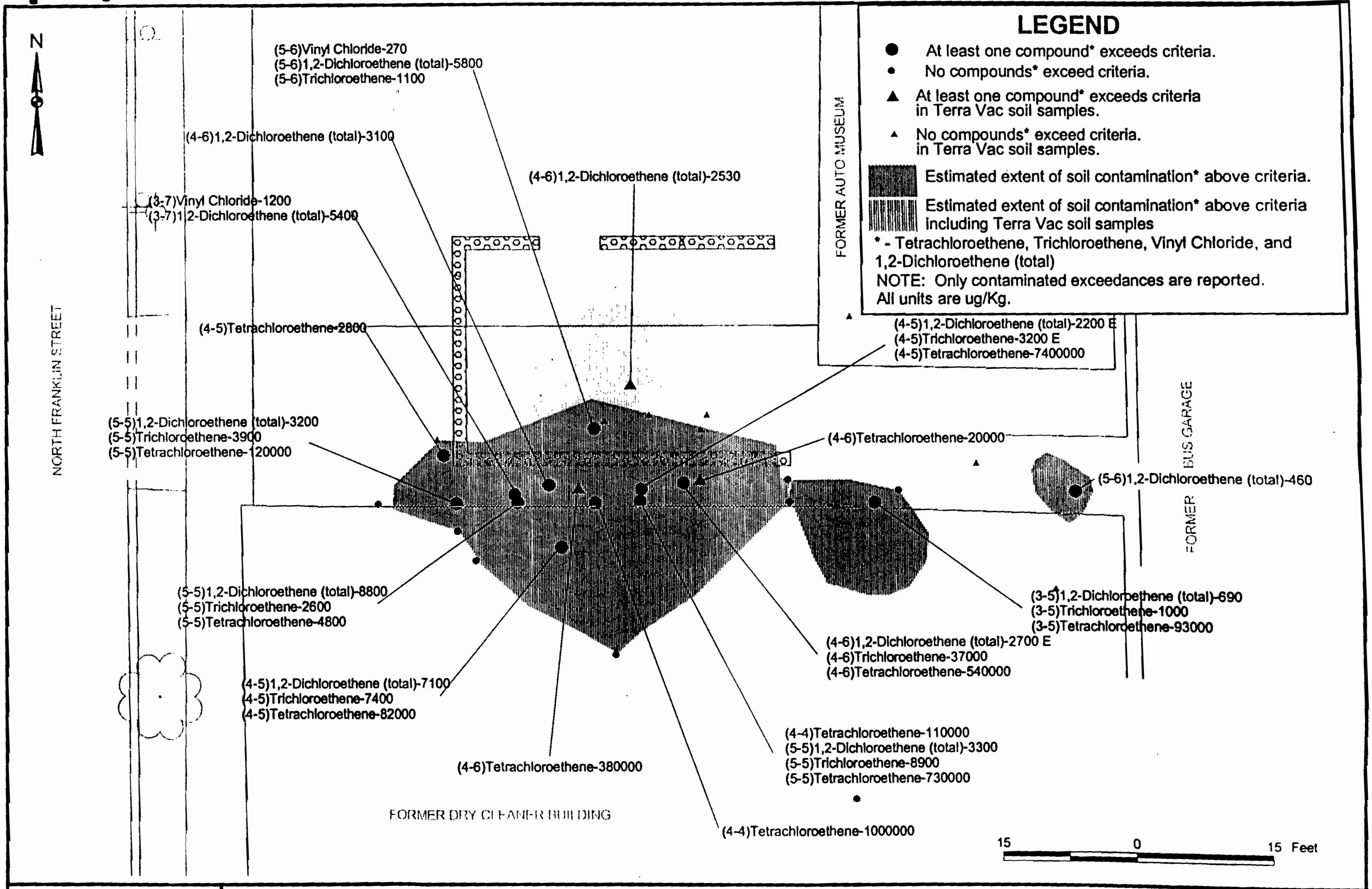


URS
Greiner

North Franklin Street
Tetrachloroethene, Trichloroethene, Vinyl Chloride, 1,2-Dichloroethene (total)
Depth: 0 - 4 ft.

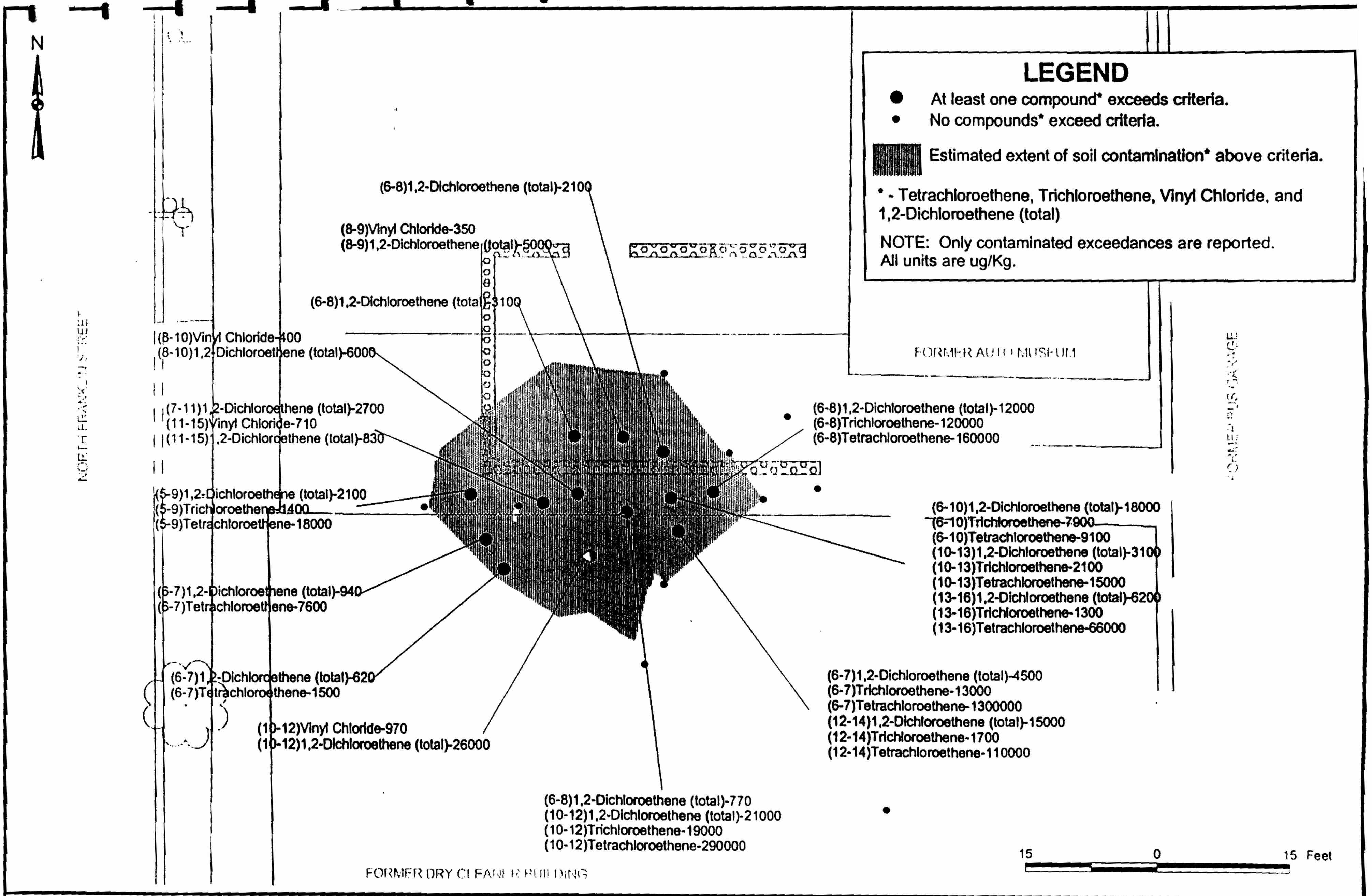
FIGURE 3



URS
Greiner

North Franklin Street
Tetrachloroethene, Trichloroethene, Vinyl Chloride, 1,2-Dichloroethene (total)
Depth: 4 - 6 ft.

FIGURE 4



URS
Greiner

North Franklin Street
Tetrachloroethene, Trichloroethene, Vinyl Chloride, 1,2-Dichloroethene (total)
Depth: > 6 ft.

FIGURE 5

APPENDIX #4

POST-TREATMENT SOIL BORING RESULTS
(OCTOBER 2000)

Appendix 4: Post-Treatment Soil Boring Results (October 2000)
10 N. Franklin St. Watkins Glen, NY
Project # 800179

Sampling Location	Depth Interval	Date	VC	MC	AC	1.1 DCE	1,2 DCE	BDC	MEK	CHL	TCE	DBC	B	PCE	T	EB	X	Total VOCs
	ft.		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
CB-02	7.0-8.0	10/18/00	7		27		17				4						51	106
CB-03	5.0-6.0	10/18/00	8		150		460										23	641
CB-03	8.0-9.0	10/18/00	43		100	5	2,200				4			76		35	180	2,643
CB-04	5.0-5.5	10/18/00					22			3	10			45				80
CB-05	5.0-5.5	10/18/00	25		110	5	13,000				13,000		3	47,000	5	4	52	73,204
CB-06	5.0-5.5	10/18/00	150		92		82		32		58			170			22	606
CB-06	9.0-10.0	10/18/00	350		31		2,900				120			24,000	54	4	440	27,899
CB-07	8.0-9.0	10/18/00			29				7									36
CB-08	5.0-5.5	10/18/00	5		260		8		81								7	361
CB-09	2.0-4.0	10/18/00			15		13				3							31
CB-09	11.0-12.0	10/18/00	250		140		950						5		5	26	670	2,046
CB-10	0.0-4.0	10/18/00		98			28				14			720				860
CB-11	1.0-4.0	10/18/00		63			38				19			670				790
CB-12	1.0-4.0	10/18/00		48	3		4				3			430,000				430,058
CB-12	4.0-6.0	10/18/00	3	46	24		450		7		60			1,400			16	2,006
CB-12	9.0-10.0	10/18/00	65		31	7	1,300		10					18	3	8	310	1,752
CB-13	0.0-4.0	10/19/00					9				4			160				173
CB-13	4.0-6.0	10/19/00	6		63		250				3			39		2	10	373
CB-14	0.0-4.0	10/19/00					6				4			150				160
CB-14	4.0-6.0	10/19/00	4		70		650				51		3	250	2	4	14	1,048
CB-15	0.0-4.0	10/19/00			5		9				6			220				240
CB-15	4.0-6.0	10/19/00	5		5		160				86			450				706
CB-G	0.0-4.0	10/18/00						3	1	3		2		28				37
CB-G	4.0-6.0	10/18/00	3		4		31				4			160				202
CB-G	10.0-12.0	10/18/00	430		19	4	3,900		5		190			14,000			9	18,557
CB-H	4.0-6.0	10/18/00	120		59	23	3,500		17		4,600			3,400,000	20	8	56	3,408,403
CB-L	0.0-4.0	10/18/00					45				31			320				396
CB-L	4.0-6.0	10/18/00			6													6

Notes: VC=vinyl chloride, MC=methylene chloride, AC=acetone, 1,1-DCE=1,1-dichloroethene, 1,2-DCE=1,2-dichloroethene, BDC=bromodichloroethane, MEK=methyl ethyl ketone, CHL=chloroform, TCE=trichloroethene, DBC=dibromochloromethane, B=benzene, PCE=tetrachloroethene, T=toluene, EB=ethylbenzene,, X=total xylenes

APPENDIX #5

ISOTEC LABORATORY BENCH-SCALE REPORT

LABORATORY TREATABILITY REPORT

NORTH FRANKLIN STREET
WATKINS GLEN, NEW YORK

MAY 5, 2000

PREPARED FOR

URS GREINER WOODWARD CLYDE
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202-1805

PREPARED BY

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
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ISOTEC CASE NO. 800179

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APPENDICES

Section 1 Executive Summary

In-Situ Oxidative Technologies, Inc. (ISOTEC^{SM}) was retained by URS Greiner Woodward Clyde (URS) to conduct a laboratory treatability study (study) on soil and groundwater samples collected at the North Franklin Street-Watkins Glen Site in New York. The purpose of the study was to determine the potential effectiveness of ISOTEC's *in situ* chemical oxidation process to oxidize site contaminants of concern in soil and groundwater at the site.

The ISOTEC process is based on Fenton's chemistry using a proprietary catalyst to produce hydroxyl radicals that oxidize chemical bonds. The target contaminants of concern for the study were trichloroethene (TCE) and tetrachloroethene (PCE). Experiments were conducted on samples of site groundwater and on a mixture of site groundwater and site soil (soil-slurry) that was prepared by ISOTEC at their facility. Results of the study indicated greater than 99% destruction of total targeted VOCs in the groundwater test (GW-test) and up to 92% destruction of total targeted VOCs in the soil-slurry test (SL-test). The study results were used to design a pilot scale application of the ISOTEC process for the site from which the study samples were collected.

Section 2 Study Objectives

The objectives of the study were as follows:

- For each ISOTEC catalyst under evaluation, determine the amount of catalyst/oxidant mix (reagent) required to oxidize the measured contaminants at the site (i.e., the site-specific stoichiometry per catalyst);
- Evaluate the effectiveness of ISOTEC's Fenton-based chemical oxidation on site groundwater samples;
- Evaluate the effectiveness of ISOTEC's Fenton-based chemical oxidation in the presence of site aquifer solids (i.e. soil); and
- Determine the most effective reagent for a potential pilot scale application at the site.

Section 3 Sample Collection

URS collected soil and groundwater samples from the site then shipped the samples to the ISOTEC facility for the study. Soil samples were collected and composited from a location identified as ISO-SB-1 on March 16, 2000 at a depth ranging from 5-6.5 feet below ground surface (bgs). The soil was collected in three 1-gallon zip lock bags and was stored at 4 degrees Celsius (°C) until mixed at the laboratory with the site groundwater sample to form the soil-slurry mix used during the study.

The groundwater was collected on March 16, 2000 from a location identified as MW-5S. The groundwater was collected in five unpreserved 1-liter glass containers and two 40-milliliter (ml) vials preserved in hydrochloric acid (HCl). The groundwater containers were filled completely with zero headspace. ISOTEC later decanted a portion of the unpreserved groundwater sample into a 250-ml jar for dissolved iron analysis. The preserved volumes were used to analyze the initial VOC content in the site groundwater. The groundwater was stored at 4°C until used during the study.

Section 4 Laboratory Treatability Study

The study consisted of the experimental setup, establishing initial conditions and experimental controls, conducting the experiments through application of various catalysts and oxidants, and then submitting the treated samples for chemical analysis.

4.1 Experimental Setup

Two sets of laboratory experiments were performed: one set on the groundwater sample and one set on a soil-slurry mix. The groundwater experiments are hereinafter referred to as Groundwater Test (GW-test) and consisted one experiment to determine the optimum catalyst/oxidant mix (reagent) and reagent volume, as evidenced by VOC oxidation in groundwater.

The soil-slurry experiments are hereinafter referred to as Soil-Slurry Test (SL-test) and consisted of one experiment to determine the optimum reagent and reagent volume as evidenced by VOC oxidation in the soil-slurry.

4.1.1 GW-test Experimental Setup

The GW-test consisted of one VOC experiment as described below.

4.1.1.1 VOC Experiment

The GW-test VOC experiment was performed in three pairs of 140 ml sealed batch reactors (reactors). Groundwater was introduced into each reactor, leaving enough headspace for predetermined reagent volumes to be injected. The reactors were sealed with aluminum caps fitted with Teflon®-lined rubber septa to facilitate reagent injections.

Each pair received either a different reagent, or a different volume of a particular reagent. One reactor of each pair served as the "treatment reactor" while the other served as the "monitoring reactor". Both reactors of each pair received identical reagent doses. The treatment reactor was not opened or sampled until the end of the experiment. The monitoring reactor was used to monitor the extent of the oxidation reaction of the pair, by periodically extracting small samples for hydrogen peroxide analysis. Additional reactors were set up for control purposes. Control reactors are discussed later in Section 4.3.

4.1.2 SL-test Experimental Setup

The SL-test consisted of the VOC experiment as described below.

4.1.2.1 VOC Experiment

The SL-test VOC experiment was performed in six pairs of 120 ml sealed batch reactors (reactors). The soil-slurry mix was prepared from a one to one ratio by weight (1:1 w/w) of composited soil ISO-SB-1 and groundwater from MW-5S. The soil-slurry was introduced into each reactor, leaving enough headspace for predetermined reagent volumes to be injected. The reactors were sealed with screw-top caps fitted with Teflon®-lined rubber septa to facilitate reagent injections. One additional reactor was setup and stored at 4°C to represent initial conditions (Section 4.2).

As with the GW-test, each pair received either a different reagent, or a different volume of a particular reagent, with one reactor serving as the "treatment reactor" and the other as the "monitoring reactor". Both reactors of each pair received identical reagent doses. The treatment reactor was not opened or sampled until the end of the experiment. The monitoring reactor was used to monitor the extent of the oxidation reaction of the pair, by periodically extracting small samples for hydrogen peroxide analysis. Additional reactors were set up for control purposes. Control reactors are discussed later in Section 4.3.

4.2 Initial Conditions

The initial conditions of each matrix (soil, groundwater and soil-slurry) were established prior to initiating the experiments.

Soil was analyzed for iron and manganese by EPA method 6010 and total organic carbon (TOC) by EPA method 9060.

Groundwater was analyzed for dissolved Iron by EPA method 6010; and VOCs by EPA method 624 +10.

Soil-slurry was analyzed for VOCs by EPA method 8260B +10.

The results of the initial condition analyses are presented in Table 4-1. The analytical laboratory reports, including chains of custody, are presented in Appendix 1.

4.3 Experimental Control

Experimental control samples (Control) were set up during the study to document the following:

- reduction in contaminant concentrations due to sample dilution by reagent volumes injected, and
- reduction in contaminant concentrations due to volatilization caused by room temperature test conditions.

The control sample was set up in a treatment reactor but was injected with distilled water instead of catalyst and oxidant. The volume of distilled water injected was identical to the volumes of reagent injected into treatment reactors. The control sample remained at and was subject to the same conditions as the treatment and monitoring reactors.

Control samples were used during the following experiments:

- GW-test VOC experiment, and
- SL-test VOC experiment.

4.4 Application of Reagents

The study experiments were performed on each matrix. Where multiple pairs of reactors were prepared for a given matrix, a series of different reagents or different volumes of the same reagent were injected into each pair of reactors (treatment and monitoring). Each monitoring reactor received an identical dose as its paired treatment reactor. Samples were periodically withdrawn from the monitoring reactors for hydrogen peroxide analysis, the results of which may have led to additional treatment dosages of the reagent under study, for its paired treatment reactor. Distilled water was used to equalize the total volume of reagent used between reactor pair.

Following the last application of reagent, all reactors remained undisturbed at room temperature for a minimum of 24 hours or until the oxidizer was completely consumed as determined by Hach H_2O_2 testing equipment. The reaction was quenched using catalase, which is an organic enzyme catalyst naturally present in most soils that decomposes hydrogen peroxide directly to oxygen without generating hydroxyl radicals as shown below.

$$H_2O_2 \rightarrow H_2O + \tfrac{1}{2} O_2$$

After the resting period, excess catalase was injected into each reactor to decompose residual hydrogen peroxide and terminate the study. The use of catalase for quenching purposes is a standard practice in Fenton's chemistry and does not interfere with laboratory analysis. However, for control purposes, the exact volume of excess catalase injected into each treatment reactor was also injected into control reactors. The treatment effectiveness was evaluated by calculating the percent VOC reduction in each treatment reactor relative to the control reactors.

The type of catalyst tested, and the number of treatment dosages evaluated is discussed below.

4.4.1 ISOTEC Catalyst 4260

ISOTEC's patented Catalyst 4260 is a circum-neutral pH (e.g. 5-8) organometallic complex with high mobility within the subsurface. Based on historical contaminant levels noted at the site and previous experience with treatment of the compounds of concern, ISOTEC selected this catalyst for most of the experiments. The stoichiometric molar ratio of Catalyst 4260 to measured site contaminants was determined and then used to prepare the Catalyst 4260 reagent. One, 2, 3, and 5 treatment dosages of the Catalyst

4260 reagent were evaluated on the soil-slurry matrix for VOC oxidation. One-half, 1 and 2 treatment dosages were evaluated on the groundwater matrix for VOC oxidation.

4.4.2 ISOTEC Catalyst 3000

ISOTEC's proprietary Catalyst 3000 is an acid-based (e.g. pH 2-3) organometallic complex with conditions similar to conventional Fenton's treatment. The stoichiometric molar ratio of Catalyst 3000 to measured site contaminants was determined and then used to prepare the Catalyst 3000 reagent. Two treatment dosages were evaluated on the soil-slurry matrix for VOC oxidation. This catalyst was not evaluated on the groundwater matrix for VOC oxidation. Again, the number of treatment dosages per experiment is based on historical contaminant concentrations noted at the site and previous experience with treatment of the contaminants of concern.

4.4.3 ISOTEC Catalyst 4460

ISOTEC's proprietary Catalyst 4460 is a concentrated organometallic complex that was also evaluated during this study. This catalyst is more concentrated than Catalyst 4260 and promotes a relatively aggressive reaction. The stoichiometric molar ratio of Catalyst 4460 to measured site contaminants was determined and then used to prepare the Catalyst 4460 reagent. Two treatment dosages of the Catalyst 4460 reagent were evaluated on the soil-slurry matrix for VOC oxidation. This catalyst was not evaluated on the groundwater matrix for VOC oxidation.

4.5 Sample Collection and Analysis

After the study was terminated by injecting excess catalase into the reactors, water from each of the GW-test VOC experiment treatment and control reactors was decanted into 40-ml glass vials for VOC analysis by EPA method 624 + 10. Final values of pH and TDS were determined from the monitoring reactor. Likewise, a sample of slurry from each SL-test VOC experiment treatment and control reactor was homogenized in the 120-ml reactor vessels and analyzed for VOC's by EPA method 8260B+10.

All study samples were submitted to a New Jersey certified analytical laboratory for analysis.

Table 4-1: Initial Conditions

Sample Matrix	**UNITS**	**MW-5S** Aqueous	**ISO-SB-1** Soil	**SL/Initial** Soil
VO Compound				
Vinyl Chloride	μg/L or μg/Kg	433	NA	ND (<1720)
Trans-1,2-Dichloroethene	μg/L or μg/Kg	18.4	NA	ND (<1720)
Trichloroethene	μg/L or μg/Kg	25.7	NA	ND (<1720)
Tetrachloroethene	μg/L or μg/Kg	89.8	NA	874 J
Total Xylenes	μg/L or μg/Kg	ND (<4.4)	NA	564 J
Total TIC's	μg/L or μg/Kg	1300	NA	79,180
Total VOC's	**μg/L or μg/Kg**	**566.9**	**NA**	**1,438**
Additional Parameters				
Iron	mg/L or mg/Kg	ND (<0.10)	22,500	NA
Manganese	mg/L or mg/Kg	NA	371	NA
Total Organic Carbon	mg/L or mg/Kg	NA	12,000	NA

Note:

- "MW-5S" and "ISO-SB-1" are Field-collected samples.
- SL/Initial is a "Laboratory" collected initial samples from SL-test prepared in 1:1 ratio (w/w) of "MW-5S" and "ISO-SB-1" samples.
- J = Concentration detected at a value below the method detection limit.
- ND = Analyzed for but not detected at the method detection limit (MDL) indicated.
- NA = Parameter not analyzed for
- VO's = Volatile organic compounds
- TIC's = Tentatively Identified Compounds or non-target compounds
- mg/L = milligrams per liter; μg/L = micrograms per liter
- mg/Kg = milligrams per kilogram; μg/Kg = micrograms per kilogram

Section 5 Treatability Study Results

5.1 GW-Test

Results of the GW-test VOC experiments are discussed below, with analytical results tabulated in Tables 5-1 and 5-2. Analytical data packages are provided in Appendix 1.

5.1.1 VOC Experiments

The results of the GW-test VOC experiments on sample MW-5S are presented in Table 5-1. The treated sample data when compared to control sample indicates greater than 99% destruction of the total VOCs detected in the groundwater sample after only one-half treatment dosage of the Catalyst 4260 reagent for both samples. The results also indicate over 99% PCE destruction after only one-half treatment dosage of Catalyst 4260. Additional dosages resulted in complete PCE destruction. Results from the GW-test control sample when compared to initial/ field sample indicates that VOC losses (including volatilization, dilution and sample preparation losses) were negligible (approximately 0% loss for MW-5S).

5.2 SL-test

The results of the SL-test VOC experiments are discussed below, with analytical results tabulated in Table 5-2. Analytical data packages are presented in Appendix 1.

5.2.1 VOC Experiments

The results of the SL-test VOC experiments are presented in Table 5-2. The data indicate up to 92.8% reduction in total targeted VOCs and 88.2% reduction of PCE after three treatment dosages of ISOTEC Catalyst 4260 reagent. An increasing trend in the percent reduction of total targeted VOCs may be noted with one treatment indicating a 6.7% reduction, two treatment dosages indicating a 42.4% reduction and three treatment dosages indicating a 92.8% reduction. Similar trend was also noted for PCE concentration.

The data also indicate a 59.2% destruction of total targeted VOCs (33% destruction for PCE) in soil-slurry samples treated with ISOTEC's experimental catalyst, Catalyst 4460. These results were achieved after two treatment dosages of the experimental catalyst, and superior to those achieved using two treatment dosages of Catalyst 4260. A noteworthy observation for the experimental catalyst is a final pH of 4.90 for the soil-slurry, which falls only slightly below the desirable pH range of 5-7 for field application.

The data also indicate effective contaminant reduction using Catalyst 3000, which achieved a 71.3% destruction of total targeted VOCs and 52.9% destruction of PCE after two treatment dosages. However, as observed by the final pH of 3.72 in the slurry, Catalyst 3000 is an acid-based catalyst while Catalyst 4260 is a circum-neutral pH catalyst designed for natural subsurface conditions.

The control sample data when compared to the initial sample data indicates a 79% VOC loss. However, since the percent VOC reduction noted for the smallest treatment application tested (one treatment) was only 6.7%, and much lower than the 79% noted in the control sample, it was concluded that the control sample data is not representative of the laboratory test conditions. Although reason for the high VOC loss in the control sample is not clear, the data from the second treatment application of catalyst 4260 (42.4% reduction) corroborates the conclusion. The tentatively identified compounds (TIC's) indicated an increase following treatment application. It is believed that the TIC increase occurred due to organic compound desorption from the soil matrix. Majority of the TIC's noted have been identified by the analytical laboratory as "unknown alkanes", which are most likely the heavier alkanes that have been desorbed and not easily susceptible to Fenton's treatment. However, the targeted VOC's (TCE and PCE) achieved significant reduction as discussed above.

Table 5-1: Results of GW-Test VOC Experiment "MW-5S"

	UNITS	Initial$^{\gamma}$ Condition Ground water (field)	Control	Treated #1	Treated #2	Treated #3
Catalyst Used		None	None	Cat-4260	Cat-4260	Cat-4260
Oxidant Used		None	None	Stab. H_2O_2	Stab. H_2O_2	Stab. H_2O_2
No. of Treatment Dosages		0	0	0.5	1	2
VO Compound						
Vinyl Chloride	µg/L	433	551	ND (<0.39)	ND (<0.39)	ND (<0.39)
1,1-Dichloroethene		ND (<2.35)	5.97	ND (<0.47)	ND (<0.47)	ND (<0.47)
Trans-1,2-Dichloroethene	µg/L	18.4	38.9	ND (<0.39)	ND (<0.39)	ND (<0.39)
Trichloroethene	µg/L	25.7	191	ND (<0.36)	ND (<0.36)	ND (<0.36)
Tetrachloroethene	µg/L	89.8	1040 D	3.24	ND (<0.39)	ND (<0.39)
Total TIC's	µg/L	1300	3,640	8.7	11.7	10.2
Total VOC's	µg/L	**566.9**	**1,826.9**	**3.24**	**ND**	**ND**
% VOC Reduction	-	**0%**	**0%**	**99.4%**	**>99.9%**	**>99.9%**
% PCE Reduction	-	**0%**	**0%**	**99.7%**	**>99.9%**	**>99.9%**
Final pH of GW	-	**NA**	**6.23**	**6.25**	**6.25**	**6.24**
Final TDS of GW	mg/L	**NA**	**870**	**955**	**1065**	**1334**

Note:

- $^{\gamma}$ = Same as Field sample for Groundwater (MW-5S).
- J = Concentration detected at a value below the method detection limit.
- ND = Analyzed for but not detected at the method detection limit (MDL) indicated.
- NA = Parameter not analyzed for
- VO's = Volatile organic compounds
- TIC's = Tentatively Identified Compounds or non-target compounds
- D = Results from diluted analysis
- mg/L = milligrams per liter; µg/L = micrograms per liter

Table 5-2: Results of SL-Test VOC Experiment

	UNITS	Initial Condition of Soil-Slurry	Control	Treated #1	Treated #2	Treated #3	Treated #4	Treated #5	Treated #6
Catalyst Used		None	None	Cat-4260	Cat-4260	Cat-4260	Cat-4260	Cat-4460[!]	Cat-3000
Oxidant Used		None	None	Stab. H_2O_2	Stab. H_2O_2	Stab. H_2O_2	Stab. H_2O_2	Stab. H_2O_2	Stab. H_2O_2
No. of Treatment Dosages		0	0	1	2	3	5	2	2
VO Compound									
Methylene Chloride	µg/kg	ND (<1720)	66.4 JB	121 B	107 B	104 B	101 B	104 B	75.6 JB
Trichloroethene	µg/kg	ND (<1720)	ND (<88.8)	32 J	43.7 J	ND (<85.3)	ND (<79.8)	ND (<78.8)	ND (<85.3)
Tetrachloroethene	µg/kg	874 J	295	1310	757	103	195	586	412
Ethylbenzene	µg/kg	564 J	ND (<88.8)	ND (<79.3)	27.5 J	ND (<85.3	ND (<79.8)	ND (<78.8)	ND (<85.3)
Total TIC's	µg/kg	79,180	32,770	230,400	218,400	174,940	217,100	232,600	66,330
Total VOC's*	µg/kg	**1,438**	295	1,342	828.2	103	195	586	412
% VOC Reduction*	-	**0%**	**79.4%**	**6.7%**	**42.4%**	**92.8%**	**86.4%**	**59.2%**	**71.3%**
% PCE Reduction	-	**0%**	**66.2%**	**0%**	**13.4%**	**88.2%**	**77.7%**	**33%**	**52.9%**
Final pH of Slurry	-	-	**5.96**	**6.03**	**5.76**	**5.41**	**5.12**	**4.90**	**3.72**

Note:
- J = Concentration detected at a value below the method detection limit.
- B = The compound was detected in the blank and the sample.
- ND = Analyzed for but not detected at the method detection limit (MDL) indicated.
- NA = Parameter not analyzed for
- VO's = Volatile organic compounds
- TIC's = Tentatively Identified Compounds or non-target compounds
- D = Results from diluted analysis
- * = Excludes Methylene Chloride, which is a lab contaminant
- mg/L = milligrams per liter; µg/L = micrograms per liter
- ! = Cat-4400 is a concentrated experimental catalyst

Section 6 Reagent Quantities

Results of the study indicated greater than 99% reduction of targeted VOCs in the groundwater test (GW-test) and up to 93% reduction of targeted VOCs in the soil-slurry test (SL-test). The data indicate that the most effective catalyst reagent was Catalyst 4260, which achieved maximum contaminant reduction under close to natural subsurface pH conditions (i.e. pH = 5-7). The study results were used to design a pilot-scale application of the ISOTEC^{SM} Process for the subject site from which the study samples were collected. The estimates assume a treatment criteria of 90% reduction of the target contamination. Although URS attempted to collect soil samples from the most contaminated area of the site, results obtained for the initial condition of the soil-slurry are lower than the previous results. Therefore, the estimates also assume the presence of a uniform higher concentration of PCE at the site than that detected in the bench-scale study initial condition samples. The treatment efficiency is determined from the ratio of percent contaminant reduction (exceeding the desired criteria) to the number treatment dosages tested. The number of treatment dosages, which give the highest value for this ratio, is the optimal treatment. Based on this assumption, three treatment dosages of catalyst 4260 is optimal for contaminant destruction in both the groundwater and the slurry samples. A reagent volume of 3 ml per 120 ml of the laboratory sample tested is equivalent to the three dosages. For the field pilot treatment program, the reagent volume determined per unit volume of sample tested in the bench-scale study has been scaled up along with loss factor of 1.5 included to offset the effect of existing radical scavengers or naturally present compounds in the subsurface. The loss factor has also been included to account for the presence of higher concentration of PCE at the site than that detected in the bench-scale study initial samples. The estimated reagent quantities for the pilot program are provided in Appendix 1. Additives such as stabilizers and mobility control agents will be used as part of the reagent components during the pilot study at a similar concentration used during the laboratory bench-scale study.

General field pilot study assumptions included the following.

- Homogeneous subsurface conditions;
- Uniform contaminant distribution within the subsurface;
- Uniform treatment distribution within the subsurface;
- Laboratory bench scale study samples represented subsurface conditions at the subject site;
- A field reagent loss factor of 1.5;
- Estimated treatment depth per injection point = 5 feet; and

- Estimated number of treatment depths per injection point = 1-3 depths.

The estimated reagent volume calculations are shown in Appendix 1. The reagent volumes were estimated based on a 5-foot injection depth interval per point. Based on these calculations, a minimum reagent volume of 39 gallons will be injected per injection point depth to achieve a 3 feet radial effect, which will be gradually increased to 222 gallons per injection point depth to achieve a 7.5 feet radial effect. In order to achieve a 10 feet radial effect, an estimated reagent volume of 329 gallons per injection point depth will be theoretically required. Field decisions regarding the injection volumes and/or injection point location will be based on the subsurface intake, radial effects noted during injection, and the distance of the injection point from the nearest monitoring point. If it becomes impossible to inject the above volume and/or no radial effects are noted in the monitoring point, the reagent concentrations may be modified (i.e. increased) to offset the effect of lower reagent volumes used. Otherwise, an increasing volume may also be tested in the same injection point until influence can be determined in the nearest monitoring point. These radial effect estimates are conservative because of the clayey nature of the subsurface. It is important to note that these estimates assume a uniform treatment distribution and are theoretical in nature. Under practical field conditions at the site, the reagents will tend to follow a preferential pathway through existing crevices/ fissures or through new channels created during drilling/ injection activities. The estimated radial effects may be lower or higher depending on whether the preferred pathways are vertical or horizontal in nature.

Section 7 Conclusions

The laboratory study results indicate that the ISOTEC process is effective in significantly reducing the concentration of TCE and PCE in site soil and groundwater. The data indicate that the most effective catalyst reagent was the experimental Catalyst 4260, which achieved maximum contaminant reduction under close to natural subsurface pH conditions (i.e. pH = 5-7). Catalyst 4460 was also effective although the final pH falls slightly below the desirable pH range of 5-7. Since ISOTEC Catalyst 4260 has been field tested before and demonstrated to be effective, this catalyst was chosen for the pilot program over Catalyst 4460, which lacks similar data. Results of the control sample analyses when compared to initial/ field sample analyses indicate that VOC losses due to the experimental setup (including volatilization, dilution, sample preparation losses) were negligible in GW-test (0% loss) and significant (79% loss) in the SL-test. However, since the smallest treatment application tested in the SL-test indicated only 6.7% reduction, which is considerably lower than the noted VOC loss (79%), it has been concluded that the control sample data is not representative of the test conditions.

A preliminary assessment of site-specific factors that could affect the ISOTEC process was performed on the content of iron, manganese and TOC in site soil. Iron was detected in site soil at 22,500 mg/Kg (Table 4-1). Much of this iron is bound to the soil matrix and unavailable to catalyze the Fenton reaction that occurs in the aqueous phase. Iron was not detected in the site groundwater. The soil manganese concentration of 371 mg/Kg is low and not available to function as a natural catalyst for Fenton process. The concentration of TOC was measured to be 12,000 mg/Kg, which is significant enough to promote minor side reactions that compete for hydroxyl radicals. However, supplying additional reagent volumes will offset reagent losses due to such competition.

The ISOTEC study results suggest that a pilot application of the ISOTEC process should be completed at the site to gather additional data on the effectiveness of this remedial alternative.

APPENDIX #1

LAB STUDY ESTIMATED REAGENT QUANTITIES

Appendix 1: Pilot Study Results - Mass Calculations
10 North Franklin St., Watkins Glen, NY
ISOTEC Job #800179

Outside Building Post-Treatment Data
(October-2000)

Contaminant of Concern (COC)			Vinyl Chloride VC	1,2-Dichloroeth [illegible]	[illegible]	[illegible]
SOIL DATA [illegible]						
Average Depth of Contamination	ft	4				
Treatment Area	Sq. ft	468				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-09	ug/kg	2.0-4.0	ND	13	3	ND
CB-10	ug/kg	0.0-4.0	ND	28	14	720
CB-11	ug/kg	1.0-4.0	ND	38	19	670
CB-12	ug/kg	1.0-4.0	ND	4	3	430000
CB-13	ug/kg	0.0-4.0	ND	9	4	160
CB-14	ug/kg	0.0-4.0	ND	6	4	150
CB-15	ug/kg	0.0-4.0	ND	9	6	220
Average Concentration	ug/kg		0	15.28571	7.571429	61702.86
Average COC Mass in Soils	lbs		0.000	0.003	0.001	11.506
Total COC Mass in Soils (0-4 ft bgs)	lbs		11.511			
[illegible]						
Average Depth of Contamination	ft	2				
Treatment Area	Sq. ft	495				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-03	ug/kg	5.0-6.0	8	460	ND	ND
CB-04	ug/kg	5.0-5.5	ND	22	10	45
CB-05	ug/kg	5.0-5.5	25	13000	13000	47000
CB-06	ug/kg	5.0-5.5	150	82	58	170
CB-08	ug/kg	5.0-5.5	5	8	ND	ND
CB-12	ug/kg	4.0-6.0	3	450	60	1400
CB-13	ug/kg	4.0-6.0	6	250	3	39
CB-14	ug/kg	4.0-6.0	4	650	51	250
CB-15	ug/kg	4.0-6.0	5	160	86	450
Average Concentration	ug/kg		22.88889	1675.778	1474.222	5483.778
Average COC Mass in Soils	lbs		0.002	0.165	0.145	0.541
Total COC Mass in Soils (4-6 ft bgs)	lbs		0.854			
SOIL DA[illegible]						
Average Depth of Contamination	ft	9				
Treatment Area	Sq. ft	481				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-02	ug/kg	7.0-8.0	7	17	4	ND
CB-03	ug/kg	8.0-9.0	43	2200	4	76
CB-06	ug/kg	9.0-10.0	350	2900	120	24000
CB-07	ug/kg	8.0-9.0	ND	ND	ND	ND
CB-08	ug/kg	5.0-5.5	5	8	ND	ND
CB-09	ug/kg	2.0-4.0	ND	13	3	ND
CB-09	ug/kg	11.0-12.0	250	950	ND	ND
CB-10	ug/kg	0.0-4.0	ND	28	14	720
CB-11	ug/kg	1.0-4.0	ND	38	19	670
CB-12	ug/kg	1.0-4.0	ND	4	3	430000
CB-12	ug/kg	4.0-6.0	3	450	60	1400
CB-12	ug/kg	9.0-10.0	65	1300	ND	18
CB-13	ug/kg	0.0-4.0	ND	9	4	160
CB-13	ug/kg	4.0-6.0	6	250	3	39
CB-14	ug/kg	0.0-4.0	ND	6	4	150
CB-14	ug/kg	4.0-6.0	4	650	51	250
CB-15	ug/kg	0.0-4.0	ND	9	6	220
CB-15	ug/kg	4.0-6.0	5	160	86	450
Average Concentration	ug/kg		41	499.5556	21.16667	25452.94
Average COC Mass in Soils	lbs		0.018	0.215	0.009	10.976
Total COC Mass in Soils (6-15 ft bgs)	lbs		11.219			
Total COC Mass in Soils (All Depths)	lbs		24			

Underneath Building Post-Treatment Data
(October-2000)

Contaminant of Concern (COC)			Vinyl Chloride VC	1,2-Dichloroethene DCE	Trichloroethylene TCE	Perchloroethylene PC
SOIL DATA (0-4 ft bgs)						
Average Depth of Contamination	ft	4				
Treatment Area	Sq. ft	116				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	0.0-4.0	ND	ND	ND	28
CB-L	ug/kg	0.0-4.0	ND	45	31	320
Average Concentration	ug/kg		0	22.5	15.5	174
Average COC Mass in Soils	lbs		0.000	0.001	0.001	0.008
Total COC Mass in Soils (0-4 ft bgs)	lbs		0.010			
SOIL DATA (4-6 ft bgs)						
Average Depth of Contamination	ft	2				
Treatment Area	Sq. ft	486				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	4.0-6.0	3	31	4	160
CB-H	ug/kg	4.0-6.0	120	3500	4600	3400000
CB-L	ug/kg	4.0-6.0	ND	ND	ND	ND
Average Concentration	ug/kg		41	1177	1534.667	1133387
Average COC Mass in Soils	lbs		0.004	0.114	0.149	109.742
Total COC Mass in Soils (4-6 ft bgs)	lbs		110.009			
SOIL DATA (6-15 ft bgs)						
Average Depth of Contamination	ft	9				
Treatment Area	Sq. ft	265				
Soil Bulk Density	g/cc	1.6				
Location ID	**Units**	**Depth**				
CB-G	ug/kg	10.0-12.0	430	3900	190	14000
Average Concentration	ug/kg		430	3900	190	14000
Average COC Mass in Soils	lbs		0.102	0.927	0.045	3.326
Total COC Mass in Soils (6-15 ft bgs)	lbs		4.400			
Total COC Mass in Soils (All Depths)	lbs		**114**			

Appendix #1: Estimated Reagent Quantities From Lab Study
North Franklin Street-Watkins Glen, NY
ISOTEC Job #800179

General Assumptions

Representative composite sample tested during bench scale study
Optimal Treatment Criteria = 90% destruction
Treatment Efficiency = Ratio of percent contaminant destruction/no. of treatments

From Bench Scale Study	**Calculations**	**Value**
Sample Volume tested	-	120 ml
Selected Catalyst	-	Cat-4260
Optimal Treatments Determined	-	3
Reagent Volume for Optimal Treatment Efficiency	-	3 ml
Assumed Loss Factor	-	1.5
Estimated reagent volume with loss factor	1.5 x 3 ml	4.5 ml
Estimated reagent volume as percent sample volume	(4.5 ml/120 ml)x100	3.75%
Pilot Study Assumptions	-	
Site Volume	-	15,600 cu ft
Reagent Loss Factor	-	1.5
Number of injection depths per injection point	-	1 to 3
Injection depth of treatment	-	5 ft
Estimated radial effect	-	3 ft to 10 ft
Conservative Overlap Reduction Factor for 3-ft radial effect	-	1
Conservative Overlap Reduction Factor for 5-ft radial effect	-	1
Conservative Overlap Reduction Factor for 7.5-ft radial effect	-	0.9
Conservative Overlap Reduction Factor for 10-ft radial effect	-	0.75
Conservative Overlap Reduction Factor for15-ft radial effect	-	0.5
Pilot Study Initial Reagent Volumes		
Site Volume for radial effect = 3 ft	3.14 x (3)^2 x 5	141.3 cu ft
Estimated reagents required per 5-ft depth/ injection point	3.75% of 141 cu ft	5.3 cu ft or 39 gallons
Estimated reagents/ injection point depth with overlap reduction	1 x 39 gallons	39 gallons
Site Volume for radial effect = 5 ft	3.14 x (5)^2 x5	393 cu ft
Estimated reagents required per 5-ft depth/ injection point	3.75% of 393 cu ft	14.7 cu ft or 110 gallons
Estimated reagents/ injection point depth with overlap reduction	1 x 110 gallons	110 gallons
Site Volume for radial effect = 7.5 ft	3.14 x (7.5)^2 x 5	883 cu ft
Estimated reagents required per 5-ft depth/ injection point	3.75% of 883 cu ft	33.1 cu ft or 247 gallons
Estimated reagents/ injection point depth with overlap reduction	0.9 x 247 gallons	222 gallons
Site Volume for radial effect = 10 ft	3.14 x (10)^2 x 5	1570 cu ft
Estimated reagents required per 5-ft depth/ injection point	3.75% of 1570 cu ft	58.9 cu ft or 439 gallons
Estimated reagents/ injection point depth with overlap reduction	0.75 x 439 gallons	329 gallons
Site Volume for radial effect = 15 ft	3.14 x (15)^2 x 5	3533 cu ft
Estimated reagents required per 5-ft depth/ injection point	3.75% of 3533 cu ft	132.5 cu ft or 987 gallons
Estimated reagents/ injection point depth with overlap reduction	0.5 x 987 gallons	493 gallons

APPENDIX #2

LAB STUDY ANALYTICAL PACKAGE

APPENDIX “B”

DATA ASSESSMENT SUMMARY

NORTH FRANKLIN STREET SITE

MARCH 16, 2000 SAMPLING EVENT

Eight groundwater samples and one matrix spike/matrix spike duplicate (MS/MSD) were collected from the North Franklin Street site on March 16, 2000 and sent to H2M Labs, Inc. (Melville, NY) for analysis. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) by NYSDEC ASP Method 95-1, total iron by NYSDEC ASP Method CLP-M, total petroleum hydrocarbons (TPH) by USEPA Method 418.1, total organic carbon (TOC) by USEPA Method 415.1, and total dissolved solids (TDS) by USEPA Method 160.1. Two trip blanks were also sent to the laboratory and analyzed for TCL VOCs.

The data were reviewed for compliance with the methods referenced above and the intent of USEPA Region II *CLP Organic Data Review, SOP No. HW-6, Rev. 11*, June 1996, and USEPA Region II *Evaluation of Metals Data for the Contract Laboratory Program (CLP), SOP No. HW-2, Rev. XI*, January 1992. The reported analytical data met the method and validation requirements, except for the instances discussed below. A summary of the validated analytical results is presented in Table 1.

TCL VOCs

The response factor percent difference (%D) for methylene chloride, acetone, 2-butanone, 2-hexanone, and 4-methyl-2-pentanone exceeded the method and USEPA Region II quality control (QC) limit of 25% in the continuing calibration (CCAL). In accordance with USEPA Region II validation guidelines, all sample results for these compounds were qualified "J/UJ" (estimated concentration/estimated quantitation limit).

Samples MW-3, MW-5, and MW-8S required secondary dilution analyses due to elevated concentrations of target compounds. Sample results reported from the diluted analyses were qualified "D".

The results for various compounds were qualified "J" by the laboratory indicating estimated concentrations detected below the quantitation limits.

No other data validation qualifications were made, and all other data are usable as reported.

Total Iron

No data validation qualifications were made, and all data are usable as reported.

TPH

No data validation qualifications were made, and all data are usable as reported.

TOC

No data validation qualifications were made, and all data are usable as reported.

TDS

No data validation qualifications were made, and all data are usable as reported.

cc: D. McCall
File 05-00035388.30

DEFINITIONS OF DATA QUALIFIERS

U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N – The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ – The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B – The analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the quantitation limit.

R – The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT SUMMARY

NORTH FRANKLIN STREET SITE

MAY 11-12, 2000 SAMPLING EVENT

Eleven groundwater samples and one matrix spike/matrix spike duplicate (MS/MSD) were collected from the North Franklin Street site on May 11-12, 2000 and sent to H2M Labs, Inc. (Melville, NY) for analysis. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) by NYSDEC ASP Method 95-1, total iron by NYSDEC ASP Method CLP-M, total petroleum hydrocarbons (TPH) by USEPA Method 418.1, total organic carbon (TOC) by USEPA Method 415.1, and total dissolved solids (TDS) by USEPA Method 160.1. One trip blank was also sent to the laboratory and analyzed for TCL VOCs.

The data were reviewed for compliance with the methods referenced above and the intent of USEPA Region II *CLP Organic Data Review, SOP No. HW-6, Rev. 11*, June 1996, and USEPA Region II *Evaluation of Metals Data for the Contract Laboratory Program (CLP), SOP No. HW-2, Rev. XI*, January 1992. The reported analytical data met the method and validation requirements, except for the instances discussed below. A summary of the validated analytical results is presented in Table 1.

TCL VOCs

The response factor percent difference (%D) for bromomethane and 2-butanone exceeded the method and USEPA Region II quality control (QC) limit of 25% in the continuing calibration (CCAL). In accordance with USEPA Region II validation guidelines, all sample results for these compounds were qualified "J/UJ" (estimated concentration/estimated quantitation limit).

The undiluted analysis of sample IW-6 exhibited surrogate recoveries above QC limits. All recoveries were within QC limits in the diluted analysis of the sample. In accordance with USEPA Region II validation guidelines, the results for all detected compounds reported from the undiluted analysis of this sample were qualified "J" (estimated concentration).

The concentrations of tetrachloroethene in samples IW-3, I2W-2, and I2W-3 were less than five times the concentration detected in the associated trip blank. In accordance with USEPA Region II validation guidelines, the results for tetrachloroethene in these samples were qualified "U" (not detected).

Samples IW-1, IW-2, IW-4, IW-5, IW-6, IW-7, IW-8, and I2W-1 required secondary dilution analyses due to elevated concentrations of target compounds. Sample results reported from the diluted analyses were qualified "D".

The results for various compounds were qualified "J" by the laboratory indicating estimated concentrations detected below the quantitation limits.

No other data validation qualifications were made, and all other data are usable as reported.

Total Iron

The matrix spike recovery for total iron was above the USEPA Region II QC limit of 125%. In accordance with USEPA Region II validation guidelines, the results for iron were qualified "J" in all samples.

TPH

There was insufficient volume collected for the laboratory to perform the TPH analysis of sample I2W-2.

No data validation qualifications were made, and all data are usable as reported.

TOC

No data validation qualifications were made, and all data are usable as reported.

TDS

No data validation qualifications were made, and all data are usable as reported.

cc: D. McCall
File 05-00035388.30

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J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N – The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ – The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B – The analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the quantitation limit.

R – The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT SUMMARY

NORTH FRANKLIN STREET SITE

JUNE 23-26, 2000 SAMPLING EVENT

Ten groundwater samples were collected from the North Franklin Street site on June 23-26, 2000 and sent to H2M Labs, Inc. (Melville, NY) for analysis. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) by NYSDEC ASP Method 95-1, total iron by NYSDEC ASP Method CLP-M, total petroleum hydrocarbons (TPH) by USEPA Method 418.1, total organic carbon (TOC) by USEPA Method 415.1, and total dissolved solids (TDS) by USEPA Method 160.1. Two trip blanks were also sent to the laboratory and analyzed for TCL VOCs.

The data were reviewed for compliance with the methods referenced above and the intent of USEPA Region II *CLP Organic Data Review, SOP No. HW-6, Rev. 11*, June 1996, and USEPA Region II *Evaluation of Metals Data for the Contract Laboratory Program (CLP), SOP No. HW-2, Rev. XI*, January 1992. The reported analytical data met the method and validation requirements, except for the instances discussed below. A summary of the validated analytical results is presented in Table 1.

TCL VOCs

The response factor percent difference (%D) for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, and/or chloromethane exceeded the method and USEPA Region II quality control (QC) limit of 25% in one or more of the continuing calibrations (CCAL). In accordance with USEPA Region II validation guidelines, associated sample results for these compounds were qualified "J/UJ" (estimated concentration/estimated quantitation limit). Not all compounds were qualified in all samples.

The concentrations of vinyl chloride and trichloroethene exceeded the range of calibration in the undiluted analysis of sample MW-3, but were below the quantitation limits in the diluted analysis. Based on professional judgement, the results from the undiluted analysis were reported and qualified "J" (estimated concentration). For the same reason, the result for vinyl chloride in sample MW-5S was qualified "J".

Samples MW-3, MW-5D, MW-5S, MW-11S, and MW-20S required secondary dilution analyses due to elevated concentrations of target compounds. Sample results reported from the diluted analyses were qualified "D".

The results for various compounds were qualified "J" by the laboratory indicating estimated concentrations detected below the quantitation limits.

No other data validation qualifications were made, and all other data are usable as reported.

Total Iron

No data validation qualifications were made, and all data are usable as reported.

TPH

No data validation qualifications were made, and all data are usable as reported.

TOC

All of the sample containers had headspace upon arrival at the laboratory. Since VOCs are among those compounds which contribute to the TOC in the sample, and may be lost when headspace is present, all sample results for TOC were qualified "J" (estimated concentration).

TDS

No data validation qualifications were made, and all data are usable as reported.

cc: D. McCall
File 05-00035388.30

DEFINITION OF DATA QUALIFIERS

U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N – The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ – The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B – The analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the quantitation limit.

R – The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT SUMMARY

NORTH FRANKLIN STREET SITE

OCTOBER 17-20, 2000 SAMPLING EVENT

Fourteen groundwater samples, 29 soil samples, one matrix spike/matrix spike duplicate (MS/MSD) for groundwater, two MS/MSDs for soil, and two equipment rinsate blanks (one for groundwater, one for soil) were collected from the North Franklin Street site on October 17-20, 2000 and sent to H2M Labs, Inc. (Melville, NY) for analysis. The groundwater samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) by NYSDEC ASP Method 95-1, total iron by NYSDEC ASP Method CLP-M, total petroleum hydrocarbons (TPH) by USEPA Method 418.1, total organic carbon (TOC) by USEPA Method 415.1, and total dissolved solids (TDS) by USEPA Method 160.1. The soil samples were analyzed for TCL VOCs by NYSDEC ASP 95-1. Two trip blanks were also sent to the laboratory and analyzed for TCL VOCs.

The data were reviewed for compliance with the methods referenced above and the intent of USEPA Region II *CLP Organic Data Review, SOP No. HW-6, Rev. 11*, June 1996, and USEPA Region II *Evaluation of Metals Data for the Contract Laboratory Program (CLP), SOP No. HW-2, Rev. XI*, January 1992. The reported analytical data met the method and validation requirements, except for the instances discussed below. A summary of the validated analytical results is presented in Table 1.

TCL VOCs (Groundwater/Associated Field QC Samples)

The response factor percent difference (%D) for acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, vinyl chloride, and/or trans-1,3-dichloropropene exceeded the method and USEPA Region II quality control (QC) limit of 25% in one or more of the continuing calibrations (CCAL). In accordance with USEPA Region II validation guidelines, associated sample results for these compounds were qualified "J/UJ" (estimated concentration/estimated quantitation limit). Not all compounds were qualified in all samples.

Sample MW-4 was analyzed immediately following a sample in which the concentrations of 1,2-dichloroethene(total), trichloroethene, and tetrachloroethene exceeded the range of calibration. While it is not believed that the presence of these compounds in sample MW-4 is due entirely due to cross-contamination, it may have contributed to the sample concentrations. These compounds were not detected in sample MW-4 for the March 16, 2000 sampling event. Based on professional judgement, the results for 1,2-dichloroethene(total), trichloroethene, and tetrachloroethene were qualified "NJ" (presumptively present at an estimated concentration).

2-Butanone was reported as being present in sample I2W-1 at a concentration below the quantitation limit. However, the mass spectrum for this compound did not meet positive identification criteria. In accordance with USEPA Region II validation guidelines, the result for 2-butanone was raised to the quantitation limit and qualified "U" (not detected).

The concentration of tetrachloroethene in samples MW-2, I2W-3, and MW-3 were less than five times the concentration detected in the associated trip blank. In accordance with USEPA Region II validation guidelines, the results for tetrachloroethene in these samples were raised to the quantitation limit and qualified "U" (not detected).

The concentration of vinyl chloride exceeded the range of calibration in the undiluted analyses of samples MW-3 and IW-6, but were below the quantitation limits in the diluted analyses. Based on professional judgement, the results from the undiluted analyses were reported and qualified "J" (estimated concentration).

Samples IW-4, IW-5, IW-6, MW-3, MW-5D, and MW-5S required secondary dilution analyses due to elevated concentrations of target compounds. Sample results reported from the diluted analyses were qualified "D".

The results for various compounds were qualified "J" by the laboratory indicating estimated concentrations detected below the quantitation limits.

No other data validation qualifications were made, and all other data are usable as reported.

TCL VOCs (Soil/Associated Field QC Samples)

The response factor percent difference (%D) for vinyl chloride, methylene chloride, acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone exceeded the method and USEPA Region II quality control (QC) limit of 25% in one or more of the continuing calibrations (CCAL). In accordance with USEPA Region II validation guidelines, associated sample results for these compounds were qualified "J/UJ" (estimated concentration/estimated quantitation limit). Not all compounds were qualified in all samples.

The initial analyses of samples CB-2(7'-8'), CB-6(9'-10'), CB-H(4'-6'), CB-G(10'-12'), CB-12(9'-10'), and CB-3(8'-9') exhibited surrogate recoveries above QC limits. The samples were reanalyzed with similar results, or required diluted analyses. In accordance with USEPA Region II validation guidelines, the results for all detected compounds in these samples were qualified "J" (estimated concentration). For those samples requiring diluted analyses, only the detected compounds reported from the undiluted analysis required qualification. The one exception to this is sample CB-6(9'-10'), in which surrogate recoveries were above QC limits in both the undiluted and diluted analyses. All detected results were qualified "J" in this sample.

The concentrations of methylene chloride in many of the samples were less than ten times the concentration detected in the associated method blank. In accordance with USEPA Region II validation guidelines, the results for methylene chloride were qualified "U" (not detected) in all samples in which it was detected, except for CB-12(1'-4'), CB-11(1'-4'), and CB-10(0'-4').

The concentration of tetrachloroethene in samples CB-7(8'-9'), CB-9(2'-4'), CB-9(4'-6'), CB-9(11'-12') and CB-L(4'-6') were less than five times the concentration detected in the associated method blank. In accordance with USEPA Region II validation guidelines, the results for tetrachloroethene in these samples were qualified "U" (not detected).

The concentration of 1,2-dichloroethene(total) exceeded the range of calibration in the undiluted analyses of sample CB-3(5'-6'), but was more than two times lower in the diluted analysis. Based on professional judgement, the result from the undiluted analysis was reported and qualified "J" (estimated concentration).

The concentrations of 1,2-dichloroethene(total) and vinyl chloride exceeded the range of calibration in the undiluted analyses of sample CB-H(4'-6'), but these compounds were not detected in the diluted analysis. In accordance with USEPA Region II validation guidelines, the results for these compounds from the undiluted analysis were reported and qualified "J" (estimated concentration).

The diluted analysis of sample CB-12(1'-4') was performed two days past the USEPA Region II technical holding time of ten days from sample collection. Tetrachloroethene was the only compound reported from the diluted analysis. In accordance with USEPA Region II validation guidelines, the result for tetrachloroethene was qualified "J" (estimated concentration).

Sample CB-6(5'-5.5') was analyzed immediately following a sample in which the concentrations of 1,2-dichloroethene (total), trichloroethene, and tetrachloroethene exceeded the range of calibration. No blank was analyzed after this sample, as required by the method. Since vinyl chloride was also detected in sample CB-6(5'-5.5'), it is expected that the presence of 1,2-dichloroethene (total), trichloroethene, and tetrachloroethene in the sample are not due entirely to cross-contamination, however this cannot be ruled out. Based on professional judgement, the results for 1,2-dichloroethene (total), trichloroethene, and tetrachloroethene in sample CB-6(5'-5.5') were qualified "NJ" (tentatively present at an estimated concentration). For the same reason, the result for tetrachloroethene in sample CB-12(9'-10') was qualified "NJ".

The laboratory diluted samples CB-15(0'-4') and CB-15(4'-6') prior to analysis due to elevated concentrations of target compounds. They did not perform undiluted analyses on these samples. The quantitation limits for the non-detect compounds in the samples are the lowest achievable at the diluted levels.

No other data qualifications were made, and all other data are usable as reported.

Total Iron

No data validation qualifications were made, and all data are usable as reported.

TPH

No data validation qualifications were made, and all data are usable as reported.

TOC

No data validation qualifications were made, and all data are usable as reported.

TDS

The TDS analysis of sample MW-5D was performed two days past the method holding time requirement of seven days from sample collection. Following the intent of USEPA Region II validation guidelines, the result for TDS in this sample was qualified "J" (estimated concentration). No other data validation qualifications were made, and all other data are usable as reported.

cc: D. McCall
File 05-00035388.30

DEFINITIONS OF DATA QUALIFIERS

U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N – The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ – The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B – The analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the quantitation limit.

R – The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT SUMMARY

NORTH FRANKLIN STREET SITE

MAY 16 AND JUNE 30, 2000 SAMPLING EVENTS

One air sample was collected from the North Franklin Street site on May 16, 2000. An additional sample was collected on June 30, 2000. Both samples were sent to Air Toxics Ltd. (Folsom, CA) and analyzed for volatile organic compounds (VOCs) by USEPA Method TO-14A.

The data were reviewed for compliance with the method and USEPA Region II *Volatile Organic Analysis of Ambient Air in Canisters, HW-18, Rev. 0,* April 1994. The reported analytical data met the method and validation requirements, except for the instances discussed below. A summary of the validated analytical results is presented in Table 1.

The USEPA Region II technical holding time for air samples collected in canisters is 14 days from sample collection for non-polar compounds, and seven days for polar compounds. The air sample collected May 16, 2000 was analyzed 26 days after sample collection. In accordance with USEPA Region II validation guidelines, all sample results were qualified "J/UJ" (estimated concentration/estimated quantitation limit). The air sample collected June 30, 2000 was analyzed 14 days after sample collection. In accordance with USEPA Region II validation guidelines, the results for polar compounds were qualified "J/UJ". No other data qualifications were made, and all other data are usable as reported.

cc: D. McCall
File 05-00035388.30

DEFINITION OF DATA QUALIFIERS

U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N – The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ – The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ – The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B – The analyte was detected in the sample at a concentration greater than the instrument detection limit, but less than the quantitation limit.

R – The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		I2W-01	I2W-01	I2W-02	I2W-02	I2W-03
Sample ID		I2W-1	I2W-1	I2W-2	I2W-2	I2W-3
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		05/12/00	10/18/00	05/12/00	10/18/00	05/12/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Vinyl Chloride	UG/L	48	130 J	25	10 J	10 U
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 U	10 U	10 U
Acetone	UG/L	10 U	9 J	4 J	2 J	13
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	3 J
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	130	230 D	39	36	2 J
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	25	19	8 J	11	5 J
Benzene	UG/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		I2W-01	I2W-01	I2W-02	I2W-02	I2W-03
Sample ID		I2W-1	I2W-1	I2W-2	I2W-2	I2W-3
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		05/12/00	10/18/00	05/12/00	10/18/00	05/12/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 U	10 UJ	10 U	10 UJ	10 U
2-Hexanone	UG/L	10 U	10 UJ	10 U	10 UJ	10 U
Tetrachloroethene	UG/L	200 D	67	15 U	19	10 U
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	4 J
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	10 U	79
Metals						
Iron	UG/L	14500 J	24400	14300 J	14800	24100 J
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	NA	2.5 U	10.0
Total Dissolved Solids	MG/L	420	1080	651	2370	618
Total Organic Carbon	MG/L	12.4	94.7	8.5	207	49.4

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TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		I2W-03	IW-01	IW-02	IW-03	IW-04
Sample ID		I2W-3	IW-1	IW-2	IW-3	IW-4
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		10/18/00	05/11/00	05/11/00	05/11/00	05/11/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 UJ	10 UJ	10 UJ	10 UJ
Vinyl Chloride	UG/L	3 J	25	19	10 U	730 D
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 U	10 U	10 U
Acetone	UG/L	18 J	10 U	10 U	10 U	2 J
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	3 J
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	4 J	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	16	140	110	1 J	1400 D
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	2 J	61	110	10 U	4 J
Benzene	UG/L	2 J	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

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TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		I2W-03	IW-01	IW-02	IW-03	IW-04
Sample ID		I2W-3	IW-1	IW-2	IW-3	IW-4
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		10/18/00	05/11/00	05/11/00	05/11/00	05/11/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 U	10 U	10 U	10 U
2-Hexanone	UG/L	10 UJ	10 U	10 U	10 U	10 U
Tetrachloroethene	UG/L	10 U	270 D	730 D	10 U	32
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	21	1 J	3 J	10 U	10 J
Metals						
Iron	UG/L	71900	1340 J	820 J	1080 J	25300 J
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	2240	1180	963	723	362
Total Organic Carbon	MG/L	212	2.2	2.5	4.0	4.5

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		IW-04	IW-05	IW-05	IW-06	IW-06
Sample ID		IW-4	IW-5	IW-5	IW-6	IW-6
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		10/19/00	05/11/00	10/19/00	05/11/00	10/20/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 UJ	10 U	10 UJ	10 U
Vinyl Chloride	UG/L	14 J	2 J	17 J	5000 DJ	1200 J
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 U	3 J	10 U
Acetone	UG/L	10 UJ	10 U	10 UJ	4 J	23 J
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	2 J	110 J	36
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	6 J
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	1 J	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	1 J	10 U
1,2-Dichloroethene (total)	UG/L	48	270	2500 D	45000 D	13000 D
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	30	140	220 DJ	9000 D	2900 D
Benzene	UG/L	10 U	10 U	10 U	2 J	2 J
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

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TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		IW-04	IW-05	IW-05	IW-06	IW-06
Sample ID		IW-4	IW-5	IW-5	IW-6	IW-6
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		10/19/00	05/11/00	10/19/00	05/11/00	10/20/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 U	10 UJ	2 J	10 UJ
2-Hexanone	UG/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Tetrachloroethene	UG/L	1000 D	1000 D	2200 D	46000 D	7500 D
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	3 J	3 J
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	4 J	2 J
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	39 J	16
Metals						
Iron	UG/L	8570	92.2 BJ	43100	2200 J	170000
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	961	252	499	638	665
Total Organic Carbon	MG/L	34.9	4.2	19.4	13.9	41.8

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		IW-07	IW-08	MW-02	MW-02	MW-03
Sample ID		IW-7	IW-8	MW-2	MW-2	MW-3
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		05/11/00	05/11/00	03/16/00	10/20/00	03/16/00
Parameter	Units					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 UJ	10 UJ	10 U	10 U	10 U
Vinyl Chloride	UG/L	8 J	24	10 U	10 U	17
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 UJ	10 U	10 UJ
Acetone	UG/L	2 J	2 J	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	1 J
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	1 J	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	400	150	10 U	10 U	1900 D
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	44	16	10 U	10 U	83
Benzene	UG/L	10 U	1 J	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 UJ	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
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Detection Limits shown are PQL

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TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		IW-07	IW-08	MW-02	MW-02	MW-03
Sample ID		IW-7	IW-8	MW-2	MW-2	MW-3
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		05/11/00	05/11/00	03/16/00	10/20/00	03/16/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 U	10 U	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 U	10 U	10 UJ	10 U	10 UJ
Tetrachloroethene	UG/L	600 D	400 D	10 U	10 U	77
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	7 J	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	42	10 U	10 U	10 U
Metals						
Iron	UG/L	4480 J	3600 J	1420	314	5990
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	257	705	440	612	521
Total Organic Carbon	MG/L	5.6	7.9	3.7	5.2	6.0

Flags assigned during chemistry validation are shown.

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Advanced Selection: WG_NoDump
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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP*'

Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-03	MW-03	MW-04	MW-04	MW-05D
Sample ID		MW-3	MW-3	MW-4	MW-4	MW-5D
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		06/23/00	10/19/00	03/16/00	10/20/00	03/16/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	UG/L	420 J	390 J	10 U	3 J	10 U
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 UJ	10 U	10 UJ
Acetone	UG/L	24 J	10 UJ	3 J	10 J	2 J
Carbon Disulfide	UG/L	29	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	13	4 J	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	5500 D	2200 D	10 U	31 NJ	16
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	200 J	14	10 U	24 NJ	10 U
Benzene	UG/L	2 J	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
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Detection Limits shown are PQL

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TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-03	MW-03	MW-04	MW-04	MW-05D
Sample ID		MW-3	MW-3	MW-4	MW-4	MW-5D
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		06/23/00	10/19/00	03/16/00	10/20/00	03/16/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Tetrachloroethene	UG/L	83	10 U	10 U	75 NJ	10 U
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	6	10 U	10 U	10 U	10 U
Metals						
Iron	UG/L	24200	25800	12400	4960	1450
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	852	1110	1000	1390	1670
Total Organic Carbon	MG/L	36.6 J	23.9	12.5	7.2	7.5

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

Advanced Selection: WG_NoDump
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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP'

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-05D	MW-05D	MW-05S	MW-05S	MW-05S
Sample ID		MW-5D	MW-5D	MW-5S	MW-5S	MW-5S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		06/23/00	10/19/00	03/16/00	06/23/00	10/19/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	UG/L	110	31 J	560 D	740 J	180 J
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 UJ	10 U	10 U
Acetone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U	8 J	10 U
1,1-Dichloroethene	UG/L	4 J	3 J	2 J	11	3 J
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	680 D	650 D	1400 D	4700 D	970 D
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	1200 D	230 D	33	580 D	71
Benzene	UG/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-05D	MW-05D	MW-05S	MW-05S	MW-05S
Sample ID		MW-5D	MW-5D	MW-5S	MW-5S	MW-5S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		06/23/00	10/19/00	03/16/00	06/23/00	10/19/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Tetrachloroethene	UG/L	3900 D	900 D	120	4500 D	420 D
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	1 J	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	6 J	10 U
Metals						
Iron	UG/L	3350	1380	12300	8930	11700
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	7460	3270 J	536	1130	812
Total Organic Carbon	MG/L	4.2 J	5.4	7.3	18.6 J	10.0

Flags assigned during chemistry validation are shown.

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Advanced Selection: WG_NoDump
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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP*'

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-07S	MW-07S	MW-07S	MW-08S	MW-08S
Sample ID		MW-7S	MW-7S	MW-7S	MW-8S	MW-8S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	06/23/00	10/20/00	03/16/00	06/23/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 UJ	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	UG/L	1 J	3 J	10 UJ	10 U	10 U
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 UJ	10 U	10 U	10 UJ	10 U
Acetone	UG/L	10 UJ	10 U	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 U	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	6 J	36	6 J	10 U	47
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	10 U	4 J	2 J	10 U	7 J
Benzene	UG/L	7 J	11	10 U	33	10
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
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Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-07S	MW-07S	MW-07S	MW-08S	MW-08S
Sample ID		MW-7S	MW-7S	MW-7S	MW-8S	MW-8S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	06/23/00	10/20/00	03/16/00	06/23/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Tetrachloroethene	UG/L	10 U	5 J	6 J	10 U	20
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	2 J	10 U	6 J	3 J
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	260 D	140
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	660 D	320
Metals						
Iron	UG/L	13700	15600	4640	31500	38200
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	4.4	2.5 U
Total Dissolved Solids	MG/L	1180	903	1090	996	1930
Total Organic Carbon	MG/L	9.5	8.0 J	12.4	20.8	7.7 J

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-09S	MW-09S	MW-09S	MW-11D	MW-11S
Sample ID		MW-9S	MW-9S	MW-9S	MW-11D	MW-11S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	06/26/00	10/20/00	06/26/00	06/26/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	UG/L	10 U	10 U	10 UJ	10 U	14
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 UJ	10 U	10 U	10 U	10 U
Acetone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	10 U	4 J	4 J	2 J	150
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	10 U	2 J	2 J	1 J	26
Benzene	UG/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
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Detection Limits shown are PQL

Advanced Selection WG_NoDump
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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP*'

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-09S	MW-09S	MW-09S	MW-11D	MW-11S
Sample ID		MW-9S	MW-9S	MW-9S	MW-11D	MW-11S
Matrix		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	06/26/00	10/20/00	06/26/00	06/26/00
Parameter	**Units**					
Volatiles						
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Tetrachloroethene	UG/L	1 J	8 J	6 J	6 J	200 D
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	2 J	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	10 U	10 U
Metals						
Iron	UG/L	7990	73300	2360	31800	20500
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	917	920	972	10500	1220
Total Organic Carbon	MG/L	1.6	2.1 J	2.7	5.5 J	2.2 J

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

Advanced Selection: WG_NoDump
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[MATRIX] = 'WG' AND [LOCID] NOT LIKE 'DUMP*'

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		MW-12S	MW-12S	MW-20S
Sample ID		MW-12S	MW-12S	MW-20S
Matrix		Groundwater	Groundwater	Groundwater
Depth Interval (ft.)		-	-	-
Date Sampled		06/26/00	10/20/00	06/26/00
Parameter	**Units**			
Volatiles				
Chloromethane	UG/L	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U
Vinyl Chloride	UG/L	10 U	10 U	41
Chloroethane	UG/L	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 U
Acetone	UG/L	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 J	10 U	10 U
1,2-Dichloroethane	UG/L	10 J	10 U	10 U
1,2-Dichloroethene (total)	UG/L	1 J	10 U	370 J
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U
Trichloroethene	UG/L	10 U	10 U	52
Benzene	UG/L	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 UJ	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL GROUNDWATER SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**MW-12S**	**MW-12S**	**MW-20S**
Sample ID		**MW-12S**	**MW-12S**	**MW-20S**
Matrix		**Groundwater**	**Groundwater**	**Groundwater**
Depth Interval (ft.)		-	-	-
Date Sampled		**06/26/00**	**10/20/00**	**06/26/00**
Parameter	**Units**			
Volatiles				
Bromoform	UG/L	10 U	10 U	10 U
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 U	10 UJ
Tetrachloroethene	UG/L	3 NJ	10 U	150 D
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U
Toluene	UG/L	2 J	10 U	2 J
Chlorobenzene	UG/L	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U
Metals				
Iron	UG/L	14000	2130	8190
Miscellaneous Parameters				
Petroleum Hydrocarbons	MG/L	2.5 U	2.5 U	2.5 U
Total Dissolved Solids	MG/L	1910	752	747
Total Organic Carbon	MG/L	1.3 J	2.4	3.8 J

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-02	CB-03	CB-03	CB-04	CB-05
Sample ID		CB-2 (7-8)	CB-3 (5-6)	CB-3 (8-9)	CB-4 (5-5.5)	CB-5 (5-5.5)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		7.0-8.0	5.0-6.0	8.0-9.0	5.0-5.5	5.0-5.5
Date Sampled		10/17/00	10/17/00	10/17/00	10/17/00	10/17/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Bromomethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Vinyl Chloride	UG/KG	7 J	8 J	43 J	14 U	25
Chloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Methylene Chloride	UG/KG	10 UJ	10 UJ	14 UJ	14 UJ	14 UJ
Acetone	UG/KG	27 J	150	100 J	14 U	110
Carbon Disulfide	UG/KG	10 U	2 J	2 J	14 U	7 J
1,1-Dichloroethene	UG/KG	10 U	13 U	5 J	14 U	5 J
1,1-Dichloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
2-Butanone	UG/KG	10 U	13 U	14 U	14 U	14 U
Chloroform	UG/KG	10 U	13 U	14 U	3 J	14 U
1,2-Dichloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
1,2-Dichloroethene (total)	UG/KG	17 J	460 J	2200 D	22	13000 D
1,1,1-Trichloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Carbon Tetrachloride	UG/KG	10 U	13 U	14 U	14 U	14 U
Bromodichloromethane	UG/KG	10 U	13 U	14 U	3 J	14 U
1,2-Dichloropropane	UG/KG	10 U	13 U	14 U	14 U	14 U
cis-1,3-Dichloropropene	UG/KG	10 U	13 U	14 U	14 U	14 U
Trichloroethene	UG/KG	4 J	13 U	4 J	10 J	13000 D
Benzene	UG/KG	10 U	13 U	14 U	14 U	3 J
Dibromochloromethane	UG/KG	10 U	13 U	14 U	14 U	14 U
trans-1,3-Dichloropropene	UG/KG	10 U	13 U	14 U	14 U	14 U
1,1,2-Trichloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Bromoform	UG/KG	10 U	13 U	14 U	14 U	14 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**CB-02**	**CB-03**	**CB-03**	**CB-04**	**CB-05**
Sample ID		**CB-2 (7-8)**	**CB-3 (5-6)**	**CB-3 (8-9)**	**CB-4 (5-5.5)**	**CB-5 (5-5.5)**
Matrix		**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Depth Interval (ft.)		**7.0-8.0**	**5.0-6.0**	**8.0-9.0**	**5.0-5.5**	**5.0-5.5**
Date Sampled		**10/17/00**	**10/17/00**	**10/17/00**	**10/17/00**	**10/17/00**
Parameter	**Units**					
Volatiles						
4-Methyl-2-Pentanone	UG/KG	10 U	13 U	14 U	14 U	14 U
2-Hexanone	UG/KG	10 U	13 U	14 U	14 U	14 U
Tetrachloroethene	UG/KG	10 U	13 U	76 J	45	47000 D
1,1,2,2-Tetrachloroethane	UG/KG	10 U	13 U	14 U	14 U	14 U
Toluene	UG/KG	10 U	13 U	14 U	14 U	5 J
Chlorobenzene	UG/KG	10 U	13 U	14 U	14 U	14 U
Ethylbenzene	UG/KG	10 U	13 U	35 J	14 U	4 J
Styrene	UG/KG	10 U	13 U	14 U	14 U	14 U
Xylene (Total)	UG/KG	51 J	23	180 J	14 U	52

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-06	CB-06	CB-07	CB-08	CB-09
Sample ID		CB-6 (5-5.5)	CB-6 (9-10)	CB-7 (8-9)	CB-8 (5-5.5)	CB-9 (2-4)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		5.0-5.5	9.0-10.0	8.0-9.0	5.0-5.5	2.0-4.0
Date Sampled		10/17/00	10/17/00	10/17/00	10/17/00	10/18/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Bromomethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Vinyl Chloride	UG/KG	150	350 J	14 U	5 J	12 U
Chloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Methylene Chloride	UG/KG	14 UJ	14 UJ	37 UJ	69 UJ	14 UJ
Acetone	UG/KG	92	31 J	29	260	15
Carbon Disulfide	UG/KG	3 J	14 U	2 J	5 J	12 U
1,1-Dichloroethene	UG/KG	14 U	14 U	14 U	14 U	12 U
1,1-Dichloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
2-Butanone	UG/KG	32	14 U	7 J	81	12 U
Chloroform	UG/KG	14 U	14 U	14 U	14 U	12 U
1,2-Dichloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
1,2-Dichloroethene (total)	UG/KG	82 NJ	2900 DJ	14 U	8 J	13
1,1,1-Trichloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Carbon Tetrachloride	UG/KG	14 U	14 U	14 U	14 U	12 U
Bromodichloromethane	UG/KG	14 U	14 U	14 U	14 U	12 U
1,2-Dichloropropane	UG/KG	14 U	14 U	14 U	14 U	12 U
cis-1,3-Dichloropropene	UG/KG	14 U	14 U	14 U	14 U	12 U
Trichloroethene	UG/KG	58 NJ	120 J	14 U	14 U	3 J
Benzene	UG/KG	14 U	14 U	14 U	14 U	12 U
Dibromochloromethane	UG/KG	14 U	14 U	14 U	14 U	12 U
trans-1,3-Dichloropropene	UG/KG	14 U	14 U	14 U	14 U	12 U
1,1,2-Trichloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Bromoform	UG/KG	14 U	14 U	14 U	14 U	12 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-06	CB-06	CB-07	CB-08	CB-09
Sample ID		CB-6 (5-5.5)	CB-6 (9-10)	CB-7 (8-9)	CB-8 (5-5.5)	CB-9 (2-4)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		5.0-5.5	9.0-10.0	8.0-9.0	5.0-5.5	2.0-4.0
Date Sampled		10/17/00	10/17/00	10/17/00	10/17/00	10/18/00
Parameter	**Units**					
Volatiles						
4-Methyl-2-Pentanone	UG/KG	14 U	14 U	14 U	14 U	12 U
2-Hexanone	UG/KG	14 U	14 U	14 U	14 U	12 U
Tetrachloroethene	UG/KG	170 NJ	24000 DJ	14 U	36 U	34 U
1,1,2,2-Tetrachloroethane	UG/KG	14 U	14 U	14 U	14 U	12 U
Toluene	UG/KG	14 U	54 J	14 U	14 U	12 U
Chlorobenzene	UG/KG	14 U	14 U	14 U	14 U	12 U
Ethylbenzene	UG/KG	14 U	4 J	14 U	14 U	12 U
Styrene	UG/KG	14 U	14 U	14 U	14 U	12 U
Xylene (Total)	UG/KG	22	440 J	14 U	7 J	12 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-09	CB-09	CB-10	CB-11	CB-12
Sample ID		CB-9 (4-6)	CB-9 (11-12)	CB-10 (0-4)	CB-11 (1-4)	CB-12 (1-4)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		4.0-6.0	11.0-12.0	0.0-4.0	1.0-4.0	1.0-4.0
Date Sampled		10/18/00	10/18/00	10/18/00	10/18/00	10/18/00
Parameter	Units					
Volatiles						
Chloromethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Bromomethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Vinyl Chloride	UG/KG	17 U	250	12 U	11 U	11 U
Chloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Methylene Chloride	UG/KG	17 UJ	17 UJ	98 J	63 J	48 J
Acetone	UG/KG	30	140	12 U	11 U	3 J
Carbon Disulfide	UG/KG	17 U	17 U	12 U	11 U	11 U
1,1-Dichloroethene	UG/KG	17 U	17 U	12 U	11 U	11 U
1,1-Dichloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
2-Butanone	UG/KG	6 J	17 U	12 U	11 U	11 U
Chloroform	UG/KG	17 U	17 U	12 U	11 U	11 U
1,2-Dichloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
1,2-Dichloroethene (total)	UG/KG	3 J	950 D	28	38	4 J
1,1,1-Trichloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Carbon Tetrachloride	UG/KG	17 U	17 U	12 U	11 U	11 U
Bromodichloromethane	UG/KG	17 U	17 U	12 U	11 U	11 U
1,2-Dichloropropane	UG/KG	17 U	17 U	12 U	11 U	11 U
cis-1,3-Dichloropropene	UG/KG	17 U	17 U	12 U	11 U	11 U
Trichloroethene	UG/KG	17 U	17 U	14	19	3 J
Benzene	UG/KG	17 U	5 J	12 U	11 U	11 U
Dibromochloromethane	UG/KG	17 U	17 U	12 U	11 U	11 U
trans-1,3-Dichloropropene	UG/KG	17 U	17 U	12 U	11 U	11 U
1,1,2-Trichloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Bromoform	UG/KG	17 U	17 U	12 U	11 U	11 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**CB-09**	**CB-09**	**CB-10**	**CB-11**	**CB-12**
Sample ID		**CB-9 (4-6)**	**CB-9 (11-12)**	**CB-10 (0-4)**	**CB-11 (1-4)**	**CB-12 (1-4)**
Matrix		**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Depth Interval (ft.)		**4.0-6.0**	**11.0-12.0**	**0.0-4.0**	**1.0-4.0**	**1.0-4.0**
Date Sampled		**10/18/00**	**10/18/00**	**10/18/00**	**10/18/00**	**10/18/00**
Parameter	**Units**					
Volatiles						
4-Methyl-2-Pentanone	UG/KG	17 U	17 U	12 UJ	11 UJ	11 UJ
2-Hexanone	UG/KG	17 U	17 U	12 U	11 U	11 U
Tetrachloroethene	UG/KG	17 U	17 U	720 D	670 D	430000 DJ
1,1,2,2-Tetrachloroethane	UG/KG	17 U	17 U	12 U	11 U	11 U
Toluene	UG/KG	17 U	5 J	12 U	11 U	11 U
Chlorobenzene	UG/KG	17 U	17 U	12 U	11 U	11 U
Ethylbenzene	UG/KG	17 U	26	12 U	11 U	11 U
Styrene	UG/KG	17 U	17 U	12 U	11 U	11 U
Xylene (Total)	UG/KG	17 U	670 D	12 U	11 U	11 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**CB-12**	**CB-12**	**CB-13**	**CB-13**	**CB-14**
Sample ID		CB-12 (4-6)	CB-12 (9-10)	CB-13 (0-4)	CB-13 (4-6)	CB-14 (0-4)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		4.0-6.0	9.0-10.0	0.0-4.0	4.0-6.0	0.0-4.0
Date Sampled		10/18/00	10/18/00	10/19/00	10/19/00	10/19/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Bromomethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Vinyl Chloride	UG/KG	3 J	65 J	12 U	6 J	11 U
Chloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Methylene Chloride	UG/KG	46 UJ	28 U	33 UJ	33 UJ	25 UJ
Acetone	UG/KG	24	31 J	12 U	63	11 U
Carbon Disulfide	UG/KG	13 U	1 J	12 U	14 U	11 U
1,1-Dichloroethene	UG/KG	13 U	7 J	12 U	14 U	11 U
1,1-Dichloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
2-Butanone	UG/KG	7 J	10 J	12 U	14 U	11 U
Chloroform	UG/KG	13 U	14 U	12 U	14 U	11 U
1,2-Dichloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
1,2-Dichloroethene (total)	UG/KG	450	1300 D	9 J	250	6 J
1,1,1-Trichloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Carbon Tetrachloride	UG/KG	13 U	14 U	12 U	14 U	11 U
Bromodichloromethane	UG/KG	13 U	14 U	12 U	14 U	11 U
1,2-Dichloropropane	UG/KG	13 U	14 U	12 U	14 U	11 U
cis-1,3-Dichloropropene	UG/KG	13 U	14 U	12 U	14 U	11 U
Trichloroethene	UG/KG	60	14 U	4 J	3 J	4 J
Benzene	UG/KG	13 U	14 U	12 U	14 U	11 U
Dibromochloromethane	UG/KG	13 U	14 U	12 U	14 U	11 U
trans-1,3-Dichloropropene	UG/KG	13 U	14 U	12 U	14 U	11 U
1,1,2-Trichloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Bromoform	UG/KG	13 U	14 U	12 U	14 U	11 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-12	CB-12	CB-13	CB-13	CB-14
Sample ID		CB-12 (4-6)	CB-12 (9-10)	CB-13 (0-4)	CB-13 (4-6)	CB-14 (0-4)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		4.0-6.0	9.0-10.0	0.0-4.0	4.0-6.0	0.0-4.0
Date Sampled		10/18/00	10/18/00	10/19/00	10/19/00	10/19/00
Parameter	**Units**					
Volatiles						
4-Methyl-2-Pentanone	UG/KG	13 UJ	14 U	12 UJ	14 UJ	11 UJ
2-Hexanone	UG/KG	13 U	14 U	12 U	14 U	11 U
Tetrachloroethene	UG/KG	1400 D	18 NJ	160	39	150
1,1,2,2-Tetrachloroethane	UG/KG	13 U	14 U	12 U	14 U	11 U
Toluene	UG/KG	13 U	3 J	12 U	14 U	11 U
Chlorobenzene	UG/KG	13 U	14 U	12 U	14 U	11 U
Ethylbenzene	UG/KG	13 U	8 J	12 U	2 J	11 U
Styrene	UG/KG	13 U	14 U	12 U	14 U	11 U
Xylene (Total)	UG/KG	16	310 J	12 U	10 J	11 U

Flags assigned during chemistry validation are shown.

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TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-14	CB-15	CB-15	CB-G	CB-G
Sample ID		CB-14 (4-6)	CB-15 (0-4)	CB-15 (4-6)	CB-G (0-4)	CB-G (4-6)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		4.0-6.0	0.0-4.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled		10/19/00	10/19/00	10/19/00	10/18/00	10/18/00
Parameter	**Units**					
Volatiles						
Chloromethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Bromomethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Vinyl Chloride	UG/KG	4 J	28 U	5 J	10 U	3 J
Chloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Methylene Chloride	UG/KG	22 UJ	28 UJ	29 UJ	10 UJ	12 UJ
Acetone	UG/KG	70	5 J	5 J	5 J	4 J
Carbon Disulfide	UG/KG	2 J	28 U	29 U	10 U	2 J
1,1-Dichloroethene	UG/KG	14 U	28 U	29 U	10 U	12 U
1,1-Dichloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
2-Butanone	UG/KG	14 U	28 U	29 U	1 J	12 U
Chloroform	UG/KG	14 U	28 U	29 U	3 J	12 U
1,2-Dichloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
1,2-Dichloroethene (total)	UG/KG	650 D	9 J	160	10 U	31
1,1,1-Trichloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Carbon Tetrachloride	UG/KG	14 U	28 U	29 U	10 U	12 U
Bromodichloromethane	UG/KG	14 U	28 U	29 U	3 J	12 U
1,2-Dichloropropane	UG/KG	14 U	28 U	29 U	10 U	12 U
cis-1,3-Dichloropropene	UG/KG	14 U	28 U	29 U	10 U	12 U
Trichloroethene	UG/KG	51	6 J	86	10 U	4 J
Benzene	UG/KG	3 J	28 U	29 U	10 U	12 U
Dibromochloromethane	UG/KG	14 U	28 U	29 U	2 J	12 U
trans-1,3-Dichloropropene	UG/KG	14 U	28 U	29 U	10 U	12 U
1,1,2-Trichloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Bromoform	UG/KG	14 U	28 U	29 U	10 U	12 U

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-14	CB-15	CB-15	CB-G	CB-G
Sample ID		CB-14 (4-6)	CB-15 (0-4)	CB-15 (4-6)	CB-G (0-4)	CB-G (4-6)
Matrix		Soil	Soil	Soil	Soil	Soil
Depth Interval (ft.)		4.0-6.0	0.0-4.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled		10/19/00	10/19/00	10/19/00	10/18/00	10/18/00
Parameter	Units					
Volatiles						
4-Methyl-2-Pentanone	UG/KG	14 UJ	28 U	29 U	10 U	12 U
2-Hexanone	UG/KG	14 U	28 U	29 U	10 U	12 U
Tetrachloroethene	UG/KG	250	220	450	28	160
1,1,2,2-Tetrachloroethane	UG/KG	14 U	28 U	29 U	10 U	12 U
Toluene	UG/KG	2 J	28 U	29 U	10 U	12 U
Chlorobenzene	UG/KG	14 U	28 U	29 U	10 U	12 U
Ethylbenzene	UG/KG	4 J	28 U	29 U	10 U	12 U
Styrene	UG/KG	14 U	28 U	29 U	10 U	12 U
Xylene (Total)	UG/KG	14	28 U	29 U	10 U	12 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-G	CB-H	CB-L	CB-L
Sample ID		CB-G (10-12)	CB-H (4-6)	CB-L (0-4)	CB-L (4-6)
Matrix		Soil	Soil	Soil	Soil
Depth Interval (ft.)		10.0-12.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled		10/18/00	10/18/00	10/18/00	10/18/00
Parameter	**Units**				
Volatiles					
Chloromethane	UG/KG	13 U	13 U	14 U	11 U
Bromomethane	UG/KG	13 U	13 U	14 U	11 U
Vinyl Chloride	UG/KG	430 J	120 J	14 U	11 U
Chloroethane	UG/KG	13 U	13 U	14 U	11 U
Methylene Chloride	UG/KG	13 UJ	13 UJ	14 UJ	11 UJ
Acetone	UG/KG	19 J	59 J	14 U	6 J
Carbon Disulfide	UG/KG	5 J	3 J	14 U	11 U
1,1-Dichloroethene	UG/KG	4 J	23 J	14 U	11 U
1,1-Dichloroethane	UG/KG	13 U	13 U	14 U	11 U
2-Butanone	UG/KG	5 J	17 J	14 U	11 U
Chloroform	UG/KG	13 U	13 U	14 U	11 U
1,2-Dichloroethane	UG/KG	13 U	13 U	14 U	11 U
1,2-Dichloroethene (total)	UG/KG	3900 D	3500 J	45	11 U
1,1,1-Trichloroethane	UG/KG	13 U	13 U	14 U	11 U
Carbon Tetrachloride	UG/KG	13 U	13 U	14 U	11 U
Bromodichloromethane	UG/KG	13 U	13 U	14 U	11 U
1,2-Dichloropropane	UG/KG	13 U	13 U	14 U	11 U
cis-1,3-Dichloropropene	UG/KG	13 U	13 U	14 U	11 U
Trichloroethene	UG/KG	190 J	4600 J	31	11 U
Benzene	UG/KG	13 U	13 U	14 U	11 U
Dibromochloromethane	UG/KG	13 U	13 U	14 U	11 U
trans-1,3-Dichloropropene	UG/KG	13 U	13 U	14 U	11 U
1,1,2-Trichloroethane	UG/KG	13 U	13 U	14 U	11 U
Bromoform	UG/KG	13 U	13 U	14 U	11 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL SOIL SAMPLE RESULTS
NORTH FRANKLIN

Location ID		CB-G	CB-H	CB-L	CB-L
Sample ID		CB-G (10-12)	CB-H (4-6)	CB-L (0-4)	CB-L (4-6)
Matrix		Soil	Soil	Soil	Soil
Depth Interval (ft.)		10.0-12.0	4.0-6.0	0.0-4.0	4.0-6.0
Date Sampled		10/18/00	10/18/00	10/18/00	10/18/00
Parameter	**Units**				
Volatiles					
4-Methyl-2-Pentanone	UG/KG	13 U	13 U	14 U	11 U
2-Hexanone	UG/KG	13 U	13 U	14 U	11 U
Tetrachloroethene	UG/KG	14000 D	3400000 D	320 D	33 U
1,1,2,2-Tetrachloroethane	UG/KG	13 U	13 U	14 U	11 U
Toluene	UG/KG	13 U	20 J	14 U	11 U
Chlorobenzene	UG/KG	13 U	13 U	14 U	11 U
Ethylbenzene	UG/KG	13 U	8 J	14 U	11 U
Styrene	UG/KG	13 U	13 U	14 U	11 U
Xylene (Total)	UG/KG	9 J	56 J	14 U	11 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL AIR SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**8 HR AIR**	**INDOOR-AIR#1**
Sample ID		**8 HR AIR**	**INDOOR-AIR#1**
Matrix		**Ambient Air**	**Ambient Air**
Depth Interval (ft.)		-	-
Date Sampled		**06/30/00**	**05/16/00**
Parameter	**Units**		
Volatiles			
Chloromethane	PPBV	0.79 U	0.94 UJ
Bromomethane	PPBV	0.79 U	0.94 UJ
Vinyl Chloride	PPBV	1.8	0.94 UJ
Chloroethane	PPBV	0.79 U	0.94 UJ
Methylene Chloride	PPBV	1.3	0.94 UJ
Acetone	PPBV	24 J	11 J
Carbon Disulfide	PPBV	3.2 U	3.7 UJ
1,1-Dichloroethene	PPBV	0.79 U	0.94 UJ
1,1-Dichloroethane	PPBV	0.79 U	0.94 UJ
2-Butanone	PPBV	3.2 UJ	8.4 J
Chloroform	PPBV	0.79 U	0.94 UJ
1,2-Dichloroethane	PPBV	0.79 U	0.94 UJ
1,1,1-Trichloroethane	PPBV	0.79 U	0.94 UJ
Carbon Tetrachloride	PPBV	0.79 U	0.94 UJ
Bromodichloromethane	PPBV	3.2 U	3.7 UJ
1,2-Dichloropropane	PPBV	0.79 U	0.94 UJ
cis-1,3-Dichloropropene	PPBV	0.79 U	0.94 UJ
Trichloroethene	PPBV	1.8	0.94 UJ
Benzene	PPBV	0.79 U	0.94 UJ
Dibromochloromethane	PPBV	3.2 U	3.7 UJ
trans-1,3-Dichloropropene	PPBV	0.79 U	0.94 UJ
1,1,2-Trichloroethane	PPBV	0.79 U	0.94 UJ
Bromoform	PPBV	3.2 U	3.7 UJ
4-Methyl-2-pentanone	PPBV	3.2 UJ	3.7 UJ

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

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[MATRIX] = 'AA'

TABLE 1
ANALYTICAL AIR SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**8 HR AIR**	**INDOOR-AIR#1**
Sample ID		**8 HR AIR**	**INDOOR-AIR#1**
Matrix		**Ambient Air**	**Ambient Air**
Depth Interval (ft.)		**-**	**-**
Date Sampled		**06/30/00**	**05/16/00**
Parameter	**Units**		
Volatiles			
2-Hexanone	PPBV	3.2 UJ	3.7 UJ
Tetrachloroethene	PPBV	130	1.3 J
1,1,2,2-Tetrachloroethane	PPBV	0.79 U	0.94 UJ
Toluene	PPBV	5.3	1.0 J
Chlorobenzene	PPBV	0.79 U	0.94 UJ
Ethylbenzene	PPBV	0.79 U	0.94 UJ
Styrene	PPBV	0.79 U	0.94 UJ
m,p-Xylene	PPBV	0.98	0.94 UJ
o-Xylene	PPBV	0.79 U	0.94 UJ
cis-1,2-Dichloroethene	PPBV	2.1	0.94 UJ
trans-1,2-Dichloroethene	PPBV	3.2 U	3.7 UJ
1,2-Dichlorobenzene	PPBV	0.79 U	0.94 UJ
1,3-Dichlorobenzene	PPBV	0.79 U	0.94 UJ
1,4-Dichlorobenzene	PPBV	0.79 U	0.94 UJ
1,2,4-Trichlorobenzene	PPBV	0.79 U	0.94 UJ
1,2,4-Trimethylbenzene	PPBV	0.79 U	0.94 UJ
1,3,5-Trimethylbenzene	PPBV	0.79 U	0.94 UJ
Vinyl Acetate	PPBV	3.2 UJ	3.7 UJ
Methyl tert-Butyl Ether	PPBV	3.2 UJ	3.7 UJ
1,3-Butadiene	PPBV	3.2 U	3.7 UJ
1,4-Dioxane	PPBV	3.2 UJ	3.7 UJ
2-Propanol	PPBV	16 J	3.7 UJ
4-Ethyltoluene	PPBV	3.2 U	3.7 UJ
Chlorotoluene	PPBV	0.79 U	0.94 UJ

Flags assigned during chemistry validation are shown.

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Detection Limits shown are PQL

TABLE 1
ANALYTICAL AIR SAMPLE RESULTS
NORTH FRANKLIN

Location ID		**8 HR AIR**	**INDOOR-AIR#1**
Sample ID		**8 HR AIR**	**INDOOR-AIR#1**
Matrix		**Ambient Air**	**Ambient Air**
Depth Interval (ft.)		-	-
Date Sampled		**06/30/00**	**05/16/00**
Parameter	**Units**		
Volatiles			
Cyclohexane	PPBV	3.2 U	3.7 UJ
Ethanol	PPBV	8.3 J	5.4 J
Ethylene Dibromide	PPBV	0.79 U	0.94 UJ
Heptane	PPBV	3.2 U	3.7 UJ
Hexachlorobutadiene	PPBV	0.79 U	0.94 UJ
Hexane	PPBV	3.2 U	3.7 UJ
Propylene	PPBV	22	3.7 UJ
Tetrahydrofuran	PPBV	3.2 U	4.2 J
Freon 11	PPBV	0.79 U	0.94 UJ
Freon 113	PPBV	0.79 U	0.94 UJ
Freon 12	PPBV	0.89	0.94 UJ
Freon 114	PPBV	0.79 U	0.94 UJ

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TABLE 1
ANALYTICAL FIELD QC SAMPLE RESULTS
NORTH FRANKLIN

Location ID		FIELDQC	FIELDQC	FIELDQC	FIELDQC	FIELDQC
Sample ID		TB1	TB2	TB	TB-6/23	TB-6/26
Matrix		Quality Control	Quality Control	Quality Control	Quality Control	Quality Control
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	03/16/00	05/11/00	06/23/00	06/26/00
Parameter	**Units**	Trip Blank (1-1)	Trip Blank (2-1)	Trip Blank (1-1)	Trip Blank (1-1)	Trip Blank (1-1)
Volatiles						
Chloromethane	UG/L	10 U	10 U	10 U	10 UJ	10 UJ
Bromomethane	UG/L	10 U	10 U	10 UJ	10 U	10 U
Vinyl Chloride	UG/L	10 U	10 U	10 U	10 U	10 U
Chloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 UJ	10 UJ	10 U	10 U	10 U
Acetone	UG/L	10 UJ	10 UJ	10 U	10 U	10 U
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 U	10 U
Chloroform	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	10 U	10 U	10 U	10 U	10 U
Benzene	UG/L	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Bromoform	UG/L	10 U	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

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TABLE 1
ANALYTICAL FIELD QC SAMPLE RESULTS
NORTH FRANKLIN

Location ID		FIELDQC	FIELDQC	FIELDQC	FIELDQC	FIELDQC
Sample ID		TB1	TB2	TB	TB-6/23	TB-6/26
Matrix		Quality Control	Quality Control	Quality Control	Quality Control	Quality Control
Depth Interval (ft.)		-	-	-	-	-
Date Sampled		03/16/00	03/16/00	05/11/00	06/23/00	06/26/00
Parameter	**Units**	Trip Blank (1-1)	Trip Blank (2-1)	Trip Blank (1-1)	Trip Blank (1-1)	Trip Blank (1-1)
Volatiles						
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 U	10 UJ	10 UJ
2-Hexanone	UG/L	10 UJ	10 UJ	10 U	10 UJ	10 UJ
Tetrachloroethene	UG/L	10 U	10 U	4 J	10 U	10 U
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	10 U	10 U
Metals						
Iron	UG/L	NA	NA	NA	NA	NA
Miscellaneous Parameters						
Petroleum Hydrocarbons	MG/L	NA	NA	NA	NA	NA
Total Dissolved Solids	MG/L	NA	NA	NA	NA	NA
Total Organic Carbon	MG/L	NA	NA	NA	NA	NA

Flags assigned during chemistry validation are shown.

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[MATRIX] = 'WQ'

TABLE 1
ANALYTICAL FIELD QC SAMPLE RESULTS
NORTH FRANKLIN

Location ID		FIELDQC	FIELDQC	FIELDQC	FIELDQC
Sample ID		RB-1 GW	RB-1 SOIL	TB1	TB-2
Matrix		Quality Control	Quality Control	Quality Control	Quality Control
Depth Interval (ft.)		-	-	-	-
Date Sampled		10/19/00	10/19/00	10/19/00	10/20/00
Parameter	**Units**	Rinse Blank (1-1)	Rinse Blank (2-1)	Trip Blank (1-1)	Trip Blank (1-1)
Volatiles					
Chloromethane	UG/L	10 U	10 U	10 U	10 U
Bromomethane	UG/L	10 U	10 U	10 U	10 U
Vinyl Chloride	UG/L	10 U	10 UJ	10 UJ	10 U
Chloroethane	UG/L	10 U	10 U	10 U	10 U
Methylene Chloride	UG/L	10 U	10 U	10 U	10 U
Acetone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ
Carbon Disulfide	UG/L	10 U	10 U	10 U	10 U
1,1-Dichloroethene	UG/L	10 U	10 U	10 U	10 U
1,1-Dichloroethane	UG/L	10 U	10 U	10 U	10 U
2-Butanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ
Chloroform	UG/L	10 U	10 U	10 U	10 U
1,2-Dichloroethane	UG/L	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	UG/L	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	UG/L	10 U	10 U	10 U	10 U
Carbon Tetrachloride	UG/L	10 U	10 U	10 U	10 U
Bromodichloromethane	UG/L	10 U	10 U	10 U	10 U
1,2-Dichloropropane	UG/L	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	UG/L	10 U	10 U	10 U	10 U
Trichloroethene	UG/L	10 U	10 U	10 U	10 U
Benzene	UG/L	10 U	10 U	10 U	10 U
Dibromochloromethane	UG/L	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	UG/L	10 UJ	10 U	10 U	10 UJ
1,1,2-Trichloroethane	UG/L	10 U	10 U	10 U	10 U
Bromoform	UG/L	10 U	10 U	10 U	10 U

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
Check by __DKF__2/13/01_

Detection Limits shown are PQL

TABLE 1
ANALYTICAL FIELD QC SAMPLE RESULTS
NORTH FRANKLIN

Location ID		FIELDQC	FIELDQC	FIELDQC	FIELDQC
Sample ID		RB-1 GW	RB-1 SOIL	TB1	TB-2
Matrix		Quality Control	Quality Control	Quality Control	Quality Control
Depth Interval (ft.)		-	-	-	-
Date Sampled		10/19/00	10/19/00	10/19/00	10/20/00
Parameter	**Units**	Rinse Blank (1-1)	Rinse Blank (2-1)	Trip Blank (1-1)	Trip Blank (1-1)
Volatiles					
4-Methyl-2-Pentanone	UG/L	10 UJ	10 UJ	10 UJ	10 UJ
2-Hexanone	UG/L	10 U	10 UJ	10 UJ	10 U
Tetrachloroethene	UG/L	1 J	10 U	2 J	10 U
1,1,2,2-Tetrachloroethane	UG/L	10 U	10 U	10 U	10 U
Toluene	UG/L	10 U	10 U	10 U	10 U
Chlorobenzene	UG/L	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	10 U	10 U	10 U	10 U
Styrene	UG/L	10 U	10 U	10 U	10 U
Xylene (total)	UG/L	10 U	10 U	10 U	10 U
Metals					
Iron	UG/L	12.3 B	NA	NA	NA
Miscellaneous Parameters					
Petroleum Hydrocarbons	MG/L	2.5 U	NA	NA	NA
Total Dissolved Solids	MG/L	10 U	NA	NA	NA
Total Organic Carbon	MG/L	1.6	NA	NA	NA

Flags assigned during chemistry validation are shown.

Made by __JJL__2/12/01_
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Detection Limits shown are PQL