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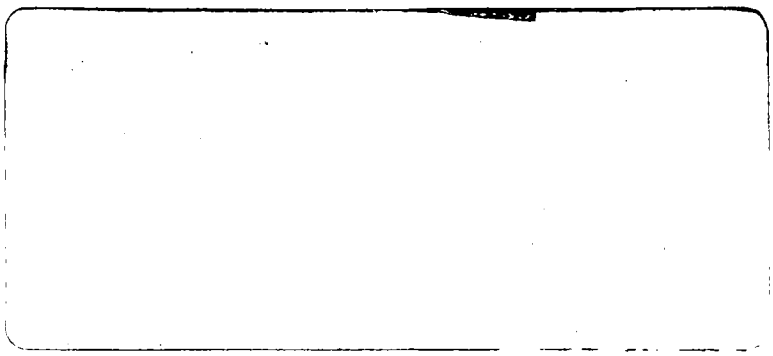

SIMON HYDRO-SEARCH

SIMON HYDRO-SEARCH

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# FINAL
# REMEDIAL DESIGN/REMEDIAL ACTION WORK PLAN FOR MACHIAS GRAVEL PIT SITE CATTARAUGUS COUNTY, NEW YORK SITE NUMBER 905013

5-93



May 28, 1993

*Prepared for:*

Motorola, Inc.
4000 Commercial Avenue
Northbrook, IL 60062

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204262022


Brendan Shine, P.E.
State of New York Registration #070187

SIMON Environmental

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Appendix A Health and Safety Plan
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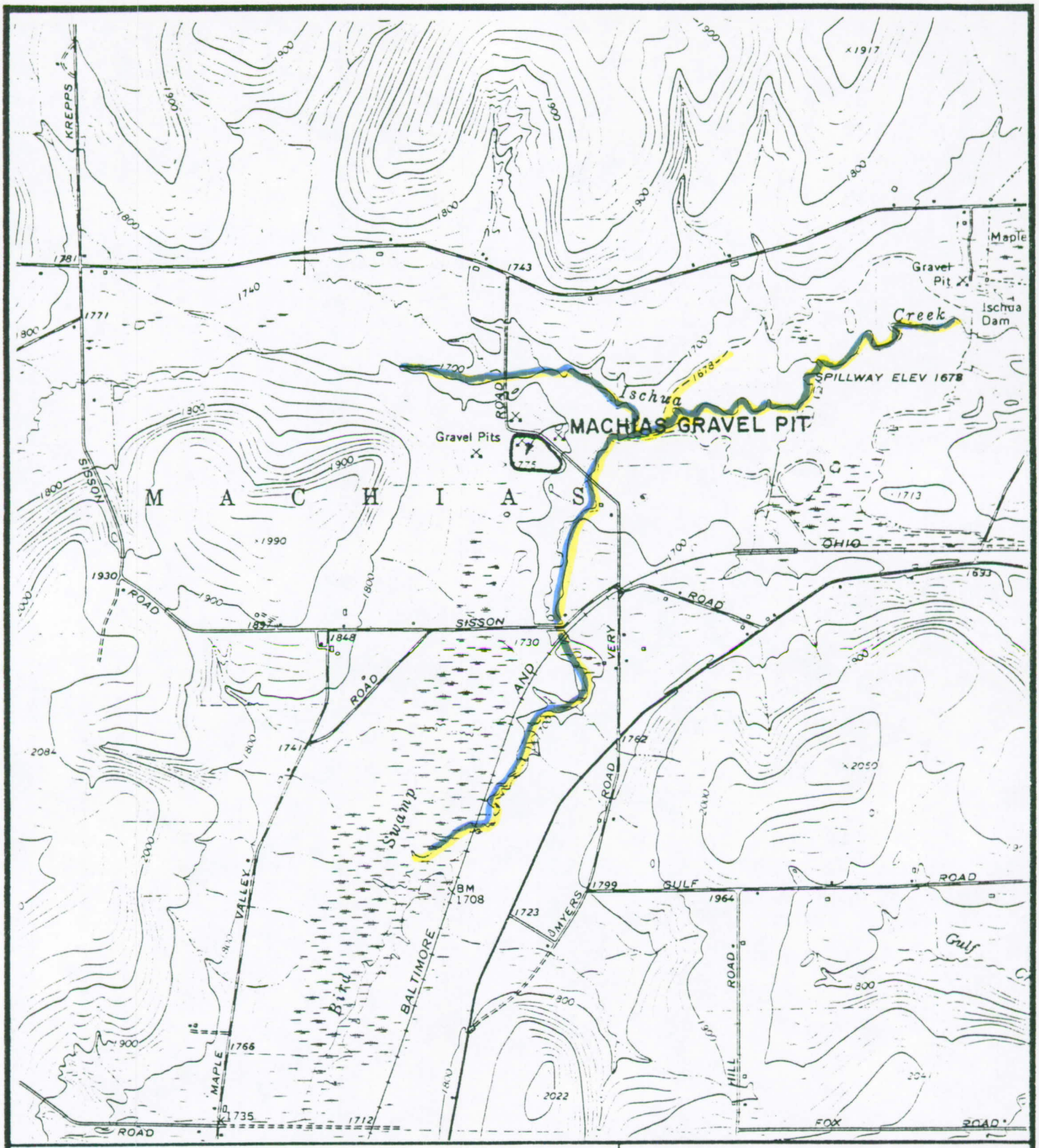
# 1.0 INTRODUCTION

## 1.1 Site Description

The Machias Gravel Pit site (NYSDEC #905013) is located on Very Road approximately 2 miles west of the Town of Machias, New York in Cattaraugus County (Figure 1-1). The site is approximately 20 acres in size and consists of an active gravel pit operation in the southern portion of the site and an inactive gravel pit in the northern portion (Figure 1-2). The inactive gravel pit was reportedly used for the storage of approximately 600 drums of waste material from the former Motorola Plant in Arcade, New York, between March and September 1978. There are currently no drums remaining on site. The drums were suspected to contain wastes such as epoxy resins, acids, flammable and non-flammable solvents and cutting oils. Based on available background information, it is estimated that the contents of approximately 300 drums were released directly on the ground surface. The oils received at the site were reportedly spread on local roads for dust control by town personnel. The gravel pit was used as the transfer point to fill a tank on a truck prior to spraying on rural roads. The remaining drummed wastes were allegedly stacked on the ground surface along the inactive gravel pit wall.

The New York State Department of Environmental Conservation (NYSDEC) initiated an investigation of the site in 1985. In 1986 and 1987, the NYSDEC provided oversight during a drum removal and soil remediation project on the site. Approximately 184 drums were removed from the site for proper disposal by the Town of Machias which is the property owner. A small volume of contaminated soil was treated on-site by aeration from the area where the drums were stored and stockpiled on plastic sheets. There are no drums (i.e., waste sources) remaining at the site.

The NYSDEC conducted a Phase II investigation in 1988 at which time four ground water monitoring wells (GW-1 through GW-4) were installed in the locations shown in Figure 1-2. Sampling of these wells showed the presence of volatile organic compounds (VOCs) in the




SCALE 1:24000

0 2000 ft

N

NEW YORK

QUADRANGLE LOCATION

LAT. 42°22'05" N
LONG. 75°30'7.5" W

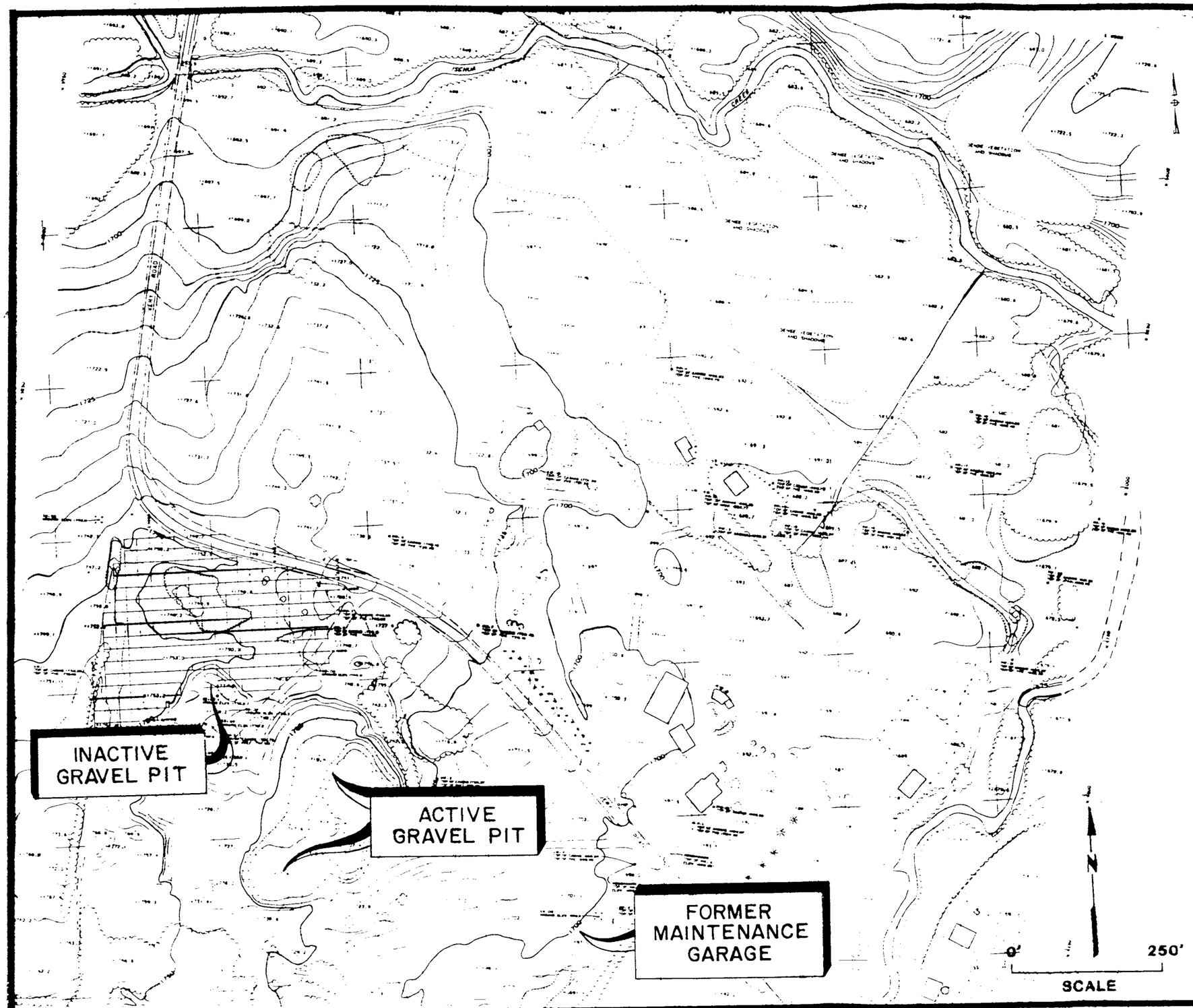
SOURCE: USGS TOPOGRAPHIC MAP
WEST VALLEY, N.Y.

# LOCATION MAP

| | |
|---|---|
| PROJECT 426112022 | REVISIONS |
| DATE JAN. 1993 | |

Hydro-Search, Inc.
CONSULTING HYDROLOGISTS-GEOLOGISTS
RENO DENVER MILWAUKEE IRVINE

FIGURE 1-1




Notes:

1. This map was produced entirely by photogrammetric methods from 1" = 600' topography taken on April 18, 1990. The user of this map is cautioned that certain areas obscured by shadows and heavy vegetation may require field verification. The outline of all buildings is the roof line.

2. Vertical accuracies can be expected to be +\- one-half contour interval for contour lines, spot elevations +\- one-quarter of a contour interval in 90% of the areas which were clearly visible photogrammetrically.

3. In instances where digital information is supplied to a client on magnetic medium, we can not be responsible for the accuracy of any subsequent computer generated mapping, beyond the originally intended map scale.

4. Elevations based on NGVD 1929 approximate.

CONTOUR INTERVAL: 5 FEET

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CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
LOCKPORT, NEW YORK PHONE 439-9720
BUFFALO, NEW YORK PHONE 688-0640

| | | |
|---|---|---|
| MOTOROLA<br>MACHIAS | DATE: 12/17/92 | |
| | DESIGNED: | |
| | CHECKED: | |
| SITE FEATURES MAP | APPROVED: | |
| | DRAWN: | SRD |
| | PROJ.: 204252022 | |
| SIMON HYDRO-SEARCH | FIGURE I-2 | |

ground water. The specific compounds of concern were trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA) in one well, GW-3.

Motorola voluntarily took over and expanded the site investigation in 1990. Since that time, Simon Hydro-Search has been contracted to install and sample 17 additional monitoring wells to define the extent of ground water contamination. Ground water from three nearby residential wells were also sampled. Additionally, a geophysical survey was conducted with test pit excavations and surface soil sampling to characterize any further potential contaminant sources.

The results of the site remedial investigation/feasibility study are detailed in a series of separate documents as follows:

- Machias Gravel Pit Remedial Investigation Report (August, 1991)
- Addendum No. 1 to the Machias Gravel Pit Remedial Investigation Report
- Addendum No. 2 to the Machias Gravel Pit Remedial Investigation Report
- Additional Cole Wells Report
- Machias Gravel Pit Feasibility Study
- Addendum No. 1 to the Machias Gravel Pit Feasibility Study
- RD/RA Support Wells Letter Report

Sampling results conducted to date are summarized in the following section.

## 1.2 Nature and Extent of Contamination

### 1.2.1 Soils

Three types of soil samples were collected during the remedial investigation (RI):

- Surface soil
- Test pit soil
- Subsurface soil

Analytical results of surface soil samples show clean conditions relative to the background soil samples, except for lead within the inactive gravel pit area (Figure 1-2). At this location, lead was detected at 608 mg/kg relative to a background sample concentration of 13.6 μg/kg. The areal extent of the elevated lead is believed to be limited to the inactive gravel pit area which is a known location of past waste handling/storage activities. The Habitat Assessment provided in Addendum No. 2 to the Machias Gravel Pit RI Report showed the elevated lead levels to pose no risk to human health and the environment.

Analytical results from test pit soil samples within the suspect drum burial area north of the inactive gravel pit show elevated levels of polyaromatic hydrocarbons (PAHs) in two of the five samples. Field notes from both test pits indicate the presence of asphalt debris mixed with the fill in these areas. PAHs are a common constituent of asphalt and are believed to be associated with this debris rather than potential drum disposal.

Subsurface soil field screening and laboratory analyses show clean conditions except for two VOCs detected in the subsurface soil just above the ground water table (approximately 43 feet below the ground surface) beneath the inactive gravel pit area. This sample showed elevated levels of TCE (291 μg/kg) and 1,1,1-TCA (27 μg/kg). This is believed to be residual contamination associated with the ground water table fluctuation as ground water is also contaminated in this area with the same constituents. It is not believed to be associated with residual contamination from the percolation of spilled liquid waste based on a lack of visual and field screening evidence for major residual contamination in unsaturated zone materials.

The preliminary risk assessment of the soils data suggest no significant risks associated with any of the levels of compounds detected.

### 1.2.2 Ground Water

Two types of ground water samples were collected during the RI and in subsequent investigations:

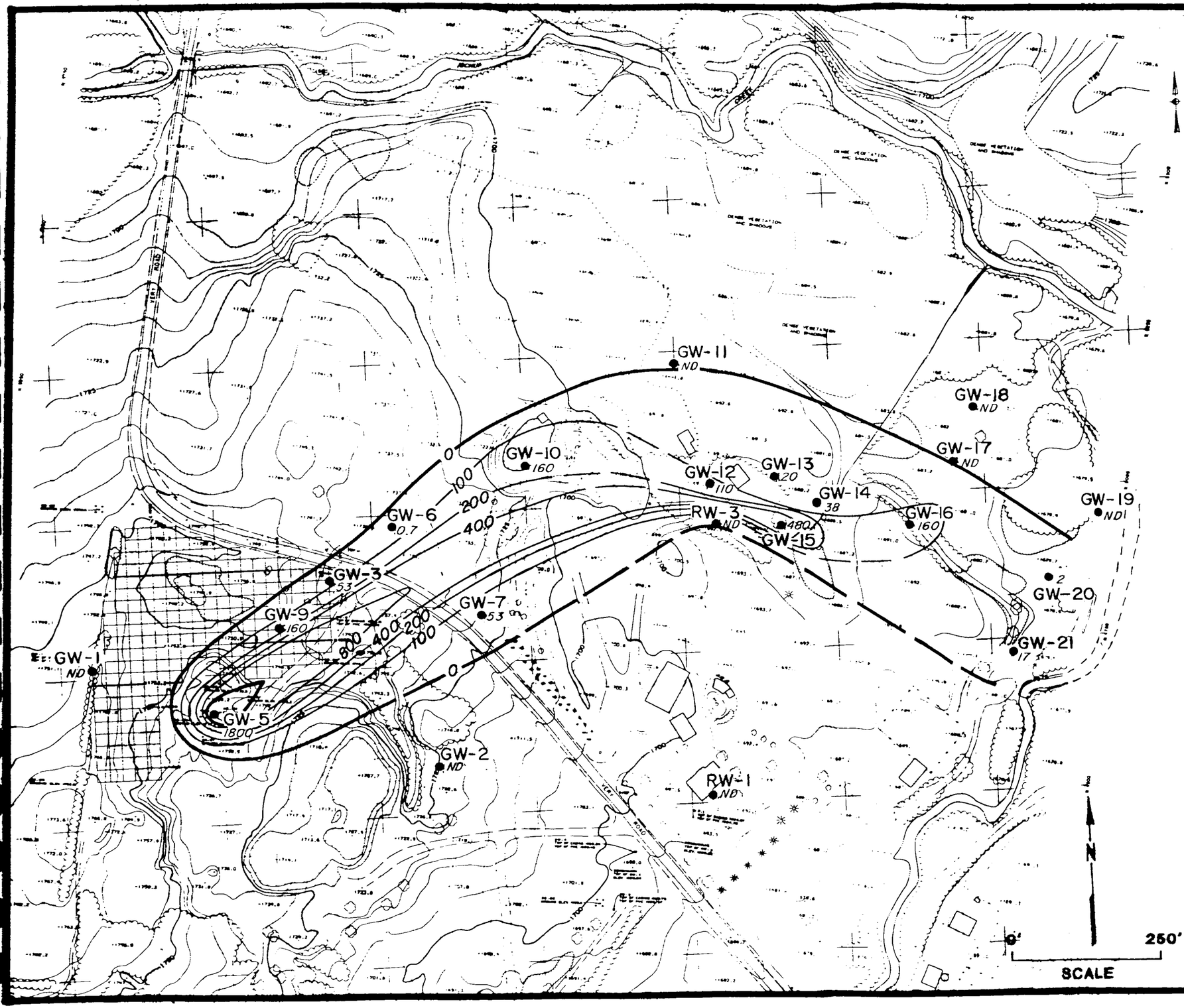
- Monitoring well
- Residential well

Analytical results from the latest round of ground water sampling (November 1992) are summarized on Table 1-1. The VOCs most frequently detected in ground water samples collected from the site are TCE and 1,1,1-TCA. TCE ranged in concentration from non-detected to 1,800 $\mu$g/l at well GW-5 located within the inactive gravel pit. 1,1,1-TCA concentrations ranged from non-detected to 380 $\mu$g/l. The highest concentration reported for 1,1,1-TCA was from the ground water sample collected from well GW-9. This well is located west of Very Road, immediately downgradient of the source area of the inactive gravel pit.

Other VOCs detected include degradation products of TCE and 1,1,1-TCA such as 1,1-dichloroethene, 1,2-dichloroethene and 1,1-dichloroethane. 1,1-Dichloroethane was detected in wells GW-3, GW-5, GW-9, GW-12, GW-15 GW-16 and GW-21. 1,2-Dichloroethene and 1,1-dichloroethene were detected in trace quantities in some of the monitoring wells as shown on Table 1-1. Chloroform was detected in the former Cole's residential well at 8 $\mu$g/l. This compound has been detected in previous sampling events at this location. The detection of chloroform in this well is not related to past waste handling issues at the site.

The analytical results of ground water samples show a slug of TCE and 1,1,1-TCA ground water contamination migrating from the inactive gravel pit source area, in a downgradient direction toward the northeast for about 750 feet, then to the east-southeast for about 850 feet, where the plume intersects a tributary of Ischua Creek which drains Bird Swamp. Based on field observations, the impacted ground water slug has approximate dimensions of 1,600 feet along the longitudinal axis, 350 feet along the transverse axis and approximately 45 feet in thickness. Assuming an aquifer porosity of 0.30 yields an estimated 15,080,000 gallons of impacted or contaminated ground water. The extent of ground water impacts is shown in Figure 1-3 for TCE and Figure 1-4 for 1,1,1-TCA.

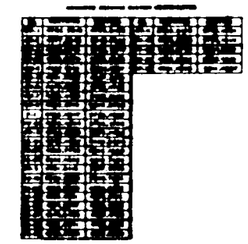
The nearest ground water receptor was identified to be the cabin well (RW-3) approximately 450 feet north of the former Cole residence. Analytical ground water modeling was used to develop




## LEGEND

—100— Isoconcentration Line

GW-1 ●500 Ground Water Sample Locations With Isoconcentration



Notes:

1. This map was produced entirely by photogrammetric methods from 1" = 600' topography taken on April 19, 1990. The user of this map is cautioned that certain areas obscured by shadows and heavy vegetation may require field verification. The outline of all buildings is the roof line.
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4. Elevations based on NGVD 1929 approximate.

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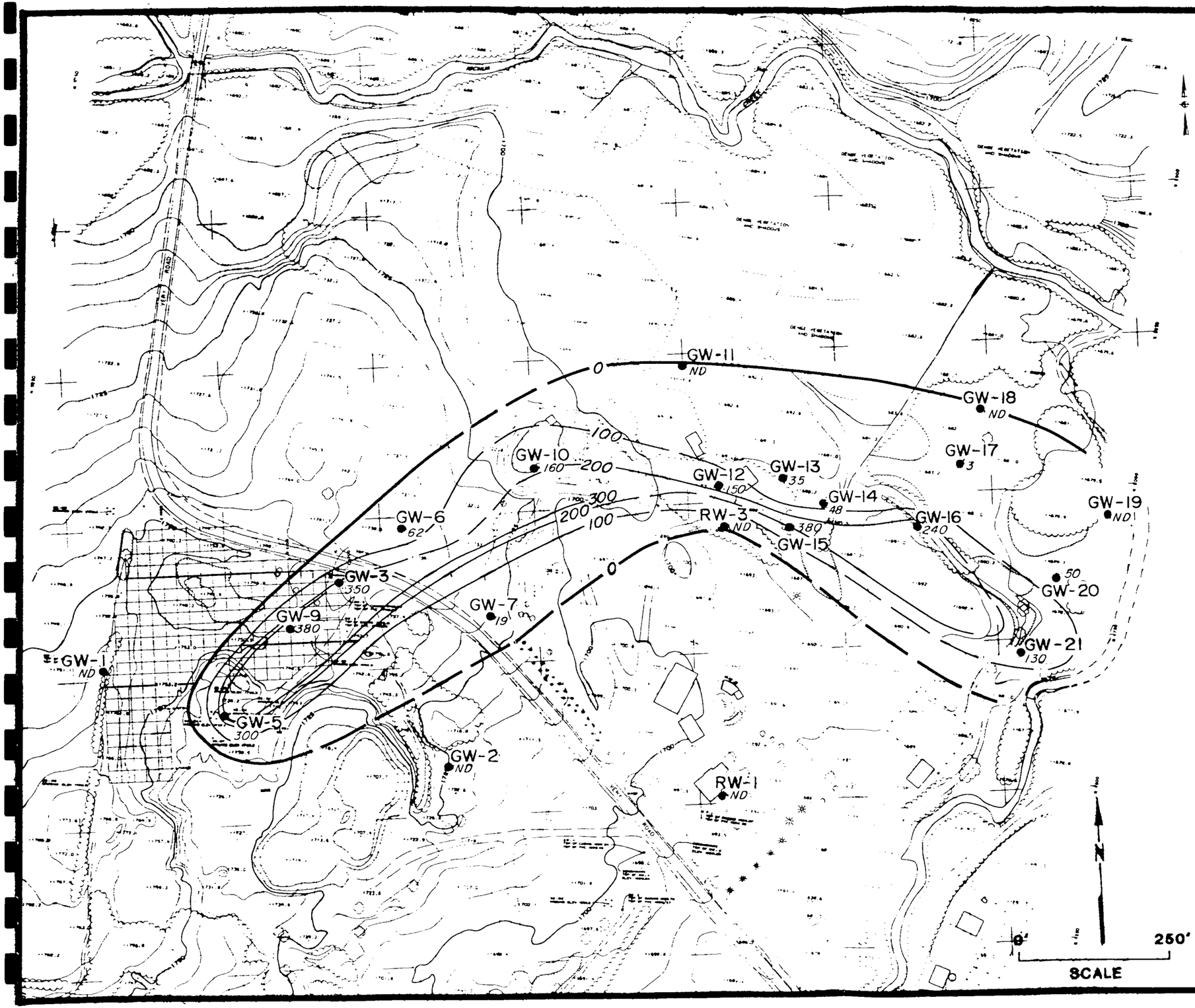
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
LOCKPORT, NEW YORK PHONE 439-9130
BUFFALO, NEW YORK PHONE 688-0900

| | |
|---|---|
| MOTOROLA<br>MACHIAS | DATE: 12/17/92 |
| | DESIGNED: |
| | CHECKED: |
| ISOCONCENTRATION MAP OF TCE | APPROVED: |
| | DRAWN: SRD |
| | PROJ.: 204262022 |
| SIMON HYDRO-SEARCH | FIGURE 1-3 |




## LEGEND

100 — Isoconcentration Line

GW-1 ● 500 — Ground Water Sample Locations With Isoconcentration

Notes:

1. This map was produced entirely by photogrammetric methods from 1" = 600' topography taken on April 19, 1990. The user of this map is cautioned that certain areas obscured by shadows and heavy vegetation may require field verification. The outline of all buildings is the roof line.

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4. Elevations based on NGVD 1929 approximate.

CONTOUR INTERVAL: 5 FEET

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LOCKPORT, NEW YORK PHONE 434-6139
BUFFALO, NEW YORK PHONE 685-6969

MOTOROLA
MACHIAS

# ISOCONCENTRATION MAP OF 1,1,1-TCA (µg/ℓ)

| | |
|---|---|
| DATE: 12/17/92 | |
| DESIGNED: | |
| CHECKED: | |
| APPROVED: | |
| DRAWN: | SRD |
| PROJ.: 204262022 | |

SIMON HYDRO-SEARCH

FIGURE 1-4

# TABLE 1-1

## SUMMARY OF DETECTED GROUND WATER VOLATILE ORGANIC COMPOUNDS
## SAMPLE DATE 11/92
## ALL VALUES IN µg/l

| | GW-1 | GW-2 | GW-3 | GW-5 | GW-6 | GW-7 | GW-9 | GW-10 | GW-11 | GW-12 | GW-13 | GW-14 | GW-15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trichloroethene | ND | ND | 53 | 1800 | 0.7 J | 53 | 180 D | 160 | ND | 110 | 20 | 38 | 490 D |
| 1,1,1-Trichloroethene | ND | ND | 350 D | 300 D | 62 | 19 | 340 D | 160 | ND | 150 | 35 | 49 | 380 D |
| 1,1-Dichloroethene | ND | ND | 5 | 0.9 J | ND | ND | 3 J | ND | ND | 2 J | ND | ND | 10 |
| 1,1-Dichloroethane | ND | ND | 0.7 J | 7 | ND | ND | 0.7 J | ND | ND | ND | ND | ND | 31 |
| Total Xylenes | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,2-Dichloroethene | ND | ND | ND | 4 J | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Tetrachloroethane | ND | ND | ND | 0.5 J | ND | ND | ND | ND | ND | ND | ND | ND | ND |

| | GW-16 | GW-17 | GW-18 | GW-19 | GW-20 | GW-21 | RW-2 | RW-3 | GW-6D[1] | RW-3D[2] | MW-4A (Field Blank) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trichloroethene | 160 | ND | ND | ND | 2 J | 17 | ND | ND | 1 J | ND | ND |
| 1,1,1-Trichloroethene | 240 D | 3 J | ND | ND | 50 | 130 | ND | ND | 63 | ND | ND |
| 1,1-Dichloroethene | 6 | ND | ND | ND | ND | 2 J | ND | ND | ND | ND | ND |
| 1,1-Dichloroethane | 7 | ND | ND | ND | ND | 3 J | ND | ND | ND | ND | ND |
| Total Xylenes | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,2-Dichloroethene | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND | ND | ND | 8 | ND | ND | ND | ND |

ND - Not Detected
J - Detected below method quantitation limit but above instrument detection limit. The value provided is an estimate.
D - All compounds identified in an analysis at a secondary dilution factor.
[1] - Duplicate of GW-6.
[2] - Duplicate of RW-3.

future worst-case time versus concentration curves for TCE and 1,1,1-TCA at the receptor well. The subsequent risk analysis showed no significant risk associated with the predicted exposure to 1,1,1-TCA; however, a total cancer risk for TCE was estimated at $2.9 \times 10^{-5}$.

### 1.2.3 Surface Water

Ground water sampling results indicate that the ground water plume has travelled approximately 1600 feet from the source area and has reached a tributary to Ischua Creek. Surface water and sediment samples collected in December of 1992 from the point of discharge immediately downstream of the indicated plume location showed no impacts of VOCs on sediments or surface water.

### 1.2.4 Record of Decision

Based upon the results of the RI/FS performed at the Machias Gravel Pit site, the NYSDEC issued a Record of Decision (ROD) on November 10, 1992. The ROD has specified the preferred site remedy to consist of ground water sparging and soil vapor extraction. The treatment system is to focus on the source area west of Very Road. The remaining contaminant plume downgradient, east of Very Road will be allowed to disperse naturally based on the results of the Habitat Assessment, however, a surface water monitoring program must be implemented to monitor for potential unpredicted occurrences.

## 1.3 Remedial Action Objectives

Remedial action at the Machias Gravel Pit site will address VOCs (namely TCE and 1,1,1-TCA) in the ground water and vadose zone soils. The remedial action will address the following exposure pathways:

- Direct contact/ingestion of contaminated ground water.
- Inhalation of contaminated vapors.

Because of the depth of the impacted vadose zone soils, direct contact and ingestion of the soils is not considered an exposure pathway. The remedial action, however, will address the contamination present.

The remedial action objectives for the Machias Gravel Pit site remediation are:

- Reduce TCE and TCA concentrations in the ground water and vadose zone soils beneath the source area (i.e., inactive gravel pit west of Very Road) to acceptable levels.
- Minimize the migration of TCE- and TCA-contaminated ground water.
- Utilize an innovative, cost-effective approach to achieve remedial action objectives in a timely manner.
- Provide a permanent remedy for the site.

## 1.4 Cleanup Goals

The New York State Department of Health (NYSDOH) has promulgated standards for ground water used as drinking water. These standards are the New York State Maximum Contaminant Levels (NYS MCLs). The NYS MCLs and Federal MCLs for TCE and TCA are presented in Table 1-2. Compliance with the NYS MCLs is measured at the point of use (e.g., the faucet). Table 1-2 also provides the NYS Ground Water Standards as defined by 6 NYCRR Part 703-705, September 1991, which, for TCE and TCA, are the same levels as the NYS MCLs. The NYS MCLs and corresponding NYS Ground Water Standards will be used as the target action levels (i.e., target concentration in ground water that requires remediation) and as the target cleanup goals for ground water (i.e., the maximum concentration observed at the faucet for a hypothetical well installed at the site for drinking water purposes).

Remedial action at the Machias Gravel Pit site will be performed in compliance with all applicable or relevant and appropriate requirements. The applicable or relevant and appropriate requirements for the site are presented on Table 1-3.

TABLE 1-2

NEW YORK STATE AND FEDERAL MAXIMUM CONTAMINANT LEVELS
AND
NEW YORK STATE GROUND WATER STANDARDS

| Compound | NYS MCL | Federal MCL | NYS Ground Water Standards |
|---|---|---|---|
| 1,1,1-Trichloroethane | 5 μg/L | 200 μg/L | 5 μg/l |
| Trichloroethene | 5 μg/L | 5 μg/L | 5 μg/l |

[1] New York State, Department of Health, State Sanitary Code, Chapter I, Part 5, Drinking Water Supplies, Subpart 5-1.

[2] Safe Drinking Water Act, 42 U.S.C. §300g, National Primary and Secondary Drinking Water Standards, 40 CFR Parts 141 and 143.

[3] New York State, Department of Environmental Conservation, Ground Water Standards, 6NYCRR Part 703-705, September, 1991.

TABLE 1-3

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

| Standard, Requirement, Criteria or Limitation | Citation | Description |
|---|---|---|
| Safe Drinking Water Act | 42 U.S.C. § 300g | |
| National Primary Drinking Water Standards | 40 CFR, Part 141 | Establishes health-based standards for public water supply systems (MCLs). |
| National Secondary Drinking Water Standards | 40 CFR, Part 143 | Establishes welfare-based standards for public water supply systems (secondary MCLs). |
| Underground Injection Control Regulations | 40 CFR, Part 144-147 | Provides for protection of underground sources of drinking water through control of underground injection. |
| Maximum Contaminant Level Goals | Pub. L. No. 99-339, 100 Stat. 642 (1986) | Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects. |
| Chapter I, Part 5, Drinking Water Supplies | Subpart 5-1 | Provides for NYS Maximum Contaminant Level determination, monitoring requirements and variances. Establishes notification procedures in the event of violations. |
| New York State, Department of Environmental Conservation, Division of Water, Water Quality Standards and Guidance Values, 1991 | 6NYCRR, Part 703-705 | Defines water classes and principal organic contaminants. Provides standards and guidance values for surface waters and ground waters. |
| Clean Water Act | 33 U.S.C. §§ 1251-1376 | |
| Water Quality Criteria | 40 CFR, Part 131 | Provides for establishment of water quality standards based on toxicity to aquatic organisms and human health. |
| Clean Air Act | 42 U.S.C. §§ 7401-7642 | |
| National Primary and Secondary Ambient Air Quality Standards | 40 CFR, Part 50 | Establishes standards for ambient air quality to protect public health and welfare. |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR, Part 61 | Sets emissions standards for designated hazardous pollutants. |
| New York State, Environmental Conservation Law | Chapter 3, Title 6 | |
| | Parts 256-257 | Provides air quality classification system and air quality standards. |
| | Part 263 | Provides county-specific air quality standards. |
| Air Clean-up Criteria | (Pages 6 & 7)-1 | Provides cross media contamination standards. |

It should be emphasized that remediation of ground water to standards as low as the NYS MCLs, Federal MCLs and NYS Ground Water Standards is rarely achieved, regardless of the technology used. From a practical standpoint, however, these will be the "target" goals. As with all ground water remediation systems, there comes a time where diminishing returns are experienced. The remediation system will, therefore, operate until that point of diminishing return is incurred. At this time, petition may be made to the DEC to terminate remedial action at the site.

In addition to the ground water cleanup goals, the cleanup level cited in the ROD for soils at the site is 1 mg/kg (part per million) for both TCE and TCA. These levels will be used as target action levels (i.e., target concentration in soils that requires remediation) and as target cleanup goals for soils beneath the site.

## 1.5 Work Plan Components

The work plan for the remedial design/remedial action (RD/RA) at the Machias Gravel Pit site consists of the following components:

- Remedial Design
- Remedial Action
- Schedule
- Quality Assurance/Quality Control

Each component is considered necessary for the successful remediation of the site. Section 2.0 presents the remedial design component which consists of a description of the selected alternative, the design objectives and elements, an overview of the pilot study from development to implementation, the full-scale design and a list of required submittals. Section 3.0 addresses the remedial action component and includes procedures for bid procurement, contractor selection, oversight responsibilities including notifications, inspections and progress reports, system monitoring, environmental monitoring and a list of required submittals. Section 4.0 presents the proposed schedule for implementation of the Work Plan and subsequent RD/RA. Quality assurance/quality control procedures (QA/QC) are presented in Section 5.0. Specifically, the section includes procedures for technical reviews, project meetings, sampling

and analytical protocols, data reduction, reporting, and contingency planning. Section 6.0 provides a listing of the references used to prepare this work plan. Appendix A includes the requirements for a health and safety plan to be used by the remediation contractor in preparing his specific plan. Appendix B provides the project contacts for the site including state and local government officials and emergency personnel.

## 1.6 Citizen Participation Plan

Also considered as part of the RD/RA Work Plan is the Citizen Participation Plan (CPP) which has been developed under separate cover by the NYSDEC. Any proposed modifications to the CPP as a result of ongoing project activities and/or community input will be considered and implemented, as appropriate.

# 2.0 REMEDIAL DESIGN

## 2.1 Air Sparging/Soil Vapor Extraction Principles

Simultaneous remediation of VOC impacted soils and ground water has recently been demonstrated at several sites across the United States and Europe using two conventional physical processes applied in conjunction with one another: vacuum extraction and aeration. Both processes function on the theory of volatilization or transfer of contaminants entrained in a solid or liquid matrix into a vapor or gaseous matrix. The technology is known by many vendor-specific names, however, in this document it is referred to as Air Sparging/Soil Vapor Extraction (AS/SVE).

Application of AS/SVE at the Machias Gravel Pit site will be implemented in-place. The technology employs a series of air injection wells that are completed both into the vadose (unsaturated) zone soils and the aquifer, and a series of air extraction wells that are completed into the vadose zone only. The air injection wells represent the "sparging" component or in-place aeration, and the air extraction wells represent the "soil vapor extraction" component or vacuum extraction. Each of the individual components is discussed in the following subsections, followed by a discussion of the combined system.

### 2.1.1 Air Sparging

VOCs such as those identified in the ground water beneath the Machias Gravel Pit site preferentially partition into the gas phase. The AS process involves the introduction of "clean air" (typically ambient air) into the VOC impacted saturated zone. The air displaces the water filling the soil pores, thereby stripping VOCs from the saturated soils. The injected air moves laterally and vertically through the ground water, subsequently stripping the water molecules of VOCs. The VOCs move from the saturated zone into the vadose zone where they are captured by the soil vapor extraction system discussed below.

The concept of AS or aeration has been used for many years in conventional water and waste water treatment systems with considerable success at removing VOCs such as hydrocarbons and solvents. The innovative aspect of AS is its in-place application. Because of differing subsurface conditions, the degree of effectiveness of AS varies between locations. Conditions at the Machias Gravel Pit site, however, are ideal for in-place AS given the sand/gravel composition of the subsurface.

### 2.1.2 Soil Vapor Extraction

SVE has been used to remediate soils contaminated with various VOCs including low molecular weight hydrocarbons, solvents and halogenated compounds (i.e., those compounds with a Henry's Law Constant greater than 0.01). SVE systems consist of either air extraction wells or air extraction wells coupled with air injection wells. SVE is specifically intended for the remediation of vadose zone soils, however, depending on the well placement, it has been shown to volatilize contaminants in ground water near the water table surface.

SVE is a proven, cost-effective technology for soil remediation. Like AS, however, the degree of effectiveness is dependent upon subsurface conditions. Subsurface conditions at the Machias Gravel Pit site are also ideal for SVE.

### 2.1.3 Air Sparging/Soil Vapor Extraction

AS in conjunction with SVE can remediate both soils and ground water at the Machias Gravel Pit site. AS by itself could remediate the ground water, however, the result would be a contaminant transfer from the ground water to the vadose zone. SVE by itself could remediate source area soils, which ultimately could result in reduced ground water contamination assuming the soils are the contaminant source.

As previously indicated, AS/SVE employs a series of air injection wells completed into the vadose zone and saturated zones, and a series of air extraction wells completed into the vadose zone.

A series of air injection and air extraction wells will be completed within the impacted vadose zone and aquifer within the source area. In addition, a line of air injection and air extraction wells will be completed to the west of Very Road and extended to the non-detect contour to the north and south. This part of the system will assure that impacts present on the west side of Very Road do not migrate to the east.

The air injection wells will be connected to air blowers that force air into the surrounding soil. The air extraction wells will either be connected to the suction side of the air blowers or to vacuum pumps, thereby inducing flow of air from the injection wells to the extraction wells.

If TCE and 1,1,1-TCA (i.e., the primary ground water contaminants at the site) concentrations in the extracted vapor require treatment, the vapor will be treated by an appropriate combination of air/water separation, activated carbon adsorption, thermal treatment or flaring. At this time, it is anticipated that vapor treatment will not be necessary. An *Application for Permit to Construct or Certificate to Operate a Process, Exhaust or Ventilation System* will be submitted to the NYSDEC along with available data in order to make the final determination. Minimal water collection is anticipated since the subsurface consists primarily of sands and gravels and because moisture in the extracted vapor is likely to condense on the inside of the well casings.

The above-ground components of the AS/SVE system will include a small building or trailer that houses the pump(s), blower(s) and system controls and the soil vapor treatment train, if necessary.

It should be emphasized that the discussion presented in this section is conceptual in nature. The actual geometry of the final remediation system design (i.e., the number and placement of injection/extraction wells) will depend on the results of the pilot study.

## 2.2 Design Approach

### 2.2.1 Design Objectives

Several design objectives have been identified. The overall purpose of the design objectives is to provide a technically-sound and cost-effective design that will attain the remedial action objectives specified in Section 1.3 and cleanup goals discussed in Section 1.4. The design objectives are as follows:

- Utilize the existing site characterization data to develop and implement the pilot study.
- Minimize subsequent data collection activities to only those activities necessary for the design or reasonable optimization of the design.
- Streamline the design process to allow for more expedited remediation.
- Identify a probable remediation time frame and select materials based on the corresponding design life.
- Provide assurance that contaminant migration or potential for contaminant migration within the ground water in the easterly direction is minimized to the maximum extent practicable.
- Provide assurance that the potential for contaminant migration to other media (i.e., ambient air and non-impacted vadose zone soils) is minimized to the maximum extent practicable.

### 2.2.2 Design Elements

The elements of the remedial design include the development and implementation of an AS/SVE pilot study and the full-scale design of an AS/SVE system. The pilot study is discussed in detail in Section 2.3. The full-scale design is discussed in detail in Section 2.4. Several submittals are associated with each of these elements. The submittals are intended to provide a continuous understanding of the project direction and progress. The submittals are identified in Section 2.5.

## 2.3 Pilot Study

### 2.3.1 Development

Bids were obtained from four contractors that market the AS/SVE technology. Each bidder was instructed to provide an estimated cost for design and implementation of a pilot study intended to demonstrate the effectiveness of AS/SVE at the Machias Gravel Pit site and provide information to design a full-scale system. VAPEX Environmental Technologies, Inc. (VAPEX) was selected as the preferred contractor based on technical approach and cost-effectiveness.

The pilot study will involve the installation of one SVE well, one AS well, two piezometers and four soil vapor probes in the source area. The placement of the wells, piezometers and probes will be such that they can be incorporated into the full-scale system. Testing will be conducted for both SVE operating parameters and combined AS/SVE operating parameters. SVE testing will be performed first to establish baseline operating conditions prior to initiation of AS testing.

Prior to initiation of the pilot study, specific details of the study will be provided in a work plan to be developed by the contractor based on their experience at similar sites. Elements of the pilot study work plan are discussed in Section 2.5.1. For purposes of this Work Plan, the following subsection provides an overview of the anticipated pilot study implementation.

### 2.3.2 Implementation

The first stage of the pilot study will be to install the SVE well, AS well, two piezometers and four soil vapor probes. Conventional drilling techniques will be used to construct each of the wells, piezometers and probes. It is anticipated that five days will be required to complete the drilling.

For the SVE tests, a small vacuum pump or blower will be used to draw a vacuum at the SVE well. The SVE well test will be performed at an anticipated air flow rate of 20 to 30 standard

cubic feet per minute (scfm) for a total duration of one to two hours. The SVE well discharge will be piped to two 180 pound vapor phase carbon canisters placed in series to control VOC emissions from the test system. During each test, the physical and chemical parameters that are indicative of SVE performance will be monitored regularly. Physical monitoring will include: well head air flow rate; well head operating vacuum; vapor probe vacuum levels; vacuum pump/blower discharge pressure; vapor discharge pressure; and temperature. Chemical monitoring will include: VOC concentration in the vapor discharge and in the carbon canister discharge. A hand held total organic vapor analyzer (OVA) equipped with a flame ionization detector will be used for real-time vapor monitoring. Vapor samples will also be collected and analyzed at an off-site laboratory.

The AS/SVE test system will be similar to that used for the vapor extraction pilot test. An oil-less air compressor connected to a high pressure air hose will be used to provide an air injection source using ambient air. The SVE and AS systems will be operated simultaneously under a variety of operating configurations over a one to two day period. The physical and chemical parameters of the combined AS/SVE system will be monitored using similar procedures to those used for the SVE test. Additional parameters to be monitored will include: air sparging well air flow rate; air sparging well operating pressure; water levels in the piezometers; hydrostatic pressure changes in the piezometers; and dissolved oxygen in piezometer ground water samples.

### 2.3.3 Assessment

Data collected during the pilot study will be interpreted and summarized in a Pilot Study Summary Report. The report will include: the results of the pilot study; the results of the air flow monitoring; discussion regarding the effectiveness of AS/SVE for the Machias Gravel Pit site; a conceptual design for the full-scale system for completion of the RD/RA. The design will be conceptual in nature in that no detailed construction drawings and specifications will be provided, but will include specific information such as vacuum pump requirements, air compressor requirements, vapor extraction and air injection well design and emission control requirements.

## 2.4 Full-Scale Design

### 2.4.1 Plans and Specifications

Focused plans and specifications will be prepared based on the results of the pilot study. The term "focused" means that the plans and specifications will include only those items directly related to the installation of the full-scale system such as, but not limited to, well construction diagrams, system layout, material specifications, performance standards, monitoring requirements and decommissioning procedures. The focused plans and specifications will be issued as part of the Design Report discussed in Section 2.5.3.

### 2.4.2 Permits and Easements

Required permits and easements will be identified as part of the full-scale design. Depending on the type of permit or easement required, assistance from the NYSDEC may be required to expedite the process.

The permits and easements identification and filing process will begin as soon as practicable to avoid or minimize delays with site remediation. Permit or easement applications will be included in the Design Report or earlier under separate cover, if possible.

### 2.4.3 Operation and Maintenance Plan

Preliminary estimates are that the AS/SVE system will be operated for one to three years before acceptable cleanup goals are met. An operation and maintenance plan will be developed during the design phase to assure that the implementation of the AS/SVE system is operated, maintained and monitored accordingly to assure optimum system performance and attainment of remedial action objectives.

The operation and maintenance plan will be developed and implemented by the remediation contractor with assistance from the Town of Machias. It is anticipated that the Town of Machias can provide the manpower to perform a daily inspection to assure all AS/SVE equipment is operational, provide system monitoring data to the remediation contractor (i.e., change out strip chart recorders or manually record system parameters) and maintain the building or trailer that houses the AS/SVE system.

The operation and maintenance plan will be provided as part of the design document.

## 2.5 Submittals

Three technical submittals will be included as part of the remedial design. These submittals include the following:

- Pilot Study Work Plan
- Pilot Study Summary Report
- Design Report

Each of these submittals is discussed in detail in this section.

### 2.5.1 Pilot Study Work Plan

As previously indicated, a pilot study work plan will be prepared and submitted by VAPEX based on their experience at similar sites.

The pilot study work plan will include the following elements:

- AS/SVE system details including well installation details and locations, and material inventories (i.e., material types and equipment sizes).
- Pilot study start-up and shutdown procedures.
- System monitoring procedures.

- Anticipated operating parameter ranges.
- Energy requirements.
- Waste/residuals handling procedures.
- Health and safety plan.
- Sampling and operating plan.
- Pilot study schedule.

### 2.5.2 Pilot Study Summary Report

Upon completion of the pilot study, a Pilot Study Summary Report will be prepared as discussed in Section 2.3.3. This summary report will summarize the pilot study implementation, present the results of the study and provide an interpretation of the results. The Pilot Study Summary Report will also present a conceptual design based on the results of the pilot study.

The intent of the Pilot Study Summary Report will be to provide sufficient information for the full-scale design of an AS/SVE system for the Machias Gravel Pit site. In addition to the data summaries, the raw data will be provided as appendices to the report.

### 2.5.3 Design Report

A design report for the full-scale AS/SVE system will be prepared based on the Pilot Study Summary Report. The Design Report is intended to provide a design that represents the "optimal configuration" for the Machias Gravel Pit Site and includes specific information such as the exact type of piping to be used, the source for the carbon canisters, equipment specifications, etc. The Design Report will also address the following:

- The collection, destruction, treatment and/or disposal of hazardous substances, including their constituents and degradation products.

- The collection, destruction, treatment and/or disposal of process residuals such as air and condensate.
- Site security measures.

The Design Report format is outlined in Table 2-1. It should be noted that this format is subject to change pending the results of the pilot study.

An operation and maintenance plan (O&M plan) will be prepared and included as an Appendix to the Design Report. The O&M plan will include procedures for monitoring and maintaining the system and procedures for emergency shutdowns including notification procedures. The O&M plan will include logs to assure that maintenance and monitoring is being performed as designed and scheduled.

TABLE 2-1

DESIGN REPORT OUTLINE

1.0 INTRODUCTION
- 1.1 Site Description
- 1.2 Remedial Action Objectives

2.0 PILOT STUDY SUMMARY
- 2.1 Pilot Study Configuration
- 2.2 Operating Parameters
- 2.3 Results
- 2.4 Conclusions and Recommendations

3.0 PRELIMINARY DESIGN
- 3.1 Site Survey
- 3.2 AS/SVE System Layout
- 3.3 Process Controls
- 3.4 System Monitoring

4.0 PLANS AND SPECIFICATIONS
- 4.1 AS Well Specifications
- 4.2 SVE Well Specifications
- 4.3 Piezometer Specifications
- 4.4 Soil Vapor Probe Specifications
- 4.5 Air Injection Specifications
- 4.6 Air Extraction Specifications
- 4.7 Instrumentation Specifications
- 4.8 Waste/Residuals Handling Specifications

5.0 PERMITS AND EASEMENTS
- 5.1 Site Access Agreements
- 5.2 Site Utilities Easements
- 5.3 Process, Exhaust or Ventilation System Permit
- 5.4 Construction Permits

6.0 QUALITY ASSURANCE/QUALITY CONTROL
- 6.1 Project Meetings
- 6.2 Sampling and Analytical Protocols
- 6.3 Data Reduction, Validation and Reporting
- 6.4 Emergency Control Plan

7.0 SCHEDULE

APPENDICES
- System Data
- Monitoring Data
- O&M Plan

# 3.0 REMEDIAL ACTION

## 3.1 Bid Procurement

VAPEX has been awarded the contract to develop and implement the pilot study for the Machias Gravel Pit site. Assuming satisfactory technical and cost management performance, this contractor will be retained through full-scale design and implementation. In the event that the design and/or full-scale implementation is awarded to a remediation contractor other than VAPEX, the NYSDEC will be notified of the selection.

## 3.2 Remediation Oversight

Simon Hydro-Search has been retained to provide oversight during the design and remediation of the site. The oversight contractor's role will be to assist with the development of the documents identified in this document and assure that actual remediation activities are performed in compliance with such documents. The oversight contractor will provide an on-site representative during the pilot study and the installation of the full-scale system, as appropriate. Other responsibilities regarding remediation oversight include inspections and progress reports as discussed below.

### 3.2.1 Inspections

Inspections of the AS/SVE system will be conducted quarterly and will include a review of the logs maintained at the site to assure that all maintenance and monitoring is being performed as designed and scheduled. Any errors associated with system monitoring and maintenance will be brought to the immediate attention of the parties involved and corrected.

### 3.2.2 Progress Reports

Monthly progress reports will be issued to NYSDEC throughout the remedial design and implementation schedule. These reports will include all pertinent information for NYSDEC to evaluate system adequacy. Upon installation, reports will be submitted on a quarterly basis.

## 3.3 Environmental Monitoring

Environmental monitoring of the effectiveness of the proposed remediation will consist of ground water monitoring and surface water sediment monitoring. Each monitoring program is discussed separately below.

### 3.3.1 Ground Water Monitoring Program

The purpose of the ground water monitoring program will be to monitor the effectiveness of the proposed AS/SVE system being installed to treat ground water in the source area west of Very Road. The wells proposed for use in the monitoring program are summarized on Table 3-1 along with the rationale used for choosing the well. Existing and proposed well locations are provided on Figure 3-1. All samples collected will be analyzed for VOCs. Specific analytical protocols are provided in Section 5.

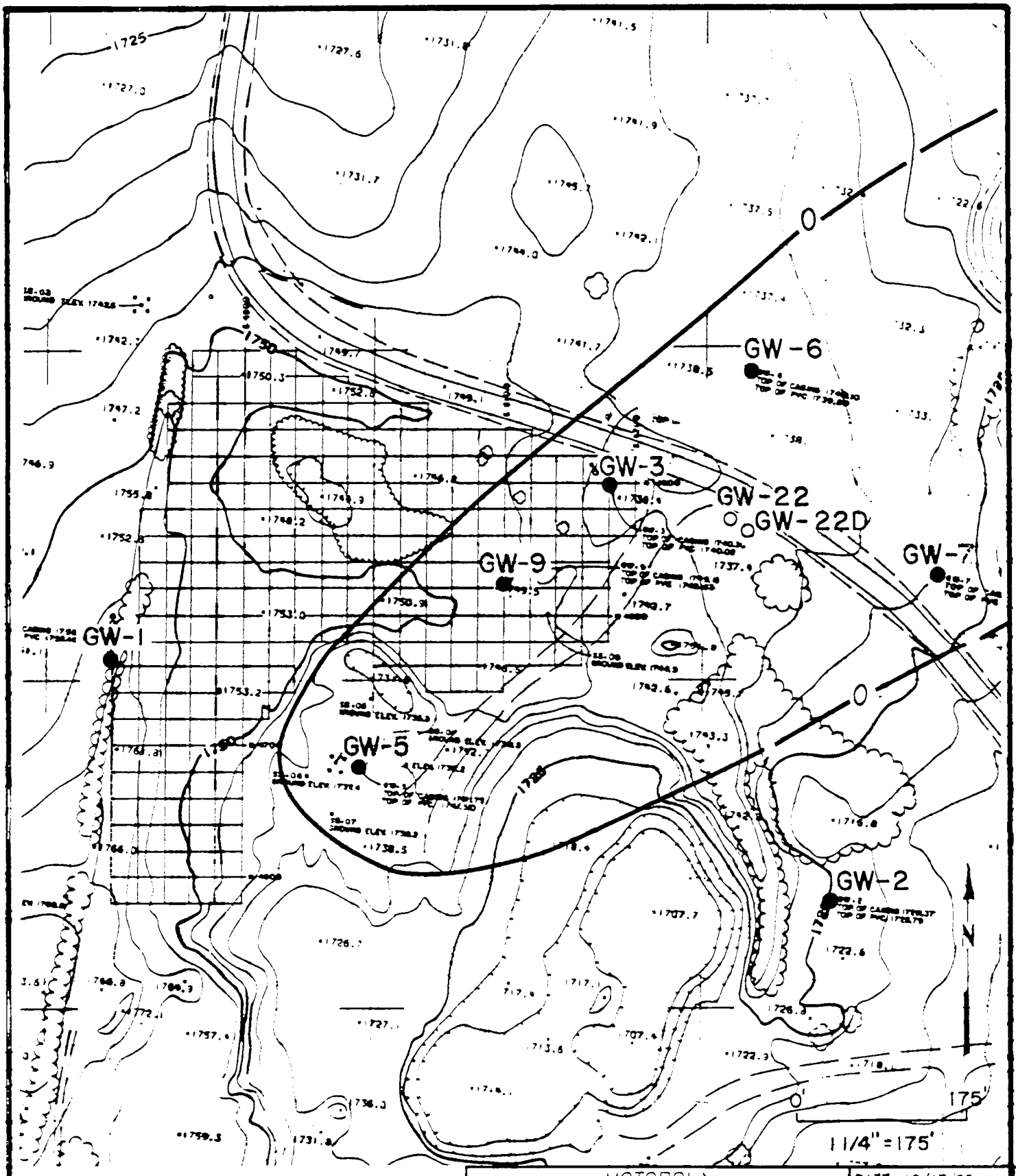
The proposed monitoring well network will provide information on the effectiveness of the remediation within the main source area and at the downgradient edge of the treatment system. Initial monitoring/sampling will be performed on a monthly basis. Depending on the consistency, rate of change and total concentrations of VOCs detected, the monitoring frequency will be changed to quarterly.

All ground water monitoring data will be provided to the NYSDEC in the quarterly progress reports discussed in Section 3.2.2. Monitoring well installation/construction procedures and

TABLE 3-1

PROPOSED GROUND WATER MONITORING NETWORK

| Well No. | Status | Rationale |
|---|---|---|
| GW-5 | Existing | Water table well located within the main portion of the source area (i.e., inactive gravel pit). |
| GW-9 | Existing | Water table well immediately downgradient of source area. |
| GW-3 | Existing | Water table well at northwest edge of treatment area. |
| GW-6 | Existing | Water table well east of Very Road to monitor plume degradation/dispersion in areas not targeted for sparging. |
| GW-7 | Existing | Water table well at southeast edge of treatment area to monitor ground water quality migrating from the treatment area. |
| Cabin Well | Existing | Water table well east of Very Road to monitor plume degradation/dispersion in areas not targeted for sparging. |
| GW-22 | Proposed | Water table well in the east-central edge of treatment area to monitor ground water quality migrating from the treatment area. |
| GW-22D | Proposed | Deep well in the east-central edge of the treatment area to monitor deep ground water quality migrating from treatment area. This well is intended to replace former well GW-3D which was damaged and abandoned in November 1992. |




## LEGEND

GW-1 ● Existing Monitoring Well

GW-22 ○ Proposed Monitoring Well

| | |
|---|---|
| MOTOROLA<br>MACHIAS | DATE: 12/17/92<br>DESIGNED:<br>CHECKED:<br>APPROVED:<br>DRAWN: SRD<br>PROJ.: 204262022 |
| **EXISTING AND PROPOSED WELL LOCATIONS** | |
| SIMON HYDRO-SEARCH | FIGURE 3-1 |

ground water sampling procedures are provided in Sections 5.4.1.1.1 and 5.4.1.1.2 of this Work Plan, respectively.

3.3.1.1 Monitoring Well Installation

To replace ground water monitoring well GW-3D, which was damaged and abandoned in November, 1992, proposed well GW-22D will be installed near the same location. Additionally, proposed well GW-22 will be clustered with GW-22D to monitor ground water quality at the water table in the east-central edge of the treatment area. Locations of these proposed wells are shown in Figure 3-1.

Prior to well installation at each location, the drill rig, all drilling equipment and well installation materials will be steam cleaned. Well screen and riser pipe will be isolated from contact with surface soils by sealing them in plastic immediately after decontamination. A hydrogeologist or engineer will supervise all drilling and well installation activities.

Drilling

Boreholes will be advanced using 4.25-inch inside diameter (I.D.) hollow stem augers. The boring for GW-22D will be advanced first and will be logged continuously for the first 10 feet of drilling using a 2-foot split spoon sampler. Samples will be collected at 2.5 foot intervals for the remainder of the boring. Split spoon samples will be logged in the field as they are collected and blow counts will be recorded on the log sheet for 6-inch intervals. The boring for GW-22, which will be located nearby, will be advanced directly to the targeted depth, based on the logs of material encountered in GW-22D.

A photoionization detector (PID) with a 11.7 eV bulb or equivalent, will be used to field screen each soil sample for total volatile organic vapors. Readings will also be taken downhole and in the breathing zone for health and safety purposes.

Drill cuttings that show detections above 1 ppm using the PID will be containerized in 55-gallon drums for later analysis and proper disposal. Any drums generated will be sealed and labeled to identify contents, date and location from which the material was derived. Drill cuttings that show no detections using the PID or analytical results that are shown to be non-hazardous will be spread on the ground around the drill site.

Well Construction

Both monitoring wells will be constructed of 2-inch I.D., schedule 40 threaded PVC riser with 5 or 10 feet of 0.010-inch machine slotted PVC screen. The screened interval will be determined by the hydrogeologist or engineer based on subsurface materials encountered. The annular space around the screen will be backfilled with clean, well-sorted silica sand to a depth of one to two feet above the top of the screen. Both wells will be constructed with a three foot bentonite-pellet seal placed immediately above the sand pack. The pellets will be hydrated and allowed to swell. The remainder of the annular space will be backfilled with cement/bentonite grout. Both wells will be completed with locking protective casings with approximately three feet of stickup and a concrete runoff diversion apron. As-built well construction data will be documented on well construction summary forms.

Well Development

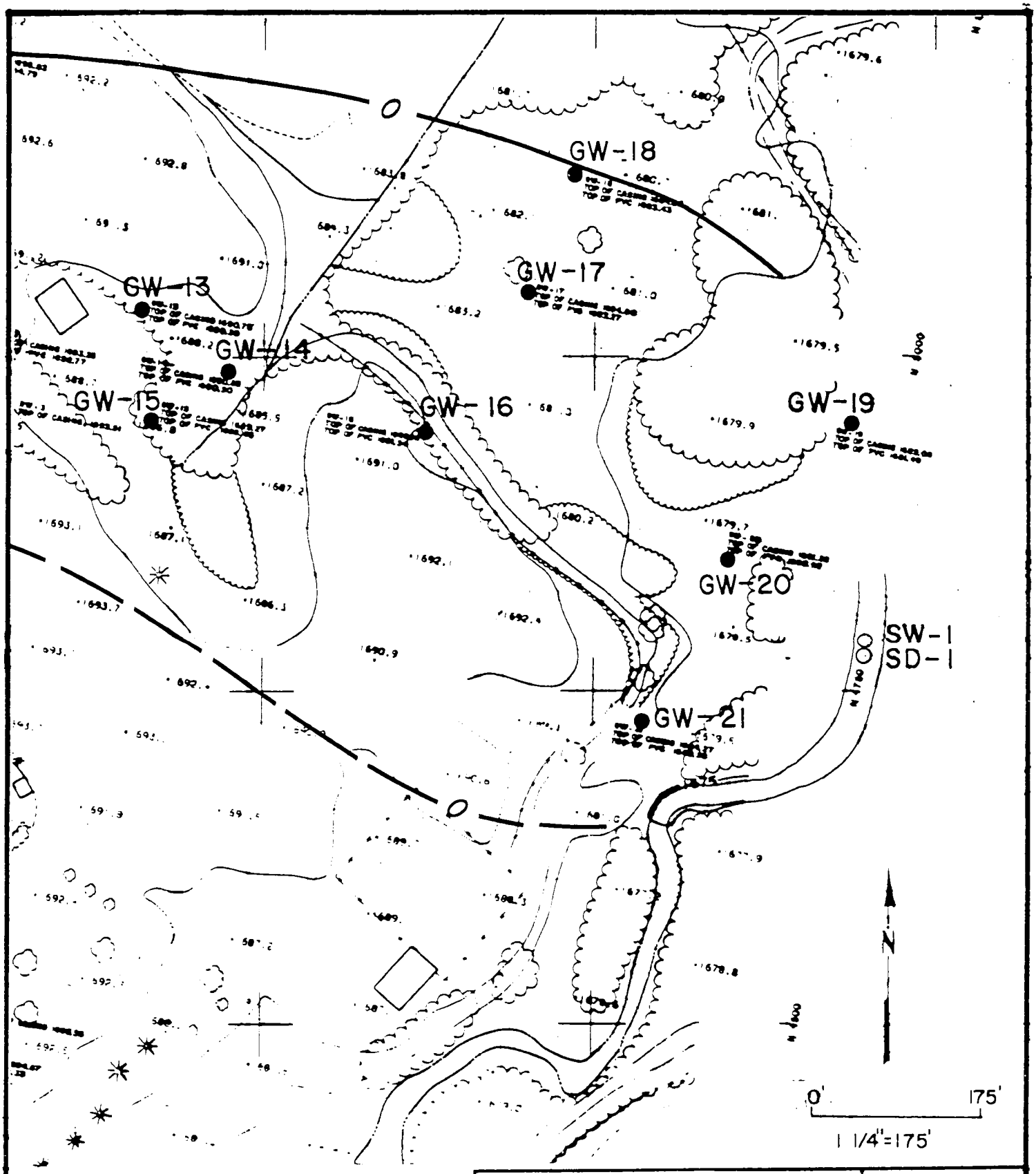
Well development will not be started until cement in the annulus of each well has been allowed to set for at least 24 hours. Both wells will be developed using the surge and bail method. A minimum of five casing volumes of water will be removed and field measurements of pH, specific conductance and temperature will be monitored to document stable conditions. Specific well development data will be documented on the as-built well construction summary forms.

### 3.3.2 Surface Water Monitoring Program

In accordance with the ROD issued by the NYSDEC, the existing ground water impacts east of Very Road will be allowed to disperse/attenuate naturally. The ultimate discharge point of the plume has been defined to be a tributary which drains Bird Swamp and flows into Ishua Creek. As discussed in Section 1, the discharge area is just east of existing monitoring wells GW-20 and GW-21. The Habitat Based Assessment developed as part of the RI showed that impacts to surface water and the environment associated with potential of impacted ground water should be negligible. A surface water and sediment sample collected from the potential discharge area shows no impacts to date.

The purpose of the proposed surface water monitoring program is to verify that potential discharge of impacted ground water will not impact adversely the surface water environment. At the present time, the proposed surface water monitoring program will include the sampling of monitoring wells GW-20 and GW-21 (two wells located immediately prior to the potential discharge area) and the collection of a surface water and sediment sample at the point of potential discharge as shown on Figure 3-2. All samples will be analyzed for VOCs. Specific analytical and sampling protocols are provided in Section 5. Surface water monitoring will be performed on a quarterly basis. The results will be provided to the NYSDEC in the quarterly reports discussed in Section 3.3.3.

To further aid in the development, implementation and interpretation of a meaningful surface water monitoring program, Dr. Joseph Atkinson of the State University of New York at Buffalo has been contracted. Dr. Atkinson's specialty is surface water hydrology and he has been contracted to develop a linked ground water - stream contaminant transport model for the site based upon which additional surface water/sediment sampling locations may be chosen. The results of Dr. Atkinson's modeling and his recommendations will be provided to the NYSDEC for review.




## LEGEND

SW-1 ○ Surface Water Sample Location

SD-1 ○ Sediment Sample Location

GW-1 ● Monitoring Well

| | |
|---|---|
| MOTOROLA<br>MACHIAS | DATE: 12/17/92<br>DESIGNED:<br>CHECKED:<br>APPROVED:<br>DRAWN: SRD<br>PROJ.: 204262022 |
| PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS | |
| SIMON HYDRO-SEARCH | FIGURE 3-2 |

In the event of unacceptable impacts to the surface water, appropriate corrective measures will be implemented.

### 3.4 Petition to Terminate Operation of the Remedial System

When mutually acceptable remedial objectives for the site have been achieved, a petition to terminate operation of the remedial system will be submitted to NYSDEC.

Site remediation will be deemed by NYSDEC to be achieved when all reasonable efforts have been made to restore TCA and TCE concentrations in the ground water to below 5 $\mu$g/l each. For impacted soils, remediation will be deemed by NYSDEC to be achieved when all reasonable efforts have been made to restore TCA and TCE concentrations in the soil to below 1 mg/kg.

Termination of the SVE system operation prior to achieving these cleanup goals will be considered by NYSDEC if the following can be demonstrated:

- The residual VOC concentration in the soils and ground water beneath and east of the site does not pose an unacceptable risk to human health or the environment;
- The residual VOC concentration in soils beneath the site is compatible with the anticipated future use of the site; and
- Further operation of the AS/SVE system will not result in significant additional further reduction of soil and ground water TCA and TCE concentrations.

The criteria outlined above for termination of the remedial system operation may be modified and refined based on the performance of the system and evaluation of remedial data.

## 3.5 Submittals

### 3.5.1 Progress Reports

Monthly and quarterly progress reports will be prepared as discussed in Section 3.2.2 and submitted to the NYSDEC.

### 3.5.2 Final Operation and Maintenance Plan

After the full-scale system has been in operation long enough to debug and optimize the system, a final O&M plan will be developed, if necessary. The final O&M plan will provide updated procedures for operation and maintenance and monitoring of the system.

### 3.5.3 Closeout Report

Within 60 days after the completion of the AS/SVE system installation, a Closeout Report will be submitted to the NYSDEC. The report will include, at a minimum, the following elements:

- As-Built Drawings
- Analytical Results
- Engineering Assessment
- Long-Term Monitoring Plan
- List of Modifications to the RD/RA Work Plan

The report is intended to provide an overview of the remediation process, an evaluation of how the remediation process functioned compared to the initial expectations and a long-term monitoring plan to demonstrate that the remedy is permanent. The Closeout Report will be signed and stamped by a New York State certified Professional Engineer.

### 3.5.4 Health and Safety Plan

The remediation contractor will be required to submit a health and safety plan for the implementation and operation of the full-scale remediation system. The health and safety plan will meet the requirements set forth in Appendix A of this Work Plan and also address any health and safety procedures to protect the public in the vicinity of the site. The contractor's health and safety plan will be submitted to the NYSDEC.

# 4.0 SCHEDULE

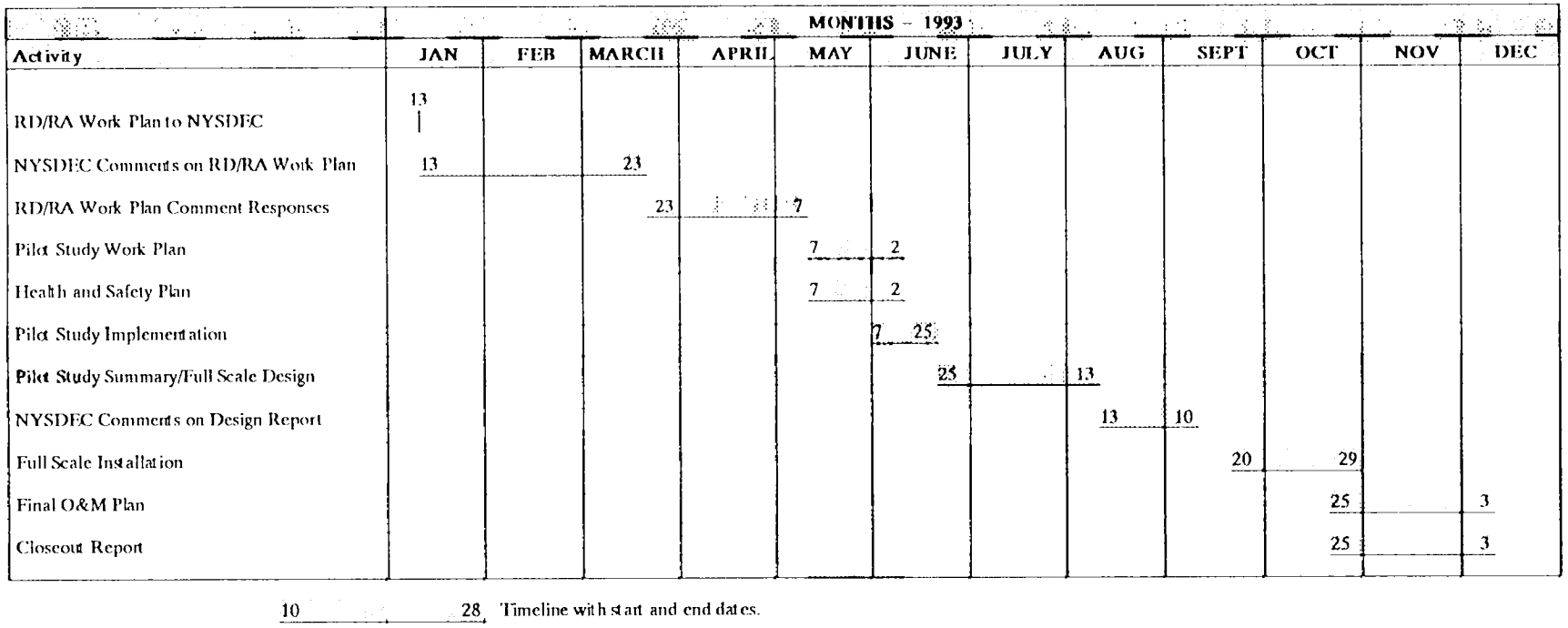
The primary components of the Machias Gravel Pit site RD/RA are the RD/RA work plan, the pilot study, the full-scale design and the full-scale remediation. The following is the anticipated schedule for the major tasks associated with the RD/RA:

| | |
|---|---|
| RD/RA Work Plan to NYSDEC | January 13, 1993 |
| NYSDEC Comments on RD/RA Work Plan | March 23, 1993 |
| RD/RA Work Plan Comment Responses to NYSDEC | May 7, 1993 |
| Pilot Study Work Plan and Health & Safety Plan to NYSDEC | June 2, 1993 |
| Pilot Study Implementation | June 7 through June 25, 1993 |
| Pilot Study Summary Report and Full Scale Design | August 13, 1993 |
| NYSDEC Comments on Design Report | September 10, 1993 |
| Full Scale Installation | September 20, 1993 |
| Final O&M Plan | December 3, 1993 |
| Closeout Report to NYSDEC | December 3, 1993 |
| Quarterly Progress Reports | Commence September 20, 1993 |

An anticipated schedule time line is provided on Figure 4-1.

# FIGURE 4–1

## ANTICIPATED PROJECT SCHEDULE



# 5.0 QUALITY ASSURANCE/QUALITY CONTROL

## 5.1 Technical Reviews

Technical reviews will be conducted throughout the RD/RA process. Most technical reviews will be conducted internally. The purpose of the technical reviews will be to assure all parties that the work associated with the RD/RA is performed in compliance with all applicable or relevant and appropriate regulations using sound technical judgement.

## 5.2 Data Quality Assurance Plan

This data quality assurance plan focuses on the QA/QC to be performed as part of the proposed environmental monitoring programs discussed in Section 3.3.

### 5.2.1 Quality Assurance Objectives for Measurement Data

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis and reporting that will provide defensible and reproducible results. This section defines the goals for the level of QA effort; accuracy, precision and sensitivity of analyses and completeness, representativeness, and comparability of measurement data. QA objectives for field measurements are also discussed as well chain-of-custody, calibration, laboratory analysis, reporting internal quality control and corrective actions.

#### 5.2.1.1 Level of QA Effort

For water (surface or ground water) and sediment samples, field duplicates and field blanks will be taken and submitted to the analytical laboratory to provide the means to assess the quality of the data resulting from the field sampling program. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Field blank samples are analyzed to check for procedural contamination and/or ambient conditions at the site which may be affecting

sample results. The general level of the QA effort for this project will be at least one field duplicate and one field blank for every round of monitoring.

Water and sediment samples will be analyzed for Target Compound List (TCL) VOCs. The level of laboratory QA effort for TCL analyses of water and sediment samples will be consistent with the NYSDEC Analytical Services Protocol (NYSDEC ASP), December 1991.

5.2.1.2 Accuracy, Precision, and Sensitivity of Analyses

Accuracy, precision and sensitivity (detection limit) criteria for analytical services for organics will be consistent with the corresponding with the NYSDEC ASP dated December, 1991. In addition, the analytical laboratory used will have a current New York State Department of Health Environmental Laboratory Approval Program (DOH ELAP) certification in all categories of CLP and Solid and Hazardous Waste.

5.2.1.3 Completeness, Representativeness, and Comparability

The analytical laboratory will provide analytical results with the completeness required in the NYSDEC ASP dated December, 1991. The sampling network was designed to provide data representative of site conditions for the intended objectives of the project as defined in Section 3.3 of this Work Plan.

5.2.1.4 Field Measurements

Measurement data will be generated during field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to determining Ph, specific conductance and temperature of water samples.

The general QA objective for field measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of data through standardized procedures.

### 5.2.2 Implementation

#### 5.2.2.1 Chain-of-Custody Procedures

Chain-of-custody procedures document the history of sample containers and samples from the time of preparation of sample containers through sample collection, shipment, and analysis. A sample is considered in custody if:

- The sample is in the sampler's physical possession;
- The sample is secured by the sampler to prevent tampering; or
- The sample is secured by the sampler in an area that is restricted to authorized personnel.

To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, a chain-of-custody record will be completed for each sample at each sampling location. Each time the samples are transferred, signatures of the person relinquishing and receiving the samples, as well as the date and time, will be documented. An example chain-of-custody record is provided in Figure 5-1.

#### 5.2.2.2 Decontamination Program

All sampling equipment will be decontaminated prior to each use by the following protocol:

- Scrub equipment thoroughly in a low-sudsing detergent solution (e.g., Alconox);
- Rinse with distilled water; and

## CHAIN OF CUSTODY RECORD

| PROJ. NO. | PROJECT NAME | | | | | NO. OF CON-TAINERS | SAMPLE DESCRIPTION |
|---|---|---|---|---|---|---|---|
| SAMPLERS: | | | | | | | |
| STA. NO. | DATE | TIME | COMP. | GRAB | STATION LOCATION | | |
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| Relinquished By: | Date / Time | Received By: | Relinquished By: | Date / Time | Received By: |
|---|---|---|---|---|---|
| | | | | | |
| Relinquished By: | Date / Time | Received By: | Relinquished By: | Date / Time | Received By: |
| | | | | | |

Remarks:

Report To:

Distribution: White-Accompanies Shipment, Yellow-Laboratory File, Pink-Field File

PROJECT 426112022

DATE 1/93

REVISIONS

Hydro-Search, Inc.
CONSULTING HYDROLOGISTS-GEOLOGISTS
Milwaukee • Denver • Reno

FIGURE 5-1

EXAMPLE CHAIN-OF-CUSTODY RECORD

- Wrap equipment in plastic or aluminum foil for handling and/or storage until next use.

All drilling and borehole sampling equipment will be steam cleaned before beginning work, between borings and prior to leaving the site.

5.2.2.3 Calibration Procedures and Frequency

The calibration procedures and frequency of calibration for analysis of specified TCL parameters to be followed are specified in the NYSDEC ASP dated December, 1991.

Calibration of the field pH meter will be checked prior to the collection of each water sample. The field pH meter will be calibrated using two reference solutions as appropriate to the pH of the sample. The calibration of the specific-conductance/temperature meter will be checked using a reference solution of 0.01 N KCl (specific conductance, 1413 $\mu$mhos/cm at 25°C.) on a daily basis. Readings must be within 5 percent to be acceptable.

5.2.2.4 Quality Control Samples

Field duplicates and field blanks will be submitted for analysis to provide the means to assess the quality of the data from the field sampling program. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Field blanks are analyzed to check for any procedural contamination that could adversely affect the integrity of the sample. The level of QC effort for this project is summarized in Section 5.2.1.1.

One set of trip blank samples will also accompany each sample shipment. Trip blanks will only be analyzed if it is suspected that custody was breached, or if one of the investigative sample containers was broken during shipment.

5.2.2.5 Analytical Procedures

All samples collected for chemical analysis will be tested for TCL organics using analytical methods specified in the NYSDEC ASP dated December, 1991.

5.2.2.6 Data Reduction, Validation and Reporting

Analytical data from the laboratory will be evaluated by the Organics Laboratory Supervisor for conformance to NYSDEC ASP requirements for accuracy, precision and completeness. Qualifications for approval, if appropriate, will be addressed in case narratives. In addition to the summarized forms for precision and accuracy of the analyses, the laboratory will provide the analytical results for blanks and duplicates and the recovery data for matrix and surrogate spikes.

All data will be reported or specified in NYSDEC ASP Superfund Category for the first round of sampling. The data will be validated by third party data validation. The resume of the person or firm conducting the data validation will be submitted to NYSDEC for approval. If the data validation report for the first round of sampling is approved by NYSDEC, subsequent data will be reported or specified according to NYSDEC ASP Category A.

5.2.2.7 Internal Quality Control Procedures

Internal quality control procedures for analysis of specified TCL parameters by the analytical laboratory will be in accordance with the NYSDEC ASP dated December 1991. These specifications include the types of audits required (surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for surrogate spikes, and the quality control acceptance criteria for these audits.

Quality control procedures for field measurements are limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by routine calibration of the

instruments, where appropriate. Quality control of field sampling will involve collecting field duplicates and blanks in accordance with the applicable procedures described in Section 5.3.

5.2.2.8 Data Assessment Procedures

Analytical data from the laboratory will be assessed for accuracy, precision, and conformance with QC criteria by the Laboratory Section Supervisors with overview by the Quality Assurance Manager in accordance with the NYSDEC ASP dated December, 1991.

Data from the field measurements will be assessed by thorough review of documentation of analytical procedures that were adhered to, and results of systems audits. All data will be reviewed for completeness by the oversight project manager as appropriate to his operational responsibilities.

5.2.2.9 Corrective Action Procedures

If a quality control audit results in detection of unacceptable conditions or data, the oversight project manager will be responsible for developing and initiating corrective actions. The laboratory will be notified if the nonconformance is of program significance. Corrective action may include:

- Reanalyzing the samples, if holding time criteria permit;
- Resampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and
- Accepting the data and acknowledging its level of uncertainty.

5.2.2.10 Quality Assurance Reports

No separate QA report is planned for the RD/RA environmental monitoring program. The reports will contain a separate QA/QC section summarizing the quality of the data collected

and/or used as appropriate to the project. Criteria for the evaluation of data will be discussed and data usability will be summarized in this section.

## 5.3 Sampling and Analysis Plan

This section provides details regarding sampling procedures to be used in the field as part of RD/RA environmental monitoring programs. Sampling program summaries for the ground water monitoring programs and the surface water monitoring program are provided on Tables 5-1 and 5-2. In addition this section will provide the sample numbering system to be used, sample handling procedures, and sample documentation/tracking. For additional information regarding sample location and rationale, refer to Section 3.3. Analytical methods to be used by the laboratory are provided in Section 5.2. The installation and development of two additional ground water monitoring wells (MW-22 and MW-22D) are described in Section 3.3.1.

### 5.3.1 Sample Collection Procedures

#### 5.3.1.1 Ground Water Sampling

Ground water samples will be collected from all monitoring wells specified for use in RD/RA environmental monitoring (see Section 3.3). The following procedures will be used for on-site monitoring well sampling:

- Depth to water and total depth of each well will be determined using an electric water level indicator. The volume of water in the well casing will then be calculated.
- A minimum of three well volumes of water will be purged from the well with a PVC or Teflon bailer prior to sampling.
- Purging will continue until three successive pH, specific conductance and temperature measurements show stable conditions to ensure that the sample is representative of formation water. If the well bails dry before removing three complete well volumes, the well will be allowed to recharge for 15 minutes and sample collection will be initiated.

TABLE 5-1

SUMMARY OF GROUND WATER MONITORING PROGRAM MATRIX

| Media | Monitoring Samples | Field QC Samples | | Lab QC Samples | | | Total |
|---|---|---|---|---|---|---|---|
| | | Duplicate | Field Blank | MS | MSD | MSB | |
| Ground Water | 7 | 1 | 1 | 1 | 1 | 1 | 11 |

MS Matrix Spike
MSD Matrix Spike Duplicate
MSB Matrix Spike Blank

TABLE 5-2

SUMMARY OF SURFACE WATER MONITORING PROGRAM MATRIX

| Media | Monitoring Samples | Field QC Samples | | Lab QC Samples | | | Total |
|---|---|---|---|---|---|---|---|
| | | Duplicate | Field Blank | MS | MSD | MSB | |
| Water (Ground and Surface Water) | 3 | 1 | 1 | 1 | 1 | 1 | 8 |
| Sediment | 1 | 1* | -- | 1 | 1 | 1 | 5 |
| Total | 4 | 2 | 1 | 2 | 2 | 2 | 13 |

MS Matrix Spike
MSD Matrix Spike Duplicate
MSB Matrix Spike Blank
* Sediment samples duplicates will be collected as "co-located" samples.

- The sample will be collected using a PVC or Teflon bailer. Sample water will be poured directly into laboratory prepared containers.

- The bailers will be decontaminated between each use by scrubbing with an Alconox solution, followed by thoroughly rinsing the bailer with distilled water.

5.3.1.2 Surface Water/Sediment Sampling

5.3.1.2.1 *Surface Water Sampling*

Surface water samples will be collected from the tributary which drains Bird Swamp and flows into Ishua Creek. Samples will be collected as grab samples from immediately above the stream channel bottom by directly dipping laboratory prepared containers into the water. At the proper depth, the container will be opened to collect the sample.

5.3.1.2.2 *Sediment Sampling*

Sediment samples will be collected using a thin-walled plastic tube coring device, or equivalent. Sediment extracted with the plastic tube may be more sample than necessary for the laboratory analyses. Therefore, a grab sample will be obtained for VOC analysis from the tube.

5.3.2 Field QC Samples

Two types of QC samples will be collected and analyzed for solids and liquids sampled during this project:

- Field blanks; and
- Duplicates

The purpose behind each QC sample is explained in Section 5.2.1.1. The sample collection procedures for each QC sample type are detailed below.

5.3.2.1 Field Blanks

For this investigation, one field blank will be collected during each round of sampling. The field blank will be analyzed for VOCs. It will be prepared by pouring Ultra-Pure water (HPLC-grade water) from a decontaminated bailer directly into laboratory prepared containers.

5.3.2.2 Duplicates, Matrix Spikes/Matrix Spike Duplicates/Matrix Spike Blanks

One duplicate (co-located for solid matrices) will be collected for each media during each round of sampling. Additionally, one matrix spike, one matrix spike duplicate and one matrix spike blank will be collected for each media. Sampling procedures for each of the samples will be identical to those used to collect investigative samples.

5.3.3 Sample Numbering System

All samples for chemical analysis, including QC samples, will be given a unique sample number. A listing of sample numbers will be maintained on the chain-of-custody and in the field logbook.

Each sample will be identified by a sample number. This project sample number, will highlight the sample matrix and location, and will be used for presentation of the data in the quarterly reports.

The project sample numbers will be composed of three components, which are described below:

- Project Identifier. A two-character designation will be used to identify the site where the sample is collected. For this project, it will be MG (Machias Gravel);
- Sample Type and Location. A two to three character type code followed by a two-digit location code will indicate sample type and location; and
- Sequence. A three-digit number will be used to indicate the monitoring event.

Some examples of the project sample numbering system are as follows:

- MG-GW05-193: Machias Gravel Pit ground water, location 05, first sampling in 1993.
- MG-SW01-493: Machias Gravel Pit surface water, location 01, fourth sampling in 1993.

QC samples will be assigned a specific sample number and submitted to the laboratory blind.

5.3.4 Sample Handling

5.3.4.1 Sample Containers and Sample Preservation

Samples will be handled and shipped as low-concentration environmental samples. The containers used to collect samples for chemical analysis will be provided by the contracted laboratory. These containers will be specific to the analysis and volume requirements of a particular sample matrix. Table 5-3 summarizes the sample containers to be utilized, preservation techniques and holding time requirements.

5.3.4.2 Sample Packaging and Shipment

Sample packaging and shipping procedures are based on U.S. EPA specifications, as well as Department of Transportation (DOT) regulations. The procedures vary according to sample concentration and matrix, and are designed to provide optimum protection of samples and the public.

All samples will be shipped within 48 hours of collection. Following collection, the exterior of sample bottles will be cleaned by wiping the outer surface with a moist cloth.

In preparation for shipment, the following procedures will be followed:

TABLE 5-3

SAMPLING CONTAINERS, PRESERVATIVES AND HOLDING TIMES

| Matrix | Parameters | Container (Number, Size, Type) | Preservation | Holding Time |
|---|---|---|---|---|
| Water (Ground and Surface Water) | TCL VOCs | 2 - 40 ml glass, TLC | Cool to 4° C<br>2 drops of 1:1 HCl | 14 days |
| Sediment | TCL VOCs | 1 - 8oz glass, TLC | Cool to 4° C | 14 days |

TCL - Target Compound List
VOC - Volatile Organic Compound
TLC - Teflon Lined Cap

Low-Concentration Environmental Samples

1. Prepare cooler(s) for shipment.

   - Tape drain plug of cooler shut;
   - Affix "This Side Up" arrow labels on all four sides, and "Fragile" labels on at least two sides of each cooler; and
   - Place mailing label with laboratory address on top of cooler(s).

2. Arrange sample containers in groups by sample number.

3. Mark volume levels on bottles with a grease pencil.

4. Ensure that all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.

5. Arrange containers in front of assigned coolers.

6. Seal sample containers within plastic zip-lock bags to prevent vermiculite from contacting samples.

7. Place approximately 2 inches of vermiculite at the bottom of the cooler to act as a cushion for the sample containers.

8. Arrange containers in the cooler so that they do not touch.

9. Fill remaining spaces with vermiculite (VOA vials should be placed in cooler suspended in vermiculite).

10. Ensure all containers are firmly packed in vermiculite.

11. If ice is required to preserve the samples, cubes should be repackaged in double zip-lock bags, and placed on top of the vermiculite.

12. Sign chain-of-custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express or other carrier, as appropriate.

13. Separate copies of COC forms. Seal proper copies within a large zip-lock bag and tape to inside lid of cooler. Retain copies of all forms in-house.

14. Close lid and latch.

15. Secure each cooler using evidence seals.

16. Tape cooler shut on both ends, making several complete revolutions with strapping tape.

17. Relinquish to Federal Express or other courier service. Retain airbill receipt for project records. (Note: All samples will be shipped for "NEXT DAY" delivery.)

18. Telephone laboratory contact and provide him/her with the following shipment information:

- Your name;
- Project name;
- Number of samples sent according to matrix and concentration; and
- Airbill number.

5.3.5 Sample Documentation

5.3.5.1 Field Records

Field observations and other information pertinent to the collection of samples will be recorded in the field. All entries will be made in a bound logbook or on field sampling sheets. The data to be recorded for each sample will include date, time, sample number, sample description, and the person collecting the sample. Photographs will be taken and logged to document sampling activities.

5.3.6 Analytical Program

All samples collected as part of RD/RA environmental monitoring programs will be analyzed for TCL VOCs as specified in Section 5.2.1.1.

## 5.4 Contingency Planning

Contingency planning will be addressed during the pilot study, full-scale design and full-scale implementation. At this time, it appears that implementation of an AS/SVE system will attain the remedial action objectives and, therefore, the need to resort to a contingency plan is not anticipated. The NYSDEC will be kept apprised during all phases of the project and will be

notified immediately of the need to implement a contingency plan. NYSDEC approval will be obtained before any contingency plan is implemented.

## 6.0 REFERENCES


U.S. EPA. "Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites", EPA/540/G-88/003, December 1988.

New York State, Department of Environmental Conservation, Division of Water. "Water Quality Standards and Guidance Values", September 25, 1990.

New York State, Department of Environmental Conservation, "Draft Cleanup Policy and Guidelines, Volumes I and II", October 1991.

New York State Department of Environmental Conservation, Instructions for the Preparation and Submission of an Application for a Permit to Construct or a Certificate to Operate Processes, Exhaust and/or Ventilation Systems, March 1980.

New York State, Department of Health. "Chapter I State Sanitary Code, Part 5, Drinking Water Supplies, Subpart 5-1, Public Water Supplies", January 1990.

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Simon Hydro-Search, "Machias Gravel Pit Remedial Investigation Report", August, 1991.

Simon Hydro-Search, "Addendum No. 1 to the Machias Gravel Pit Remedial Investigation Report", January, 1992.

Simon Hydro-Search, "Addendum No. 2 to the Machias Gravel Pit Remedial Investigation Report", March, 1992.

VAPEX Environmental Technologies, Inc. Proposal for the Performance of and Air Sparging Remedial Program, Machias Gravel Pit Site, New York, October 28, 1992.

# APPENDIX A

# HEALTH AND SAFETY PLAN

## HEALTH AND SAFETY

A Health and Safety Plan (HSP) will be developed for all field activities included in this Work Plan. The HSP will comply with requirements outlined by the Occupational Health and Safety Administration (OSHA) 29CFR, Part 1910.120 - Hazardous Waste Operations and Emergency Response Standard. Specifically, the HSP must include:

- General Information
    - Address
    - Tasks/Activities
    - Personnel/Responsibilities
- Site/Hazard Characteristics
    - Facility Description
    - Site Access
    - Unusual Features
    - Nature of Contamination
    - Hazard form/Characteristics
    - Major Health Hazards
- Task Health and Safety Analysis
    - Hazard/Risk Evaluation
    - Personal Protection
    - Area/Personnel Monitoring
- General Site Requirements
    - Work Zones
    - Fit Test Requirements
    - Medical Monitoring Requirements
    - Training Requirements
- Contamination Control
    - Local Resources
    - Site Resources
    - Personnel Roles
    - Emergency Contacts
    - Emergency Routes
        - Hospital
        - Evacuation

- Site Communications
- Reporting Procedures
- Response Procedures

- Minimum Attachments

  - Attachment A Site Maps
  - Attachment B Route to Hospital
  - Attachment C Chemical Hazard Information
  - Attachment D Site Safety Plan Acknowledgment Form

Project field personnel will be required to undergo a right-to-know briefing to be performed by Motorola or its representative regarding plant operational practices and hazards. All project field personnel will also be required to provide documentation of 40-hour health and safety training and appropriate follow-up training.

# APPENDIX B

# PROJECT CONTACTS

# PROJECT CONTACTS

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