Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision
New York Twist Drill - Loading Dock Area Site
Operable Unit No. 1
Melville, Town of Huntington, Suffolk County, New York
Site Number 1-52-169
Voluntary Cleanup Site V00128-1

March 2004

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* ERIN M. CROTTY, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

New York Twist Drill - Loading Dock Area Inactive Hazardous Waste Disposal Site
Operable Unit No. 1
Melville, Town of Huntington, Suffolk County, New York
Site No. 1-52-169
Voluntary Cleanup Site V00128-1

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for Operable Unit #1 of the New York Twist Drill - Loading Dock Area site, a Class 2 inactive hazardous waste disposal site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for Operable Unit #1 of the New York Twist Drill - Loading Dock Area inactive hazardous waste disposal site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened releases of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and/or the environment.

Description of Selected Remedy

Based on the results of the Site Investigation, supplemental investigations and the Remedial Action Work Plan (RAWP) for the New York Twist Drill - Loading Dock Area site and the criteria identified for evaluation of alternatives, the NYSDEC has selected continuation of NAPL bailing, enhanced reductive dechlorination technology for source area remediation and control of VOC migration in the dissolved on-site plume as the remedy for the site. The components of the remedy are as follows:

- Periodic recovery of non-aqueous phase liquids (NAPLs) from productive wells;

- After a period of time acceptable to the NYSDEC to allow some additional NAPL recovery by hand bailing, source area remediation using the enhanced reductive dechlorination (ERD) technology will be implemented;
- Use of the ERD technology to remediate dissolved phase contaminant mass in the groundwater between the source area and the downgradient property border;
- Continued operation of the building positive pressure HVAC system;
- Long term periodic monitoring of the indoor air quality and the on-site groundwater;
- GA groundwater standards to be met at the downgradient property border are the cleanup objectives for the groundwater remediation;
- New York State Department of Health guidance values for indoor air quality (IAQ) will be used to ensure that IAQ remains acceptable during treatment;
- Development of a site management plan;
- Institutional controls in the form of an environmental easement that restricts the use of contaminated groundwater beneath the site and limits the use and development of the property to commercial or industrial uses; and
- Annual certification for the imposed institutional controls.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

MAR 3 1 2004

Date

Dale A. Desnoyers, Director
Division of Environmental Remediation

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SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has selected this remedy for the New York Twist Drill - Load Dock Area Site for Operable Unit 1, the remedial program for the on-site contamination. (The off-site groundwater investigation and remediation will be addressed separately under operable unit 2.) The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this on-site remedy. As more fully described in Sections 3 and 5 of this document, degreasing operations during the manufacturing of twist drills between 1966 and 1984 have resulted in the disposal of hazardous wastes, including chlorinated volatile organic compounds (VOCs) consisting primarily of tetrachloroethene (PCE). These wastes have contaminated the groundwater at the site, and have resulted in:

- a significant threat to human health associated with potential exposure to volatile organic vapors present in the soil gases beneath the building and to chlorinated VOCs in the groundwater beneath and downgradient of the site.

- a significant threat to the environment associated with the groundwater contamination of the underlying sole source aquifer.

To eliminate or mitigate the on-site portion of these threats, the NYSDEC has selected the following remedy:

- Removal of non-aqueous phase liquids (NAPLs) from any well that contains measurable amounts of NAPL until free-phase product recovery by hand bailing or other methods is no longer effective;

- Source area remediation using the enhanced reductive dechlorination (ERD) technology to create an *in situ* reactive zone (IRZ) to remediate chlorinated solvents present as NAPL, adsorbed phase, and dissolved phase contaminant mass in the source area groundwater near the eastern loading dock;

- Use of the ERD technology to remediate dissolved phase contaminant mass in the groundwater between the source area and the downgradient property border to prevent further impacts to the off-site groundwater;

- Continued operation of the building positive pressure HVAC system to help prevent the potential migration of vapors into the indoor air of the building;
- Periodic monitoring of the indoor air quality and the on-site groundwater;
- Development of a site management plan to be used during future redevelopment;
- Imposition of an institutional control in the form of an environmental easement that restricts the use of contaminated groundwater beneath the site and limits the use and development of the property to commercial or industrial uses; and
- Annual certification for the imposed institutional controls.

The selected remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The New York Twist Drill - Loading Dock Area Site is located at 25 Melville Park Road in a large industrial/commercial area in Melville in Suffolk County. This six-acre site is currently being used as a multi-tenant office building, as are many of the nearby properties in this portion of the industrial area.

The site is located slightly east of Route 110 and is located on the north side of the first east-west street that is south of the south service road for the Long Island Expressway. The IW Industries, Inc. inactive hazardous waste disposal site (Site Number 152102) is adjacent to the site along the eastern property border. Please see the attached site location map, Figure 1.

Operable Unit (OU) No. 1, which is the subject of this PRAP, consists of the on-site remedial program. OU-1 includes all land and buildings within the property boundaries and the groundwater directly beneath the property. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

The remaining operable unit for this site is OU-2, defined as off-site groundwater. This operable unit will be addressed at a future date in a separate Proposed Remedial Action Plan and record of decision. The NYSDEC is currently negotiating a consent order for a remedial investigation/feasibility study with the potentially responsible parties.

The site was divided into on-site and off-site operable units because the on-site contamination is being addressed under the NYSDEC's Voluntary Cleanup Program. The current volunteer, as will be discussed further under Section 4, is only responsible for addressing the on-site portion of the contamination.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The site was operated by New York Twist Drill (NYTD) from 1966 (when the building was originally constructed) to 1984. NYTD manufactured carbon steel and other hardened metal twist drills. After NYTD vacated the building, it was gutted and converted into a two-story office complex in 1985. No known manufacturing activities have occurred at the site since the departure of NYTD.

The process of manufacturing twist drills consisted of modifying steel bars, which ranged from 1/4-inch to 2-inches in diameter. After the bars were cut, they were thermally tempered, degreased with a chlorinated solvent in a vapor degreaser, ground and pointed, finished, packaged and shipped.

A State Pollutant Discharge Elimination System (SPDES) permit was in place between the late 1960's through the early 1980's. There were some discharge violations above allowable SPDES permit limits during this period for pH, iron and 1,1,1-trichloroethane.

The former manufacturing area for NYTD was an approximately 63' by 103' area in the northeast corner of the building. This area is directly north of the east loading dock and extends northward to the north wall of the building. Figure 2 shows the location of the former manufacturing area and some of the historical features that have been evaluated.

A 116' deep diffusion well was located in the former manufacturing area. This well was reportedly used to discharge cooling water between 1966 and 1981. Also, a former underground storage tank used to hold waste oils was reportedly connected to a floor drain in the manufacturing area. Since the site was completely renovated in 1985, it is impossible to determine the exact method of disposal that resulted in the environmental contamination found at this site. However, the above two features have been fully investigated and are considered as potential discharge points.

Cyanide bearing wastes, related to a nitriding process to harden the drill bits, were treated on site. This treated process water was discharged to the area shown on Figure 2 under the SPDES permit discussed above.

A barium washer was used in the manufacturing of the drill bits. An underground storage tank located east of the manufacturing area was used to temporarily store the related barium wastes before they were eventually shipped off-site.

3.2: Remedial History

Investigations performed for potential purchasers of the property in the mid-1990s, prior to NYSDEC involvement with this site, provided initial data on the nature and extent of the contamination. The following investigations were performed at that time:

- Phase I Environmental Site Assessment (Aqua Terra, March 1993)

- Phase I Environmental Site Assessment with Subsurface Investigation (Fugro East, January 1995)

- An Additional Subsurface Investigation and Ground Penetrating Radar Letter Report (Fugro East, January 1995)

- Additional Subsurface Investigation and Ground Penetrating Radar Letter Report (Fugro East, October 1995)

- Petrex Soil Gas Survey Report (NERI, Rizzo Assoc., November 1995)

- Preliminary Remedial Action Plan (ERI, May 1996)

- Work Plan for Voluntary Cleanup Action (ERI, August 1996)

- Additional Investigation Update (ERI, August 1996)

The above investigations included the following:

- Research of historical information;

- Several geophysical surveys to identify subsurface tanks or leaching pools;

- The collection of 37 soil gas samples from the shallow soils to locate volatile organic compound (VOC) contaminated soils and possible vapor exposure pathways;

- The collection of soil samples in the former manufacturing area to evaluate various areas of interest;

- The screening and sampling of soils during the installation of monitoring wells;

- The collection of soil and groundwater samples at different depths below the water table from profile borings installed by direct push technology located near the source area to determine the vertical extent of the groundwater contamination;

- The collection of nine groundwater samples from nine soil borings by a hydropunch sampler;

- The installation and sampling of 18 monitoring wells;

- The collection of indoor air samples; and

- The performance of a baseline risk assessment.

It was discovered that the groundwater downgradient of the former NYTD manufacturing area is contaminated primarily with tetrachloroethene (PCE), a common industrial solvent used for degreasing.

Two groundwater samples collected near the water table on the upgradient/north side of the former manufacturing area in 1994 and 1996 detected 5 ppb and 16 ppb, respectively of PCE. These low concentrations may represent the contributions from upgradient sources in this industrial area. The GA groundwater standard for PCE is 5 ppb.

In these initial investigations, the highest groundwater contamination levels were found by the southeast corner of the former manufacturing area in a July 1996 sample collected at 58' below ground surface (bgs) where NAPL was present. Tetrachloroethene was detected at 30,500,000 ppb, trichloroethene (TCE) was detected at 498,300 ppb and 1,1,1-trichloroethane (TCA) was detected at 142,700 ppb.

The groundwater contamination extended to the southern property border where 9,800 ppb PCE, 100 ppb TCE and 30 ppb TCA were detected in a July 1996 discrete sample collected at 76' bgs.

No significant soil contamination was detected except for some petroleum detected in a soil sample collected at 45' to 47' bgs in the borehole for MW-12.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include the former owners and operators of New York Twist Drill. The NYSDEC is currently negotiating an Order on Consent with the PRPs for the investigation and remediation of OU-2 which covers off-site groundwater contamination. If an agreement cannot be reached with the PRPs, the NYSDEC will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

On March 28, 1997, the NYSDEC and WHCS Real Estate Limited Partnership (Volunteer) entered into a Voluntary Cleanup Agreement (VCA) to investigate the property. Because the Volunteer qualified for "innocent owner" status, the Volunteer was only required to address the on-site contamination under the VCA. An innocent owner acquired title to the property in an already contaminated condition after the cessation of the disposal or discharge of the contamination; did not participate in the operation of the facility from which the contamination was released; has not by its own actions caused a release from a property other than as a result of ownership subsequent to cessation of the disposal or discharge of the contamination.

Preliminary results of the investigation performed by the Volunteer's consultants indicated that on-site remediation was required. Therefore, on January 13, 1998, WHCS Real Estate Limited Partnership and NYSDEC entered into a new VCA for the remediation of the on-site contamination. In 2002, WHCS Real Estate Limited Partnership assigned the remediation VCA to MPR, LLC who also qualified for innocent owner status.

Because an innocent owner volunteer is only responsible for addressing the on-site portion of the contamination, the NYSDEC listed the site as a Class 2 site in the Registry of Inactive Hazardous

Waste Disposal Sites in New York on May 3, 1999 so that the off-site groundwater contamination could be addressed under NYSDEC's inactive hazardous waste site program. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

SECTION 5: SITE CONTAMINATION

The results of investigations conducted prior to NYSDEC involvement in the site provided preliminary data on the site contamination. A subsequent site investigation (SI) and supplemental site investigative work have been performed at this site under the voluntary cleanup agreements. A remedial action work plan (RAWP) has been developed to evaluate the alternatives for addressing the significant threats to human health.

5.1: Summary of the Site Investigations

The purpose of the SI was to define the nature and extent of any contamination resulting from previous activities at the site. The SI was conducted between February 1997 and May 1997. Supplementary site investigative work has also been performed at various stages of this project, as needed, to fill in data gaps that became apparent as the project progressed.

The field activities and findings of the investigation are described in the SI report. The following activities were conducted during the SI:

- Research of historical information contained in state and county files;
- Interviews with former employees of NYTD;
- The performance of a geophysical survey utilizing ground penetrating radar (GPR) and a magnetometer inside the former manufacturing area in an attempt to find a former diffusion well;
- The use of GPR and a magnetometer outside the manufacturing area to locate former underground tanks and leaching pools;
- The collection of groundwater level measurements to confirm groundwater flow direction;
- The collection of soil cores in soil borings to determine the underlying lithology;
- The collection of 16 soil cores using direct push technology from profile soil borings in the source area to determine the vertical extent of the contamination in soil and groundwater;
- The retrieval and sampling of three soil cores below the water table from one direct push profile boring in a zone of elevated concentrations in the dissolve groundwater plume of chlorinated solvents to determine the vertical extent of the groundwater contamination in this area;

- The collection of six soil samples from 11 soil cores retrieved from three direct push borings to evaluate historical features related to the former manufacturing operations;

- The collection of 31 screening groundwater samples from eight borings using direct push technology or by a hydropunch in a conventional boring to determine the vertical extent of the on-site groundwater plume;

- The collection of groundwater samples from 15 existing monitoring wells; and

- The installation and sampling of three new monitoring wells.

A pilot test was performed in 1998 to evaluate *in situ* chemical oxidation using injections of Fenton's Reagent (hydrogen peroxide and an iron catalyst) to treat the chlorinated solvents in the on-site groundwater.

The following supplemental site investigative work was performed in the first half of 1998 during the development of a pilot test work plan for chemical oxidation:

- In March 1998, seven water table injection wells, five deep injection wells and two monitoring wells were installed and soil cuttings were screened for evidence of soil contamination.

- In March and April 1998, the 12 new injection wells and 20 existing wells were sampled for VOCs and biogeochemical sampling parameters to establish baseline groundwater quality data prior to treatment.

- Five soil samples were collected from soil borings by a former underground storage tank that was previously used to store process wastes containing barium.

- On April 16, 1998, sub-slab core samples were collected inside the former manufacturing area to determine the potential presence of sub-slab vapors.

Three rounds of groundwater samples were collected from 32 injection and monitoring wells after injections of Fenton's Reagent on July 15, 1998 (3 days after injections), July 20, 1998 (one week after injections) and August 3 and 4, 1998 (three weeks after injections). Indoor air quality samples were collected before and after the injections.

A supplemental work plan was approved in 1999 that proposed two additional rounds of injections to resolve some uncertainties over the pilot test results and to perform further groundwater treatment. On March 1 and 2, a pre-injection round of groundwater sampling of 32 injection and monitoring wells detected much higher concentrations than were expected. NAPL was discovered in two wells on March 23, 1999. This discovery prompted additional site investigative work. Eventually, the volunteer withdrew the proposed additional injections of Fenton's Reagent.

The discovery of NAPL in March 1999 presented the opportunity to remove product from some of the wells. Recovery of product by hand bailing from selected wells was initiated in March 1999.

Hand bailing to recover product has been performed periodically, usually monthly, since then. In January 2002, more wells were added to the list of wells that are periodically gauged for the presence of NAPL. NAPL monitoring and recovery was enhanced further in November 2003 with the installation of seven new wells under the former manufacturing area. From May 1999 to December 2003, 340 gallons of a NAPL/water mixture were recovered.

Indoor air quality samples were collected in March 1999, June 1999 and October 1999.

In August 1999, nine new injection and monitoring wells were installed. Five of these wells were sampled for volatile organic compounds. Fifteen new and existing wells were sampled for biogeochemical sampling parameters.

In September 1999, an innovative geophysical technique known as vertical induction profiling (VIP) was conducted to determine whether areas of contamination exist beneath the building's foundation and by the eastern loading dock area.

In November and December 1999 and January 2000, the following three phased supplemental sampling events were performed to investigate potential source areas suggested by the VIP profiling results:

- During Phases I and II, six direct push borings outside the portion of the building formerly used for manufacturing and two borings inside the building were performed and, based on field screening results, 17 soil samples were collected.

- During Phase III, five angle borings were drilled under the former manufacturing area to collect five groundwater samples from beneath the building.

- Indoor air samples were collected before, during and after the performance of the indoor soil borings.

Indoor air samples were collected in April 2000, September 2000, January 2001, and April 2001 to periodically monitor indoor air quality.

On September 23, 2000, a sub-slab magnetic anomaly in the former manufacturing area was investigated in an attempt to locate the former diffusion well. The anomaly was an inactive electric conduit box. Air samples were collected before and after this investigation as part of the quarterly air sampling in place at that time.

In 2000 and early 2001, the volunteer solicited and evaluated competitive cleanup proposals from various consulting firms to determine the best alternative to remediate the site. The proposal from a new consultant was selected by the volunteer.

A groundwater sampling round from most of the site monitoring wells was collected in July and August 2001 to determine current contaminant levels and to collect biogeochemical data necessary for a preliminary evaluation of potential remedial alternatives.

A pilot test work plan to evaluate enhanced reductive dechlorination (ERD) as a potential remedial technology was developed in 2002 and early 2003. A pre-injection round of sampling was collected in June 2003. The first injections for this pilot test were performed on August 18, 2003.

The new pilot test is still in progress. The injections are actively treating a portion of the dissolved on-site groundwater plume, thereby working to contain the dissolved plume and help prevent further contamination of the off-site groundwater.

The following supplemental sampling has been performed by the new consultants after they took over as the consultants for this site in 2001:

- In July and August 2001, as part of a pre-remedial design groundwater characterization effort, 30 groundwater samples were collected from selected existing monitoring wells for VOC analysis and 16 groundwater samples were collected to determine the existing biogeochemical conditions.

- In August and September 2001, separate samples of the NAPL being recovered from IW-1, IW-9, and MW-13 were collected to determine the constituents and physical properties of the NAPL.

- In November 2002, a geophysical survey was performed inside the portion of the building formerly used for manufacturing to locate the former diffusion well.

- On March 28, 2003, a 4' x 4' excavation was performed inside the building and the former diffusion well was discovered.

- On April 12, 2003, the diffusion well was inspected further and piping and a pump were removed from the well.

- In May and June 2003, four additional outdoor monitoring wells and four additional outdoor injection wells were installed for a pilot test to evaluate enhanced reductive dechlorination (ERD) as a potential groundwater remedial technology.

- In June 2003, groundwater samples were collected from 39 wells to establish baseline groundwater quality data prior to the proposed pilot test injections.

- Monthly monitoring of the ongoing ERD pilot test since the first injections on August 18, 2003 is currently providing up to date data on groundwater quality and biogeochemical conditions in selected wells.

- Indoor air quality samples were collected in July 2003 and November 2003 to determine pre-injection and post-injection indoor air quality.

- In July and August 2003, five vertical profile borings (four inside the building and one outside) resulting in the collection of 27 groundwater samples by a hydropunch sampler to determine the vertical and horizontal extent of the groundwater contamination under the former manufacturing area.

- In August and September 20003, seven new indoor injection/monitoring wells inside the southeastern portion of the former manufacturing area were installed.

- Several indoor air sampling events were performed in August 2003 to ensure that indoor drilling had not affected indoor air quality.

- In October 2003, two angle borings were drilled from outside the former manufacturing area and screened auger groundwater samples were collected from the groundwater beneath the building to further characterize the groundwater contamination beneath the building.

- Based on the results of the above angle boring sampling, two new injection/monitoring wells were installed in the angle borings under the building in October 2003.

- In November 2003, four indoor soil borings were performed in the former manufacturing area resulting in the collection of four soil samples and four soil gas samples to establish whether the soils under the slab were contaminated.

- Indoor air quality samples were collected on February 5, 2004.

To determine whether the soil, groundwater, soil gas and indoor air contain contamination at levels of concern, data from the investigations were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".

- Concentrations of PCE in indoor air were compared to the NYSDOH's guideline for PCE in air of 100 micrograms per cubic meter ($\mu g/m^3$) and to background concentration levels. The NYSDOH recommends that actions be taken to reduce indoor air contamination to as close to background as practical.

- For other contaminants detected in indoor air, values detected are compared to typical background concentrations.

Based on the SI and supplemental sampling results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the following reports:

- Voluntary Investigation Report, December 1997

- *In Situ* Chemical Oxidation Pilot Test Report of Findings, December 4, 1998
- Geophysical Site Characterization Survey, Vertical Induction Profiling Method Report, October 18, 1999
- Groundwater Sampling Results from August 2001 Report, October 15, 2001
- Monthly progress reports submitted by the volunteer from May 2001 thru December 2003.
- Remedial Action Work Plan, February 2004

5.1.1: Site Geology and Hydrogeology

The geology at the site consists of fine to coarse sand and gravel. Two to four thick foot lens of clay and sandy silt have been detected in many of the borings in the range of 56 feet to 68 feet bgs.

Currently, the depth of the water table is approximately 52 feet bgs. However, during drought conditions in the summer of 2002, the water table was as much as 4.5 feet lower. The groundwater flow direction in the shallow aquifer is towards the south-southeast. The horizontal hydraulic gradient in the shallow aquifer is approximately 0.001 ft/ft. The hydraulic conductivity in the area of the on-site plume is approximately 50 to 100 ft/day. The estimated average horizontal groundwater flow velocity is approximately 0.3 ft/day.

5.1.2: Nature of Contamination

As described in the SI report and supplemental reports noted at the end of Section 5.1 , many soil, groundwater, soil gas and indoor air samples were collected to characterize the nature and extent of contamination. As summarized in Tables 1 through 4, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

The primary VOC of concern is tetrachloroethene (PCE). However, other chlorinated solvents are also present such as trichloroethene, 1,2-dichloroethene, 1,1,1-trichloroethane, 1,1-dichloroethene, and 1,1-dichloroethane. The first two of these compounds are probably the result of partial degradation of the PCE. There was one isolated detection of chloroform slightly above the groundwater standard.

Aromatic hydrocarbon VOCs have also been detected, such as toluene, ethylbenzene and xylenes, at concentrations above the groundwater standard. The presence of these compounds is attributed to the historic discharge of petroleum at the site.

The NAPL being recovered from some wells is a mixture consisting primarily of PCE and a mixed oil product in the range of mineral oil, both of which have very limited solubility in water. Some of the NAPL is slightly more dense than water with a specific gravity of 1.03 and is identified as dense, non-aqueous phase liquids (DNAPLs) while some of the NAPL is slightly less dense than water with a specific gravity of 0.98 and is identified as light, non-aqueous phase liquids (LNAPLs). DNAPLs tend to sink in the aquifer while LNAPLs tend to float on top of the water table.

The following SVOCs were detected in groundwater samples at trace concentrations below the groundwater standard: naphthalene, 1,2,4-trimethylbenzene, 1,3,5,-trimethylbenzene and 2-methylnaphthalene.

Barium, cyanide (CN), iron, manganese, sodium and mercury were the only inorganics detected in samples at slightly elevated concentrations.

5.1.3: Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

Chemical concentrations are reported in parts per billion (ppb) for water, parts per million (ppm) for NAPL and soil, and micrograms per cubic meter ($\mu g/m^3$) for soil gas and air samples. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 through 4 summarize the degree of contamination for the contaminants of concern in groundwater, soil and indoor air.

As has been mentioned earlier, manufacturing took place in the northeast corner of the building. Essentially, all the environmental contamination originates around this area. The various investigations included sampling of the soils in areas of interest outside of the building where former leaching pools and underground storage tanks related to the manufacturing processes were located. Some of the features investigated are illustrated in Figure 2.

Non-Aqueous Phase Liquids (NAPL)

As discussed earlier in Section 3.2, high concentrations of groundwater contamination from PCE, TCE and 1,1,1-TCA were detected at the southeast corner of the former manufacturing area in 1996. In 1999, a mixture of separate-phase PCE and petroleum was first detected as NAPL in some of the injection and monitoring wells.

NAPL is currently being recovered from monitoring wells with screen zones straddling the water table (most screened between 45' and 60' bgs) and in intermediate depth wells (most screened at 23 feet to 38 feet below the water table.)

Petroleum (LNAPL) that would normally float on top of the groundwater has been found in intermediate depth wells screened below the water table. This information suggests that there may have been some sort of subsurface injection that was the source of this groundwater contamination. For that reason, several different attempts were made to locate a former 116' deep diffusion well that was located in the floor of the former manufacturing area. The diffusion well was reportedly used to discharge non-contact cooling water. The well eventually was found and evaluated. Although its location is very close to the suspected origin of the groundwater plume, there was no evidence that it was used for the discharge of wastes. The presence of a pump inside the well casing suggests that it was last used to supply process water, not for diffusion. However, prior uses of the well may have contributed to the groundwater contamination.

Surface Soil

None of the original surface soil layer still exists near the former manufacturing area. The entire area around the former manufacturing area is mostly paved now. There is a small ornamental 15' x100' grass and tree area outside the east wall of the former manufacturing area. However, this curbed area is more than six inches above the original grade prior to 1984, when the site was last used for manufacturing. Since none of the original surface soils are exposed today, these soils were not specially sampled in this project.

Subsurface Soil

Since all remnants of the manufacturing area were removed in 1985 when the building was converted to an office building complex, finding the exact source of the groundwater contamination has been difficult. Much of the extensive supplemental site investigative work was performed to look for and evaluate potential sources areas in the unsaturated soils. As can be seen under Sections 3.2 and 5.1, many geophysical surveys have been performed to locate potential subsurface discharge points. Additionally, three separate soil gas surveys have been used as preliminary screening tools to detect areas with potential VOC soil contamination and/or to help select the best soil sampling locations. Soil samples have been collected in all known areas of interest. The soils in most soil borings were screened with meters capable of detecting the VOCs of interest.

One of the most important features found during the various investigations was an abandoned floor drain located in the southeast corner of the former manufacturing area during one of the interior inspections of this portion of the building. There was no evidence of vapors in the drain and the piping connected to the drain was no longer functional. It is believed that this floor drain was originally connected to a former underground waste oil storage tank that was located just outside the building. County health department records indicate that this tank has already been removed. However, this feature became a primary area of interest since the tank and floor drain were very near the suspected origin of the groundwater contamination. Soil samples were collected from soil borings that were placed within the suspected location of this former tank. No residual soil contamination was found.

No PCE has been detected at concentrations above the recommended soil cleanup objectives in TAGM-4046 in any of the numerous soils samples that have been collected from the unsaturated zone above the water table. The highest concentration detected was 1.0 ppm of PCE, which is below the soil cleanup objective of 1.4 ppm. The relatively low concentrations detected in the soil gas surveys do not indicate an existing chlorinated solvent source in the unsaturated soils. Based on the comprehensive investigation of unsaturated soils, it has been determined that NAPL beneath the water table is the source of dissolved-phase groundwater contamination.

The semi-volatile organic compounds of interest at this site are mostly oil related. Oils are not well detected by traditional analyses for SVOCs. A better indicator of oil contamination is an analysis that reports the total petroleum hydrocarbons (TPH) present in the soils. The highest TPH concentrations detected were in a soil sample collected at 45'-47' bgs in the soil boring for MW-12. This particular analysis detected 1,100 ppm of lubricating oil and 290 ppm of diesel fuel #2 for a total of 1,390 ppm total petroleum hydrocarbons. Although the NYSDEC has no specific guidance value for TPH, TAGM-4046 allows a maximum of 500 ppm of total SVOCs. The amount of TPH detected in soils has been extremely limited especially in light of the NAPL detected in the underlying groundwater. Since the petroleum related NAPL has been found mostly beneath the water table, injection of the oils below the water table in some manner is the most likely source of the NAPL. The available data does not indicate any significant discharges of petroleum to the unsaturated soils above the water table.

Inorganic contamination detected in soil samples has been extremely limited. Mercury was detected at 1.8 ppm in one sample (B-2) collected at 10'-12' bgs by the suspected location of a former cyanide neutralization tank in the former waste water treatment area. The SCG for mercury is 0.1 ppm. Based on the depth of the sample and the anticipated use of the property, the potential for exposure to these soils is low.

Total cyanide was detected in sample B-2 at 24 ppm. Another soil sample collected from an angle boring beneath the floor of the manufacturing area detected cyanide detected 9.1 ppm of total cyanide. There is no SCG for total cyanide. However, the potential for exposure to these soils is low since most of the site is paved.

Barium was detected in a few soil samples. The only detection above the SCG of 300 ppm for this metal was 489 ppm of barium. This soil sample was collected at 20'-22' bgs immediately outside the eastern wall of the former manufacturing area near the area where treated process wastes were discharged. The potential for exposure to these soils is low.

Table 3 shows the ranges of the contaminants detected in soil samples.

Groundwater

Fifty six permanent monitoring or injection wells have been constructed at this site to evaluate groundwater quality, some of which have been used in a previous pilot test for treatment and some are currently being used in a new pilot test to treat the groundwater. Figure 4 shows the locations of those wells that are near or downgradient of the former manufacturing area. Additionally, numerous discrete groundwater samples collected by direct push technology, from hydropunch samplers driven inside conventional drill equipment and from screened augers have also been used to determine the extent of the on-site groundwater contamination.

The well locations where NAPL has been recovered are important since it is expected that the main source(s) of the groundwater contamination would be very close to these wells. The most productive wells for recovering product (NAPL) have been IW-1 (45'-60'), IW-3 (45'-60') and IW-9 (75'-90'). IW-1 mostly recovered DNAPL. IW-3 recovered mostly LNAPL in 2002 when the water table was lower due to drought conditions. No product was detected in this well in 2003. Intermediate depth well IW-9 has almost exclusively recovered LNAPL. IW-1 is immediately adjacent to the suspected former location of the underground waste oil storage tank. IW-3 and IW-9 are less than 15' downgradient of the suspected tank location.

To a lesser extent, NAPL has also been recovered from MW-13 and MW-25D, and has recently been detected intermittently in IW-22. Water table well MW-13 and intermediate depth well MW-25D are both less than 15' downgradient of the former location of the waste oil storage tank. IW-22 (50'-70') is a new indoor well that is only few feet away from the former diffusion well. Figure 3 shows the locations of the all the wells that have recovered NAPL.

The next paragraphs will discuss the northern, southern, east-west and vertical extent of the on-site groundwater plume. As mentioned earlier, the groundwater flows towards the south-southeast. Figures 5, 6 and 7 indicate total VOC concentration distribution in the shallow aquifer zone (45' to 60' bgs), intermediate aquifer zone (60' to 90' bgs) and deep aquifer zone (130' to 185' bgs), respectively during June 2003 prior to the initiation of the ERD pilot test.

As stated previously in Section 3.2, PCE was detected as high as 16 ppb in the shallow groundwater just north of the former manufacturing area. This concentration may be indicative of contributions from upgradient sources.

An October 15, 2003 groundwater sample from angle boring AB2 at 65'-70' beneath the eastern portion of the former manufacturing area (see Figure 4 for boring location) detected 6,900 ppb of PCE and 86 ppb of TCE. This sample location is considered to be very near the northern-most limit of the PCE plume. The actual discharge point may be slightly south of this sampling location, where higher concentrations were detected. Some limited movement of the contaminants counter to the groundwater flow could have occurred through chemical diffusion due to the sharp concentration gradient between the source area and groundwater directly upgradient of a source. In addition, DNAPL could collect above the thin two to four foot thick clay/silt layers that exist between 56' and 68' and spread laterally along the sloping surface of a lower permeability lens.

The groundwater source area is located underneath the southeast corner of the former manufacturing area and extends outside the building southward to at least MW-12, MW-13, and IW-9. In an east-west direction, most of the mass is located between IW-1 and IW-23.

The groundwater contamination decreases significantly with depth with low total VOC concentrations (13 ppb) currently detected in MW-20D, screened between 175' and 185' bgs and located near the expected southern limit of the groundwater source area.

The dissolved PCE plume (downgradient of the area where NAPL is being recovered) extends at least to the southern property border where as high as 9,930 ppb of total chlorinated VOCs were detected in a discrete sample collected at 76' bgs in July 1996, with 99% of it as PCE. A more recent June 2003 sample from MW-31, located by the southern property border and screened between 60' and 70' bgs, detected a total of 5,170 ppb of total chlorinated VOCs, with 70% of it PCE.

There is a small downward vertical gradient. The vertical center of the plume at the southern property border is judged to be approximately between 65' and 79' bgs (13' to 27' below the water table).

Tables 2A (treated area) and 2B (untreated area) provide ranges of VOCs detected in June 2003 pre-injection sampling from wells inside and outside the treatment zone, respectively. Table 2A also provides ranges of concentrations detected four months after pilot test injections of molasses to evaluate enhanced reductive dechlorination as a potential groundwater remedial alternative. The pre-injection sampling included 39 wells. The post-injection sampling included only 8 wells in the treatment zone. The preliminary results of the pilot test will be discussed later in this document. Wells that are currently being used to recover NAPL were not sampled.

In the June 2003 pre-injection dissolved plume, PCE and TCE were detected as high as 38,000 ppb and 10,000 ppb, respectively in water table well MW-13, a well that had recovered a small amount of NAPL in the past. Newly constructed IW-16 detected the highest concentration of 1,2-DCE at 5,500 ppb. Vinyl chloride, an undesirable breakdown product, was not detected in any of the 39 wells selected for the pre-injection sampling round.

The only metals that have been detected in the on-site groundwater above groundwater standards are iron, manganese, and sodium. Iron was detected as high as 51,900 ppb while manganese was detected as high as 2,650 ppb. The groundwater standard for iron and manganese is a total of the two concentrations not to exceed 500 ppb. Iron and manganese occur naturally in Long Island groundwater at concentrations above the groundwater standard. However, some of the iron concentrations may be partially due to the injection of an iron catalyst during the earlier pilot test for *in situ* chemical oxidation. The maximum concentration of 51,900 ppm of iron was detected in post-injection sampling. The iron has undoubtedly been diluted naturally since that sampling event. Consequently, this concentration is not representative of current conditions.

Sodium has been detected above the groundwater standard in two samples collected in April 1997. The concentrations detected were 33,400 ppb and 24,600 in MW-14 and MW-4, respectively. The groundwater standard for sodium is 20,000 ppb. Sodium in groundwater is sometimes the result of using salt (sodium chloride) for de-icing of roads and parking areas. Consequently, these detections may not be due to prior site manufacturing operations.

The moderate concentrations of iron, manganese and sodium are not considered to be significant and do not require remediation. As will be discussed later, an institutional control to prevent use of contaminated groundwater beneath the site to prevent consumption of chlorinated solvents would also prevent potential impacts from these inorganics.

Total cyanide was detected in only one groundwater sample slightly above the groundwater standard of 200 ppb. The amount detected was 209.0 ppb of total cyanide in MW-13 in a sample collected in March 1998, prior to the injections of Fenton's Reagent in this well. The next highest detection of cyanide was 105.0 ppb of cyanide detected in injection well 2 (IW-2) prior to the 1998 injections. Fenton's Reagent is commonly used to treat waste water containing cyanide. The pilot test monitoring results indicated that some treatment of the cyanide took place as a result of the 1998 injections. Consequently, it was concluded that the one slight exceedence of the groundwater standard was remediated. For these reasons, cyanide was removed as a contaminant of interest and was not included as a sampling parameter in subsequent groundwater sampling rounds after the 1998 injections.

Mercury was detected at a maximum concentration of 0.03 ppb in the on-site groundwater, below the groundwater standard of 0.7 ppb. Consequently, groundwater does not require remediation for mercury.

Barium was detected at a maximum concentration of 299 ppb in a groundwater sample collected near the location of the underground tank that was used to temporarily store barium wastes. The applicable groundwater standard for barium is 1,000 ppb. Consequently, groundwater does not require remediation for barium.

Soil Gas

Three separate soil gas surveys have been completed prior to or in conjunction with soil sampling events. Besides their use for selecting the most appropriate locations for soil sampling, these surveys also were used to determine whether VOCs are present in the soil gases near the buildings. As expected, the main contaminant in the soils gases is PCE.

The most recent soil gas survey was conducted on November 5, 2003. Four soil gas samples were collected at a depth of four feet below the slab of the manufacturing area by the northern-most portion of the source area groundwater contamination. The highest concentrations detected were 13,100 $\mu g/m^3$ of PCE, 350 $\mu g/m^3$ of TCE, 166 $\mu g/m^3$ of 1,1,1-TCA and 42 $\mu g/m^3$ of toluene in sample AGM-3.

At this site, the concentrations of PCE detected in soil gases beneath the slab of the former manufacturing area indicate that there is the potential for future impacts to indoor air quality. However, the HVAC system maintains a positive pressure inside the building that helps prevent migration of vapors into the building. Also, historical indoor air sampling results, as discussed below, do not indicate that vapor intrusion is occurring.

Air

The indoor air inside the building has been sampled many times during this project since 1998. These samples were used to determine whether site-related VOCs were volatilizing from the underlying groundwater or from undiscovered sources in the underlying soil and impacting the indoor air quality. Some of these samples were also used to ensure that the field sampling activities were not impacting the indoor air quality. Outdoor air quality has also been evaluated at various times during this project.

Indoor air quality monitoring data collected from July 1998 to February 2004 indicate that there are no current impacts to indoor air quality from site-related contaminants. Table 4 indicates the range of detections of potentially site related contaminants in these samples.

In the indoor air samples used to evaluate potential vapor intrusion into the building, the highest concentration of PCE detected was 22 $\mu g/m^3$ in a June 1999 sample. This concentration is within NYSDOH's guidance value for tetrachloroethene in air of 100 $\mu g/m^3$. However, this concentration is above background concentrations for PCE, which NYSDOH considers to be about 10 $\mu g/m^3$. The

NYSDOH recommends that actions be taken to reduce indoor air contamination from this compound to as close to background as practical.

In two recent samples collected on February 5, 2004 from within the former manufacturing area, PCE was not detected in one of those samples and detected at 5.6 $\mu g/m^3$ in the other. No other site related contaminants were detected.

The following additional detections in the indoor air samples which could potentially be site related are: 1,1,1-trichloroethane, ethylbenzene, xylenes, methyl ethyl ketone and 1,2,4-trimethylbenzene. The NYSDOH does not list any specific guidance value for these compounds. The NYSDOH compares the concentrations detected to typical background concentrations of these compounds. In this case, the actual concentrations detected in the historical indoor air samples are similar to typical background levels. Consequently, there is no evidence of vapor migration from these potentially site related contaminants into the indoor air.

Toluene was detected in some historical indoor air samples. Toluene is a component in most paints and adhesives used in building construction and maintenance. The indoor air sampling locations are in rooms that have been renovated at different stages of this project. Consequently, it is believed that most of the detections are related to these activities. Toluene has also been detected in an outdoor air sample near the air intake for the HVAC system. This may be indicative of some contribution by nearby industrial properties. Although low concentrations of toluene (42 $\mu g/m^3$) were detected in the November 5, 2003 soil gas samples, the majority of toluene detections in indoor air are not considered to be site related. The highest concentration detected in indoor air was 84.3 $\mu g/m^3$ in a sample collected on June 22, 2000. Toluene was not detected in either of the two samples collected on February 2, 2004.

Outdoor air sampling using field instruments has been performed during all field sampling events in accordance with NYSDOH's generic community air monitoring plan. All detections have been within guidance values.

An outdoor air sample for laboratory analysis was last collected on August 1, 2003. No site related contaminants were detected in this sample.

5.2: <u>Interim Remedial Measures</u>

An interim remedial measure (IRM) is often conducted at a site prior to final remedy selection to reduce contaminant mass in a timely manner. The 1998 injections of Fenton's Regent into selected wells near the loading dock area, besides evaluating *in situ* chemical oxidation as a potential remedy, were an effective IRM that reduced contaminant mass near the source area.

In July 1998, nine shallow injections wells (IW-1 through IW-7, MW-12 and MW-13) that straddled the water table were injected with 20,667 gallons of Fenton's Reagent (a strong oxidizer) and six intermediate zone injections wells (IW-8 through IW-12 and MW-13D), most of which were screened between 75' and 90' bgs, were injected with 6,504 gallons of Fenton's Reagent. Three post-injection rounds of groundwater sampling were collected three days, one week, and three weeks after the injections. These sampling events indicated that the injections had reduced the concentrations in the shallow injection wells by an average of 84% and to a much lesser extent in the deep injection wells and the monitoring wells immediate downgradient of the injections.

Two additional rounds of pilot test injections were proposed to further reduce contaminant mass and to collect additional data. However, a March 1999 pre-injection round of groundwater sampling detected a significant increase in contaminant levels. Product was first discovered in some of the wells at this time. This discovery prompted supplemental sampling to locate the source of the product. After the completion of the supplemental sampling, other remedial alternatives were considered.

The Fenton's Reagent injections did not actually result in increased contamination. The injections did reduce contaminant mass. However, it appears that the injections destroyed organic carbon in the aquifer matrix, causing a transfer of sorbed-phase mass to the dissolved phase, thereby making it appear that there was a change in contaminant levels.

The 1998 injections were also beneficial in that the product that became available in some of the existing source area wells could be easily recovered. As discussed earlier in Section 5.1, this product recovery has also been effective in reducing contamination mass in groundwater prior to the selection of a final remedy. Consequently, this ongoing product recovery is also considered to be an IRM.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 1.8 of the SI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

There are no known exposure pathways at the site. However, potential exposure pathways exist. These are:

- Ingestion of groundwater
- Inhalation of vapors in indoor air

There are no current users of the on-site groundwater for drinking purposes, but groundwater could be used in the future. Although the ingestion of contaminated groundwater is a potential exposure pathway, it is unlikely because the area is serviced by public water, which is routinely monitored and treated, if necessary, to ensure that it complies with federal and state drinking water standards.

Inhalation of contaminated vapors is possible at the on-site building due to potential vapor intrusion from contaminated groundwater. However, the building ventilation system at the site is maintained under positive pressure to prevent migration of vapors into the indoor air and the indoor air is monitored periodically.

Potential off-site exposures will be evaluated under off-site OU-2. There is one public supply well field approximately 4,200 feet to the southwest of the site that should not be affected by the discharges. Another public supply well field is approximately two miles south of the site. The groundwater flow direction in the vicinity of the site is to the south-southeast. Further investigation is needed to establish whether the plume of chlorinated solvents that originates at the site will eventually impact this well field. There are also other public water supply wells further away than two miles that would also require further evaluation to determine if the groundwater plume might result in potential future impacts to those wells.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

Site contamination has impacted the groundwater resource in the two upper-most aquifers beneath and downgradient of the site, known as the Upper Glacial and Magothy aquifers. Both these aquifers and a third aquifer beneath them are the sole source of drinking water for the area. The Magothy aquifer in the vicinity of the site is currently being used to supply public drinking water.

The majority of the site and the surrounding industrial area is paved. There are no nearby surface water bodies that could be affected. Consequently, there are no fish and wildlife impacts.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to chlorinated solvents and petroleum in the underlying groundwater;
- the migration of chlorinated solvents from groundwater into indoor air through soil vapors; and
- the migration of the on-site groundwater contamination to off-site where additional exposures to contaminated groundwater are possible.

Further, the remediation goals for the site include attaining to the extent practicable:

- elimination of groundwater source areas, thereby removing the source of the dissolved groundwater plume;
- ambient groundwater quality standards to be met at the downgradient property border, thereby preventing any further impacts to off-site groundwater; and
- ensure that indoor air quality continues to meet NYSDOH guidance values.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the New York Twist Drill - Loading Dock Area Site were identified, screened and evaluated in the RAWP which is available at the document repositories identified in Section 1.

A summary of the remedial alternatives that were considered for this site is discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated groundwater and soil gases at the site.

Alternative 1: No Action with Periodic Monitoring

Present Worth:	*$962,000*
Present Worth Capital Cost:	*$0*
Annual OM&M:	
(Years 1-7):	*$75,000*

(Years 8-30):	*$37,000*

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Under this alternative, an on-site long-term groundwater monitoring program and indoor air monitoring would be conducted. Institutional controls would be imposed to limit the future site usage to commercial or industrial uses and to prevent the use of the groundwater beneath the site without adequate treatment.

It would take several months to develop a long term monitoring plan. The existing monitoring wells can be used for this monitoring. Consequently, this remedy could be implemented in several months time.

Due to the degree and nature of the groundwater contamination, the remedial objectives would not be met within the foreseeable future.

Alternative 2: Continuation of NAPL Bailing, Enhanced Reductive Dechlorination Technology for Source Area Remediation and Control of VOC Migration in the Dissolved On-Site Plume

Present Worth:	*$1,755,000*
Present Worth Capital Cost:	*$320,000*
Annual OM&M:	
(Years 1-7):	*$151,000*
(Years 8-30):	*$37,000*

Under this alternative, NAPL recovery by hand bailing from productive wells in the groundwater source area would continue to be performed on a routine basis until further recovery of product is impracticable. As long as product is available for removal, this technique would effectively reduce the mass of the contamination in a cost effective manner. NAPL bailing, by itself, would not achieve the remedial objectives.

The source area groundwater and the on-site dissolved groundwater plume would be treated using enhanced reductive dechlorination (ERD). This would be implemented through the injection of an easily degradable carbohydrate solution creating anaerobic and strongly reducing *in situ* reactive zones (IRZs). ERD is a bioremediation technique that stimulates the growth of indigenous bacteria in the groundwater. The types of bacteria degrade chlorinated VOCs through the process of dehalogenation. For this alternative to be effective, the reducing conditions must be strong enough to achieve complete remediation. Weak reducing conditions can result in the build up of 1,2-DCE and/or vinyl chloride.

Some of the intermediates, such as alcohols, developed as a result of the injections have a solvent-like effect on the contaminants. This action helps to release the contaminants that are adsorbed to the underlying formation and makes them available for treatment. This effectively reduces the time to complete remediation, as compared to more traditional technologies such as extraction and treatment.

The pH of the groundwater may decrease slightly as a result of the injections. Occasionally, some pH adjustment by the addition of sodium bicarbonate would be necessary to maintain a favorable environment for the growth of the bacteria responsible for the biodegradation. However, the injections would not result in any long term, undesirable side effects to the underlying aquifer.

The injected liquids would be mixed in a treatment tank to the desired concentration and a pre-determined amount would be pumped into each proposed injection well. The injection events would be performed regularly to maintain optimum conditions for biodegradation.

A long term groundwater monitoring plan would be implemented to periodically monitor the groundwater quality. Additionally, long term monitoring of biogeochemical parameters would be performed so that the injections of the carbohydrate solution and other additives can be designed to maintain favorable conditions for the growth of bacteria and to maintain strong reducing conditions.

Indoor air quality monitoring would be performed periodically for at least the first two years to ensure that indoor air quality is not impacted. Initially, this sampling would be quarterly.

The HVAC system in the building would continue to maintain a positive pressure inside the building. This positive pressure helps prevent migration of vapors into the building.

In the event that unacceptable levels of site related contaminants are detected in the indoor air, additional engineering controls would be installed to limit vapor intrusion and/or an appropriate soil vapor treatment system would be installed and operated until the indoor air quality would no longer be threatened.

Institutional controls would be imposed. The site use would be limited to commercial/industrial uses, thereby preventing residential uses where more sensitive populations could potentially receive longer periods of exposures. Additionally, the underlying on-site groundwater would not be used without adequate treatment, thereby preventing direct contact or ingestion of contaminated groundwater by site personnel.

Based on the biogeochemical sampling results and the amount of breakdown products present, the conditions at this site are favorable for the ERD technology. However, each site must be evaluated separately to make sure that the strong enough reducing conditions can be maintained and complete degradation can occur. For this reason, a pilot test is currently being performed to evaluate this remedy. The pilot test is being performed in the dissolved plume immediately downgradient of the groundwater source area.

The carbohydrate solution used for the pilot test was a dilute solution of molasses. Injections of molasses are being made periodically into shallow depth (between 45 and 60' bgs) injection wells IW-16, IW-5, MW-12, and IW-6 and intermediate depth (either from 60' to 75' or 75' to 90' bgs) injection wells IW-10, IW-14, IW-13, IW-15 and IW-11. These wells form an east-west transect.

(See Figure 4 for well locations.) The injected molasses flows with the groundwater, thereby expanding the extent of the IRZ to the south.

The preliminary results of the pilot test that was initiated on August 18, 2003 are very encouraging. It should be noted that it is expected to take between six and twelve months to set up an IRZ capable of achieving complete degradation of all the potential breakdown products of PCE. Five months into the ongoing test, an IRZ has already been developed up to approximately 95 feet and 44 feet south of the shallow and intermediate injection wells, respectively. It has been demonstrated that the more highly chlorinated contaminants in the IRZ, PCE and TCE, are being degraded to 1,2-DCE without the development of any detectable concentrations of vinyl chloride, an undesirable breakdown product.

VOC analytical results for monitoring wells MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23 and MW-27D continue to demonstrate that the natural rate of reductive dechlorination occurring within the anaerobic IRZ has been significantly accelerated as a result of the reagent injections. Data from these wells indicate a significant decline in PCE concentrations when comparing baseline results with the Month 4 ERD pilot test monitoring event. For example, the percentage of total VOC mass comprised of PCE for the wells sampled during Month 4 has decreased from 73% to 6% from the baseline round to the Month 4 sampling event, respectively. It remains to be demonstrated that the reducing conditions will be sufficiently strong enough to further degrade the 1,2-DCE.

The pilot test will continue until a final remedy is selected for this site, thereby limiting the amount of additional contaminants that would migrate off-site.

If this bioremediation remedy is selected, injections in the source area would be implemented within a reasonable time period acceptable to the NYSDEC after some additional NAPL recovery by hand bailing. Some time lag before source area treatment commences would be planned to allow more NAPL recovery by hand bailing before the underlying formation would be disturbed by the source area injections. Monitoring of the deep groundwater would be performed periodically to determine if there would be any migration of the contaminants vertically downward before and during source area treatment.

Additional injection wells in the dissolved plume would be used, if necessary, to treat the entire on-site groundwater plume. The amount of the on-site groundwater contamination that would migrate off-site before the IRZ takes full effect would be minimized as much as possible.

There is a slight chance that only partial bioremediation of the chlorinated VOCs would take place, leaving residual concentrations of 1,2-DCE and/or vinyl chloride that migrates beyond the IRZ. Under such circumstances, if expanding the IRZ and/or attempting to strengthen the reducing conditions is not feasible, an aerobic bioremediation technique may be implemented at or near the downgradient property border to finish the treatment. A technique known as biosparging would be considered for this supplemental treatment. Air would be injected in the groundwater to increase the oxygen levels in the groundwater that contains the residual 1,2-DCE or vinyl chloride contamination. Vinyl chloride biodegrades much faster under aerobic conditions and should be easily controlled by this technique, if present.

The time to design and implement Alternative 2 would be approximately six months.

Alternative 3: Continuation of NAPL Bailing, *In Situ* Chemical Oxidation for Source Area Remediation, Enhanced Reductive Dechlorination Technology for Control of VOC Migration in the Dissolved On-Site Plume

Present Worth:	*$2,085,000*
Present Worth Capital Cost:	*$700,000*
Annual OM&M:	
(Years 1-7):	*$143,000*
(Years 8-30):	*$37,000*

Under this alternative, hand bailing and control of VOC migration in the dissolved groundwater plume would be addressed as outlined in Alternative 2. However, the source area groundwater contamination would be remediated by *in situ* chemical oxidation using injections of Fenton's Reagent.

Fenton's Reagent is hydrogen peroxide and an iron catalyst. When injected properly into the injection wells, hydroxyl radicals, which are a very strong oxidizer, would be produced and, when in contact with the groundwater contaminants, would oxidize them. A complete oxidation reaction between the chlorinated VOCs and the hydroxyl radicals would yield water, carbon dioxide, a hydrogen ion, and a halide anion. The hydrogen peroxide would be consumed in the reaction or would break down readily.

The reaction is non-selective. Natural organic material in the treatment zone would also be oxidized. The reaction would generate heat and pressure in the subsurface.

Prior to injections, pH adjustment of the treatment area is required by the injection of an acid. The hydrogen peroxide and iron catalyst would be gravity fed separately into the injection wells. A series of injections would be required at this site. Each set of injections would treat only the dissolved contaminants. However, the injections would work to release the adsorbed phase contaminants bound to the formation, making them more available for treatment in the successive injections.

The reaction would be very fast, resulting in only the contaminants in relatively close proximity to the injection wells being treated. Consequently, a large number of injection wells would be required.

In this case, any residual contamination that would migrate downgradient of the source area treatment zone would be addressed under the successive dissolved phase treatment by enhanced reductive dechlorination.

As in Alternative 2, the source area treatment would commence within a reasonable time period acceptable to the NYSDEC after some additional NAPL recovery by hand bailing. Some time lag before source area treatment commences would be planned to allow more NAPL recovery by hand bailing before the underlying formation would be disturbed by the source area injections.

As in Alternative 2, long term monitoring of groundwater quality and biogeochemical conditions would be necessary so that the injections would be adjusted, as necessary. The indoor air quality would also be monitored for a minimum of two years from the commencement of treatment.

As in Alternative 2, the HVAC system would maintain positive pressure inside the building. Any unacceptable vapor intrusion that may be detected would be addressed by engineering controls and/or active treatment.

As in Alternative 2, institutional controls would be imposed to restrict site use and prevent the use of the on-site groundwater without adequate treatment.

The time to design and implement Alternative 3 is approximately one year.

Alternative 4: Continuation of NAPL Bailing, Nano-Scale Zero-Valent Iron with the Establishment of a Limited *In Situ* Reactive Zone for Source Area Remediation and Enhanced Reductive Dechlorination Technology for VOC Migration in the Dissolved On-Site Plume

Present Worth:	*$2,247,000*
Present Worth Capital Cost:	*$862,000*
Annual OM&M:	
(Years 1-7):	*$143,000*
(Years 8-30):	*$37,000*

Under this alternative, hand bailing and control of VOC migration in the dissolved groundwater plume would be addressed as outlined in Alternative 2. However, the source area groundwater contamination would be remediated by the injection of nano-scale, zero-valent iron (ZVI) to produce an *in situ* reduction reaction to dehalogenate the chlorinated VOCs. The injected finely-divided iron is essentially corroded anaerobically by the chlorinated VOCs that are adsorbed onto the metal surface. Dehalogenation takes place on the metal surface.

The fine particles of nano-scale ZVI have to be evenly dispersed in the underlying groundwater by the injections. This would be more difficult in the areas where thin lens of clay and silts are present in the shallow groundwater. Direct contact with the contaminants by the injected iron would be necessary for the reduction reaction to occur. The contaminant must remain in contact with the iron for a period of time sufficient to complete the degradation or only partial breakdown would occur. Direct contact by the iron with NAPL will result in an increased rate of degradation for the NAPL.

The nano-scale ZVI lasts for a relatively long time. Therefore, only a very limited number of injections would be needed. The injections are done by pressure pulsing technology. Continuous, low-frequency pulses effectively expands the porosity of the underlying formation and gives a much larger effective radius that receives the particles. The size of the nano-scale ZVI particles are designed so that the particles are small enough to fit between the pores of the formation during injection but will be big enough in the more porous portions of the treatment area so that they will settle out and remain in place for treatment. Due to the effective radius normally achieved by the injection technique, only a few injection wells would be required.

A bench-scale treatability test would be necessary to determine if the nano-scale ZVI is capable of treating the source area contaminants and to better determine the injection quantities and methodology.

Any chlorinated VOC that may be only partially degraded in the source area and would migrate away from the source area would be subsequently treated by the ERD remedy as outlined in Alternative 2 for the dissolved plume.

As in Alternative 2, the source area treatment would commence within a reasonable time period acceptable to the NYSDEC after some additional NAPL recovery by hand bailing. Some time lag before source area treatment commences would be planned to allow more NAPL recovery by hand bailing before the underlying formation would be disturbed by the source area injections.

As in Alternative 2, long term monitoring of groundwater quality and biogeochemical conditions would be necessary so that the subsequent injections could be adjusted, as necessary. The indoor air quality would also be monitored for a minimum of two years from the commencement of treatment.

As in Alternative 2, the HVAC system would maintain positive pressure inside the building. Any unacceptable vapor intrusion that may be detected would be addressed by engineering controls and/or active treatment.

As in Alternative 2, institutional controls would be imposed to limit site usage and to prevent use of the on-site groundwater without adequate treatment.

The time to design and implement Alternative 4 is approximately one year.

Alternative 5: Continuation of NAPL Bailing and Extraction and Treatment for Control of VOC Migration and Source Area Remediation

Present Worth:	*$3,295,000*
Present Worth Capital Cost:	*$710,000*
Annual OM&M:	
(Years 1-7):	*$166,000*
(Years 8-30):	*$116,000*

In Alternative 5, hand bailing of NAPL would continue as outlined in Alternative 2.

The entire on-site groundwater plume from the source area to the downgradient property border would be treated by an on-site extraction and treatment system.

The groundwater treatment would consist of the installation of five new recovery wells. One shallow and one intermediate depth recovery well would be installed in the source area to prevent further migration of the high concentration groundwater. One shallow and one intermediate depth recovery well would be placed within a portion of the dissolved groundwater plume, immediately downgradient of the source area, in an area where relatively higher dissolved concentrations have been detected, as compared to the rest of the dissolved plume. This recovery location would remove more dissolved mass than other potential locations. Finally, one recovery well screened between the shallow and intermediate zone in the suspected horizontal and vertical center of the plume would be constructed at the downgradient property border to prevent further migration of the contaminants to off-site properties.

As a preliminary estimate, the four recovery wells in the source area and in the dissolved plume hot-spot would be designed for a 30-gpm recovery rate. The recovery well at the downgradient property border would recover 40-gpm.

It is assumed that the recovered groundwater would all be piped to a treatment building. The groundwater would first go through a NAPL separator to recover any available product. Next the groundwater would be sent to a low profile air stripper where the contaminants would be removed from the groundwater by volatilization. The resultant air stream that now contains the contaminants would be treated, if necessary, to meet existing air regulations. It is anticipated that two 3000-pound vapor phase granular activated carbon (VPGAC) units would be used to adsorb the air contaminants. The treated groundwater would be discharged either on-site, off-site, or to the community sewage system. The treated air would be discharged via a stack on top of the treatment building. The air and water discharges would meet applicable regulatory requirements.

A long term groundwater monitoring plan would be required to monitor the progress of the groundwater treatment. Periodic monitoring of the air and water emissions would also be required. The activated carbon would be replaced, as necessary. The spent carbon would be sent to an approved off-site facility for processing.

As in Alternative 2, the HVAC system would maintain positive pressure inside the building. Any unacceptable vapor intrusion that may be detected would be addressed by engineering controls and/or active treatment.

As in Alternative 2, institutional controls to restrict future site usage and prevent the use of the on-site groundwater without treatment would be imposed.

Due to the high concentrations in the source area and presence of thin layers of silt and clay in the shallow groundwater where considerable adsorbed product resides, it is estimated that it will take 30 years to remove all the contamination that can be recovered utilizing this technique.

The time to design and implement Alternative 5 is approximately 18 months.

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 5.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the SI report, RAWP and the PRAP have been evaluated. The responsiveness summary (Appendix A) presents the public comments received and the manner in which the NYSDEC addressed the concerns raised.

In general, the public comments received were substantially supportive of the remedy, except for one written comment letter which is an attachment at the end of the responsiveness summary in Appendix A. Besides objections to the proposed remedy, the author contends that the investigations have not adequately determined the extent of the contamination in the source area. Detailed responses to these comments are presented in Response 8 in the responsiveness summary. Although the comment letter brings up some valid concerns, the proposed remedy already has elements in it that address most of these concerns. Additionally, the author's objections to the ERD technology are not supported by the currently available data. Many of the objections to the remedy are based on early monitoring data, before the treatment zone has been fully established. Contrary to the conclusions expressed in the comment letter, the NYSDEC has concluded that the preliminary results for the pilot test are very favorable. The NYSDEC still considers the selected alternative to offer the best chances for success.

There were also two valid public concerns that were raised at the March 11, 2004 public meeting: 1) whether the on-site remedy will treat 1,2-dichloroethene that may be generated as a result of the injections, and 2) whether the remedy will remediate the soil gas contamination under the former manufacturing area. There are already elements in the selected remedy that deal with these concerns.

Regarding the treatment of 1,2-DCE generated in the on-site groundwater as a result of the injections, element 7 of the selected remedy (see Section 8 - Summary of the Selected Remedy) addresses this concern. The NYSDEC expects complete degradation of the on-site chlorinated volatile organic compounds of interest after the IRZ has been fully developed. However, if significant concentrations of <u>untreated</u> 1,2-DCE or vinyl chloride, as determined by the NYSDEC, are detected beyond the fully developed dissolved plume IRZ, either the IRZ will be adjusted to achieve effective treatment or a work plan for aerobic treatment would be developed and implemented before the residuals would have a chance to pass beyond the downgradient property border. See the response to the comment 1 in the responsiveness summary for further discussion on this issue.

Regarding whether the remedy will remediate the soil gas contamination, the NYSDEC believes that the source of most of the relatively low concentrations of tetrachloroethene detected in the soil gases beneath the former manufacturing area are primarily attributable to volatilization from the underlying source area groundwater. Since the selected remedy will remediate the source area groundwater, it is expected that the soil gas concentrations will reduce as the groundwater is remediated. Please note that there has been a comprehensive investigation of all potential areas of interest and tetrachloroethene was not detected in any of the numerous soils samples at concentrations above the cleanup objective of 1.4 ppm. Consequently, soil contamination is not considered to be a source of the relatively limited soil gas detections. See the response to comment 2 in the responsiveness summary for further discussion on this issue.

SECTION 8: <u>SUMMARY OF THE SELECTED REMEDY</u>

Based on the Administrative Record (Appendix B) and the discussion presented below, the NYSDEC has selected Alternative 2, Continuation of NAPL Bailing, Enhanced Reductive Dechlorination Technology for Source Area Remediation and Control of VOC Migration in the

Dissolved On-Site Plume as the remedy for this site. The elements of this remedy are described at the end of this section.

The selected remedy is based on the results of the SI and supplemental site investigative work and the evaluation of alternatives presented in the RAWP.

Alternative 2 is being selected because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by restoring groundwater quality to the extent practicable. Alternatives 3, 4, and 5 would also comply with the threshold selection criteria but to a lesser degree or with lower certainty. Alternative 1 does not pass the threshold criteria and consequently, is not a viable alternative.

Because Alternatives 2, 3, 4, and 5 satisfy the threshold criteria, the five balancing criteria are particularly important in selecting a final remedy for the site.

Timely treatment in this operable unit of the on-site groundwater is important to limit further migration of contaminated groundwater. Alternatives 2, 3 and 4 have the advantage that the ongoing ERD pilot test for the dissolved portion of the on-site plume is already actively treating the groundwater and can be expanded easily to treat the entire dissolved plume. Alternative 5 would take time to design and implement, but it is a proven, tradition technique for containing a groundwater plume.

Alternatives 2, 3 and 4 differ only in the manner that they would treat the source area. Alternative 2 would be the easiest to implement because all the wells required for injections are already in place. The source area treatment equipment is the same as for the dissolved plume treatment. The final design can be implemented without additional equipment. Alternative 4 requires preliminary testing to determine whether the remedy is suitable whereas no additional testing would be required for Alternative 2, besides the ongoing pilot test evaluation. Alternative 3 would also not require any significant additional testing since *in situ* chemical oxidation has been evaluated previously at this site and has proven to be effective in destroying the contaminants.

Continuing to compare the source area treatments under Alternatives 2, 3 and 4, the injectants used under Alternative 2 cause no long lasting effects while Alternatives 3 and 4 add iron to the formation. However, potential exposure to the iron in groundwater would be prevented by the institutional controls. Under Alternative 3, the Fenton's Reagent, which is a very strong oxidizer, presents a worker safety hazard due to its toxicity and reactivity. Additionally, vapors may be generated in the subsurface during the chemical reactions for the source area injections. The injectants for Alternatives 2 and 4 do not present any safety issues.

Under Alternatives 2, 3 and 4, the hazardous wastes are destroyed on-site while the spent activated carbon under Alternative 5 requires off-site shipping and disposal. Alternative 5 has the potential to release contaminants to the air discharge if the activated carbon is not changed properly. Additionally, since contaminated water is pumped to the surface, there is a greater chance of contact with the contaminated groundwater as compared to Alternatives 1, 2, 3 and 4.

While Alternative 5 is a proven technique, the existing site conditions would make it difficult to achieve the goal of GA groundwater standards at the downgradient property border within a reasonable time frame. The amount of the contamination that is adsorbed on the less porous portions of the underlying formation (clays and silts) will not be treated well by this alternative. Alternatives 2, 3 and 4 would have better success with remediating the adsorbed contamination since the injections will promote desorption or release of the contaminants. Consequently, better cleanup results would be expected with those remedies. Between Alternatives 2, 3 and 4, Alternative 2 offers the best chance for achieving the remedial goals in the shortest time since the carbohydrate solution is capable of diffusing within areas of lower permeability, providing a greater opportunity to remediate adsorbed contaminants.

The source remediation under Alternative 4 is a new emerging technology and it is more difficult than the other injection remedies to complete the injections properly. However, it has the advantage of directly working on the NAPL. Overall, there are more questions regarding whether the source remediation will work as proposed compared to the other source remedies.

The injections for the source remediation under Alternative 3 would cause very good release of the contaminants bound to the formation, as was demonstrated in an earlier pilot test. This is good in that it makes the released material more available for treatment. However, since much of the released material is denser than water and would tend to sink in the aquifer, there would be a greater chance that the mobilized contaminants could also migrate vertically downward where it would be more difficult to treat. Consequently, this could be a negative effect from these injections. The source area injections under Alternatives 2 and 4 result in more gradual desorption that would present a much lesser potential for undesirable downward migration of the contaminants.

Alternatives 2 and 4 use reductive dechlorination to remediate the source area and dissolved plumes. Consequently, the geochemical conditions would be the same for both treatments. However, under Alternative 3, the source area is an aerobic (excess oxygen) treatment while the dissolved plume is an anaerobic treatment. Since the two treatments require different geochemical conditions, they would not be expected to work as well together as the remedies proposed under Alternatives 2 and 4.

Alternatives 2, 3 and 4, having no permanent, aboveground treatment structures or mechanical compounds as does Alternative 5, can be more easily modified to address additional areas of contamination discovered during the remediation. The structures and mechanical equipment for Alternative 5 make it more likely than the other viable alternatives for equipment failure and system downtime.

Comparing the cost of the viable alternatives, Alternatives 2, 3 and 4 are low cost to medium cost alternatives while Alternative 5 is a high cost alternative. The cost of the injectants are lower for Alternative 2 as compared by Alternatives 3 and 4. The required long term monitoring for Alternatives 2, 3 and 4 would be shorter than Alternative 5. There would be more maintenance required for Alternative 5. Consequently, the operation and maintenance cost for Alternative 5 would be much greater than the other viable alternatives.

The dissolved plume treatment is the same in Alternatives 2, 3 and 4. In the event that incomplete degradation in the IRZ results in the build up of 1,2-DCE or vinyl chloride, supplemental treatment might be required at the downgradient border to remediate these contaminants. All VOCs of interest in the dissolved plume would be treated under Alternative 5 without the need for supplemental treatment.

Alternatives 3 and 4 would treat more of the contaminants in the source area than Alternative 2. The heavier, long chain portions of the semi-volatile organic compounds in the petroleum contamination may not be amenable to biological treatment. Alternative 5 would not be able to extract most of the petroleum related contaminants that are strongly bound to the formation. However, since there is very limited mobility to the petroleum contamination, the institutional controls for on-site groundwater use would prevent exposure to any residual petroleum in the source area that is not remediated under Alternatives 2 and 5.

The estimated present worth cost to implement the Alternative 2 is $1,755,000. The present worth capital cost to construct the remedy is estimated to be $320,000 and the estimated average annual operation, maintenance, and monitoring costs for 30 years is $63,600.

The elements of the selected remedy are as follows:

1. NAPL bailing in productive wells will continue until NAPL recovery is no longer productive.

2. After a reasonable time period acceptable to the NYSDEC to allow some additional NAPL recovery by hand bailing, source area injections and monitoring will commence.

3. The injections of the carbohydrate solution will continue into the pilot test injection wells to maintain the established IRZ currently treating most of the dissolved plume.

4. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance and monitoring of the remedial program.

5. Additional injection and monitoring wells will be constructed, as specified in the final design.

6. The dissolved plume treatment and monitoring will be expanded to the new injection and monitoring wells relating to that effort.

7. If significant concentrations, as determined by the NYSDEC, of untreated 1,2-DCE or vinyl chloride are detected beyond the dissolved plume IRZ, either the IRZ will be adjusted to achieve effective treatment or a work plan for aerobic treatment will be developed and implemented before the residuals would have a chance to pass beyond the downgradient property border.

8. If the source area treatment under Alternative 2 is ineffective, the incremental benefit of implementing the source area treatment outlined under either Alternative 3, Alternative 4 or potentially a new technology will be evaluated and implemented.

9. The HVAC system will maintain positive pressure inside the building. Any unacceptable vapor intrusion that may be detected will be addressed by engineering controls and/or active treatment.

10. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation is technically impracticable or not feasible.

11. Development of a site management plan to: (a) address residual contaminated soils that may be excavated from the site during future redevelopment. The plan will require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations; and (b) evaluate the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified.

12. Imposition of an institutional control in the form of an environmental easement that will: (a) require compliance with the approved site management plan; (b) limit the use and development of the property to commercial or industrial uses only; (c) restrict use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Suffolk County Department of Health; and, (d) require the property owner to complete and submit to the NYSDEC an annual certification to ensure that the institutional controls are still in place.

13. The property owner will provide an annual certification, prepared and submitted by a professional engineer or environmental professional acceptable to the NYSDEC, which will certify that the institutional controls and engineering controls put in place, are unchanged from the previous certification and nothing has occurred that would impair the ability of the control to protect public health or the environment or constitute a violation or failure to comply with any operation and maintenance or site management plan.

14. Since the remedy results in untreated hazardous waste remaining at the site, a long term monitoring program will be instituted. Several on-site monitoring wells will be sampled periodically during and after treatment. The monitoring wells will be chosen during the remedial design, but the sampling plan could be adjusted based on site conditions. Monitoring will continue until the NYSDEC determines that monitoring is no longer required. This program will allow the effectiveness of the remedy to be monitored and will be a component of the operation, maintenance and monitoring for the site.

SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

A number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.
- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.
- A public meeting/invitation fact sheet was distributed to the public contact list to inform the public about the site, to solicit public comments on the PRAP and to notify the public about a public meeting at which the NYSDEC presented the PRAP.
- A public meeting was held on March 11, 2004 to present and receive comments on the PRAP.
- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

TABLE 1
Non-Aqueous Phase Liquids in Groundwater, August and September 2001

	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	tetrachloroethene	240-410,000	0.005	4 of 4
	trichloroethene	5.5-3,900	0.005	4 of 4
	1,1,1-trichloroethane	ND-1,400	0.005	2 of 4
	ethylbenzene	ND-640	0.005	1 of 4
	xylene (total)	ND-2,700	0.005	2 of 4
Semivolatile Organic Compounds (SVOCs)	TPH - gasoline range organics (GRO)	24-180,000	NA	NA
	TPH - diesel range organics (DRO)	858,000 (one sample analyzed)	NA	NA

Legend for Tables 1-4

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m³ = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; GA groundwater standards are used for groundwater, TAGM-4046 cleanup objectives are used for soils, and NYSDOH's guidance value for tetrachloroethene is used for indoor air samples. There are no specific guidance values for TPH, soil gases or other contaminants in indoor air other than tetrachloroethene.

[c] The December 2003 post-injection round of sampling included only MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23, and MW-27D

[d] The NYSDOH Fact Sheet guidance value for tetrachloroethene (perc) is 100 µg/m3. However, the NYSDOH also recommends that actions be taken to reduce indoor contamination to this compound to as close to background as practical.

ND = not detected

N/A = not applicable

SB = site background

TABLE 2A

TREATED AREA - Enhanced Reductive Dechlorination Pilot Test
Pre-Injection and Post-Injection Groundwater Sampling Results for Volatile Organic Compounds
Injection and Monitoring Wells Within the *In Situ* Reactive Zone

Shallow Wells- **IW-5, MW-12, IW-6, IW-16**, IW-7, MW-32, MW-8, MW-7, MW-11, MW-10, MW-9
Intermediate Wells - **IW-10, IW-14, IW-13, IW-15, IW-11**, IW-12, MW-33, MW-23, MW-27D, MW-28D
(Wells Used for Injections are Bolded)

Contaminants of Concern	June 2003 Pre-Injection Concentration Ranges (ppb)[a]	December 2003[c] Post-Injection Concentration Ranges (ppb)[a]	SCG[b] (ppb)[a]
Tetrachloroethene	39-22,000	21-1,800	5
Trichloroethene	8-9,200	31-2,500	5
cis-1,2-Dichloroethene	ND-5,500	390-11,000	5
trans-1,2-Dichloroethene	ND-80	ND-140	5
Vinyl Chloride	ND in all samples	ND in all samples	2
1,1-Dichloroethene	ND-6	ND-13	5
1,1,1-Trichloroethane	ND-170	ND-83	5
1,1-Dichloroethane	ND-11	2-8	5
Toluene	ND-5	ND-3	5
Ethyl benzene	ND-13	ND-9	5
Xylene (total)	ND-98	ND-70	5

Legend for Tables 1-4

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; GA groundwater standards are used for groundwater, TAGM-4046 cleanup objectives are used for soils, and NYSDOH's guidance value for tetrachloroethene is used for indoor air samples. There are no specific guidance values for TPH, soil gases or other contaminants in indoor air other than tetrachloroethene.

[c] The December 2003 post-injection round of sampling included only MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23, and MW-27D

[d] The NYSDOH Fact Sheet guidance value for tetrachloroethene (perc) is 100 µg/m3. However, the NYSDOH also recommends that actions be taken to reduce indoor contamination to this compound to as close to background as practical.

ND = not detected

N/A = not applicable

SB = site background

TABLE 2B
UNTREATED AREA - Enhanced Reductive Dechlorination Pilot Test
Pre-Injection Groundwater Sampling Results for Volatile Organic Compounds from Injection and Monitoring Wells Outside of the *In Situ* Reactive Zone

Shallow Wells-IW-2, MW-13, IW-4, MW-3, MW-4, MW-31, MW-15, MW-14, MW-29, MW-1
Intermediate Wells-IW-8, MW-13D, MW-30, MW-16D, MW-26D
Deep Wells- MW-20D, MW-19D, MW-18D

Contaminants of Concern	June 2003 Concentration Ranges (ppb)[a]	SCG[b] (ppb)[a]
Tetrachloroethene	5-38,000	5
Trichloroethene	ND-10,000	5
cis-1,2-Dichloroethene	ND- 3,400	5
trans-1,2-Dichloroethene	ND-37	5
Vinyl Chloride	ND in all samples	2
1,1-Dichloroethene	ND-6	5
1,1,1-Trichloroethane	ND-520	5
1,1-Dichloroethane	ND-3	5
Toluene	ND-19	5
Ethylbenzene	ND-14	5
Xylene (total)	ND-210	5

Legend for Tables 1-4

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; GA groundwater standards are used for groundwater, TAGM-4046 cleanup objectives are used for soils, and NYSDOH's guidance value for tetrachloroethene is used for indoor air samples. There are no specific guidance values for TPH, soil gases or other contaminants in indoor air other than tetrachloroethene.

[c] The December 2003 post-injection round of sampling included only MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23, and MW-27D

[d] The NYSDOH Fact Sheet guidance value for tetrachloroethene (perc) is 100 µg/m3. However, the NYSDOH also recommends that actions be taken to reduce indoor contamination to this compound to as close to background as practical.

ND = not detected

N/A = not applicable

SB = site background

Table 3
Historical Detections in Soil Samples Collected Above the Water Table
1994-2003

	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	tetrachloroethene	ND-1.0	1.4	none
Semivolatile Organic Compounds (SVOCs)	Total Petroleum Hydrocarbons	ND-1,390 total (1,100 lubricating oil and 290 diesel #2)	N/A	N/A
Inorganic Compounds	Mercury	ND-1.8	0.1	one sample
	Barium	ND-489	300 or SB	one sample
	Cyanide (CN)	ND-24	N/A	N/A

Legend for Tables 1-4

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; GA groundwater standards are used for groundwater, TAGM-4046 cleanup objectives are used for soils, and NYSDOH's guidance value for tetrachloroethene is used for indoor air samples. There are no specific guidance values for TPH, soil gases or other contaminants in indoor air other than tetrachloroethene.

[c] The December 2003 post-injection round of sampling included only MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23, and MW-27D

[d] The NYSDOH Fact Sheet guidance value for tetrachloroethene (perc) is 100 µg/m3. However, the NYSDOH also recommends that actions be taken to reduce indoor contamination to this compound to as close to background as practical.

ND = not detected

N/A = not applicable

SB = site background

Table 4
Indoor Air Concentrations
July 7, 1998 through February 5, 2004
(Potential Site Related Detections Only)

AIR	Contaminants of Concern	Concentration Range Detected (µg/m^3)[a]	SCG[b] (µg/m^3)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	tetrachloroethene	ND-22	100[d]	0 of 28
	1,1,1-trichloroethane	ND-7.2	N/A	N/A
	ethylbenzene	ND-1.3	N/A	N/A
	xylenes (total)	ND-6.8	N/A	N/A
	methyl ethyl ketone	ND-12	N/A	N/A
	1,2,4-trimethylbenzene	ND-8.3	N/A	N/A

Legend for Tables 1-4

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; GA groundwater standards are used for groundwater, TAGM-4046 cleanup objectives are used for soils, and NYSDOH's guidance value for tetrachloroethene is used for indoor air samples. There are no specific guidance values for TPH, soil gases or other contaminants in indoor air other than tetrachloroethene.

[c] The December 2003 post-injection round of sampling included only MW-32, MW-8, MW-7, MW-11, MW-10, MW-33, MW-23, and MW-27D

[d] The NYSDOH Fact Sheet guidance value for tetrachloroethene (perc) is 100 µg/m3. However, the NYSDOH also recommends that actions be taken to reduce indoor contamination to this compound to as close to background as practical.

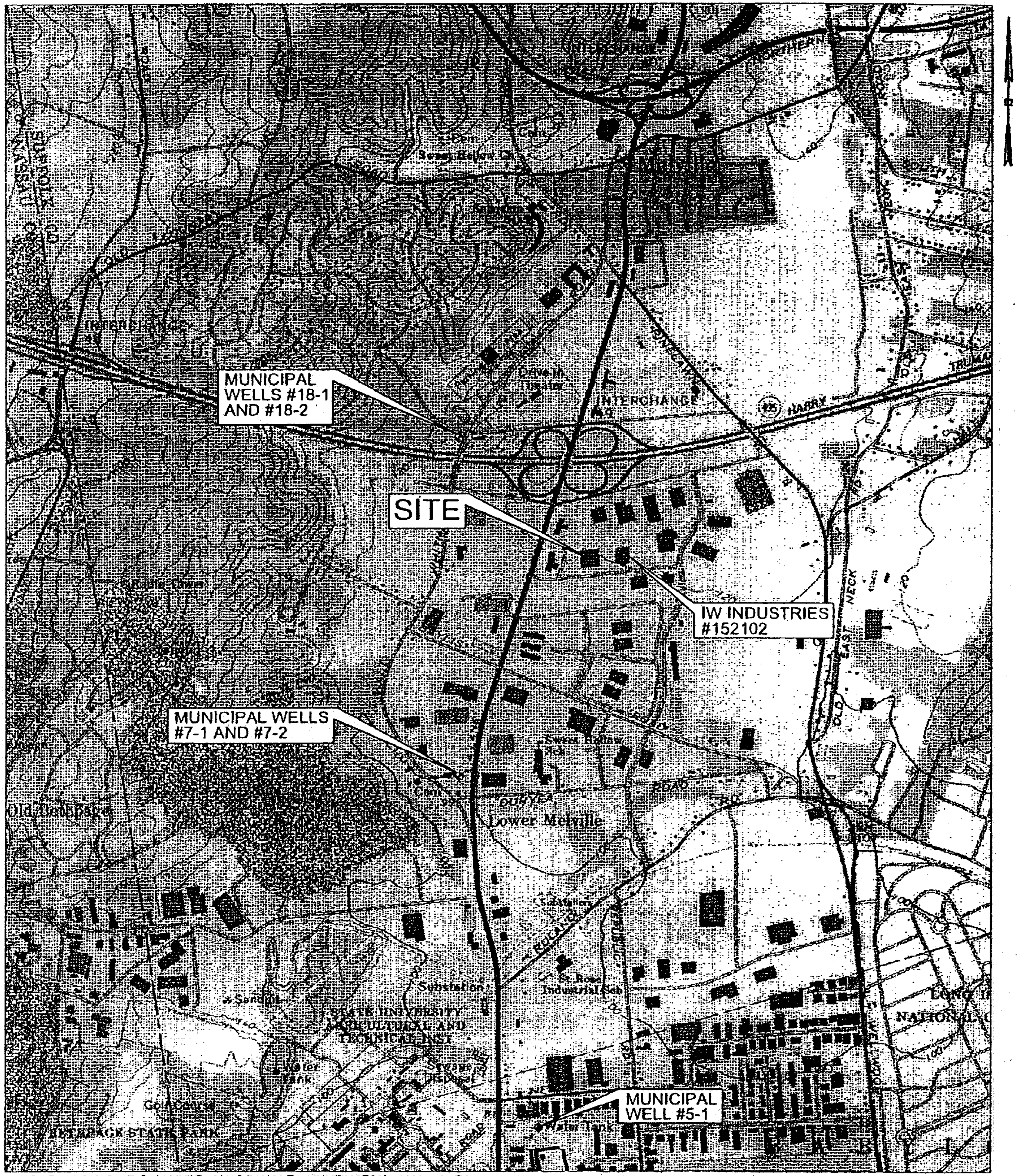
ND = not detected

N/A = not applicable

SB = site background

Table 5
Remedial Alternative Costs

Remedial Alternative	Present Worth Capital Cost	Annual OM&M (Average for 30 Years)	Total Present Worth
Alternative No. 1 No Action with Long-Term Monitoring	$0	$45,867	$962,000
Alternative No. 2 Enhanced Reductive Dechlorination for Source and Dissolved Plume Treatment	$320,000	$63,600	$1,755,000
Alternative No. 3 *In Situ* Chemical Oxidation for Source Area Treatment and Enhanced Reductive Dechlorination for Dissolved Plume Treatment	$700,000	$61,733	$2,085,000
Alternative No. 4 Nano-Scale Zero-Valent Iron for Source Area and Enhanced Reductive Dechlorination for Dissolved Plume Treatment	$862,000	$61,733	$2,247,000
Alternative No. 5 Groundwater Extraction and Treatment for Source Area Dissolved Plume Treatment	$710,000	$127,667	$3,295,000

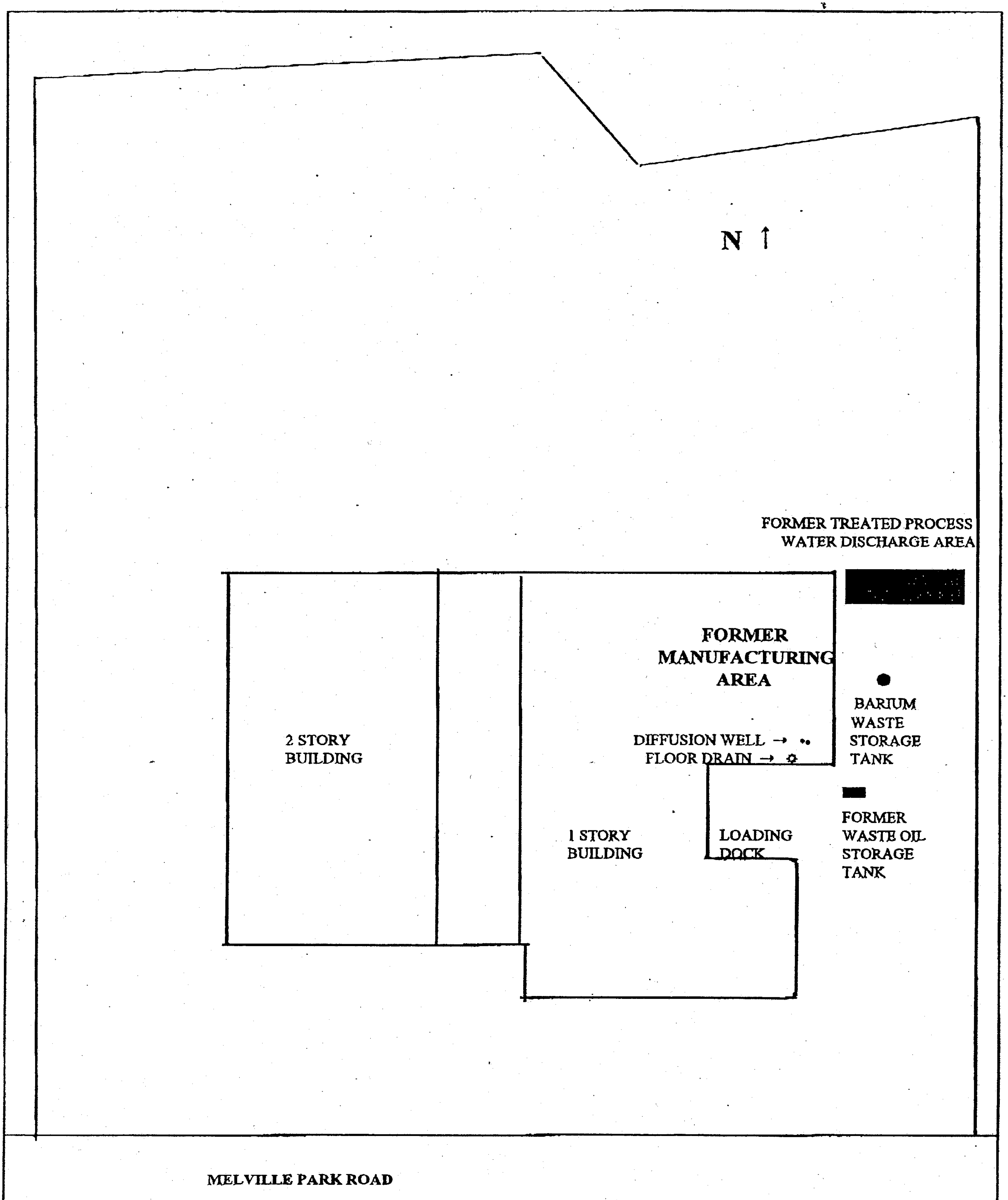


SOURCE: U.S.G.S. 7.5 MINUTE QUADRANGLE, HUNTINGTON, N.Y., 1979

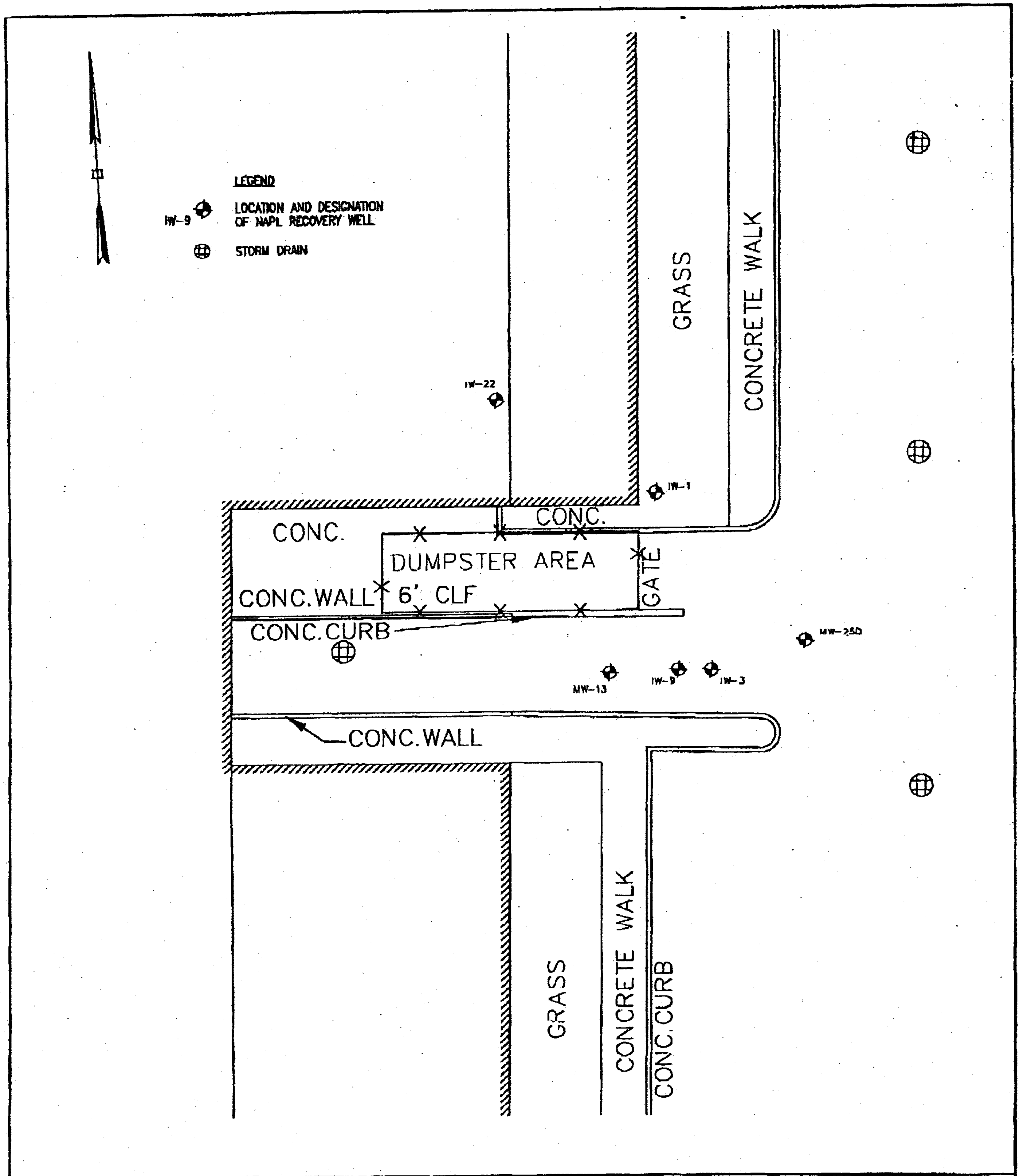
0 2000
SCALE IN FEET

SITE LOCATION MAP
25 MELVILLE PARK ROAD, MELVILLE, NEW YORK

DRAWING NUMBER
1



AREAS OF INTEREST 25 MELVILLE PARK ROAD FIGURE 2

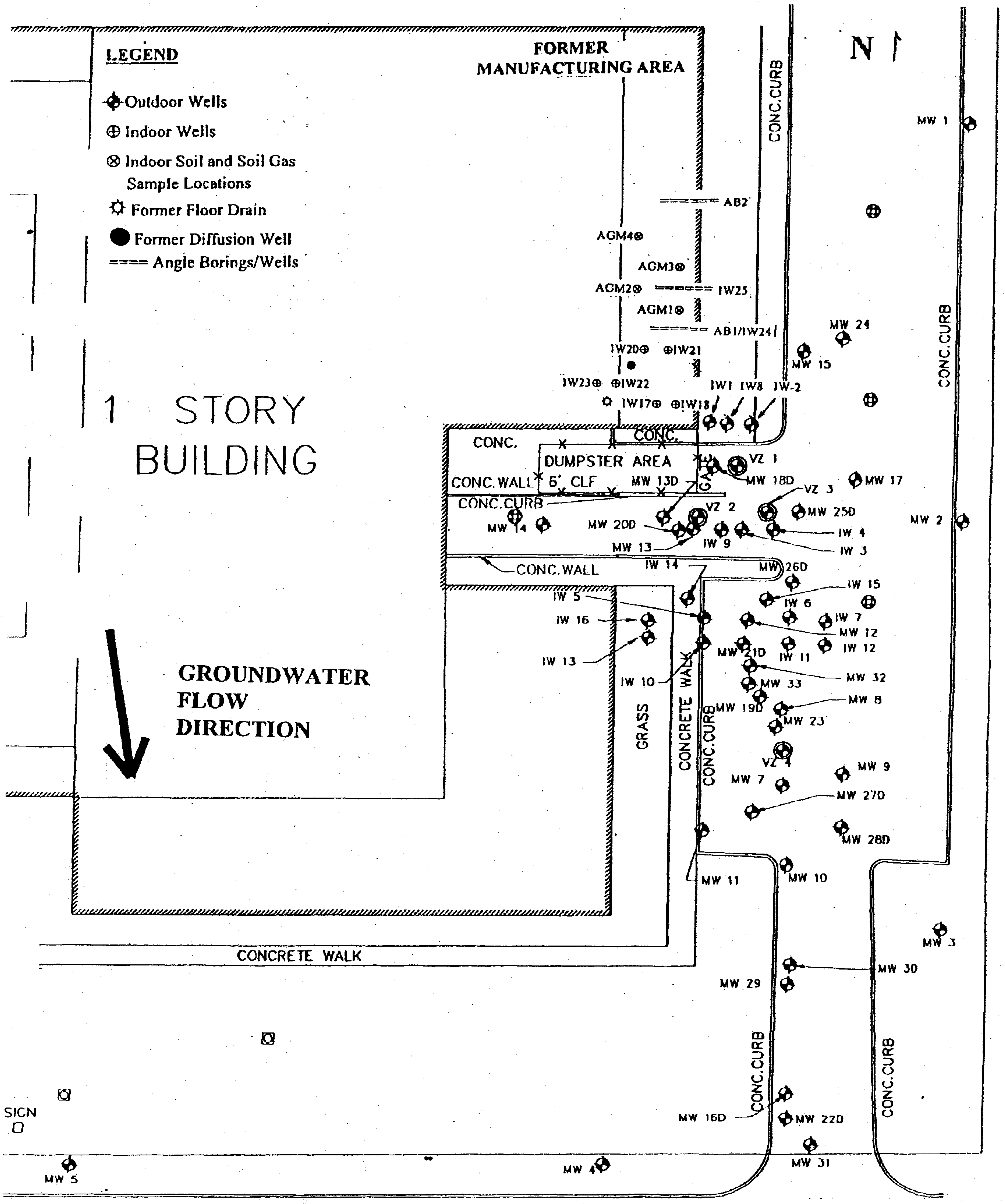


0 20
SCALE IN FEET

SHEET TITLE
LOCATIONS OF NAPL RECOVERY WELLS

25 MELVILLE PARK ROAD, MELVILLE, NEW YORK

DRAWING NUMBER
3

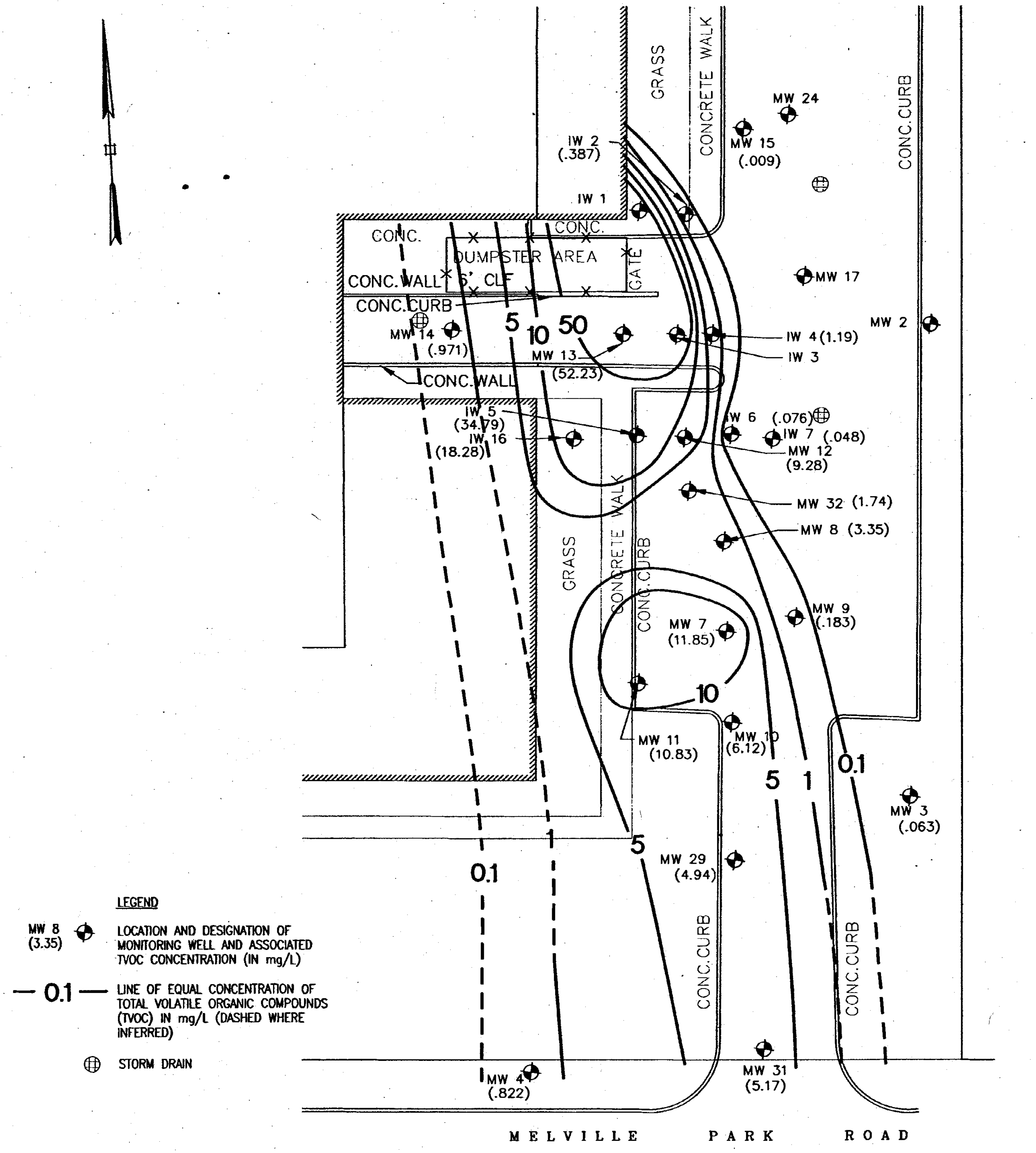


LOCATION OF MONITORING WELLS
25 MELVILLE PARK ROAD

FIGURE 4

Acad Version : R16.0
User Name : pinnacle

Date\Time : Fri, 20 Feb 2004 - 12:27pm
Path\Name : G:\APROJECT\WHCS Melville\RAP\RAWP\SITE PLAN.dwg - Layout Tab : SHALLOW



LEGEND

MW 8 (3.35) ⊕ LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)

— 0.1 — LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)

⊕ STORM DRAIN

0 30
SCALE IN FEET

ARCADIS
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PROJECT MANAGER S. FELDMAN	DEPARTMENT MANAGER N. VALKENBURG	LEAD DESIGN PROF.	CHECKED BY C. KEEN
SHEET TITLE TVOC CONCENTRATION DISTRIBUTION IN THE SHALLOW AQUIFER ZONE (45-60 FT BLS) DURING JUNE 2003 25 MELVILLE PARK ROAD, MELVILLE, NEW YORK 25 MPR, LLC.		TASK/PHASE NUMBER 00008	DRAWN BY LMC
		PROJECT NUMBER NY001332.0008	DRAWING NUMBER 5

Acad Version : R16.0
User Name : pinnacle

Date\Time : Fri, 20 Feb 2004 – 12:28pm
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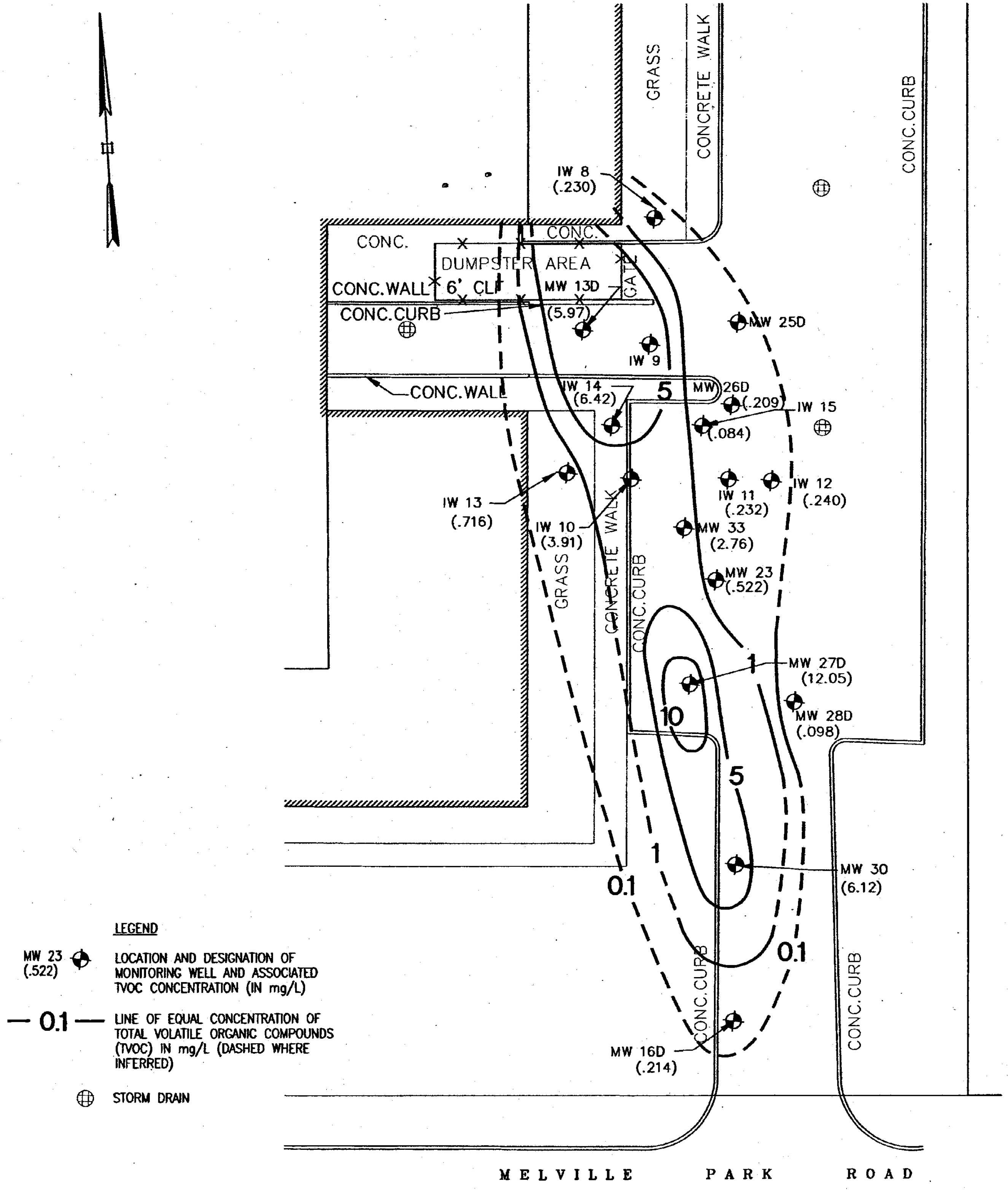

LEGEND

MW 23 (.522) ⊕ LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)

— 0.1 — LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)

⊕ STORM DRAIN

0 30
SCALE IN FEET

ARCADIS
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PROJECT MANAGER S. FELDMAN	DEPARTMENT MANAGER N. VALKENBURG	LEAD DESIGN PROF.	CHECKED BY C. KEEN
SHEET TITLE TVOC CONCENTRATION DISTRIBUTION IN THE INTERMEDIATE AQUIFER ZONE (60–90 FT BLS) DURING JUNE 2003 25 MELVILLE PARK ROAD, MELVILLE, NEW YORK 25 MPR, LLC.		TASK/PHASE NUMBER 00008	DRAWN BY LMC
		PROJECT NUMBER NY001332.0008	DRAWING NUMBER 6

Acad Version : R16.0
User Name : pinnocle

Date\Time : Fri, 20 Feb 2004 - 12:30pm
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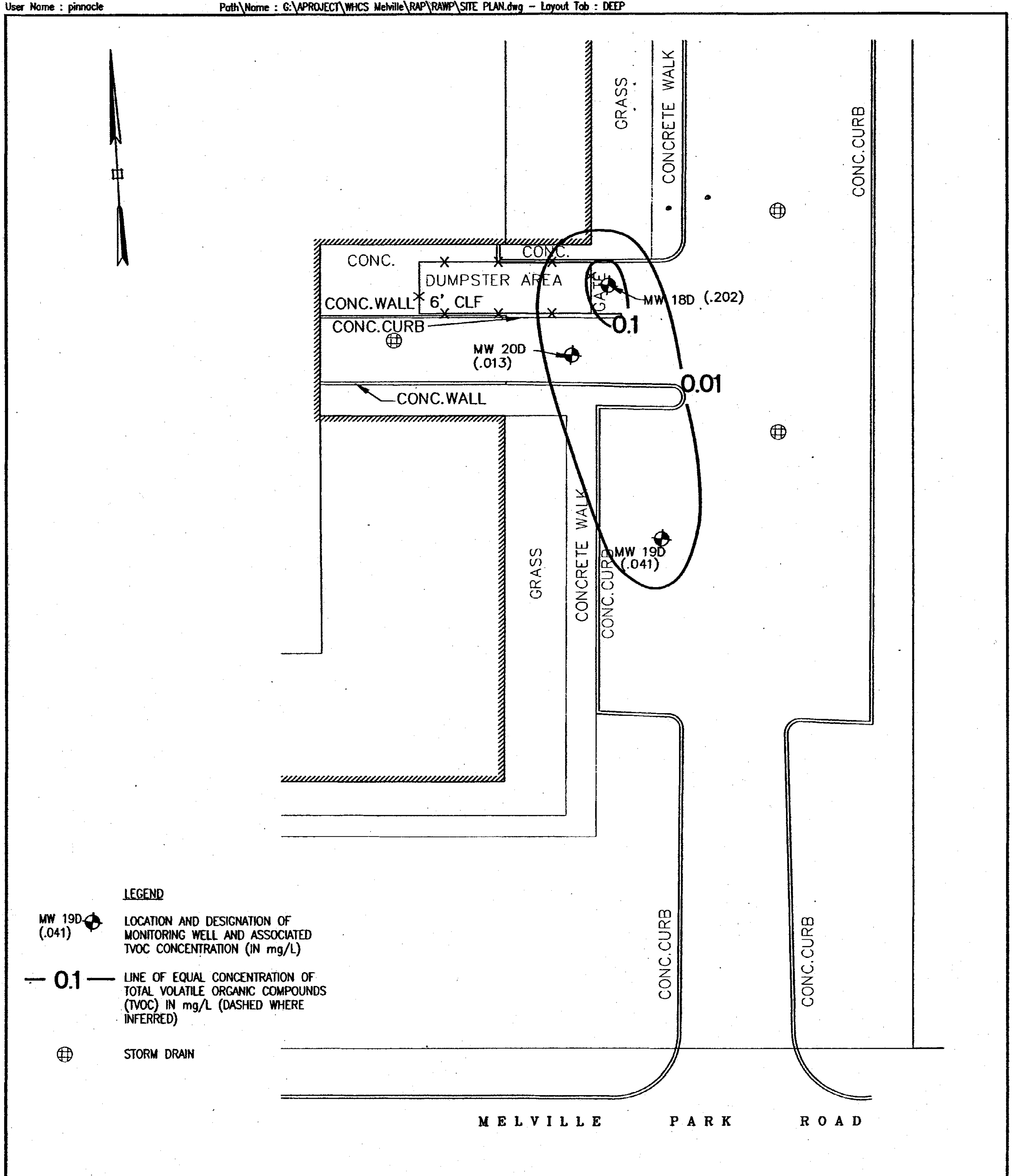

LEGEND

MW 19D (.041)	LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)
— 0.1 —	LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)
⊕	STORM DRAIN

0 30
SCALE IN FEET

ARCADIS
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PROJECT MANAGER S. FELDMAN	DEPARTMENT MANAGER N. VALKENBURG	LEAD DESIGN PROF.	CHECKED BY C. KEEN
SHEET TITLE TVOC CONCENTRATION DISTRIBUTION IN THE DEEP AQUIFER ZONE (130-185 FT BLS) DURING JUNE 2003 25 MELVILLE PARK ROAD, MELVILLE, NEW YORK 25 MPR, LLC.		TASK/PHASE NUMBER 00008	DRAWN BY LMC
		PROJECT NUMBER NY001332.0008	DRAWING NUMBER 7

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

New York Twist Drill - Loading Dock Area
Operable Unit No. 1
Melville, Suffolk County, New York
Site No. 1-52-169

The Proposed Remedial Action Plan (PRAP) for the New York Twist Drill - Loading Dock Area site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 25, 2004. The PRAP outlined the remedial measure proposed for the contaminated groundwater and soil gases at the New York Twist Drill - Loading Dock Area site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on March 11, 2004, which included a presentation of the Site Investigation (SI), supplemental investigations and the Remedial Action Work Plan (RAWP) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 27, 2004.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the NYSDEC's responses:

COMMENT 1:

What about the 1,2-DCE that is developing as a result of the pilot test injections? How will you know if it is present in the off-site?

RESPONSE 1:

The pilot test for the ERD technology is ongoing. So far, there are six months of monitoring data available to give a preliminary assessment of this remedy. These initial results are very encouraging. However, it may take an additional six months or more for the IRZ to fully develop before maximum reducing conditions are achieved.

As discussed in the presentation for the March 11, 2004 public meeting, there has been a detected increase in 1,2-DCE concentrations in the pilot test based on the first six months of monitoring data. These increases are the result of significant mass desorption and the dechlorination of PCE and TCE. The 1,2-DCE is one of the temporary by products of this degradation process. However, there is evidence that complete degradation of some of the 1,2-DCE generated or released from the formation is occurring. At this time, the release and generation of 1,2-DCE is greater than the current degradation rate of this compound. As the treatment zone continues to develop, resulting in even stronger reducing conditions in the treatment zone, and as the reservoir of contaminant mass bound to the formation is released and degraded, eventually a clean water front will develop. The following factors indicate that strong reducing conditions capable of achieving complete degradation have already been achieved:

1. There is evidence of significant increase in reduced forms of electron acceptors (i.e, sulfate reduction, evidence of methanogenesis), which can only occur in a strongly anaerobic environment. Sulfate concentrations have been substantially reduced. Methane concentrations have increased one or two orders of magnitude. Field parameters such as oxidation/reduction potential (ORP) and dissolved oxygen (DO) further suggest a shift towards reducing conditions.

2. The total organic carbon (TOC) concentrations indicate that sufficient TOC has been delivered to the subsurface to maintain the treatment zone.

3. There has been an increase in the concentrations of ethene and ethane, the final step before complete degradation of the chlorinated volatile organic compounds present at this site.

Periodic groundwater monitoring during the pilot test from the points of injection to the downgradient property border is continuing to monitor the apparent increase in the concentrations of 1,2-DCE and to check for possible generation of vinyl chloride. Eventually, a long term monitoring plan will be developed to take over the monitoring currently being done for the pilot test. The construction and monitoring of additional wells at the downgradient property border will be a component of the long term monitoring plan. All off-site groundwater sampling will be conducted under subsequent OU-2.

The NYSDEC expects some limited increases in 1,2-DCE and possibly the generation of some limited amounts of vinyl chloride while the PCE and TCE concentrations and amount of adsorbed mass are decreasing and the treatment zone continues to develop. These temporary increases are acceptable as long as the amount of overall mass leaving the site doesn't increase significantly. The main concern in this regard is the potential for vinyl chloride generation. Vinyl chloride has a greater toxicity than the other breakdown products.

Element 7 of the selected remedy states, "If significant concentrations, as determined by the NYSDEC, of untreated 1,2-DCE or vinyl chloride are detected beyond the dissolved plume IRZ, either the IRZ will be adjusted to achieve effective treatment or a work plan for aerobic treatment will be developed and implemented before the residuals would have a chance to pass beyond the downgradient property border." In the unlikely condition where there is a significant increase in the amount and toxicity of the contaminants leaving the site and/or the fully developed treatment zone does not treat all the contaminants, the NYSDEC will require the implementation of element 7.

There will be contaminant mass that continues to leave the site before treatment becomes fully effective. As long as the treatment does not worsen the releases and the treatment becomes effective within a reasonable period of time, the NYSDEC will address this contamination in subsequent off-site OU-2.

COMMENT 2:

Will indoor air samples be taken again? Will soil gas samples be taken again? Will the levels of soil gas decline as the remedy proceeds? What is the source of the soil gases under the building? Is it caused by contaminated soil or groundwater?

RESPONSE 2:

The above questions deal with the relatively limited soil gas contamination that has been detected under the slab of the former manufacturing area and the indoor air quality inside the building. It is first necessary to understand the results of the comprehensive investigations that have been performed at this site from 1995 to 2003. A summary of the environmental sampling conducted during this period is available in Sections 3.2 and 5.1 of the ROD.

The contaminant of primary concern in soil gases and indoor air is PCE. PCE has been detected as free product in wells near the southeast corner of the former manufacturing area. The source area groundwater extends beneath the southern half of the former manufacturing area. Some volatilization of the PCE in groundwater to the pore spaces in the soils above the water table (soil gases) is expected. Undoubtedly, this is one of the sources of the soil gas detections under the slab.

The subject of most of the supplemental investigative work that has been performed at this site since 1997 has been to determine if there might also be a source in the soils above the water table that would require remediation. If there was soil contamination, it would be another source of the soil gas contamination. However, PCE has not been detected in any of the soil samples at concentrations above the cleanup objective of 1.4 ppm. The highest concentration detected was 1.0 ppm in a soil sample collected at 45'-47' bgs from the boring for MW-13D. The available soil data suggests that there is not a major PCE source in the soils above the water table. Furthermore, the relatively low soil gas concentrations detected are not indicative of a major, undiscovered source in the soils.

The above logic has resulted in the NYSDEC concluding that the most likely source of the soil gas contamination is volatilization from the underlying source area groundwater. Consequently, once the source area groundwater contamination has been remediated, it is expected that the main source of the soil gas contamination will have been eliminated and the soil gas concentrations will decrease.

There are no current provisions for the future sampling of the soil gases under the building. The reason for this is that the potential exposure pathway would be by inhalation of PCE vapors that might migrate into the indoor air. Consequently, the best way to monitor for potential exposures to PCE vapors would be by monitoring the indoor air quality. The selected remedy includes long term monitoring of indoor air quality.

There have already been 28 indoor air monitoring events over the last five and one-half years that indicate that vapor migration from the soil gases to the indoor air is not occurring. At some future time, if the groundwater source area has been eliminated and the periodic indoor air monitoring results continue to meet NYSDOH guidance values, termination of the long term indoor air quality (IAQ) monitoring will be considered. At that time, the NYSDEC and NYSDOH will review all the available data. It is very possible that soil gas sampling will be required prior to termination of the IAQ monitoring to demonstrate whether the soil gas contamination has attenuated. However, if there are many years of acceptable indoor air quality (IAQ) data, this data, by itself, may be sufficient to terminate future IAQ sampling. The NYSDEC believes the decision on whether to require additional soil gas sampling should be delayed until that time.

COMMENT 3:

What standards are the NYSDEC using to say that the groundwater is clean?

RESPONSE 3:

The primary groundwater cleanup objective is to reduce the on-site groundwater contamination levels so that the groundwater that leaves the site at the downgradient (south) property border will meet GA groundwater standards. Once this goal is achieved, the residual on-site groundwater contamination levels will cause no further adverse impacts to the off-site groundwater. The following site related contaminants have a groundwater standard of 5 ppb: PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, xylenes, toluene and ethylbenzene. Vinyl chloride and 1,2-dichloroethane, two additional site related contaminants, have groundwater standards of 2 ppb and 0.6 ppb, respectively.

One of the remediation goals is the elimination of groundwater source areas. An institutional control that will prevent the use of the on-site groundwater without adequate treatment will prevent exposure to the on-site groundwater that will remain above the groundwater standards.

COMMENT 4:

Are the chemicals being used in the pilot test and in the proposed remedy benign? Is there any downside to using molasses in the injections?

RESPONSE 4:

A dilute solution of molasses is currently being used during the ERD pilot test as the easily degradable carbohydrate solution to create the IRZ. Although other options are available, it is likely the final design will continue to use molasses for the injections. Molasses is a safe, non-toxic, soluble organic food source and contains sucrose, reducing sugars, organic non-sugars, trace nutrients and water.

Besides molasses, sodium bicarbonate is benign and will continue to be injected periodically for pH adjustment. Sodium bicarbonate is comprised of two inorganic ions (sodium and bicarbonate) that are typically highly prevalent in natural groundwater systems. The limited quantity that is injected will reach equilibrium with the natural groundwater system within a relatively short distance downgradient of the IRZ.

While the injections are being performed, some of the molasses will migrate beyond the downgradient property border and treat a small portion of the off-site plume. However, as one moves further off-site, the effect of the injections will dissipate and the aquifer will return to normal aerobic conditions. The use of the molasses by the natural microbial community will remove the molasses from the off-site groundwater within a relatively short distance downgradient of the site.

There are other alternatives besides molasses that can be used as the easily degradable carbohydrate solution. These include methanol, milk, ethanol, corn syrup and sodium lactate. However, the molasses solution provides many advantages over the other carbon sources including a diverse variety of carbohydrates and essential growth nutrients, cost effectiveness and its benign nature. Consequently, it is not anticipated that any of these alternatives will be utilized at this site.

COMMENT 5:

How did the contamination get there? Was it injected into the groundwater?

RESPONSE 5:

The site building was completely converted to a multi-tenant office building in 1985. There are no remnants of the former manufacturing operations at the site which could be visually inspected to determine the exact method of disposal. However, all areas of interest have been investigated thoroughly.

The two most prominent areas of interest were:

1. A former underground storage tank (UST) outside the southeast corner of the former manufacturing area that was used to hold waste oils.

2. A former 116 feet deep diffusion well in the floor of the former manufacturing area.

These two areas of interest are the only ones within the groundwater source area.

The UST was reportedly removed in 1990. This tank was the primary area of interest because most of the wells where NAPL is currently being recovered are within 15 feet of this former tank location. The UST was formerly connected to a floor drain inside the manufacturing area. This old floor drain was discovered during one of NYSDEC's inspections of the manufacturing area after all the floor tiles had been removed. A pipe that led outside of the building was apparently cut off at some point outside the building. There were no residual vapors in the piping. However, the direction of the piping gave a good indication of where the former UST was actually located. Soil borings were performed directly in the former tank location. The soils were loosely compacted in this area suggesting that this area may have been excavated in the past. However, there was no residual soil contamination detected. It is possible that the potential soil contamination associated with the UST was excavated during the tank removal or that any residual soil contamination in this area has attenuated, leaving only the underlying groundwater as the only media with residual contamination.

The other primary area of interest was the former diffusion well that was reportedly used to discharge cooling water. Since petroleum related NAPL was discovered in some of the wells screened below the water table, some sort of injection below the water was suspected. LNAPL is usually found floating on top of the water table since it is less dense than water. For this reason, the former diffusion well was considered as one of the more likely sources of the groundwater contamination.

After three attempts, the well was finally located in the floor of the former manufacturing area. The depth of the discovered well matched the depth of the diffusion well. However, there was an abandoned pump inside the well. This means that this well may have been last used for water supply, not for discharge. There was no visual evidence of gross contamination in this well, as would be expected if this well was a major source of the significant groundwater contamination. However, prior uses of this well cannot be ruled out as a potential source of the groundwater contamination.

COMMENT 6:

What is the nature and extent of the plume off-site? South Huntington Water District has two supply wells that pump 1,200 gallons per day in the potential area of the off-site plume.

RESPONSE 6:

There is currently no off-site groundwater data. The off-site groundwater will be investigated under the forthcoming OU-2.

The on-site groundwater flow direction is towards the south-southeast. The South Huntington well field that contains wells #7-1 and #7-2 is located approximately 3,600 feet to the southwest. Unless the groundwater plume is diverted in some manner by other wells between the well field and the site, it is not expected that this well field will be impacted by this site. However, the vertical and horizontal extent of the off-site groundwater plume will be determined in the remedial investigation for OU-2.

COMMENT 7:

When will OU-2 start? Will it be done by the NYSDEC or someone else?

RESPONSE 7:

The NYSDEC anticipates the signing of an order on consent with the potentially responsible party in the near future. This party will most likely start the off-site investigation this summer.

COMMENT 8

See the attached March 26, 2004 comment letter at the end of the responsiveness summary.

RESPONSE 8

Response 1 and Response 5 address many of the comments in the March 26, 2004 comment letter. The following additional comments will be answered in this response:

1) On-site NAPL has not been delineated, contained or removed.
2) The on-site source has not been found.
3) There has been no net reduction in mass as a result of the ERD injections.
4) The dissolved plume continues to migrate in the off-site direction.
5) The preferred remedy is ineffective.

Regarding the on-site NAPL delineation and treatment, the source area has been extensively investigated. Please see Section 5.1 of the ROD for a summary of the investigations. As mentioned in Response 5, the former underground storage tank located outside the southeast corner of the former manufacturing area is the most likely primary source of the groundwater contamination. There are 15 wells within 20 feet of the suspected tank location. Most of these wells have been screened for the presence of NAPL in the past. In fact, five of these wells have been or are currently being used to recover product by hand bailing. There have also been other soil borings performed in this area for the purpose of collecting either soil samples and/or discrete groundwater samples by direct push technology. Consequently, the NAPL source area has been well defined.

Although the exact method of disposal is unknown, the extent of the contamination has been adequately defined. As discussed in Response 2, there is no evidence of any soil contamination. The numerous borings in the vicinity of the suspected tank location did not detect a source in the unsaturated zone. Furthermore, soil screening was performed during the installation of wells inside the building (i.e., immediately north of the loading dock area), and there was no evidence of VOC impacts in the unsaturated soils. Consequently, the comprehensive investigation at the site does not show evidence of a present-day VOC source area in the unsaturated soils. The 13,100 $\mu g/m^3$ (1.9 ppmv) of PCE detected in a recently collected soil gas sample from under the slab is not a strong indicator of the presence of an unsaturated zone contaminant source that would require remediation. This relatively low concentration is consistent with volatilization from the underlying source area groundwater.

The NAPL recovery by hand bailing has been effective in reducing source area mass and will continue to help reduce contaminant mass. The proposed source area remediation by ERD technology should further remediate the source area. This technology has been used at other sites to treat source area groundwater where NAPL is present. The NYSDEC is unaware of any studies that indicate that this technology cannot be successfully used to treat source area groundwater. However, in the unlikely case that the technology does not work in source area, element 8 of the proposed remedy allows the use of other technologies in the source area.

As has been mentioned in Response 1, it may take an additional six month or more for the IRZ to develop maximum reducing conditions. It is unfair to judge the ERD technology on the results of the preliminary data. It is certainly too early to suggest that this technology will be unable to treat the 1,2-DCE or vinyl chloride that may be generated. In fact, it is speculation at this junction whether any significant concentrations of vinyl chloride may be generated later. No significant vinyl chloride has been detected yet. The supplemental treatment specified under element 7 of the remedy would be required if significant undesirable breakdown products or off-site migration of untreated breakdown products occurs.

To suggest that the pilot test injections have actually caused additional mass to migrate beyond the downgradient border is simply not accurate. There is no data that supports this conclusion. In fact, the first evidence that the leading edge of injection molasses has reached the downgradient property border was in the February 2004 biogeochemical results. Because the IRZ has not completely developed yet, there is no question that contaminant mass continues to migrate from the on-site groundwater to the off-site groundwater. However, there is no indication that any of the remedial measures implemented to date have worsened the problem. The NYSDEC is watching the results of the periodic groundwater sampling at and near the downgradient property border closely. An extensive groundwater sampling round that includes all the wells in the IRZ near the downgradient property border is planned for April 2004 (Month 8).

The offered conclusions regarding the effectiveness of the ERD pilot test to date have completely ignored the fact that there is strong evidence of significant desorption of the contaminant mass bound to the formation. This significant desorption without any increases in the detected dissolved total VOC mass indicates that reduction in contaminant mass in the dissolved plume is already occurring. In fact, one of the most impressive features of the ERD technology so far has been its ability to quickly attack that adsorbed mass in such a short time. Eventually, the NYSDEC expects that the adsorbed mass downgradient of the current IRZ will be removed and exhausted and that a net decrease in the dissolved plume will become apparent. The dissolved plume will diminish as the release of adsorbed mass decreases and the rate of reductive dechlorination increases with the strengthening IRZ. There may be some temporary increases in the dissolved plume while adsorbed mass is released to the dissolved phase. As these processes continue to take hold, the IRZ is expected to establish a reactive barrier that will control the downgradient migration of VOCs.

Environmental
Resources
Management

Suite 210
520 Broad Hollow Road
Melville, NY 11747
(631) 756-8900
(631) 756-8901 (fax)
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26 March 2003

BY HAND

Robert Stewart
Project Manager
New York State Department of Environmental Conservation
SUNY Building 40
Stony Brook, New York 11790-0244

RE: Proposed Remedial Action Plan
New York Twist Drill – Loading Dock Area
(a.k.a. 25 Melville Park Road)
Operable Unit 1
Melville, Suffolk County, New York
Site No. 152169
February 2004

Dear Mr. Stewart:

This letter provides comments on the Proposed Remedial Action Plan (PRAP) for the New York Twist Drill Site (Site) on behalf of the parties contacted by the New York State Department of Environmental Conservation (NYSDEC) with respect to off-site contamination that may be emanating from the Site. It is evident that the effectiveness of any off-Site investigation and/or remediation effort is highly dependent upon the success of the on-Site delineation and remediation efforts.

We understand that the proposed on-Site remedy is based on the results of the Site Investigation (SI), supplemental site investigative work and pilot testing carried out on the Site. We also understand that the PRAP identifies Non-aqueous Phase Liquid (NAPL) Bailing and Enhanced Reductive Dechlorination (ERD) Technology for Source Area Remediation and Control of Volatile Organic Compound (VOC) Migration in the Dissolved On-Site Plume as the preferred remedy for this Site. Our analysis of the available data demonstrates that:

- the on-Site NAPL has not been successfully delineated, contained or removed;
- the ERD process has only shifted the source chemicals to degradation products without any net reduction in mass;

- the dissolved plume emanating from the NAPL and other soil sources continues to migrate in the off-Site direction; and,
- the preferred remedy is ineffective.

On-Site DNAPL has not been successfully delineated, contained or removed.

The PRAP catalogs the Site investigative work that has been carried out on the 25 Melville Park Road property. Work started in 1993 with a site assessment for a property transfer and has continued through 2003 with further attempts to identify the exact source(s) of contamination. The PRAP indicates, "finding the exact source of the groundwater contamination has been difficult". The investigations have identified several potential sources including: a diffusion well, a floor drain located in the southeastern corner of the former manufacturing area, a waste oil storage tank located in the loading dock area, a process water discharge area and barium waste storage tank as potential sources of the contamination. However, none of these sources satisfactorily explain the distribution of contaminants observed at the Site.

For example, the 2003 investigation determined that the diffusion well is 116-feet deep. PCE has a density of 1.63-grams/cubic centimeter (g/cm^3) and is therefore characterized as a dense non-aqueous phase liquid (DNAPL) because its density is greater than water (1 g/cm^3). If PCE had been discharged into the diffusion well, it would have migrated vertically through the water column in the well and consequently NAPL containing high concentration of PCE should be observed at the bottom of the diffusion well.

As discussed in the PRAP, NAPLs are being recovered from the top of the water table and from 23 to 38-feet below the water table. The NAPL is composed of a mixture of primarily PCE and hydrocarbons in the molecular weight range of mineral oil. The density of the NAPL being recovered ranges from 0.98 to 1.03 g/cm^3 and NAPLs with these densities would likely be detected at or near the water table. This is inconsistent with discharge from a diffusion well, which would have resulted in LNAPL contamination at the water table.

The ERD process has only shifted the source chemicals degradation products without any net reduction in mass

Selection of the ERD Technology as the preferred remedy for on-Site contamination is based on pilot testing currently underway. Carbon injection and the distribution of carbon in the aquifer have been monitored for five months. This process has resulted in the generation of *cis*-1,2 DCE in basically equal concentrations to previously detected concentrations of either PCE or TCE. Total VOC (TVOC) concentrations in many of the wells are not significantly less than at the start of the pilot test and in a few wells (MW-32, MW-8D and MW-11) TVOC concentrations have increased considerably. This situation is not an uncommon problem at many enhanced bio-remediation projects. The breakdown of PCE and TCE generally is the relatively easy step in the process. The degradation of *cis*-1,2 DCE and then vinyl chloride (VC) can be much more difficult to achieve due to the need for certain bacteria to be present.

Although some ethane has been observed during the pilot program, on the whole, the reduction has not progressed beyond *cis*-1,2-DCE. This has been observed at other sites. We are concerned that continuation of the ERD Technology may move reduce the *cis*-1,2-DCE to VC, without progressing all the way to ethane. VC, a known human carcinogen, has the potential to present far greater risk to off-Site receptors than do PCE or TCE. Therefore, without a better demonstration that the ERD process can achieve complete reduction of the PCE and TCE to ethane, there is a real risk that the remedy selected by the NYSDEC will make conditions worse than they are now.

The Selected Remedy is Not Appropriate In Light of the On-Site Conditions Presented.

Biological treatment processes such as ERD are not a viable approach to deal with high residual or pure phase LNAPL or DNAPL. At concentrations such as those observed at the Site, the contamination is an inhibitor to biological growth and consequently, effective remediation using this technique will not be sufficiently effective.

The Site also appears to be a poor candidate for ERD due to the high permeability and groundwater velocity across the Site. To sustain anaerobic conditions at the proper levels, carbon additions must be done at a very high frequency. The PRAP does not indicate that such effort is contemplated.

Because the Pilot Program, on the whole, has not reduced the PCE and TCE beyond *cis*-1,2-DCE, it may well be that the bacterial population containing organisms which are capable of degrading *cis*-1,2-DCE to ethane are not present. ERD is not a viable technology for this Site if this is the case.

The dissolved plume emanating from the DNAPL and other soil sources continues to migrate in the off-Site direction

The attached figures compare the concentration of contaminants measured in 2001 and 2003 at the shallow zone (45-60 feet Below Land Surface [BLS]), the intermediate zone (70-90 feet BLS) and the deep zone (100-185 feet BLS). In all three zones the concentrations at the "leading edge" of the plume have significantly increased over the 2-year period. With respect to the shallow zone, MW-29 has increase from 4,240 ppb to 4,940 ppb. The concentration at the property line is 5,170 ppb – versus a ground water standard of 5 ppb. With respect to the intermediate zone, the concentration at MW-16D has increase from 52 ppb to 214 ppb – MW-27 has increased from 8,840 ppb to 12,050 ppb. With respect to the deep zone, MW-19D has increase from 3 ppb to 41 ppb.

In all three zones, the "elongation" of the plume is evident – demonstrating a migration that will not be captured or controlled by the PRAP remedy. While these plume maps were prepared before the commencement of the Pilot Program, the results thus far suggest that the PRAP remedy will not reverse these trends because total mass of VOCs has remained essentially the same. At best, it appears that the selected remedy will result in the migration of *cis*-1,2-DCE rather than PCE or TCE towards the property line, and possibly, off-Site.

The preferred remedy will be ineffective until the source of the contamination is found

The distribution of PCE observed in the subsurface at the Site is inconsistent with any of the presumed sources/discharge points. Soil gas sampling, carried out in 2003, still reveals the presence of PCE in the soil gas at substantial concentration (the highest observed concentration reported in the PRAP was more than 13,000 micrograms per cubic meter [μg/m^3]). These results indicate there is a yet defined/detected source present on the Site. As the reducing zone, even if it were effective in the reductive dechlorination of PCE, is not configured to capture this undefined source, contaminants will continue to migrate downgradient, and, possibly, off-Site.

The presence of high levels of contamination from an on-Site up gradient or yet to be defined source up gradient of the treatment area means that the PRAP remedy would need to continue indefinitely.

Positive Controls at the Southern (Downgradient) Property Line Should Be Implemented So That Experiments Going Forward As To the Best Remedy Do Not Result in Off-Site Contamination.

While we recognize that the Voluntary Cleanup Agreement(VCA) does not require the property owner to investigate or remediate off-Site contamination, the property owner cannot be allowed to ignore data which strongly suggest that the Site is causing contaminants to migrate off-Site. Because the Pilot Program to date has not demonstrated that TVOCs are being reduced in any meaningful way, we urge the Department to require implementation of an IRM to prevent any contaminants from migrating off of the property. These might include an active hydraulic system (pump & treat), a slurry wall and/or and "funnel and gate" system that forces the migrating groundwater through an effective reductive treatment zone.

Summary

The selection of Enhanced Reductive Dechlorination (ERD) Technology for Source Area Remediation and Control of Volatile Organic Compound (VOC) Migration in the Dissolved On-Site Plume as the preferred remedy for the Site should be reconsidered. The PRAP remedy:

- Has not been demonstrated as an effective means of treating or containing the DNAPL source areas;

- Has not been demonstrated as an effective means of reducing the PCE and TCE beyond *cis*-1,2-DCE;

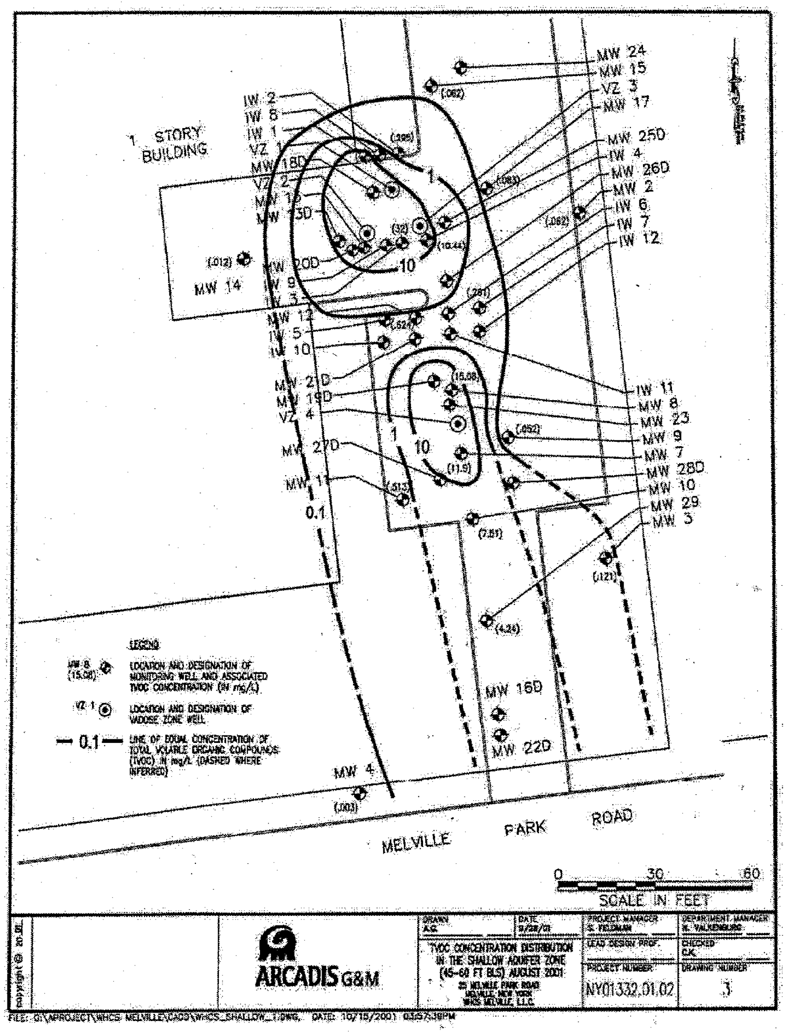
- Runs the risk of reducing the *cis*-1,2-DCE to VC without further reduction to ethane;
- Has not been demonstrated to be capable of preventing the migration of TVOCs towards the downgradient property line, and, potentially, off of the Site.

Accordingly, we ask that the DEC reconsider its proposed on-Site remedy and require the implementation of positive controls at the down gradient (southern) property line until such time as a more effective remedy is identified.

Sincerely,

Gregory K Shkuda

Gregory K. Shkuda, PhD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VZ 3
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IW 4
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IW 8
IW 1
VZ 1
MW 18D
VZ 2
MW 1
MW 13D
MW 20D
IW 9
IW 3
MW 12
IW 5
IW 10
MW 21D
MW 19D
VZ 4
MW 27D
MW 11
IW 11
MW 8
MW 23
MW 9
MW 7
MW 28D
MW 10
MW 29
MW 3
MW 14
MW 16D
MW 22D
MW 4
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10
MELVILLE PARK ROAD
0 30 60
SCALE IN FEET
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LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)
LOCATION AND DESIGNATION OF VADOSE ZONE WELL
LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)
ARCADIS G&M
DRAWN A.G.
DATE 9/28/01
PROJECT MANAGER S. FELDMAN
DEPARTMENT MANAGER N. VALKENBURG
TVOC CONCENTRATION DISTRIBUTION IN THE SHALLOW AQUIFER ZONE (45-60 FT BLS) AUGUST 2001
25 MELVILLE PARK ROAD MELVILLE, NEW YORK WHCS MELVILLE, L.L.C.
LEAD DESIGN PROF.
CHECKED C.K.
PROJECT NUMBER NY01332.01.02
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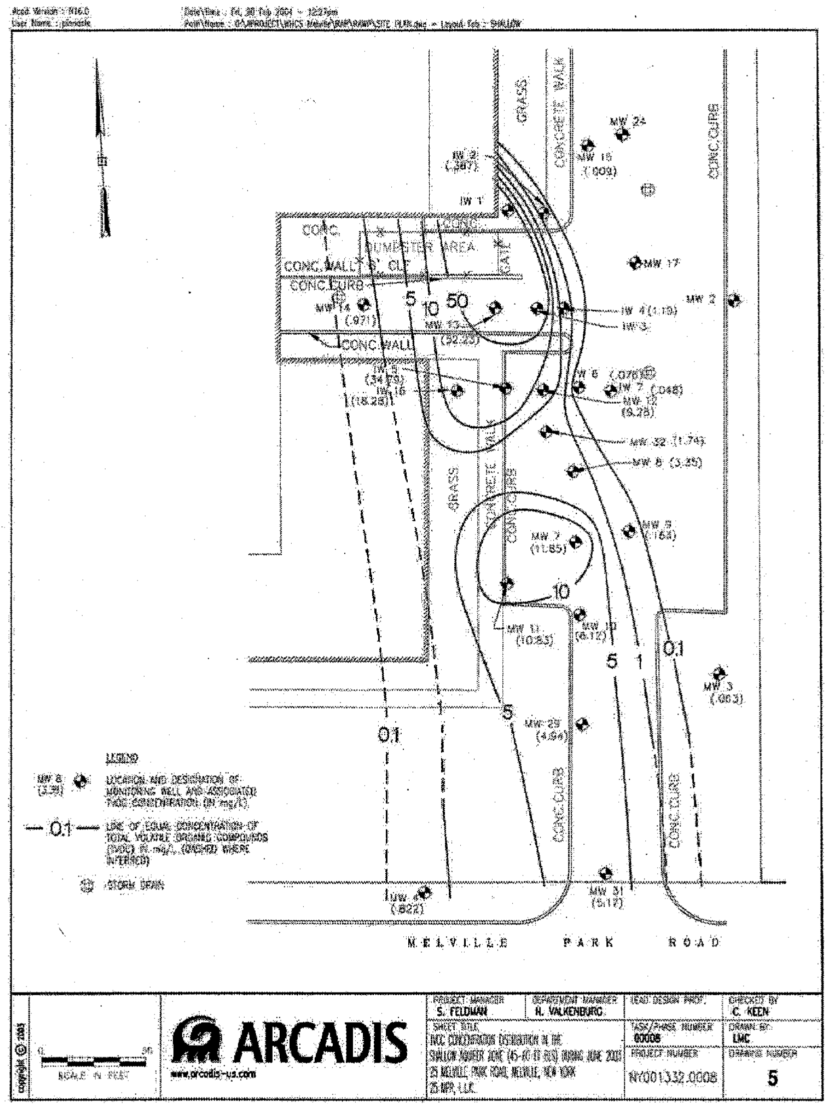
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CONC.CURB
CONC.
DUMPSTER AREA
GATE
CONC. WALL 5' CLF
CONC.CURB
CONC. WALL
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IW 1
MW 24
MW 16 (.009)
MW 17
MW 2
IW 4 (1.19)
IW 3
MW 14 (.971)
MW 13 (32.23)
IW 5 (34.15)
IW 6 (18.28)
MW 6 (.070)
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1
5
10
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MELVILLE PARK ROAD
LEGEND
LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)
LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)
STORM DRAIN
0 30
SCALE IN FEET
ARCADIS
www.arcadis-us.com
PROJECT MANAGER S. FELDMAN
DEPARTMENT MANAGER H. VALKENBURG
LEAD DESIGN PROF.
CHECKED BY C. KEEN
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PROJECT NUMBER NY001332.0008
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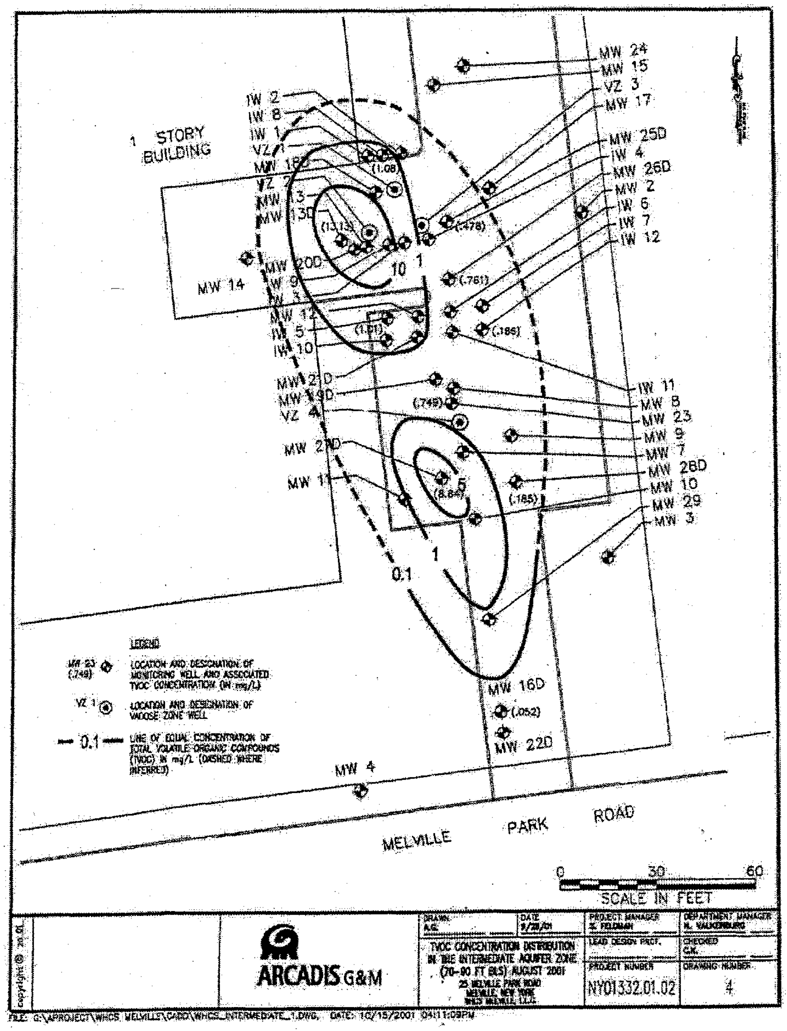

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WHCS MELVILLE, LLC

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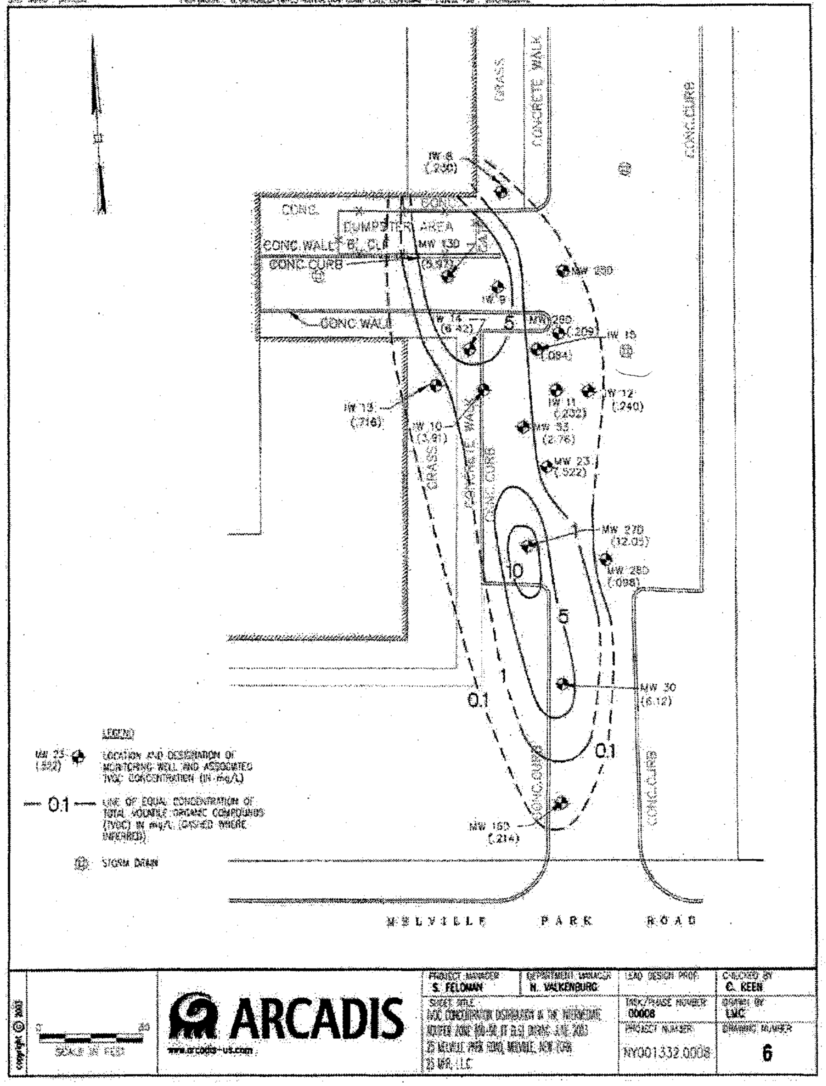

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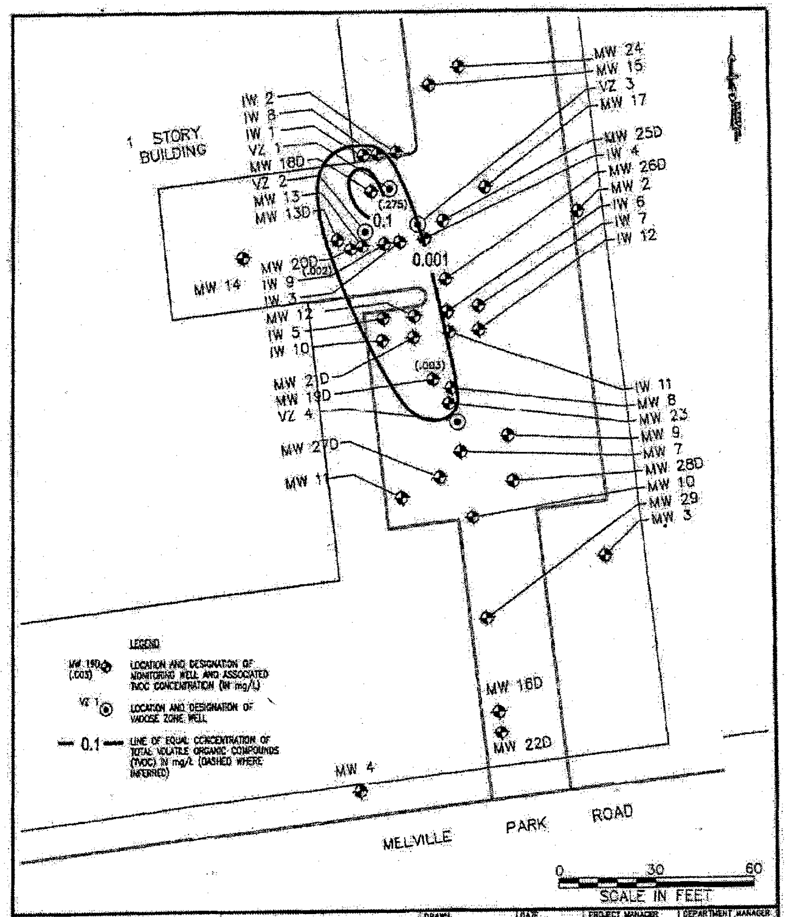

LEGEND

MW 19D (.003) — LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)

VZ 1 ◎ — LOCATION AND DESIGNATION OF VADOSE ZONE WELL

— 0.1 — LINE OF EQUAL CONCENTRATION OF TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) IN mg/L (DASHED WHERE INFERRED)

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DRAWN A.G.
DATE 9/28/01
PROJECT MANAGER S. FELDMAN
DEPARTMENT MANAGER N. VALKENBURG

TVOC CONCENTRATION DISTRIBUTION IN THE DEEP AQUIFER ZONE (100-185 FT BLS) AUGUST 2001
25 MELVILLE PARK ROAD
MELVILLE, NEW YORK
WHCS MELVILLE, L.L.C.

LEAD DESIGN PROF.
CHECKED C.K.
PROJECT NUMBER NY01332.01.02
DRAWING NUMBER 5

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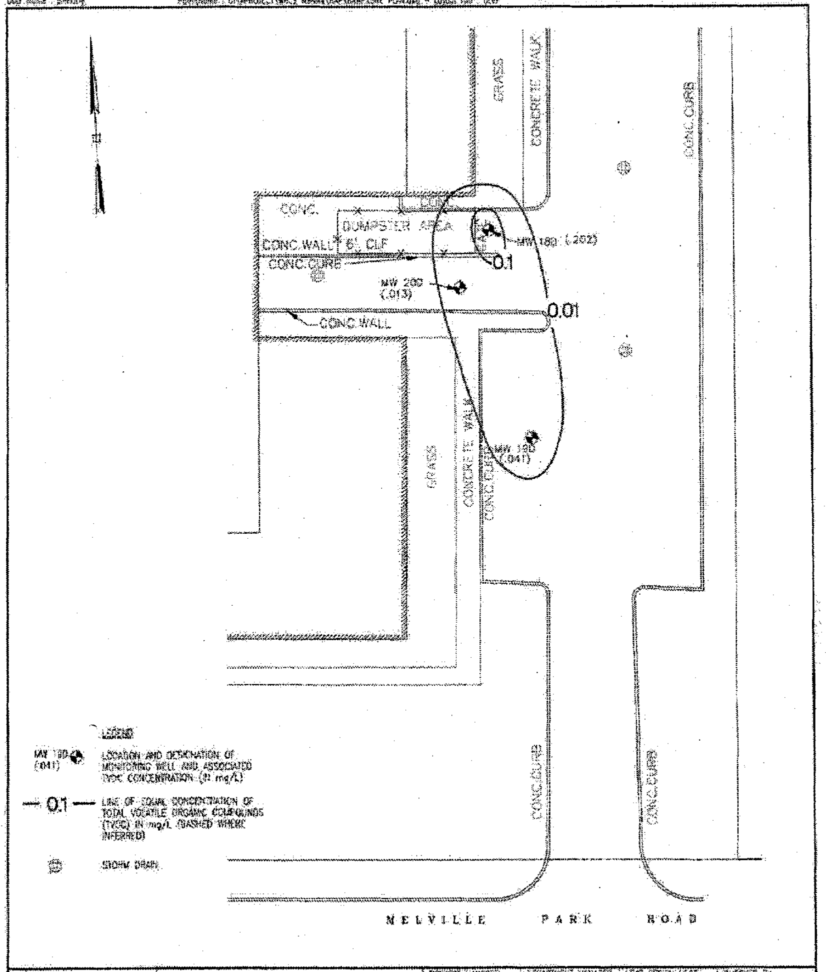

LEGEND

MW 19D (.041) — LOCATION AND DESIGNATION OF MONITORING WELL AND ASSOCIATED TVOC CONCENTRATION (IN mg/L)

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⊕ STORM DRAIN

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0 30
SCALE IN FEET

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DEPARTMENT MANAGER N. VALKENBURG
LEAD DESIGN PROF.
CHECKED BY C. KEEN

SHEET TITLE:
TVOC CONCENTRATION DISTRIBUTION IN THE DEEP AQUIFER ZONE (130-185 FT BLS) DURING JUNE 2003
25 MELVILLE PARK ROAD, MELVILLE, NEW YORK
25 MPR, LLC

TASK/PHASE NUMBER 00008
DRAWN BY LMC
PROJECT NUMBER NY001332.0008
DRAWING NUMBER 7

APPENDIX B

Administrative Record

Administrative Record

New York Twist Drill - Loading Dock Area
Operable Unit No. 1
Site No. 1-52-169

1. Proposed Remedial Action Plan for the New York Twist Drill - Loading Dock Area site, Operable Unit No. 1, dated February 2004, prepared by the NYSDEC.

2. Voluntary Investigation Agreement, Index No. W1-0778-96-11, between NYSDEC and WHCS Real Estate Limited Partnership, executed on March 28, 1997.

3. Voluntary Remediation Agreement, Index No. W1-0778-96-11, between NYSDEC and WHCS Real Estate Limited Partnership, executed on January 13, 1998.

4. "Work Plan for Voluntary Investigation", February 1997, prepared by Camp Dresser & McKee

5. "Voluntary Investigation Report", Volume I, December 1997, prepared by Camp Dresser & McKee

6. "Voluntary Investigation Report", Appendices, December 1997, prepared by Camp Dresser & McKee

7. "Revised *In Situ* Oxidation Pilot Test Work Plan", May 19, 1998, prepared by SECOR International Incorporated

8. "*In Situ* Chemical Oxidation Pilot Test Report of Findings", December 4, 1998, prepared by SECOR International Incorporated

9. "Geophysical Site Characterization Survey, Vertical Induction Profiling Method Report", October 18, 1999, prepared by Ground Truth Technology

10. "Groundwater Sampling Results from August 2001", October 15, 2001, prepared by ARCADIS G&M

11. "Progress Reports 1 through 30: May 2001 through February 2004", 30 documents dated between October 15, 2001 and March 10, 2004, prepared by ARCADIS G&M

12. "Enhanced Reductive Dechlorination Pilot Test Work Plan", April 1, 2003, prepared by ARCADIS G&M

13. "Remedial Action Work Plan", February 11, 2004, prepared by ARCADIS G&M

14. "Fact Sheet, Proposed Remedial Action Plan", February 2004, prepared by NYSDEC