Department of Environmental Conservation

Division of Environmental Remediation

RECORD OF DECISION

Haight Farm Site

Clarendon (T), Orleans County

Site Number 8-37-006

March 1998

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* JOHN P. CAHILL, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Haight Farm Inactive Hazardous Waste Site
Clarendon (T), Orleans County, New York
Site No. 8-37-006

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Haight Farm inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Haight Farm inactive hazardous waste site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography 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 release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Haight Farm site and the criteria identified for evaluation of alternatives the NYSDEC has selected excavation and off-site treatment/disposal of contaminated soil and on-site treatment of contaminated groundwater beneath the spill area by the use of Dual Phase Vapor Extraction (DVE). The components of the remedy are as follows:

- An estimated 1340 cubic yards of contaminated soil from the spill area would be excavated and sent offsite for landfill disposal. If soil concentrations exceed the Universal Treatment Standard (UTS) for TCE of 6 parts per million (ppm), the soil would be treated prior to disposal.

- Following backfilling of the excavation, a Dual Phase Vapor Extraction (DVE) system would be installed to treat the heavily contaminated groundwater beneath the spill area of the site. The DVE unit would be equipped to treat both air and water emissions from the treatment process.

- An operation and maintenance program would be developed, and the treatment unit would be monitored regularly for proper operation and needed maintenance. The unit would be operated until groundwater concentrations drop to below groundwater standards, or until vapor concentrations have reached asymptotic levels for a sustained period of time and continued operation of the treatment unit would not result in significant mass removal of contaminants.

- A groundwater monitoring program would be developed and instituted, to determine the effect of the soil removal and the groundwater treatment on contaminant concentrations in groundwater, both on and off site.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being 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.

3/17/98
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

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SECTION 1: SITE LOCATION AND DESCRIPTION

The Haight Farm Site, No. 8-37-006, is an approximately 2-acre residential property located on Upper Holley Road in the Town of Clarendon, Orleans County, New York. The site, which is located in a rural area, is bordered to the north and south by residential properties, on the west by Upper Holley Road (with a residence directly across the road), and to the east by woodlands. At one time two structures were located on the property; a house, located in the southwest corner of the property, which was demolished in 1995 and a garage, located approximately 35 feet northeast of the house, which burned down in 1994. The northeast portion of the property was cleared of brush and small trees during the Phase 2 RI. Figure 1 shows the site location and layout.

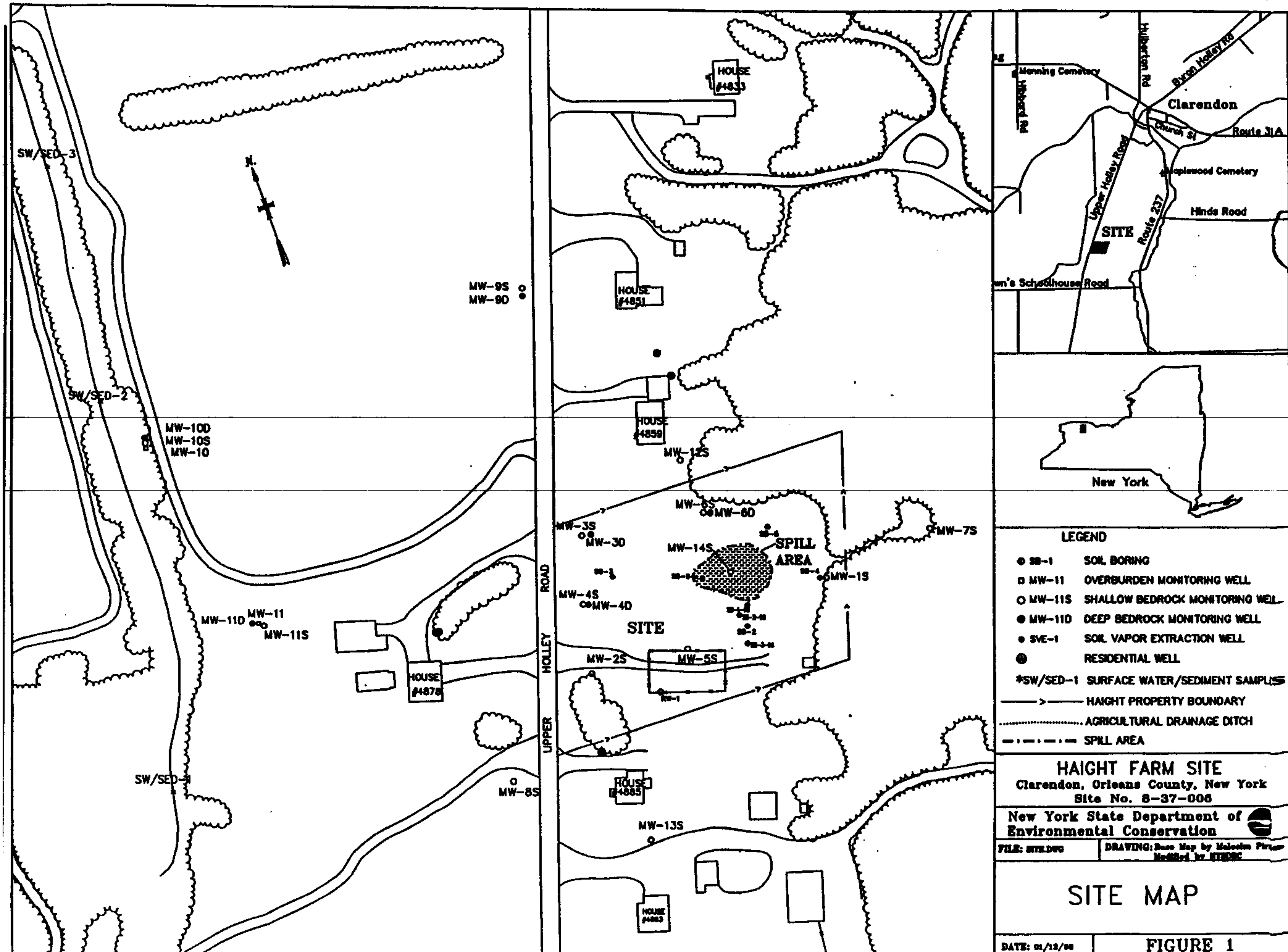
The site is situated on the gently sloping western portion of the Niagara Escarpment, approximately 1300 feet west of the Escarpment. The eastern side of the site is approximately ten feet higher in elevation than the western side. The site, and the area east of Upper Holley Road, is situated in an upland area underlain by shallow bedrock. West of Upper Holley Road, the land surface slopes downward to a mixed terrain of hills and flat-lying muckland. An extensive muckland located west of the site is drained by a network of ditches that discharge into the East Branch of Sandy Creek approximately 1.6 miles north of the site. The nearest of these drainage ditches is located approximately 500 feet west of the Haight Farm site.

SECTION 2: SITE HISTORY

2.1 Operational/Disposal History

The property comprising the site was purchased by the Earl Haight family in 1953 and used as their primary residence. Approximately 40 drums were stored on the property by the property owner from some time in 1969 through 1984. The drums came from Erdle Perforating Company, in the nearby town of Holley. In 1984, while the drums were being removed by the property owner, the contents of several drums, estimated at 200 gallons, were spilled. The NYSDEC was contacted by the New York State Police, and conducted an emergency drum removal. Under the New York State Superfund Emergency Drum Removal Program, thirty barrels of liquid waste (approximately 1000 gallons) were repacked and removed, along with an additional 13 empty drums. In addition to the drums which spilled, other drums were corroded and showed signs of leakage. Sample results showed that the drums contained the degreasing solvent trichloroethene (TCE), one of a class of compounds known as volatile organic compounds (VOCs).

Following the spill, TCE contamination was identified in three residential water wells, two on properties adjacent to the site, and the Haight residence well. The NYSDEC currently maintains water treatment systems on the two residential wells still in use (the house on the site was demolished by the Town in 1995), and the NYSDOH and the Orleans County Health Department



Clarendon
Byron Holley Rd
Hulberton Rd
Church St
Route 31A
Maplewood Cemetery
Manning Cemetery
Hibbard Rd
Hinds Road
Upper Holley Road
Route 237
SITE
Schoolhouse Road
New York
LEGEND
SB-1 SOIL BORING
MW-11 OVERBURDEN MONITORING WELL
MW-11S SHALLOW BEDROCK MONITORING WELL
MW-11D DEEP BEDROCK MONITORING WELL
SVE-1 SOIL VAPOR EXTRACTION WELL
RESIDENTIAL WELL
*SW/SED-1 SURFACE WATER/SEDIMENT SAMPLES
HAIGHT PROPERTY BOUNDARY
AGRICULTURAL DRAINAGE DITCH
SPILL AREA
HAIGHT FARM SITE
Clarendon, Orleans County, New York
Site No. 8-37-006
New York State Department of Environmental Conservation
SITE MAP
FIGURE 1
UPPER HOLLEY ROAD
SW/SED-3
SW/SED-2
SW/SED-1
MW-10D
MW-10S
MW-10
MW-11D
MW-11
MW-11S
MW-9S
MW-9D
MW-8S
HOUSE #4878
HOUSE #4833
HOUSE #4851
HOUSE #4859
HOUSE #4885
HOUSE #4883
MW-12S
MW-6S
MW-6D
MW-3S
MW-3D
MW-14S
SPILL AREA
MW-7S
MW-1S
MW-4S
MW-4D
SITE
MW-2S
MW-5S
MW-13S
N

continue to monitor residential wells in the vicinity of the site. A municipal water line is scheduled to be installed along Upper Holley Road by the end of 1998, bringing municipal water to the affected properties.

2.2 Remedial History

In 1990-1991, the Potential Responsible Parties (PRPs), Erdle Perforating Company and Earl M. Haight, conducted a Phase I RI. Results of the RI indicated soil and groundwater contamination on site. The primary contaminant of concern is trichloroethene (TCE). Other contaminants include lower concentrations of 1,2-dichloroethene (1,2-DCE), which is a breakdown product of TCE, as well as the chlorinated solvents trichloroethane (TCA) and tetrachloroethane (PCE), and the petroleum hydrocarbons benzene, toluene, and xylene. These compounds are only found where TCE is present.

After protracted legal negotiations the PRPs were determined to be financially unable to continue the remedial program, therefore the NYSDEC assumed responsibility for completing the remediation of this site. In 1995-1996 the NYSDEC performed a Phase II RI, to further define contamination on site and to characterize the off-site groundwater contamination. The findings of the Phase II Remedial Investigation are detailed below.

SECTION 3: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the Site presents a significant threat to human health and the environment, the NYSDEC has recently completed a Phase II Remedial Investigation/Feasibility Study (RI/FS).

3.1 Summary of the Remedial Investigation

The purpose of the Phase 2 Remedial investigation was to define the extent of soil and groundwater contamination both on and off site, and to determine whether Soil Vapor Extraction would be an effective technology for cleaning up the contaminated soil on site.

The Phase II RI was conducted in 2 phases. The first phase was conducted between November 1995 and July 1996. A report entitled "Phase II Remedial Investigation Report, Haight Farm Superfund Site, Clarendon, New York," dated July 1996, has been prepared describing the field activities and findings of the RI in detail. The second phase, consisting of a Dual Phase Vapor Extraction Pilot Study, was conducted between November 1996 and January 1997. A report entitled "Dual Phase Vacuum Extraction Pilot Study Results" has been prepared describing the results of the pilot study.

The RI included the following activities:

- Soil gas survey to determine the extent of soil contamination.
- Installation of soil borings and monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions.
- Collection of surface soil, surface water and sediment samples.
- A Soil Vapor Extraction pilot test, to determine the effectiveness of this technology in remediating the contaminated soil on site.
- A Dual Phase Vapor Extraction pilot test, to determine the effectiveness of this technology in remediating the contaminated soil and groundwater on site.

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater, drinking water and surface water SCGs identified for the Haight Farm site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. NYSDEC TAGM 4046 soil cleanup guidelines were used as SCGs for soil and the NYSDEC Technical Guidance for Screening Contaminated Sediments was used for surface water sediments.

Based upon the results of the remedial investigation, in comparison to the SCGs and potential public health and environmental exposure routes, certain areas and media of the site require remediation. These are summarized below. More complete information can be found in the Phase II RI Report.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, SCGs are given for each medium.

3.1.1 Nature of Contamination:

As described in the Phase II RI Report, many soil gas, soil, groundwater, surface water, and sediment samples were collected at the Site to characterize the nature and extent of contamination. The analytical results confirmed the results of the Phase I RI, that the primary contaminant of concern is the chlorinated solvent trichloroethene. Trichloroethene (also called trichloroethylene, or TCE) is a colorless, man-made liquid which is used primarily as a solvent for removing grease from metal. It has a variety of other uses such as a dry cleaning solvent and as a chemical intermediate (building block) in the production of other chemicals. It generally gets into drinking water by improper waste disposal. Chlorinated solvents tend to persist in the environment and do not break down quickly. TCE in particular is volatile but only partially soluble in water, therefore it will tend to absorb onto soil particles and evaporate into the air and soil gas.

Other contaminants found at the site include other chlorinated solvents, and petroleum hydrocarbons. These compounds were found in significantly lower concentrations than TCE in both soil and groundwater, and were only present in locations where TCE was also found. The other chlorinated solvents include 1,2-dichloroethene, which is a breakdown product of TCE, and trichloroethane and tetrachloroethene, which are also frequently used in manufacturing as solvents and degreasers. The petroleum hydrocarbons found included benzene, toluene, ethylbenzene, and xylenes, which are common components of gasoline. Benzene and toluene are also frequently used in manufacturing. These compounds, as well as the chlorinated solvents, may have been present in the drums stored on the property which spilled. Since the other two compounds, ethylbenzene and xylenes, were found near the location of the former garage, they likely resulted from gasoline spilled or leaked near the garage.

3.1.2 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in soil and groundwater and compares the data with the proposed remedial action levels (SCGs) for the Site. The following are the media which were investigated and a summary of the findings of the investigation.

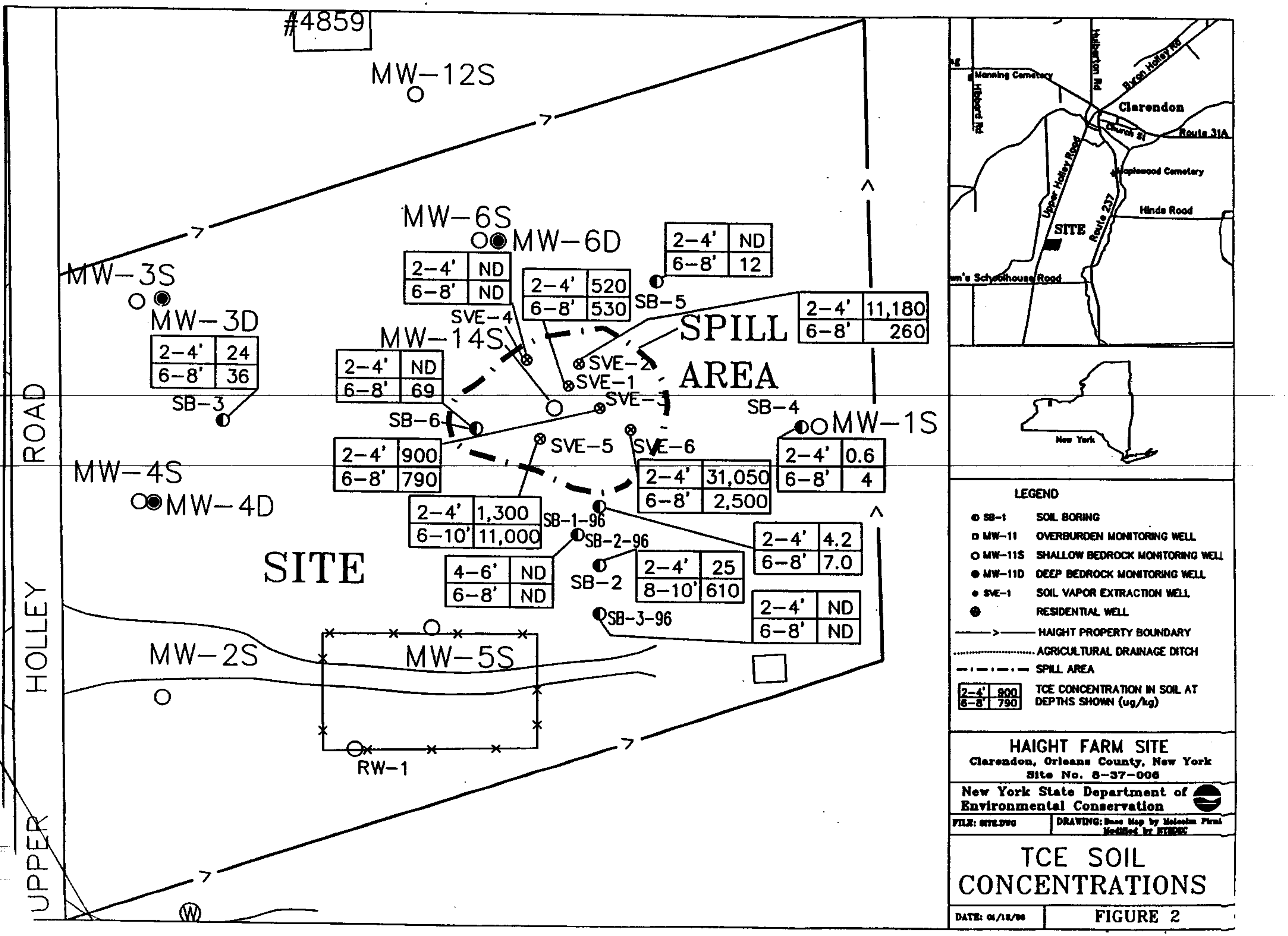
Soil/Bedrock

The geology of the site consists of approximately 10 feet of overburden soil, on top of fractured dolomite bedrock. The depth to bedrock varies from 7.5 feet in the center of the site, to 15 feet on the western edge of the site. In the spill area, the soil is described as follows:

- Fine-grained sand and silt layer, from 0-6 feet deep.
- Sand and gravel layer, from 6 to an average of 12 feet deep.

Sampling during the Phase II RI to determine the extent of chlorinated solvents in soil included both a soil gas survey and soil samples collected from borings and analyzed, to correlate soil gas readings with soil concentrations. Soil contamination on site at concentrations exceeding the guidance levels in NYSDEC Technical and Administrative Guidance Memoranda (TAGM) 4046, "Determination of Soil Cleanup Objectives and Cleanup Levels," appears to be confined to the spill area. The spill area is approximately 3000 square feet in extent, as shown in Figure 2. TCE concentrations here range from 25 parts per billion (ppb) to 31,000 ppb, with an average concentration of approximately 3000 ppb, as compared to the TAGM 4046 cleanup objective for TCE of 700 ppb. Low concentrations of tetrachloroethene and trichloroethane in some of the samples indicate that small amounts of these chlorinated solvents may also have been present in the drums which were spilled. One sample, in the spill area, contained elevated concentrations of the petroleum hydrocarbons benzene (380 ppb), toluene (3900 ppb), and xylene (6900 ppb).

The TCE contamination in the soil extends down to the top of bedrock, a depth of approximately 12 feet, and is primarily concentrated in the spill area, as shown in Figure 2. The volume of contaminated soil in the spill area is estimated at 1340 cubic yards. Of this volume, 82% of the



#4859
MW-12S
MW-6S
MW-6D
MW-3S
MW-3D
2-4' 24
6-8' 36
SB-3
2-4' ND
6-8' ND
SVE-4
MW-14S
2-4' ND
6-8' 69
SB-6
2-4' 900
6-8' 790
2-4' 520
6-8' 530
2-4' ND
6-8' 12
SB-5
SPILL AREA
2-4' 11,180
6-8' 260
SVE-2
SVE-1
SVE-3
SVE-5
SVE-6
SB-4
MW-1S
2-4' 0.6
6-8' 4
2-4' 31,050
6-8' 2,500
2-4' 1,300
6-10' 11,000
SB-1-96
SB-2-96
2-4' 4.2
6-8' 7.0
4-6' ND
6-8' ND
SB-2
2-4' 25
8-10' 610
SB-3-96
2-4' ND
6-8' ND
MW-4S
MW-4D
SITE
MW-2S
MW-5S
RW-1
UPPER HOLLEY ROAD
Clarendon
Route 31A
Church St
Manning Cemetery
Hilbert Rd
Halberton Rd
Byron Holley Rd
Upper Holley Road
Route 237
Maplewood Cemetery
Hinds Road
SITE
Schoolhouse Road
New York
LEGEND
SB-1 SOIL BORING
MW-11 OVERBURDEN MONITORING WELL
MW-11S SHALLOW BEDROCK MONITORING WELL
MW-11D DEEP BEDROCK MONITORING WELL
SVE-1 SOIL VAPOR EXTRACTION WELL
RESIDENTIAL WELL
HAIGHT PROPERTY BOUNDARY
AGRICULTURAL DRAINAGE DITCH
SPILL AREA
2-4' 900
6-8' 790
TCE CONCENTRATION IN SOIL AT DEPTHS SHOWN (ug/kg)
HAIGHT FARM SITE
Clarendon, Orleans County, New York
Site No. 8-37-006
New York State Department of Environmental Conservation
FILE: SITE.DWG
DRAWING: Base Map by Malcolm Pirnie Modified by NYSDEC
TCE SOIL CONCENTRATIONS
FIGURE 2

contaminant mass is estimated to be contained in the top sand and silt layer (0-6'). 18% of the contaminant mass is estimated to be contained in the lower sand and gravel layer, at a depth of 6-12'. The bedrock contains a very small percent of the total mass of contaminants. Concentrations have dropped somewhat since the Phase I RI, indicating loss of TCE to the air through volatilization and to the groundwater through dissolution, but concentrations remain well above the cleanup objectives.

Groundwater

The groundwater geology is described as follows:

- A shallow aquifer comprised of saturated sand and gravel, and the saturated, fractured and weathered upper bedrock zone, which are in direct hydraulic communication.

- A middle zone made up of competent, fine grained dolomite, underlying the shallow aquifer. This rock restricts the movement of water due to the small number of fractures in the rock, but does allow some movement of water to occur.

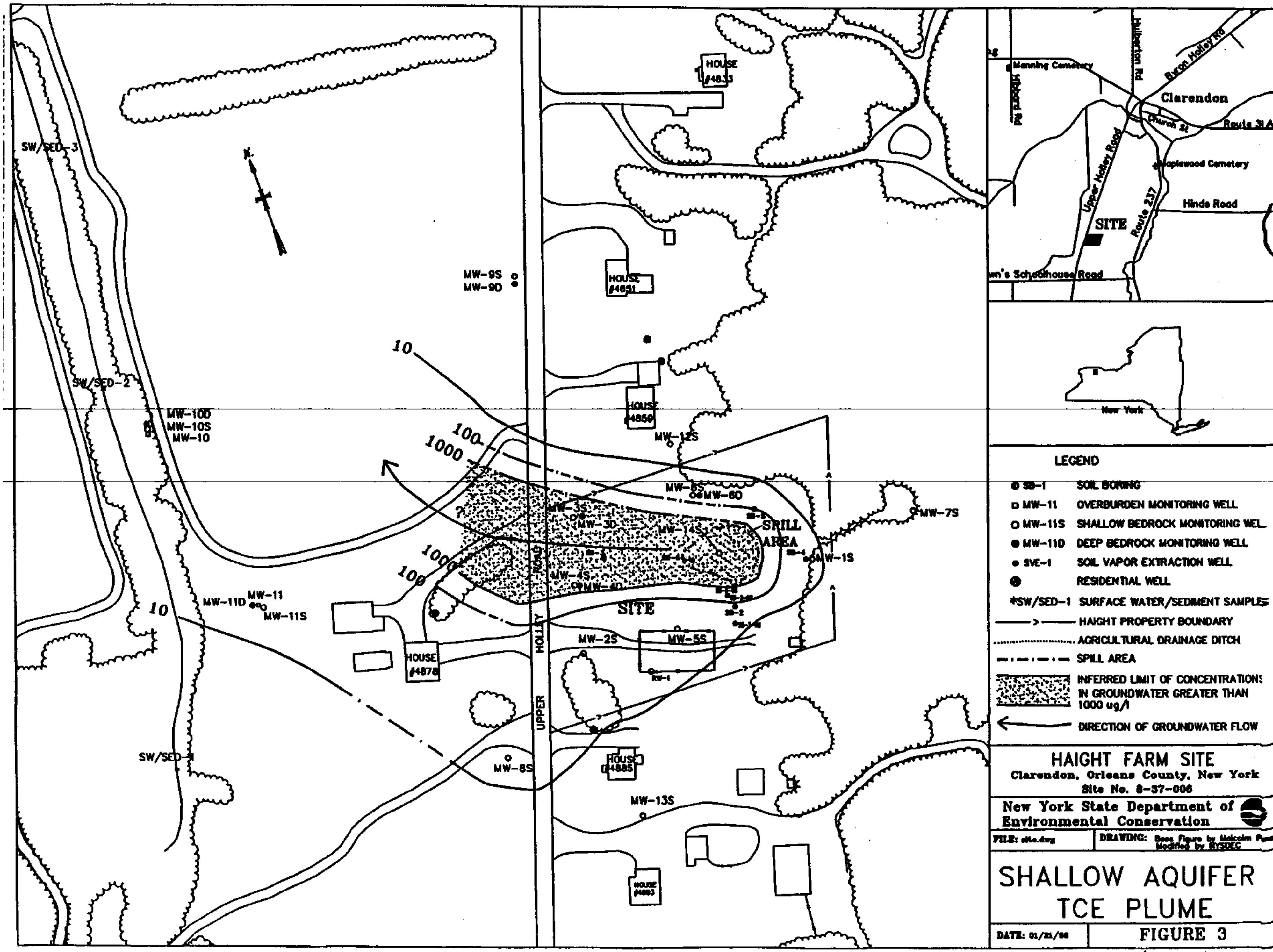
- A deep, water bearing zone of more highly fractured dolomite, occurring at approximately 38 to 58 feet below grade.

- A lower shale aquitard.

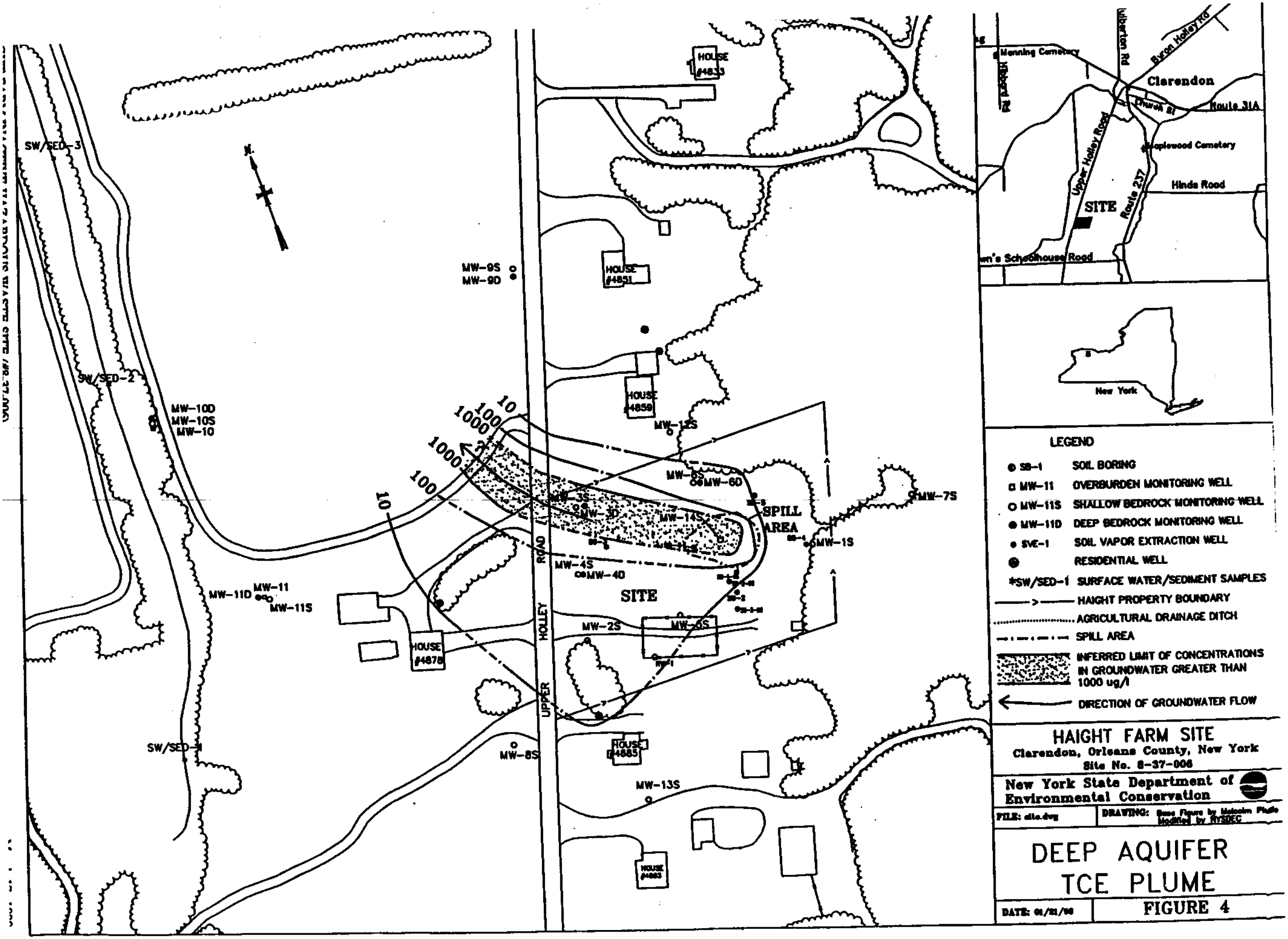
Groundwater sampling in the Phase II RI was conducted in three identifiable zones: the shallow aquifer located in the overburden and upper highly fractured bedrock; the middle zone of less permeable bedrock; and the deep water bearing zone of more highly fractured bedrock. The middle zone and the deep water bearing zone were sampled at 10 foot intervals using packer sampling procedures, to determine the vertical distribution of VOCs. Contamination at concentrations exceeding groundwater standards was found throughout the formation, including elevated concentrations in the less permeable middle zone. Figures 3 and 4 show the extent of TCE contamination in the shallow and deep aquifer at concentrations of 10 ppb to 100 ppb, 100 ppb to 1000 ppb, and greater than 1000 ppb. The leading edges of the plumes have not been fully delineated. TCE concentrations in groundwater in the spill area range from 40 ppb up to 8,800 ppb, as compared to the drinking water standard of 5 ppb.

Other contaminants found in the groundwater include the TCE breakdown product 1,2-dichloroethene (1,2-DCE), the chlorinated solvents TCA and PCE, and the petroleum hydrocarbons benzene and toluene. These compounds were found in low concentrations, in scattered wells.

Shallow groundwater wells were sampled three times during the Phase I RI in 1990-91, immediately prior to the Phase II RI in August 1995, during the Phase II RI in December 1995, and again in May 1996. Concentrations of TCE in the residential wells adjacent to the site vary significantly with time, but do show an overall downward trend. Concentrations of TCE in the shallow groundwater



SW/SED-3
N.
MW-9S
MW-9D
10
SW/SED-2
MW-10D
MW-10S
MW-10
100
1000
1000
100
MW-11D
MW-11
MW-11S
10
HOUSE #4878
UPPER HOLLEY ROAD
SW/SED-1
MW-8S
HOUSE #4833
HOUSE #4851
HOUSE #4859
MW-12S
MW-6S
MW-6D
MW-3S
MW-3D
MW-4S
MW-4D
SPILL AREA
MW-7S
MW-1S
SITE
MW-2S
MW-5S
HOUSE #4885
MW-13S
HOUSE #4883
Manning Cemetery
Hibbard Rd
Hulberton Rd
Byron Holley Rd
Clarendon
Church St
Route 31A
Maplewood Cemetery
Upper Holley Road
Route 237
Hinde Road
SITE
Schoolhouse Road
New York
LEGEND
SB-1 SOIL BORING
MW-11 OVERBURDEN MONITORING WELL
MW-11S SHALLOW BEDROCK MONITORING WELL
MW-11D DEEP BEDROCK MONITORING WELL
SVE-1 SOIL VAPOR EXTRACTION WELL
RESIDENTIAL WELL
*SW/SED-1 SURFACE WATER/SEDIMENT SAMPLES
HAIGHT PROPERTY BOUNDARY
AGRICULTURAL DRAINAGE DITCH
SPILL AREA
INFERRED LIMIT OF CONCENTRATIONS IN GROUNDWATER GREATER THAN 1000 ug/l
DIRECTION OF GROUNDWATER FLOW
HAIGHT FARM SITE
Clarendon, Orleans County, New York
Site No. 8-37-006
New York State Department of Environmental Conservation
FILE: site.dwg
DRAWING: Base Figure by Malcolm Pirnie Modified by NYSDEC
SHALLOW AQUIFER
TCE PLUME
DATE: 01/21/98
FIGURE 3



LEGEND
SB-1 SOIL BORING
MW-11 OVERBURDEN MONITORING WELL
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INFERRED LIMIT OF CONCENTRATIONS IN GROUNDWATER GREATER THAN 1000 ug/l
DIRECTION OF GROUNDWATER FLOW
HAIGHT FARM SITE
Clarendon, Orleans County, New York
Site No. 8-37-006
New York State Department of Environmental Conservation
FILE: site.dwg
DRAWING: Base Figure by Malcolm Pirnie Modified by NYSDEC
DEEP AQUIFER
TCE PLUME
FIGURE 4
DATE: 01/21/98
Clarendon
Byron Holley Rd
Route 31A
Church St
Maplewood Cemetery
Hinds Road
Route 237
Upper Holley Road
SITE
Hibbard Rd
Manning Cemetery
New York
UPPER HOLLEY ROAD
SPILL AREA
SITE
HOUSE #4833
HOUSE #4851
HOUSE #4859
HOUSE #4878
HOUSE #4885
HOUSE #4883
MW-9S
MW-9D
MW-10D
MW-10S
MW-10
MW-11D
MW-11
MW-11S
MW-12S
MW-6S
MW-6D
MW-7S
MW-3S
MW-3D
MW-14S
MW-1S
MW-4S
MW-4D
MW-2S
MW-5S
MW-8S
MW-13S
SW/SED-1
SW/SED-2
SW/SED-3
N
10
100
1000

monitoring wells also vary significantly depending upon the groundwater elevation, but have not shown an overall downward trend. This information, combined with the low solubility of TCE in water and the high concentrations of TCE in soil in the source area, indicate that concentrations of TCE in groundwater are likely to remain elevated for the foreseeable future as long as the spill area remains as an unremediated source of contamination.

One concern during the Phase II RI was the possible presence of pools of TCE that had not dissolved into the groundwater (known as Dense Non-Aqueous Phase Liquid (DNAPL)), in the fractured bedrock. Because TCE is relatively insoluble in water, DNAPL would form an ongoing source of groundwater contamination that would take a very long time to naturally attenuate. At the time of the spill it was estimated that 200 gallons were released from the drums, which samples indicated to contain up to 65% TCE. An evaluation of the potential for DNAPL presence was conducted during the Phase II RI, with the conclusions being that 1) historically, the presence of DNAPL immediately following the spill appears likely, and 2) currently, while the presence of DNAPL in the bedrock cannot be ruled out, it does not appear to be strongly indicated at this time.

Sediments and Surface Water

Three sediment and surface water samples were collected from the agricultural drainage ditch located approximately 500 feet west of the site, to determine whether contaminated groundwater was discharging into the ditch, resulting in an impact to the environment. All of the samples were nondetect for site contaminants, indicating that either the contaminants are not reaching the drainage ditch, or they are volatilizing into the air and/or being diluted by the water in the drainage ditch.

3.2 Interim Remedial Measures - Vapor Extraction Pilot Studies:

Interim Remedial Measures (IRMs) are conducted at sites when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. An IRM using Soil Vapor Extraction to treat the contaminated soil in the spill area was planned for the Haight Farm site. However, pilot studies determined that, given the specific geology of the site, this technology would not be effective.

The planned IRM was based upon presumptive remedies developed by the USEPA for sites with volatile organic compounds in soils, such as those found at the Haight Farm site. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. Based upon the following presumptive remedy guidance directives: *Presumptive Remedies: Policy and Procedures*, USEPA Directive 9355.0-47FS, September 1993, and *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites With Volatile Organic Compounds in Soils*, USEPA Directive: 9355.0-48FS, September 1993, the presumptive remedies identified by EPA are Soil Vapor Extraction (SVE), Thermal Desorption, and Incineration. The Directive indicates that SVE is the primary presumptive remedy, with thermal desorption as the primary ex-situ presumptive remedy, and incineration the secondary ex-situ presumptive remedy.

Based upon the above guidance, two pilot studies were conducted during the RI, to determine whether SVE would be an effective remedy for the contaminated soil in the spill area. A Soil Vapor Extraction (SVE) pilot test was performed during the Phase II RI, followed by a Dual Phase Vacuum Extraction (DVE) pilot test.

In the SVE process a vacuum is applied to the soil, causing the volatile contaminants to evaporate into the air within the pore spaces of the soil (called soil vapor). The volatile compounds are then extracted from the soil vapor and treated by activated carbon to remove the contaminants. The carbon is then removed for off-site treatment and disposal.

Results of the SVE pilot test indicated that a vacuum was successfully induced in the overburden. However, the layers of soil at the site and the associated heterogeneity resulted in variations of air permeability in the subsurface and the associated induced vacuum measured at the observation points. This heterogeneity resulted both from the presence of differing layers of soil, and from the variations in soil grain sizes within the layers. In some instances a strong vacuum would be induced at some distance from the air extraction point, while closer to the extraction point almost no vacuum would be induced. As a result, it was concluded that SVE would not be likely to successfully affect all of the soil within the spill area.

A similar system termed dual phase vacuum extraction (DVE), which uses a stronger vacuum than SVE systems, is potentially more effective than SVE for remediating the contaminated soil and bedrock. Because of the stronger vacuum used, it appeared likely that a DVE system could more effectively remove contaminants from the less permeable sand and silt layer. An additional concern in the spill area is that during high water conditions the groundwater rises into the more highly fractured bedrock and soil, which would diminish the effectiveness of SVE. With the stronger vacuum, the dual phase vacuum extraction system can remove water as well as soil vapor, thereby lowering the water table and allowing soil vapors to be removed from a greater depth. An IRM Decision Document was issued in July 1996 calling for the use of DVE to remediate the contaminated soil, dependent on a pilot test to be performed first.

The DVE pilot test was performed both to determine the effectiveness of a stronger vacuum, and to measure more precisely the different reactions to the vacuum in the upper sand and silt overburden, the lower sand and gravel overburden, and the fractured bedrock. The results, as discussed in the report "Dual Phase Vacuum Extraction Pilot Study Results," indicated that DVE would effectively remediate the lower sand and gravel layer, which contains approximately 18% of the total mass of the contaminants. However, neither SVE nor DVE would be effective at removing contaminants from the upper sand and silt layer, where most of the contaminant mass is located, due to the soil variability, low air permeability of this layer, and short-circuiting to the more permeable, sand and gravel layer below. While the increased vacuum did increase yields from the upper sand and silt layer, it still did not successfully influence all of the soil.

The DVE pilot test also included an evaluation of the effectiveness of DVE at remediating the heavily contaminated groundwater directly beneath the spill area. The results indicated that DVE would be effective, however, because of the relatively low porosity of the bedrock and the resulting slow movement of groundwater, extraction wells would have to be spaced closely together, on the order of 10 feet, to effectively influence the groundwater beneath the spill area.

3.3 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 health risks can be found in Section 5 of the Phase I RI Report.

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Completed pathways which are known to or may exist at the site include:

- A potential pathway for trespassers (currently) or future site users to be exposed to chlorinated solvents in surface soils.

- A potential for future construction workers to be exposed to volatile organic compounds through inhalation of vapors and fugitive dust emissions during possible future construction activities.

- A potential for future construction workers to be exposed to contaminated soils by direct contact during possible future construction activities.

- Currently a potential for nearby residents to be exposed to chlorinated volatile organic compounds through ingestion of contaminated groundwater exists. Groundwater in the area is used extensively for drinking water by the residents in the area via private supply wells. Without the water treatment systems already in place, exposure through ingestion would occur. The possibility of completion of this pathway will be reduced by the water line scheduled to be installed along Upper Holley Road by the end of 1998.

3.4 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. An apparent completed exposure pathway for terrestrial plants and wildlife to contaminants in surface soils has been identified. The Fish and Wildlife Impact Assessment included in Section 7 of the Phase II RI presents a more detailed discussion of the potential impacts from the site to fish and wildlife resources.

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 Potential Responsible Parties (PRP) for the site, documented to date, include: Erdle Perforating, and Earl M. Haight (now deceased). The NYSDEC and the PRPs entered into a Consent Order in March 1989 (Index No. B8-0067-8412). The Order obligated the responsible parties to implement a Remedial Investigation/Feasibility Study (RI/FS) remedial program.

The PRPs performed the Phase I RI at the site. After lengthy legal negotiations, it was determined that Erdle Perforating was financially unable to complete the RI/FS or any subsequently required remedial program. Therefore, the NYSDEC performed the Phase II RI and the FS, and will complete the remediation of this site using the State Superfund.

SECTION 5: 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. The overall remedial goal is to meet all Standards, Criteria, and Guidance (SCGs) and be protective of human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Reduce, control, or eliminate to the extent practicable the contamination present within the soils present at the site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.
- Prevent, to the extent possible, continued migration of contaminants to groundwater and contamination of downgradient water supply wells.
- Provide, to the extent practicable, for attainment of SCGs for groundwater quality.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Haight Farm site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled "Feasibility Study Report for the Haight Farm Inactive Hazardous Waste Disposal Site", January 1998.

A summary of the detailed analysis follows.

6.1 Description of Alternatives

The potential remedies are intended to address the contaminated soil and groundwater at the site. As used in the following text, the "Time to Implement" reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction, operate the remedy, or to negotiate with responsible parties for implementation of the remedy. The "Estimated Time to Completion" reflects the estimated length of time that the remedial system would have to be operated to achieve the remedial objectives. For example, with Alternative 2 the DVE treatment system could be constructed and installed on the site in three to six months. The DVE system would then have to be operated for one to two years before concentrations of contaminants in the soil would drop to below the cleanup objectives.

6.1.1 Alternatives for Soil

Alternative 1
No Action

The No Action Alternative is evaluated as a procedural requirement and as a baseline to evaluate the other alternatives. Under this alternative, no remedial action would be taken for either the contaminated soil or the contaminated groundwater, and maintenance of the residential drinking water filters would be discontinued when the water line is installed on Upper Holley Road. There would be no additional groundwater monitoring. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2
Dual Phase Vapor Extraction (DVE) with Pneumatic Fracturing

Present Worth:	$ 364,400
Capital Cost:	$ 95,000
Annual O&M:	$ 148,700
Time to Implement	3-6 months
Estimated Time to Completion	1 - 2 years

This alternative would use DVE to remove contaminants from the overburden, in conjunction with a DVE enhancement technology, pneumatic fracturing, to enhance extraction rates from the geologic formations with low permeability present at the site. In this process, high pressure air would be injected into the formation, fracturing the low permeability soils, creating horizontal channels which increase the flow of air, thereby enhancing the process. The alternative would include the installation of vapor extraction wells, and the operation of a vacuum blower system to extract soil vapors from the overburden, with treatment of the emissions. The soil fracturing would be performed before starting the DVE system. The fracturing may have to be repeated or material to keep the fractures open may need to be injected, depending upon the soil response and settling. The system would be operated until the site cleanup objectives have been met, or until the maximum practicable removal has been achieved.

Alternative 3
In-Situ Thermal Desorption

Present Worth:	$ 373,900
Capital Cost:	$ 373,900
Annual O&M:	$ 0
Time to Implement	3-6 months
Estimated Time to Completion	9 months - 1 year

Thermal desorption is an innovative technology for the treatment of organic contaminated soil, sediment, and sludge which generates a lower volume of off-gas, has less environmental impact, and fewer permitting requirements than many other on-site treatment technologies. Thermal desorption technologies use heat to physically separate organic compounds from a media (such as soil). In situ thermal desorption consists of heating the soil in place, and extracting the desorbed organic compounds using a vacuum extraction system. For this alternative, wells would be installed in the overburden, and heating elements placed in the wellbores. The heating elements would heat the soil to a temperature of up to 1,000°C, vaporizing the contaminants in the soil. The vapors would be drawn up through the wells by a vacuum system. As the vapors are drawn through the soil, most contaminants would be destroyed in the extremely hot soil near the heat source. The chlorine generated by the breakdown of the chlorinated solvents would be stabilized by precipitation with natural soil elements, principally carbonates and iron, to form stable chlorides. Remaining contaminants would be cleaned in a vapor treatment system, consisting of a flameless thermal oxidizer and activated carbon.

Alternative 4
Excavation and Off-Site Treatment

Present Worth:	$ 317,300
Capital Cost:	$ 317,300
Annual O&M:	$ 0
Time to Implement	3-6 months
Estimated Time to Completion	3-6 months

For this alternative, approximately 1,340 cubic yards of contaminated soil exceeding the remedial objective of 700 parts per billion (ppb) would be excavated and transported to an off-site RCRA permitted treatment facility. Excavation would continue vertically and laterally until confirmatory samples demonstrate complete removal of contaminated soil above the remedial goals. Soil with concentrations of TCE exceeding the Universal Treatment Standard (UTS) of 6 ppm would be treated by the treatment facility prior to being disposed of in a landfill. Soil with concentrations of TCE below the UTS (and therefore below the Contained-In Criteria of 64 ppm) would be disposed of in an industrial solid waste landfill. Clean fill and topsoil would be imported to fill the excavation.

6.1.2 Alternatives for Groundwater

The evaluation of the no action alternative above includes an evaluation of no further action for groundwater. The alternatives evaluated in this section, in particular the limited action alternative, assume that one of the treatment/disposal alternatives for soil described above is selected and the contaminated soil acting as the source of groundwater contamination would be remediated.

Alternative GW1
Limited Action

Present Worth:	$ 179,700
Capital Cost:	$ 49,300
Annual O&M:	$ 11,900
Time to Implement	N/A
Estimated Time to Completion:	10 years

The limited action alternative would consist of groundwater monitoring following the soil source area remediation. An additional well pair would be installed at the leading edge of the plume. Eight groundwater monitoring wells would be sampled quarterly for the first year and then annually for up to thirty years to determine whether groundwater contaminant concentrations are decreasing as expected. If groundwater contaminant concentrations do not drop with time, the need for further groundwater treatment would be re-evaluated.

Alternative GW2
On-Site Dual Phase Vapor Extraction

Present Worth:	$ 350,200
Capital Cost:	$ 86,200
Annual O&M: (first two years)	$ 77,100
(next three years)	$ 12,000
Time to Implement	3-6 months
Estimated Time to Completion	5 years

This alternative would extract and treat the heavily contaminated groundwater immediately beneath the spill area, which is acting as a secondary source of contamination for off-site groundwater. The alternative would focus on the shallow aquifer in the overburden and highly fractured surface of the bedrock at depths of 13 to 17 feet. Approximately 10 vapor extraction wells would be installed into the middle layer of less fractured bedrock, based on the results of the DVE pilot study performed at the site. The extracted water and vapors would be treated on site using carbon, and the treated water would be discharged into an upgradient recharge trench. This alternative would also remove contaminants from the fractured bedrock above the groundwater. An additional well pair would be installed at the leading edge of the plume. Selected groundwater monitoring wells would be sampled annually for up to thirty years to determine whether groundwater contaminant concentrations are decreasing as expected.

Alternative GW3
Groundwater Extraction and Treatment

Present Worth:	$ 2,003,500
Capital Cost:	$ 635,600
Annual O&M:	$ 177,200
Time to Implement	3-6 months
Estimated Time to Completion	10 years

This alternative would extract and treat the contaminated groundwater both on and off site. A series of groundwater extraction wells would be installed along the centerline of the shallow and the deep aquifer plumes, extending from the spill area northwest across Upper Holley Road for approximately 300 feet. The extracted groundwater would be treated by air stripping. This technology would use the tendency for dissolved VOCs to pass from the groundwater to air when the water is aerated. The extracted groundwater would be passed through an air stripper, and discharged into an upgradient recharge trench. The treatment system would be installed in a small heated building. If necessary the air would be treated using carbon to remove contaminants. Because the wells would be located on both sides of Upper Holley Road, it would be necessary to place a pipeline beneath the road and pump the extracted groundwater from the western side of Upper Holley Road to a treatment system located on site.

6.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

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

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

The most significant SCGs at this site are the New York Water Quality Standards, the New York Drinking Water Standards, the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. HWR-94-4046, "*Determination of Soil Cleanup Objectives and Cleanup Levels*", the federal Universal Treatment Standards, and the New York Contained-In Criteria. The standards for TCE found in the first three SCGs are summarized in Table 1.

Universal Treatment Standards (UTSs), promulgated by EPA in 59 FR 47982 (Sept. 19, 1994) and amended in 60 FR 242 (Jan. 3, 1995), set treatment standards that must be met for soil and sediments to be eligible for on- or off-site land disposal (e.g., disposal in a landfill, surface impoundment, waste piles, etc.). These treatment standards are set at levels which substantially diminish the toxicity of the waste, or substantially reduce the likelihood of migration of hazardous constituents from the waste, so that short-term and long-term threats to human health and the environment are minimized. For TCE, the contaminant of concern in soil at this site, the UTS treatment standard is 6.0 ppm.

The Contained In Criteria, as described in Technical and Administrative Guidance Memoranda (TAGM) 3028, *"Contained-In" Criteria for Environmental Media*, 11/30/92, lists action levels for contaminated soil and sediment, below which the soil is no longer considered hazardous and can be disposed of as industrial solid waste. The action level for TCE is 64 ppm, which is higher than the concentrations found on site. However, the soil must also meet the UTS standard before disposal, therefore soil containing TCE at concentrations less than the UTS standard of 6 ppm can be disposed of at an industrial solid waste landfill.

Soils: The No Action alternative would not meet SCGs since it would leave high concentrations of TCE in onsite soils, and in onsite and offsite groundwater. DVE with pneumatic fracturing, in-situ thermal desorption, and off-site disposal would all meet SCGs for soil, although due to difficult subsurface site conditions DVE with pneumatic fracturing and in-situ thermal desorption may have difficulty achieving these concentration reductions. All three treatment/disposal alternatives would result in groundwater eventually achieving SCGs, since the primary source of groundwater contamination would be remediated.

Groundwater: Since the primary source of groundwater contamination, i.e. the contaminated soil in the spill area, is assumed to have been treated, all of these alternatives would eventually achieve groundwater standards for TCE, through natural degradation and physical attenuation. The main difference would be the length of time required for the alternative to be effective. The limited action alternative would take the longest time, since no groundwater treatment would be instituted. The DVE alternative would achieve a greater mass removal of contaminants, and would take less time than the other alternatives to remediate the heavily contaminated groundwater acting as a secondary source of offsite groundwater contamination.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

Soils: The no action alternative would not be protective of human health or the environment within an acceptable time frame. The remaining three alternatives would be protective of human health and the environment.

Groundwater: The primary potential exposure has been contaminated groundwater impacting residential wells near the site. This exposure has been controlled by carbon treatment systems on the two residential wells near the site which have been found to be contaminated. A water line is scheduled for installation on Upper Holley Road and should be operational by the end of 1998, eliminating this exposure scenario. In addition, no evidence of the discharge of groundwater to surface water has been found. Therefore, since no route of exposure to the contaminants in the groundwater has been identified, all three alternatives would be protective of human health and the environment at this time.

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.

Soils: The No Action alternative would cause no increased short-term impacts since no intrusive work would take place.

Both DVE with pneumatic fracturing and in-situ thermal desorption would result in air emissions that would require treatment, posing a short-term risk should the air emissions control device be breached. This risk would be reduced through the proper use of air treatment devices. Excavation and off-site disposal would involve more extensive soil handling, with an increased risk of exposure to dust. There is the potential for greater exposure, although for a shorter period of time. However, the use of engineering controls, include air monitoring and dust suppression measures, would minimize and/or eliminate any possible impact during excavation.

All the alternatives except the No Action alternative would involve the handling of contaminated media. These actions could potentially impact worker health and safety, the environment, and the local community. DVE with pneumatic fracturing and in-situ thermal desorption would have limited potential for worker exposure, since the only intrusive activity would be the installation of wells. Excavation and off-site disposal would involve more extensive soil handling, since contaminated soil would be excavated and hauled offsite. However, the use of engineering controls would minimize and/or eliminate any possible impact during excavation. Offsite hauling would pose a short-term risk due to possible spills of contaminated media offsite, which could be mitigated by properly covering contaminated media and by establishing proper emergency spill response measures.

An additional concern is the impact that the noise of the remedial actions would have on adjacent residents. There are two residences directly adjacent to the site, and another directly across the road. Since DVE with pneumatic fracturing and in-situ thermal desorption systems would operate 24 hours a day, their noise impact would be greater than excavation and off-site disposal, which would be conducted during daylight hours. However, engineering controls could be implemented which would control these impacts.

The length of time over which short-term impacts, including noise, would occur would be least for the excavation and on-site disposal alternative, as under this alternative the complete remedy would be implemented within three months. The DVE alternative would have a greater impact than in-situ thermal desorption, as it would be operated for one to two years, as opposed to nine to twelve months. Again, it should be possible to control these impacts through the use of engineering controls.

Groundwater: The limited action alternative would result in the fewest short-term impacts, as the only action taken would be groundwater monitoring. Both DVE and groundwater extraction and treatment would incorporate an air emission source and a water discharge, however air emissions and the water discharge would be treated to prevent worker and resident exposure to contaminants. A concern with both of these alternatives is the impact of noise upon the adjacent residents. DVE would cause less of an impact than groundwater extraction and treatment because it would be operated for a shorter period of time. With either alternative, the treatment system would be carefully designed to minimize noise levels.

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 controls intended to limit the risk, and 3) the reliability of these controls.

Soils: The no action alternative would allow the continued migration of contaminants from the soil to the groundwater, and continued migration of contaminated groundwater offsite. The remaining technologies would all be permanent remedies. However, DVE with pneumatic fracturing and in-situ thermal desorption may not achieve as great a removal of contaminants, resulting in residual concentrations remaining in the soils. The excavation and off-site disposal alternative would effectively eliminate all contamination exceeding the remedial goals on site.

Groundwater: Since the primary source of groundwater contamination is assumed to have been remediated, groundwater concentrations would be expected to decrease with time via natural degradation and physical attenuation. As discussed above, the primary difference between the three alternatives is the length of time within which groundwater contaminant concentrations would diminish to beneath groundwater standards. In the long term, all three alternatives would be permanent, effective remedies. DVE would remove the greatest mass of contaminants in the shortest time period, with the contaminants captured in the carbon used to treat the extracted vapors and sent offsite for treatment.

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.

Soils: With the no action alternative, reduction in the toxicity, mobility, or volume of waste would occur very slowly through natural attenuation, not in an acceptable time frame. The other three alternatives would all remove and destroy or dispose of contaminants exceeding the cleanup objectives, thereby reducing toxicity and volume. Since contaminants would no longer be migrating to groundwater, the mobility would also be significantly reduced.

Groundwater: Under the limited action alternative, groundwater monitoring would be performed to verify that the soil remedial alternative chosen has reduced the mobility of the contaminants. The DVE and the groundwater extraction and treatment alternatives would remove contaminants from the groundwater and treat them, thereby reducing the mobility and volume of contaminants in the groundwater. The groundwater extraction and treatment alternative would treat a larger volume of groundwater. However, it is expected that DVE would remover a greater volume of contaminants in a shorter time frame.

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

Soils: The no action alternative would be the easiest to implement, since no construction would be necessary. Excavation and off-site disposal would also be easy to implement, since this alternative is easily engineered, treatment/disposal facilities are readily available, and regulatory requirements are easily met. DVE with pneumatic fracturing and in-situ thermal desorption could be implemented, however, due to the specific geologic conditions at this site the success of these alternatives is less certain, and the remedies would require more engineering. In-situ thermal desorption is an innovative technology with a limited number of applications, therefore more effort may be required to adjust the system to operate effectively given the specific conditions at this site. In addition, in-situ thermal desorption would be more difficult to implement administratively, as only one vendor is currently available, thereby requiring a sole source procurement.

Groundwater: The limited action alternative would be the easiest to implement. The DVE system would be straightforward to implement, as the system is commercially available from several vendors, and there would be no anticipated administrative or legal barriers to the implementation of this alternative. Groundwater extraction and treatment would be the most difficult to implement. As discussed above, this alternative would require that extraction wells be installed both on site and across Upper Holley Road from the site. This would require either installing a water line from the extraction wells on the west side of the road underneath Upper Holley Road to the treatment system on site, or installing two treatment systems, with the one on the west side of the road installed on private property that is not part of the site.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

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

8. **Community Acceptance** - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan have been evaluated. The "Responsiveness Summary" included as Appendix A presents the public comments received and the Department's response to the concerns raised. In general the public comments received were supportive of the selected remedy.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented below, the NYSDEC is selecting Alternative 4, Excavation and Off-Site Disposal as the remedial alternative for the contaminated soils, and Alternative GW2, Dual Phase Vapor Extraction as the remedial alternative for groundwater.

This selection is based upon the following considerations:

Soil: The No Action alternative was rejected because this alternative is not protective of human health or the environment, does not meet/satisfy SCGs, and does not satisfy the RAOs. It would leave in place a volume of highly contaminated soil which is the source of a plume of contaminated groundwater.

The three remaining alternatives are DVE with Pneumatic Fracturing, In-Situ Thermal Desorption, and Excavation and Off-Site Disposal, which have all been successfully used at other sites to remediate soil contaminated with volatile organic compounds. Of these three alternatives, DVE with Pneumatic Fracturing is the least likely to successfully achieve the soil cleanup objective for TCE, a result of the soil heterogeneity at this site. In-Situ Thermal Desorption is an innovative technology which, while highly promising, has not yet been implemented at many sites. As a result, it is not known whether the technology could effectively handle the soil conditions at the Haight Farm site. In addition, In-Situ Thermal Desorption would be administratively difficult to implement as only one company currently offers it, therefore a sole source procurement would be required. Excavation and off-site disposal, on the other hand, would be technically straightforward, and would reliably remove from the site all soil containing TCE at concentrations exceeding the site cleanup objectives in soil identified in the SCG column of Table 1. It could be implemented quickly and completed within a relatively short period of time, with the least overall disruption to the neighboring residents. Therefore, while all three alternatives are, in general, expected to be effective remedies, given the site-specific soil conditions Excavation and Off-Site Disposal is the most appropriate for this site, and is the selected remedy for the contaminated soil.

Groundwater: The three alternatives evaluated are Limited Action, DVE, and Groundwater Extraction and Treatment. Of these, the Limited Action alternative was rejected because it would leave in place a secondary source of off-site groundwater contamination, i.e., the heavily contaminated shallow groundwater directly beneath the spill area, which is inconsistent with the State's approach of remediating the sources of groundwater contamination. Groundwater Extraction and Treatment was rejected because it would be less effective than DVE at remediating the heavily contaminated groundwater beneath the spill area, and it would remove a smaller mass of contaminants than DVE. Additionally, hydraulically containing the plume offsite has very limited benefits in terms of protection of human health and the environment, since after the Town of Clarendon installs the water line there will be no current groundwater users within the current extent of the plume. The limited benefits do not justify the significant increase in cost associated with this alternative. Of the technologies considered, DVE would most effectively remediate the heavily contaminated groundwater beneath the spill area by removing a greater mass of contaminants in a shorter time period. DVE is a proven, reliable technology, and the pilot test showed that it would be effective at this site for groundwater treatment. It has the added advantage of remediating the fractured bedrock above the saturated zone in the spill area, which cannot be addressed by avation. Therefore, DVE is the selected remedy for the contaminated groundwater.

ıne estimated present worth cost to implement both parts of the proposed remedy is $667,200. The cost to construct the remedy is estimated to be $403,500 and the estimated average annual operation and maintenance cost for 5 years is $77,100 for the first two years, and $12,000 for the next three years.

The elements of the selected remedy are as follows:

1. A remedial design program will be implemented to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS will be resolved.

2. An estimated 1340 cubic yards of contaminated soil from the spill area will be excavated and loaded into trucks. Once confirmatory sampling has shown that soil contaminated above cleanup objectives have been removed from the spill area, the excavation will be backfilled with clean fill.

3. The excavated soil will be segregated by TCE concentration. Soil containing TCE in concentrations exceeding UTS of 6 ppm will be sent for offsite treatment prior to landfill disposal. Soil containing TCE in concentrations less than 6 ppm will be taken for offsite disposal in a secure, hazardous waste or industrial solid waste landfill.

4. Once confirmatory samples have demonstrated removal of contaminated soil exceeding the site cleanup criteria, the excavation will be backfilled with clean fill. Backfilled areas will be properly compacted and graded to pre-remedial site conditions, or other elevations deemed appropriate to promote drainage, and seeded.

5. Following excavation of contaminated soil, vapor extraction wells will be installed into the bedrock in the spill area to a depth of approximately thirty feet, and screened from the top of bedrock to the bottom of the well. It is estimated that ten wells will be needed.

6. A heated, sound insulated shed for the DVE unit will be constructed, and the DVE unit and associated equipment will be mobilized to the site and installed. The DVE unit will be equipped with a carbon adsorption or other appropriate system to treat both air and water emissions from the treatment process.

7. A water recharge trench will be excavated upgradient of the spill site, for discharge of the treated water.

8. A pilot test of the DVE system will be performed, to optimize the unit operation for site conditions.

9. Once the DVE unit is successfully operating, the contractor trailers and decontamination facilities will be demobilized from the site. An operation and maintenance program will be developed, and the treatment unit will be monitored regularly for proper operation and

needed maintenance, with the carbon units changed out as needed. Treated and untreated air and water samples will be collected and analyzed as needed to monitor the effectiveness of the system.

10. The unit will be operated until groundwater contaminant concentrations achieve groundwater standards, or until vapor concentrations reach asymptotic levels for a sustained period of time and continued operation of the treatment unit would not result in significant mass removal of contaminants.

11. Since the remedy results in residual hazardous waste remaining at the site, a long term groundwater monitoring program will be developed and instituted, to determine the effect of both system operation and the soil removal on contaminant concentrations in groundwater. As part of the monitoring program, a groundwater monitoring well cluster will be installed at the leading edge of the plume. This program will allow the effectiveness of the selected remedy to be monitored and will be a component of the operation and maintenance for the site.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation (CP) activities were undertaken in an effort 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:

- A repository for documents pertaining to the site was established.
- A site mailing list was established which included nearby property owners, local political officials local media and other interested parties.
- On May 11, 1992, a fact sheet was sent out announcing the public meeting to present the results of the Phase I RI.
- On May 28, 1992, a public meeting was held to present the results of the Phase I RI.
- On October 6, 1995, a fact sheet was sent out announcing the public meeting to describe the upcoming RI.
- On October 19, 1995, a public meeting was held to describe the upcoming Phase II RI.
- On July 22, 1996, a fact sheet was sent out announcing the public meeting to describe the results of the Phase II RI, and the proposed IRM.

- On August 13, 1996, a public meeting was held to describe the results of the Phase II RI, and the proposed IRM.

- On November 20, 1996, a fact sheet was sent out announcing the beginning of the IRM pilot study.

- On January 22, 1998, a fact sheet was sent out announcing the public meeting for the FS and the PRAP.

- On February 3, 1998, a public meeting was held to present the FS and the PRAP, and to receive public comment.

- In March 1998, a Responsiveness Summary was prepared and made available to the public, to address the comments received during the public comment period for the PRAP.

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs	SCGs[1] (ppb)
roundwater	Volatile Organic Compounds (VOCs)	Trichloroethene	ND (.002) to 8800	28 of 50	5
		1,2-Dichloroethene (total)	ND (.08) to 20	1 of 50	5
		Trichloroethane	ND (.0008) to 6	1 of 50	5
		Tetrachloroethene	ND (.002) to 1	0 of 50	5
		Benzene	ND (1.0) to 19	4 of 50	0.7
		Toluene	ND (2.0) to 16	1 of 50	5
		Ethylbenzene	ND (2.0) to 3	0 of 50	5
ils	Volatile Organic Compounds (VOCs)	Trichloroethene	ND (.05) to 31,000	8 of 39	700
		Trichloroethane	ND (.008) to 0.004	0 of 39	800
		Tetrachloroethene	ND (.02) to 50	0 of 39	1400
		Benzene	ND (2.0) to 380	1 of 39	60
		Toluene	ND (2.0) to 3900	1 of 39	1500
		Xylenes	ND (10) to 6900	1 of 39	1200

Standards and Guidance Values

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
Soil			
1. No Action	$ 0	$ 0	$ 0
2. DVE with Pneumatic Fracturing	$95,000	$148,700	$364,400
3 In-Situ Thermal Desorption	$373,900	$0	$373,900
4. Excavation and Off-Site Disposal	$317,300	$0	$317,300
Groundwater			
GW1. Limited Action	$49,300	$11,900	$179,700
GW2. DVE	$86,200	(first 2 yrs) $77,100 (next 3 yrs) $12,000	$350,200
GW3. Groundwater Extraction and Treatment	$635,600	$177,156	$2,003,500

APPENDIX A
Responsiveness Summary

RESPONSIVENESS SUMMARY

Haight Farm Site
Proposed Remedial Action Plan
Town of Clarendon (T), Orleans County
Site No. 8-37-006

The Proposed Remedial Action Plan (PRAP) for the Haight Farm Site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on January 23, 1998. This Plan outlined the preferred remedial measure proposed for the remediation of the contaminated soil and groundwater at the Haight Farm Site. The preferred remedy is a combination of excavation and off-site treatment/disposal of contaminated soil, and on-site treatment of contaminated groundwater beneath the spill area by the use of Dual Phase Vapor Extraction (DVE).

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on February 3, 1998 which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) 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. No written comments were received. The public comment period for the PRAP officially closed on February 23, 1998.

This Responsiveness Summary responds to all questions and comments raised at the February 3, 1998 public meeting. The following are the comments received at the public meeting, with the NYSDEC's responses:

COMMENT 1: How about just paying for our water line hookups and leaving the contaminated groundwater there, it isn't hurting anybody, is it?

RESPONSE 1: The water line currently being installed on Upper Holley Road will eliminate the major potential source of exposure, namely contamination in drinking water wells. However, the contaminated groundwater will still be there, requiring continuous monitoring by the State and making it difficult to develop or use not only the site property, but also offsite property affected by the groundwater plume. Even installation of the water line required special construction procedures and health and safety training and monitoring, due to the presence of the contaminated groundwater. By treating the heavily contaminated groundwater on site, we will significantly shorten the time needed for groundwater concentrations of Trichloroethene (TCE) to drop to below groundwater standards, making it possible to ultimately remove the site from the Registry of Inactive Hazardous Waste Sites.

COMMENT 2: You knew that the top part of the soil was contaminated, why wasn't this in the design before? Why wasn't something done sooner?

RESPONSE 2: By proposing soil vapor extraction (SVE) as an Interim Remedial Measure (IRM) we had planned to address the soil contamination quickly, without waiting until the investigation process was completed. When SVE was selected for the IRM, excavation and off-site disposal was also evaluated. At that time, however, the regulations required that TCE be incinerated, regardless of the concentration of TCE, or whether the material was pure TCE or soil contaminated with TCE. At that time, incineration prices were approximately $1,000 per ton, which would have resulted in a project cost of $1 to 2 million dollars, as opposed to $300,000 for SVE. In addition, SVE is an accepted, widely used remedy for TCE-contaminated soils, which has been shown to be effective at many sites across the country. After further evaluation during the SVE system design, it was determined that unfortunately, the soil conditions at this site are such that SVE would be unable to achieve the remedial objectives. In the interim, regulations governing the disposal of soil contaminated with TCE have changed, bringing the prices down to a level roughly equivalent to the cost of SVE. Therefore, we selected excavation and off-site disposal.

COMMENT 3: From what everyone has said, it is the soil that is causing the problem. If you are going to dispose of the soil, the rest of it would go on evaporating, it is not going to migrate.

RESPONSE 3: The Feasibility Study evaluated no further action for groundwater other than removing the soil that is the source of groundwater contamination, and allowing contaminant concentrations in the groundwater to slowly diminish. As discussed in Response 1, however, the presence of contaminated groundwater would be a factor in any plans to use or develop the properties above the plume for the next 20 to 30 years. The selected remedy, however, could be easily implemented, and is estimated to treat the on-site groundwater in only one to two years. This should allow for unlimited future use of the properties in the near future.

COMMENT 4: You are working below the ground, how can you say, this is exactly where the contamination is located.

RESPONSE 4: We have sampled both soil and groundwater extensively, and have the spill area well defined. When doing the soil excavation, we will collect and analyze confirmation samples from the sides of the excavation before backfilling, to confirm that the contaminated soil has been removed. When the groundwater system is installed, the existing monitoring wells will be used to monitor changes in groundwater level on site, which will enable us to determine whether the system is successfully influencing the full extent of the spill area. As stated, off site the full extent of the plume of contaminated groundwater has not been fully defined, because of a change in the direction of groundwater flow. During implementation of the remedy additional groundwater monitoring wells will be installed to enable us to confirm and then monitor the extent of the plume.

COMMENT 5: Does the TCE go out of the groundwater and onto the soil as the groundwater raises and lowers, contributing to the contamination of the soil?

RESPONSE 5: The problem referred to occurs when the groundwater contaminants absorb strongly onto soil, are only slightly soluble in water, and are present in high concentrations. When this situation occurs, groundwater contaminants will come into contact with soil when groundwater levels are high, and are then left behind in the soil when the groundwater level drops. While this has been a problem at other sites, it does not appear to be happening here. Soil sampling does not show the elevated concentrations of TCE at the groundwater surface that occur under this situation. In part this is due to the nature of the soil at the groundwater surface, which is primarily sand and gravel. Contaminants do not absorb onto sand and gravel to the extent they absorb onto soils with high clay or high organic content. While the surface soil layer does have a higher organic content, this soil is not in contact with groundwater.

COMMENT 6: Say sixty years from now we have a water main break in that spot, would there be a problem? I don't want to have to worry about it 50 years from now.

RESPONSE 6: By doing a source removal and treating the on-site groundwater, we estimate that within five years groundwater contaminant concentrations will have dropped to below remedial objectives. Once the groundwater has achieved remedial objectives, there should be no restrictions on activities in the future. The State will keep the Town of Clarendon informed of the progress of the groundwater remediation in the interim.

COMMENT 7: Is there anything you can inject into the groundwater that would absorb the contaminants?

RESPONSE 7: Technologies are being explored involving injection of compounds into soil and groundwater that could chemically break down contaminants. However, these technologies are still in the research and development stage, and are not yet at a point where they could be used at this site.

COMMENT 8: You said the reason you are going to do the soil excavating in the winter is because you would expect chemicals to go into the air, what about nearby livestock?

<u>RESPONSE 8</u>: Because TCE is volatile, there will be some evaporation of TCE into the air when the soil is excavated. However, measures will be taken to control air emissions from the site. As with the investigations, the upcoming site work will be designed to protect both construction workers and adjacent residents. Continuous air monitoring will be performed to monitor for both volatile organic compounds and particulates during construction activities, both near the work area and at the property line. If measurements of the air indicate that contaminants are leaving the site at levels approaching the NYSDOH's action level, appropriate control measures, such as wetting the soil, covering the work area or stopping work will be taken. This air monitoring will ensure that elevated concentrations of contaminants are not leaving the site. Performing the remedial work in the winter will tend to significantly decrease TCE evaporation because of the colder weather and the damper air.

APPENDIX B
Administrative Record

Administrative Record
Haight Farm

The following documents constitute the Administrative Record for the Haight Farm site Record of Decision:

January 1989:	Engineering Investigations at Inactive Hazardous Waste Sites in the State of New York, Phase I Investigations, Haight Farm Site
November 1991:	Remedial Investigation Report, Haight Farm Site
July 1996:	Phase II Remedial Investigation Report, Haight Farm Superfund Site
July 1996:	Decision Document, Interim Remedial Measure, Haight Farm Site
October 1996:	Responsiveness Summary for the IRM Decision Document
January 1998:	Feasibility Study
January 1998:	Proposed Remedial Action Plan
March 1998:	Summary of analytical results of residential well sampling for 4878 Upper Holley Road and 4885 Upper Holley Road, December 1984 through October 1997.