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905013

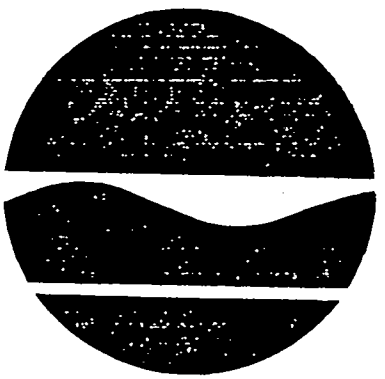
PROPOSED REMEDIAL ACTION PLAN

Machias Gravel Pit

Site No. 905013

Prepared by:

New York State
Department of Environmental Conservation



September 1992

MACHIAS GRAVEL PIT

Site #905013

PROPOSED REMEDIAL ACTION PLAN

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I. SITE LOCATION AND DESCRIPTION

The Machias Gravel Pit site (#905013) is located on Very Road approximately 2 miles west of the Town of Machias, Cattaraugus County, New York (Figure 1). The area is rural in nature with approximately six residences within 1/4 mile of the site. The topography is variable and consists primarily of rolling hills. Surface runoff at the site flows north and east toward Ischua Creek and its tributaries approximately 1/4-1/2 mile from the site. The Ischua Creek spillway forms a wetland area 1/4 mile east of the site while Bird Swamp occupies a large area 2,000 feet south of the site. Farm lands and woods prevail to the north and west, respectively.

The site is located on the eastern section of a glacially rounded hill which is composed of glacial fluvial deposits. The general stratigraphy of the area contains glacial, lacustrine and fluvial sediments over the Gowanda Shale Member of the Canadaway Formation. The Gowanda Shale consists of gray-black, thin to thick bedded siltstone. This unit is approximately 275 feet thick and is reported to be at a depth of approximately 90 feet beneath this site (NYS Water Resource Commission, 1973).

Groundwater at the site is under unconfined conditions within glacio fluvial sand and gravel deposits. The water table generally follows the general topography of the area and is encountered approximately 45-50 feet beneath the site. Groundwater moves in a easterly direction from the site at a rate of between 0.5 to 38 feet per day. (Figure 3)

All residents in the area rely on groundwater for domestic supplies. One cabin, now unoccupied, is directly east of the site and is within the plume area of contaminants from the gravel pit. No other homes are expected to be affected by this site.

II. SITE HISTORY

A. Background

The site is approximately 20 acres in size and consists of an active gravel pit operation at the southern portion of the site and an inactive gravel pit at the northern portion (Figure 2). The inactive gravel pit to the north reportedly was 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. The drums were suspected of containing epoxy resins, acids, flammable and non flammable solvents and cutting oils. The oils received at the site were reportedly used on

local roads for dust control by town personnel. The gravel pit was used as a transfer point to fill tank trucks prior to spraying the oil on rural roads. Soil staining in the area of GW-5 indicate that the contents of some of the drums were spilled directly on the ground surface. The remaining drummed wastes were allegedly stacked on the ground surface within the inactive gravel pit.

B. Previous Investigations

In September 1979 Recra Research of Amherst, NY, submitted a Phase I Investigation on behalf of the New York State Department of Environmental Conservation (NYSDEC). The results of this records search indicated that a Phase II investigation was necessary. In October 1984 Walter B. Satterthwaithe Associates, Inc. (WBSAI), on behalf of the Town of Machias, dug 8 test pits at the site to determine if soil contamination was present. No appreciable contamination was noted. Then in October 1985 (WBSAI) again on behalf of the Town of Machias, performed groundwater sampling of four private wells on a private parcel of land due east of the gravel pit and conducted an electromagnetic conductivity survey at the gravel pit. Results indicated no observable impacts to the four wells from the gravel pit area and no indication of any contaminant plume at the gravel pit.

In January 1986 (WBSAI) completed a waste characterization on material taken from 79 drums on site. In February 1986 (WBSAI) submitted a cleanup plan to the Town of Machias.

Between October 1986 and May 1988 a total of 184 drums were removed from the site, by the Town, under the direction of NYSDEC.

Additional groundwater samples were taken from the private property due east of the site in February 1986 by WBASI; March 1986 by NYSDOH; September 1988 by NYSDOH; and May 1989 by NYSDEC. Results indicated low chloroform levels (<10 parts per billion, ppb). Chloroform, however, has not been associated with the site.

In February 1990 Lawler, Matusky, & Skelley Engineers completed a Phase II investigation at the site for the NYSDEC to determine if the hazardous waste previously stored at the site posed a significant threat to the environment or public health. The investigation included a resistivity survey and magnetometer survey; installation of four (4) overburden monitoring wells; groundwater sampling on-site and off-site; and surface soil sampling.

Results of the Phase II investigation provided inconclusive results on the two geophysical surveys. Some buried metallic objects were indicated. Analysis of groundwater collected from the four new wells and from the private wells east of the site indicated ten (10) volatile organic compounds at one (1) on-site well, GW-3, with a high of 440 ppb. This well is located directly east of the known drum storage area and is directly

downgradient with respect to groundwater flow. All four on-site wells contained low levels of identified and tentatively identified semi-volatile compounds. Soil sampling from two on-site locations indicated seven (7) different volatile organic compounds with a high of 98 ppb, and twelve (12) different semi-volatile compounds with a high of 1800 ppb. Both of these sampling locations were at the old drum storage area. Based on these results, in August 1990, the site was reclassified to 2 - (significant threat to the environment).

C. Remedial Investigation

From information obtained during the Phase II investigation, it was apparent that a Remedial Investigation and Feasibility Study (RI/FS) was necessary. An RI/FS work plan was developed and an Order on Consent for the RI/FS was negotiated. The Order was signed by Motorola on November 28, 1990 and by the NYSDEC on December 10, 1990. Field work began in December 1990 with a report being issued in August 1991. Elements of the Remedial Investigation included:

a. Magnetic survey on the north and west portion of the site.
b. Seven (7) test pits to check for buried drums.
c. Surface soil sampling at three (3) locations.
d. Subsurface soil sampling at two (2) locations.
e. Installation of five (5) additional overburden monitoring wells and sampling of all new and existing monitoring wells.
f. Installation of one (1) water level monitoring well.
g. Hydraulic testing of each well.
h. Residential well sampling
i. Site air quality sampling
j. Two -dimensional analytical groundwater modeling.

Based on the results of this initial work supplemental data was requested. The results of this additional work is contained in the following three Addendums.

1. Addendum No. 1 to the Remedial Investigation Report (RI), January 1992, - Field Sampling

2. Addendum No. 2 to the Remedial Investigation Report (RI), March 1992, - Habitat Evaluation and Ecological Risk Analysis

3. Addendum No. 1 to the Feasibility Study (FS), May 1992, - Air Sparging/Soil Vapor Extraction.

Addendum #1 to the RI, included:

a) Two (2) additional monitoring wells
b) Groundwater sampling
c) Residential well sampling
d) Six (6) additional surface soil sampling locations
e) Two (2) additional subsurface soil sampling locations.

Addendum #2 to the RI, included:

a) An On-site and off-site Habitat Evaluation to characterize potentially impacted habitat, and

b) Ecological Risk Assessment to describe potential environmental risks. The two main areas of concern were the on-site Habitat and the area of Ischua Creek.

Addendum #1, to the FS, included:

a) Analysis of Air Sparging/Soil Vapor Extraction
b) Comparison of Alternatives

Subsequent to collection of the supplemental data contained in the three addendums and in anticipation of remedial design activities, additional work was performed to further delineate the leading edge of the volatile organic plume downgradient from the existing monitoring wells. Five additional wells (GW-11 through GW-15) were installed and sampled.

III. CURRENT STATUS

A. Remedial Investigation Results

Results of the full Remedial Investigation are as follows:

1. Site Characteristics

a. Overburden soils consist of sand, silty sand and gravel.

b. Depth to bedrock (Gowanda Shale) - approximately 90 feet.

c. Groundwater flow direction - radial off the gravel pit then east-northeast.

d. Groundwater flow rate - 0.5-38 feet/day.

e. Depth to groundwater contamination - 50-55 feet.

f. Groundwater contamination noted at GW-3, GW-3D, GW-5, GW-6, GW-7, GW-9, GW-10, GW-11, GW-12, GW-13, GW-14, and GW-15.

g. Soil contamination noted at GW-5, TP-3 and TP-5.

2. Geophysical and Analytical Results

a. A magnetic survey over fill areas on the northern portion of the site (hatched area, Fig. 2) indicated no buried drums. Seven trenches were dug within the area then soil samples were taken and analyzed for Volatile Organic Compounds (VOC), Polyaromatic Hydrocarbon (PAH) and total metals (Tables 1,2 & 3).

b. Surface soil sampling was conducted at three locations for VOCs, PAHs, and metals and at six locations for lead only. (Tables 1,2, 3 & 4).

c. Subsurface soil screening was conducted at each monitoring well installation. Soil samples were taken at four of these wells. (Tables 1,2,3 & 4)

d. Sixteen monitoring wells were installed and sampled for VOCs, phenols, total and dissolved chromium, nickel, iron and lead. Well depths ranged from 78 feet on-site to 15 feet off-site.

e. Private well sampling was conducted at two residential wells down gradient and to the east of the site. These wells, RW-01 and RW-03, are located on the former Cole property. Motorola purchased this property in order to expedite the RI and with the intent of possibly implementing institutional controls at RW-01 and RW-03 as part of the remedial plan.

Sample results indicate no site related volatile organic compounds at these wells. However, four wells lie up gradient of RW-03, the cabin well. These wells are GW-6, GW-7, GW-10, and GW-12. Each of these wells contain site related compounds. At the present time the cabin well is unoccupied and its well (RW-03) is not being used.

Chloroform has been found at RW-01 on several occasions. Each time the analysis indicated less than 10 ppb which is not a level of concern. Since this compound is not site related it is assumed to be related to past use of the swimming pool at the rear of the former Cole residence. A carbon filter is presently in place at this well.

3. Data Summary

Data generated during the RI indicates limited soil contamination at the inactive gravel pit area. The primary contaminant transport media is groundwater. The main contaminants are Trichloroethene and 1,1,1-Trichloroethane. Both are solvents. Based on groundwater flow observations, the contaminant plume is noted moving in an easterly direction and has extended east of Very Road. The primary receptor would be the cabin well to the east or downgradient from the plume. This cabin, however, is unoccupied.

4. Habitat Evaluation and Ecological Risk Assessment

The habitat evaluation for the Machias Gravel Pit site included an identification and characterization of significant habitats, wetlands, regulated streams, and other special natural resources within a 2-mile radius of the site and 9 miles downstream from the site. Notably important resources of the project vicinity included the presence of State regulated wetlands, designated trout streams, and the presence of fish and wildlife species that would utilize the habitats at the site.

The focus of the ecological risk analysis was the on-site habitat (the gravel pit) and Ischua Creek. Important exposure routes include direct uptake from soil or surface water, as well as consumption of plants and prey species. Conclusions from the above indicate that aquatic toxicity is not expected. Estimated surface water concentrations of 1,1,1-trichloroethane and trichloroethene are below toxic levels of concern. In addition, no potential terrestrial toxicity is expected. Measured soil concentrations of lead are below toxic levels of concern. Finally, ecological risks to aquatic and terrestrial species are not expected. Concentrations of the constituents of concern do not exceed the available toxic effect levels.

B. Risk Assessment (RA)

The RA as presented in the Remedial Investigation provided a discussion of the potential health and environmental hazardous associated with each exposure pathway for each contaminated media. It has provided an evaluation of the human health risk associated with future exposure to groundwater contamination from the site. The assessment includes four major components:

1. Identification of contaminants of concern.
2. Exposure assessment.
3. Toxicity assessment.
4. Risk characterization

1. Contaminants of Potential Concern

In preparing the RA, Motorola identified site related compounds in the soils and in the overburden groundwater at the site. Table 7 presents a summary of volatile organics, semi-volatile compounds (PAHs) and inorganics detected in soils at the site.

Table 8 presents a summary of contaminants detected in groundwater at the site. Contaminant concentrations at the site were compared to USEPA Maximum Contaminant Limits (MCLs) and/or USEPA Lifetime Health Advisory levels for drinking water. Although total concentrations of lead and nickel exceeded MCL and/or Health Advisory levels, dissolved concentrations are non-detect suggesting non-mobility within the groundwater system. However, worst-case assessments were used, therefore, total lead and total nickel were considered as contaminants of concern along with 1,1,1-trichloroethane and trichloroethene.

2. Exposure Assessment

Potential exposure pathways identified at the site include:

a. Groundwater Pathway

- Drinking water consumption
- Skin absorption of contaminants in water by direct contact during washing or bathing.
- Inhalation of VOCs released into ambient air during showering or other washing activities.

b. Soil Pathway

- Absorption through skin on contact
- Accidental ingestion

c. Air Pathway

- Volatilization from soils on site.

d. Surface Water Pathway

- During precipitation events

3. Toxicity Assessment/Risk Characterization

Potential exposure scenarios were developed from USEPA documents entitled "Risk Assessment Guidance for Superfund" and "Exposure Factors Handbook". In evaluating potential risks, both carcinogenic and noncarcinogenic health effects were considered.

The criteria used to evaluate the potential for noncarcinogenic health effects are generally referred to as reference doses (RFD) or reference concentration (RfC). The criteria that are used in the evaluation of carcinogenic risk are referred to as carcinogenic slope factors (CSF). The USEPA has developed oral and inhalation criteria, however, dermal criteria have not been developed. Therefore, the criteria for ingestion was used for the dermal route in accordance with Appendix A of Volume 1 of the USEPA Risk Assessment Guidance of Superfund, 1989. Table 9 presents toxicity criteria for the contaminants of concern.

[Note: In general, regulatory agencies in the United States have not established a uniform cancer risk level for distinguishing between risks which are deemed acceptable and those which may be of concern. The EPA has generally considered risks in the range of one in ten thousand ($1x10^{-4}$) to one in ten million ($1x10^{-7}$) to be acceptable, and has recently adopted a risk level of one in a million ($1x10^{-6}$) as a "point of departure" for selecting the risk level that will be considered acceptable (EPA 1990)].

Estimated risk associated with potential exposure to non-carcinogenic chemicals is expressed as the ratio of the estimated exposure to the smallest exposure that might possibly cause adverse effects. The ratio is called a Hazard Index. A hazardous index greater than one indicates that adverse effects may be possible while a value less than one means that adverse effects would not likely occur.

The estimates of future noncarcinogenic risks associated with the groundwater pathway are summarized in Table 10. The total adult and child hazard index values are 3.51 E-02 and 3.40 E-01, respectively. Since these values are less than 1.0 significant noncarcinogenic effects for adults and children is negligible.

The estimate of future carcinogenic risks associated with groundwater are summarized in Table 11. The total lifetime cancer risk estimate is 2.90 E-05 which is within the risk range considered acceptable by the EPA.

Significant health risks associated with soil, surface water, and air exposure pathways are not expected. There is minimal concentration of contaminants in the old drum storage area, and a low potential for release and migration. Since there are few receptors in close promixity to the site the potential for exposure is low, therefore the potential for significant risk is also low.

IV. ENFORCEMENT STATUS

Under Article 27 of the Environmental Conservation Law (ECL) entitled "Inactive Hazardous Waste Disposal Sites", the (NYSDEC) and Motorola Inc. entered into an Order on Consent (Index # B9-0273-89-05). The order was signed by Commissioner Thomas C. Jorling on December 10, 1990. The Order stipulated that Motorola would develop and implement a Remedial Investigation and Feasibility Study for the Machias Gravel Pit Site.

A second Order on Consent will be negotiated for development, and implementation, monitoring and maintenance of the selected remedial alternative. On May 15, 1992 the site was referred to the Division of Environmental Enforcement for initiation of this Order.

V. GOALS FOR THE REMEDIAL ACTIONS

A. Goals and Objectives

The overall goal of site remediation is to ensure the protection of human health and the environment. Remedial actions for the Machias Gravel Pit site will address VOCs (specifically trichloroethene and 1,1,1-trichloroethane) in the groundwater.

The objectives of the remedial action will be to provide a permanent remedy for the site that mitigates threats associated with groundwater contamination as rapidly and cost-effectively as possible. Remedial actions for the groundwater will address the following exposure pathways:

1. Direct contact/ingestion of contaminated groundwater.

2. Inhalation of contaminated vapors.

B. Standards, Criteria and Guidelines

Remedial action objectives have been developed in the RI to be protective of human health and the environment and to comply with applicable Standards, Criteria and Guidelines (SCGs). SCGs are categorized as chemical-specific, location-specific and action-specific.Chemical-specific SCGs for the site potentially apply to soils, groundwater and air. Location-specific SCGs apply to streams and action-specific SCGs regulate various remedial alternatives.

Implementation of remedial actions at the site must be consistent with New York State and Federal regulations. The regulations to consider are the applicable or relevant and appropriate requirements. A preliminary list is presented in Table 12. Additional review may be necessary during remedial design.

C. Action Levels and Cleanup Goals

The New York State Department of Environmental Conservation (NYSDEC) has promulgated groundwater standards under 6NYCRR703.5. The New york State Department of Health (NYSDOH) applies standards at the point of use. These standards are the New York State Maximum Contaminant Levels (NYS MCLs). The NYS and Federal MCLs for the contaminants of concern found in the groundwater at the site are presented in Table 13. The NYS MCLs will be used as action levels and clean-up goals for the groundwater at this site. For the two main contaminants of concern, trichloroethene and 1,1,1-trichloroethane, the cleanup goal will be 5 ppb in groundwater.

For soils impacted through air sparging, the goal will be to meet a clean-up level of 1 part per million (ppm) for TCE and 1,1,1-TCA.

VI. DESCRIPTION & EVALUATION OF ALTERNATIVES

The Feasibility Study has taken into consideration regulations established by the State and Federal governments which deal with the remediation of inactive hazardous waste sites. As such, it is required that the selected remedial alternative for a site be protective of human health and the environment, cost effective, comply with statutory requirements, and be permanent.

A. Development of Remedial Response Actions

During development of the remedial response actions a full range of potentially feasible alternatives were assessed which might be appropriate for groundwater remediation at the site. General response actions identified for the Machias Gravel Pit included:

1. No action
2. Institutional Controls
3. Containment
4. On-site treatment
5. Off-site treatment
6. On-site disposal
7. Off-site disposal

Further screening of these actions provided the following associated technologies and process options.

No Action is defined as taking no action on the contaminant plume to restrict its movement or to reduce contaminant levels. Variations of the No Action alternative include Point-of-use Treatment; Alternate Water Supply; and Replacement of Existing Wells.

Institutional Controls would be combined with the No Action response action. Institutional controls would insure that there is no future threat to human health by implementing necessary controls within the area of the contaminant plume.

Containment was deemed not practical at this site.

On-site Treatment included above ground and in-situ applications. The above ground options included pumping of groundwater then treatment via:

- Air Stripping with Thermal oxidation; carbon adsorption or Incineration.
- Steam Stripping with Condensation, Carbon Adsorption or Thermal Oxidation.
- Carbon Adsorption with granular activated carbon (GAC) or powdered activated carbon (PAC).

The in-situ option considered most feasible was Air Sparging/ Soil Vapor Extraction.

Off-Site Treatment of groundwater is feasible but less desirable due to regulations and cost.

On-Site Disposal after treatment included:

- Surface water discharge to nearby waterways and,
- Groundwater discharge through injection wells or infiltration gallies.

Off-Site Disposal to a municipal treatment facility was considered not feasible due to the distance factor.

B. Overview of the Alternatives

The following four alternatives were evaluated in detail.

1. No Action
2. Air Stripping/Vapor Phase GAC/Pipeline Discharge to Ischua Creek.
3. Air Stripping/Vapor Phase GAC/Injection Well Discharge to Groundwater.
4. Air Sparging/Soil Vapor Extraction (AS/SVE)

It is anticipated that the pump and treat alternatives and the AS/SVE alternative can equally achieve the desired goal of contaminant reduction at the source area west of Very Road.

VII. THE PREFERRED ALTERNATIVE

A. Air Sparging/Soil Vapor Extraction

Remedial action at the Machias Gravel Pit will include simultaneous remediation of overburden groundwater and soils by using two conventional physical processes in conjunction with one another: areation and vacuum extraction. The technology is referred to as Air Sparging/Soil Vapor Extraction (AS/SVE).

AS/SVE uses a series of air injection wells completed into the unsaturated and saturated overburden zone, and a series of air extraction wells completed in the unsaturated overburden zone. Figure 6 presents a cross-section of a typical AS/SVE system.

A pilot study west of Very Road will be required in order to properly size and place the wells for this system. Air injection wells will likely be placed at the outer edges of the contaminated area with air extraction wells being placed toward the center of the source area. The lower portions of the well casing will be slotted or screened to provide a mechanism for air-water and air-soil interaction. The extracted vapors will be treated by an appropriate combination of air/water separation, activated carbon adsorption, thermal treatment or flaring. Minimal water collection is anticipated.

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

B. Monitoring Program

A general site monitoring program will be developed and implemented using existing wells and new well installations. The program will be set up to monitor the groundwater plume both west and east of Very Road. Additional monitoring wells will be necessary between the known extent of the plume and Ischua Creek and Tributary #34. If necessary, control of the plume will be required in this area. All monitoring will be conducted in accordance with the Quality Assurance Plan implemented for the site investigation.

C. Rationale for Selection

The Air Sparging/Soil Vapor Extraction alternative was evaluated and measured against the following eight (8) criteria:

1. Compliance with New York State Standards; Criteria and Guidelines (SCGs)
2. Overall Protection of Human Health and the Environment
3. Short-Term Impacts
4. Long-term Effectiveness and Permanence
5. Reduction of Toxicity, Mobility or Volume
6. Implementability
7. Cost
8. Community Acceptance

Compliance with SCGs

Air sparging and soil vapor extraction are proven technologies. It is anticipated that air sparging in conjunction with Soil Vapor Extraction will remediate both soils and groundwater at the site. Established cleanup standards for the aquifer will be met. This technology complies with all chemical-, action-, and location-specific SCGs.

Overall Protection of Human Health and the Environment

The AS/SVE system will reduce the contaminant loading in both soils and groundwater to established cleanup goals. This will provide unrestricted use of the site upon completion of the remedial effort.

Short-term Impacts

Because there are no significant short-term risks at the site and because this alternative provides for rapid treatment with significant contaminant reductions in the short-term, it is considered effective for the short-term.

Worker exposure may occur during system installation. Proper worker protection, environmentally sound construction techniques and adequate monitoring will be necessary to mitigate any problems encountered.

Long-Term Effectiveness and Permanance

The AS/SVE system will permanently reduce the chemical loading in both groundwater and soils to a point where the aquifer will ultimately be remediated. Remediation time is estimated at 1 to 5 years.

Reduction of Toxicity, Mobility and Volume

Extraction and treatment of vapors through the system will permanently reduce the amount of contamination in the groundwater and soil by 99 to 100 percent. A properly designed AS/SVE system will need to be positioned to cover enough area to assure complete treatment of the plume. The volume of impacted soils is estimated at 7000 cubic yards to 20,000 cubic yards of which the total volume can be remediated.

Implementability

Air sparging/soil vapor extraction is not as conventional as ground water pump and treat systems, therefore, implementation would present some difficulties with respect to proper well placement and air injection/extraction rates. A pilot-scale study would be recommended to overcome these difficulties. Normal agency coordination is anticipated. The equipment and material necessary to implement this alternative are readily available. Off-gas treatment, if necessary may include air water separation, vapor phase carbon adsorption, thermal treatment or flaring. The proper permitting requirements would need to be met.

Cost

The significant costs associated with the AS/SVE system are injection and extraction well capital installation costs and off-gas treatment costs. The pilot study which is estimated to cost $40,000 to $60,000, may include from 30 to 50 injection/extraction wells. Remediation at the site is estimated to cost $20 to $50 per cubic yard of contaminated unsaturated soil. The total present worth cost of this alternative is estimated to be $220,000 to $1,000,000. Table 14 presents the costs associated with each of the final four alternatives which were evaluated.

Community Acceptance

Community concerns are expected to focus on whether or not the selected alternative is protective of public health and the environment. On March 24, 1992, a meeting was held at the Machias Town Hall. At that time it was made clear, by those present, that the no-action alternative would not be acceptable. A final assessment of community attitudes toward the preferrred alternative will be made following the formal public comment period and informational meeting.

VII. Summary of Government's Position

The basis for the government's position is Article 27, Title 13 of the Environmental Conservation Law. No substantive issues remain. The Town of Machias owns the gravel pit and is regulated in its use by DEC imposed mining restrictions relative to site contamination. Motorola has purchased the adjacent property downgradient of the site and has enacted institutional control on its groundwater use. Proposed monitoring will monitor groundwater flow toward two local downgradient creeks. A public meeting will be scheduled for September 1992 to present the Proposed Remedial Action Plan (PRAP). A responsiveness summary will be prepared addressing the comments and recommendations of the responsible parties and the public.

From information gathered to date and evaluations of each of the proposed remedial alternatives, the NYSDEC and NYSDOH believe that the preferred alternative will be protective of human health and the environment, will meet existing applicable or relevant and appropriate requirements of Federal and State statutes, and will be cost effective.

A bibliography of significant points in the RI/FS process is listed in the Administrative Record. (Appendix E)

APPENDIX A

Figures

Figure	
1	Site Location Map
2	Site Map
3	Water Table Map
4	Isoconcentration Map of TCE
5	Isoconcentration Map of TCA
6	Air Sparging/Soil Vapor Extraction System

APPENDIX B

Tables

APPENDIX C

List of Acronyms

NYSDEC	New York State Department of Environmental Conservation
WBSAI	Walter B. Satterthwaithe Associates, Inc.
ppb	parts per billion
ppm	parts per million
RI/FS	Remedial Investigation/Feasibility Study
VOC	Volatile Organic Compound
PAH	Polyaromatic Hydrocarbon
USEPA	United States Environmental Protection Agency
SCGs	Standards, Criteria and Guidelines
TCE	Trichloroethene
TCA	1,1,1 - Trichloroethane

APPENDIX D

References

1. New York State Water Resource Commission, 1973.

2. USEPA Exposure Factor Handbook. Office of Health and Environmental Assessment. EPA/600/8-89/343, 1989a.

3. USEPA Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response. EPA/540/1-89/002, 1989c.

4. Recra Research, Inc., Machias Gravel Pit, New York State Superfund Phase I Summary Report, September 1983.

5. Walter B. Satterthwaithe Associates, Inc., Investigative Protocols, Town of Machias, Machias, New York, January 1985.

6. Water B. Satterthwaithe Associates, Inc., Groundwater Monitoring at the Machias Gravel Pit, October 1985.

7. Walter B. Satterthwaithe Associates, Inc., Machias Gravel Pit, Proposed Cleanup Plan, February, 1986.

8. Lawler, Matusky & Skelly Engineers, Phase II Investigation, Machias Gravel Pit, Site #905013, Town of Machias, Cattaraugus County, Volume I and Volume II, February 1990.

9. Hydro-Search, Inc., Machias Gravel Pit, Remedial Investigation Report, Site Number 905013, August 1991.

10. Hydro-Search, Inc., Machias Gravel Pit, Remedial Investigation Report, Site Number 905013, Appendices, August 1991.

11. Hydro-Search, Inc., Draft Feasibility Study, Site Number 905013, July 1991.

12. Hydro-Search, Inc., Addendum No. 1 To The Machias Gravel Pit Remedial Investigation Report, Site Number 905013, January 1992.

13. Simon Hydro-Search, Addendum No. 2 to the Machias Gravel Pit Remedial Investigation Report, Site Number 905013, March 1992.

14. Simon Hydro-Search, Machias Gravel Pit, Draft Feasibility Study, Site Number 905013 Addendum No. 1, May 1992.

15. Simon Hydro-Search, Machias Gravel Pit Site, Additional Well Installations, Site Number 905013, August 20, 1992.

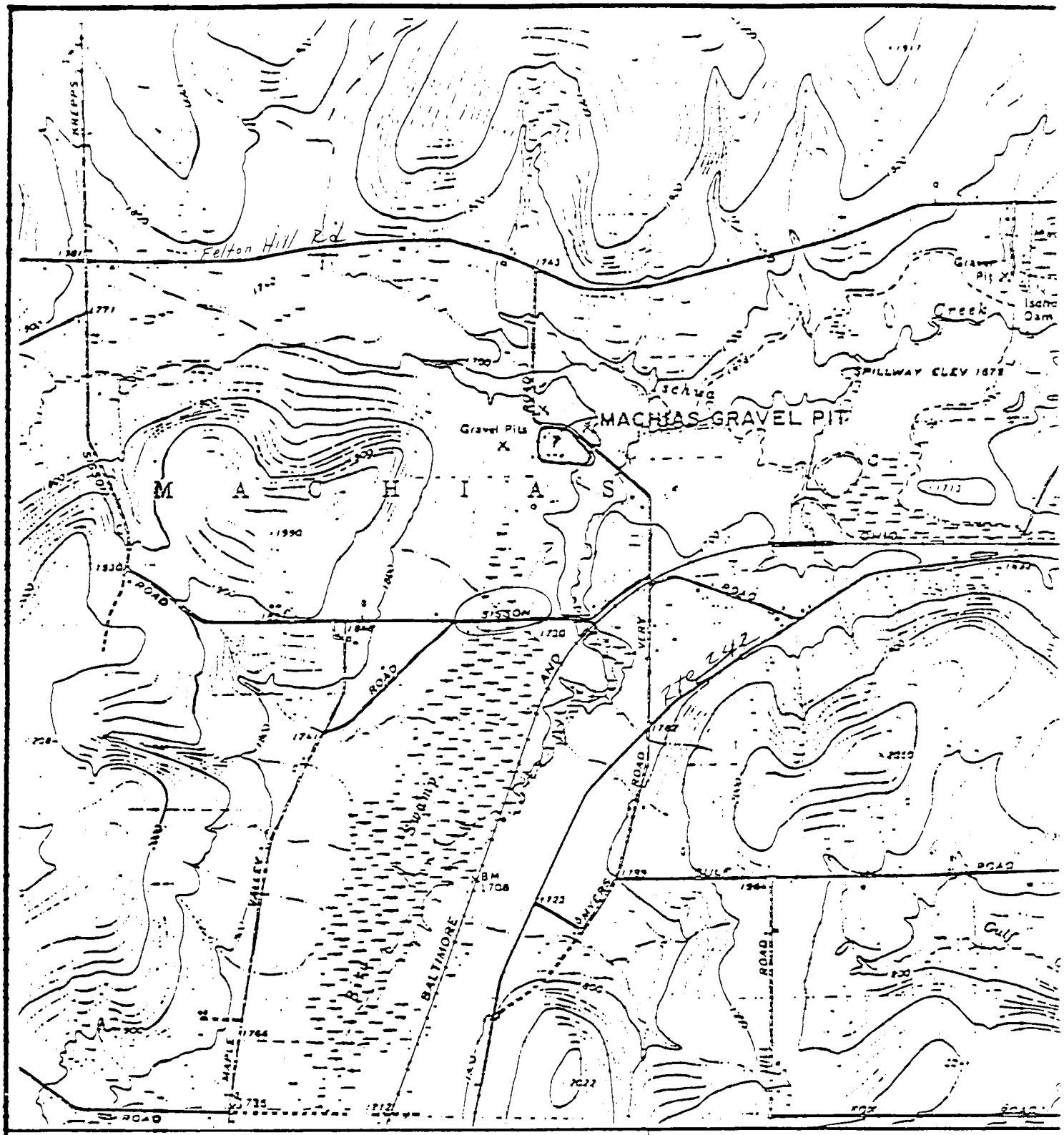
APPENDIX E

ADMINISTRATIVE RECORD

Machias Gravel Pit #905013

10-3-78	Memo - C. Halgas (Catt. co.) to J. McMahon (DEC) Re: Background information on Motorola Waste
7-30-82	Memo - ECO Frank Luhr to Region HQ, Site Inspection Re: Complaint of 100 drums at site.
8-3-89	Draft Phase II Investigation submitted to Region 9 DEC from Albany. Report by Lawler, Matusky & Skelley.
9-28-89	Site Inspection by G. Pietraszek
1-24-90	Meeting - DEC & Motorola, Re: Phase II work.
3-7-90	Meeting DEC & Motorola
3-26-90	Phase II, Volume I & II sent to Town of Machias for Public Repository
5-1-90	Memo - Spagnoli (Region 9) to O'Toole (HWR, Albany). Request to DEE for negotiation of Order on Consent.
5-25-90	Memo - O'Toole (HWR) to D. Markell (DEE) Request for negotiation of an Order on Consent.
6-22-90	Motorola to DEC. Submission of Phase II Work Plan
6-25-90	DEC to Motorola. Draft Consent Order for RI/FS
8-3-90	Notification sent to Town of Machias. Site classification Change 2a to 2.
9-4 to 9-6-90	Field work - well installations
9-18-90	Motorola to DEC. Submittal of RI/FS work plan.
9-24-90	DEC to Motorola. Approval of RI/FS work plan.
11-28-90	RI/FS Order on Consent signed by Motorola
11-29-90	Meeting - DEC/Motorola/Town of Machias, discussion of RI/FS proposal.
12-10-90	RI/FS Order on Consent signed by Deputy Commissioner Edward O. Sullivan
12-3 to 12-15-90	RI Field work.

4-22-91	Motorola to DEC, Draft RI report
5-8-91	Memo - E. Barcomb to E. Belmore, Transfer of project from Bureau of Site Control to Western Remedial Action.
5-10-91	RI sent to Town of Machias for Public Repository
6-6-91	Memo - DOH to DEC, Comments on RI
7-29-91	Motorola to DEC, submittal of Draft FS
8-29-91	Motorola to DEC submittal of Final RI
9-30-90	DEC to Motorola, comments on Final RI
10-10-91	DEC mailed Public Fact Sheet
10-21-90	DEC to Motorola, Comments on FS
1-24-92	Motorola to DEC, submittal of Addendum #1 to the RI
3-17-92	DEC mailed notice of Public Availability meeting.
3-21-92	Motorola to DEC, submittal of Addendum #2 to the RI.
3-24-92	Public meeting at Machias Town Hall, Public Availability Session.
3-24-92	Meeting - DEC & Motorola, regarding RI/FS work to date
5-6-92	Meeting - DEC/Motorola regarding FS alternatives.
5-6-92	Letter - G. Pietraszek (DEC) to M. Loch (Motorola) RI approval.
5-15-92	Memo - M. O'Toole (HWR) to R. Piaggione (DEE) Referral for Remedial Design/Remedial Action Order on Consent.
5-4-92	Motorola to DEC, submittal of Addendum #1 to FS
5-27-92	Motorola to DEC, submittal of final FS
8-30-92	Motorola to DEC, submittal of Final RI
8-17-92	Letter - Pietraszek to M. Tillow, provided Addendum #1 to FS, for public availability.
8-21-92	Motorola to DEC, submittal of Additional well installation report.



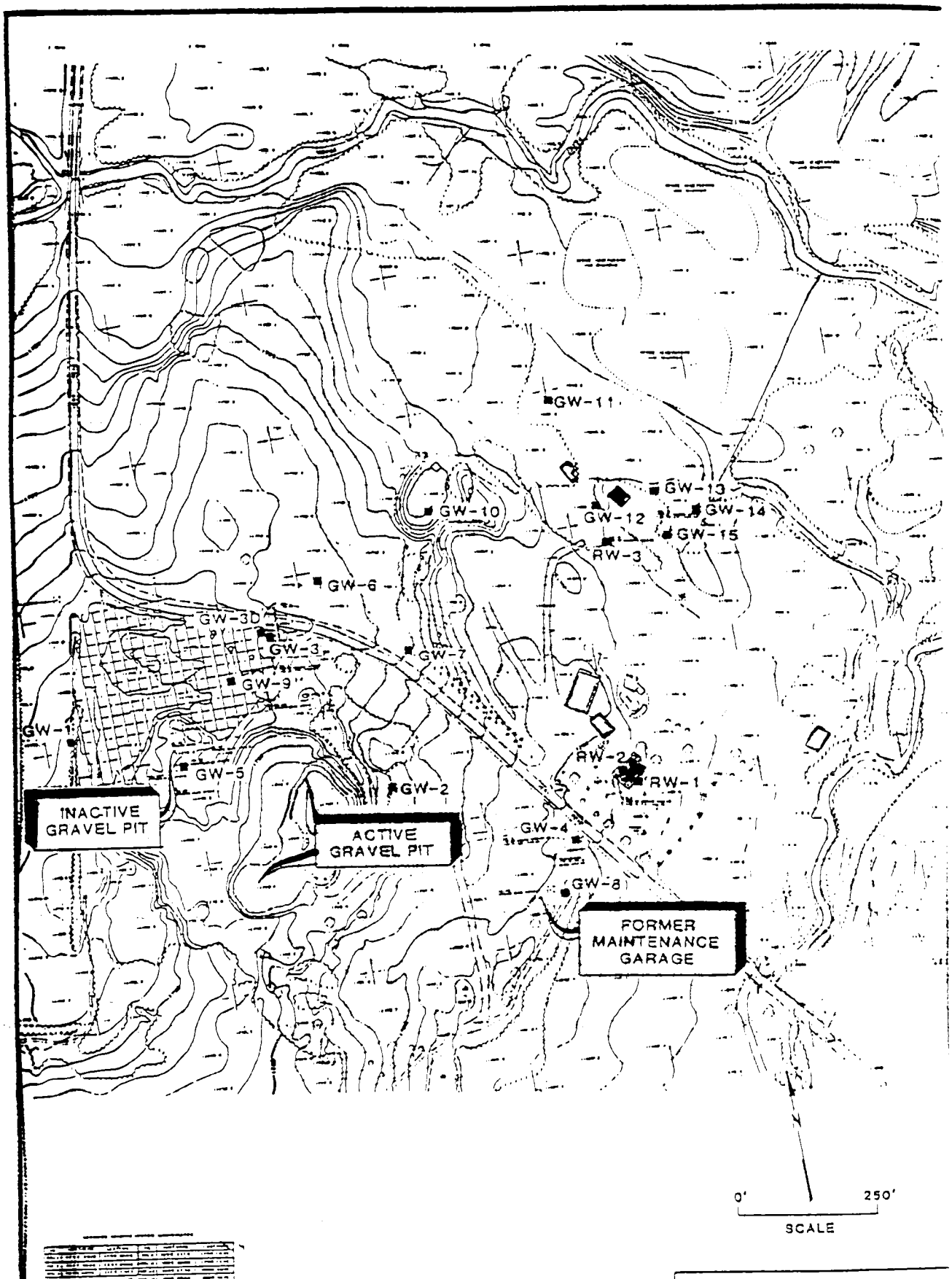
LOCATION MAP
FIGURE 1

PROJECT 425115O3-2

REVISIONS

DATE April 1981

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



CONTOUR INTERVAL: 5 FEET

MCINTOSH & MCINTOSH, P.C.

FIGURE 2

PROJECT #28119402

DATE 3/97

Hydro-Search, Inc.

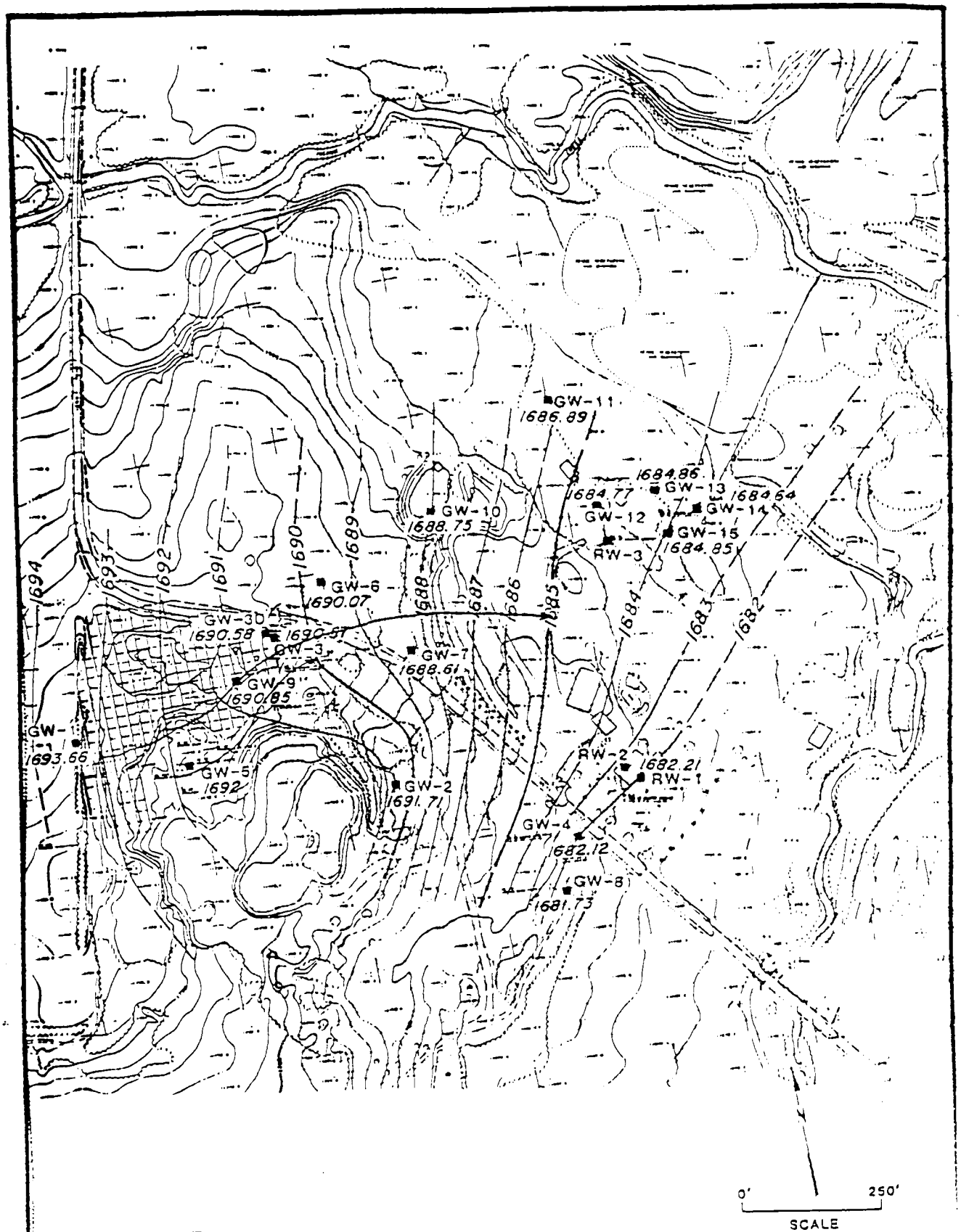


FIGURE 3

WATER TABLE MAP
MACHIAS GRAVEL PITS

CONTOUR INTERVAL: 1 FEET

PROJECT 428115402

DATE 3/92

Hydro-Search, Inc.

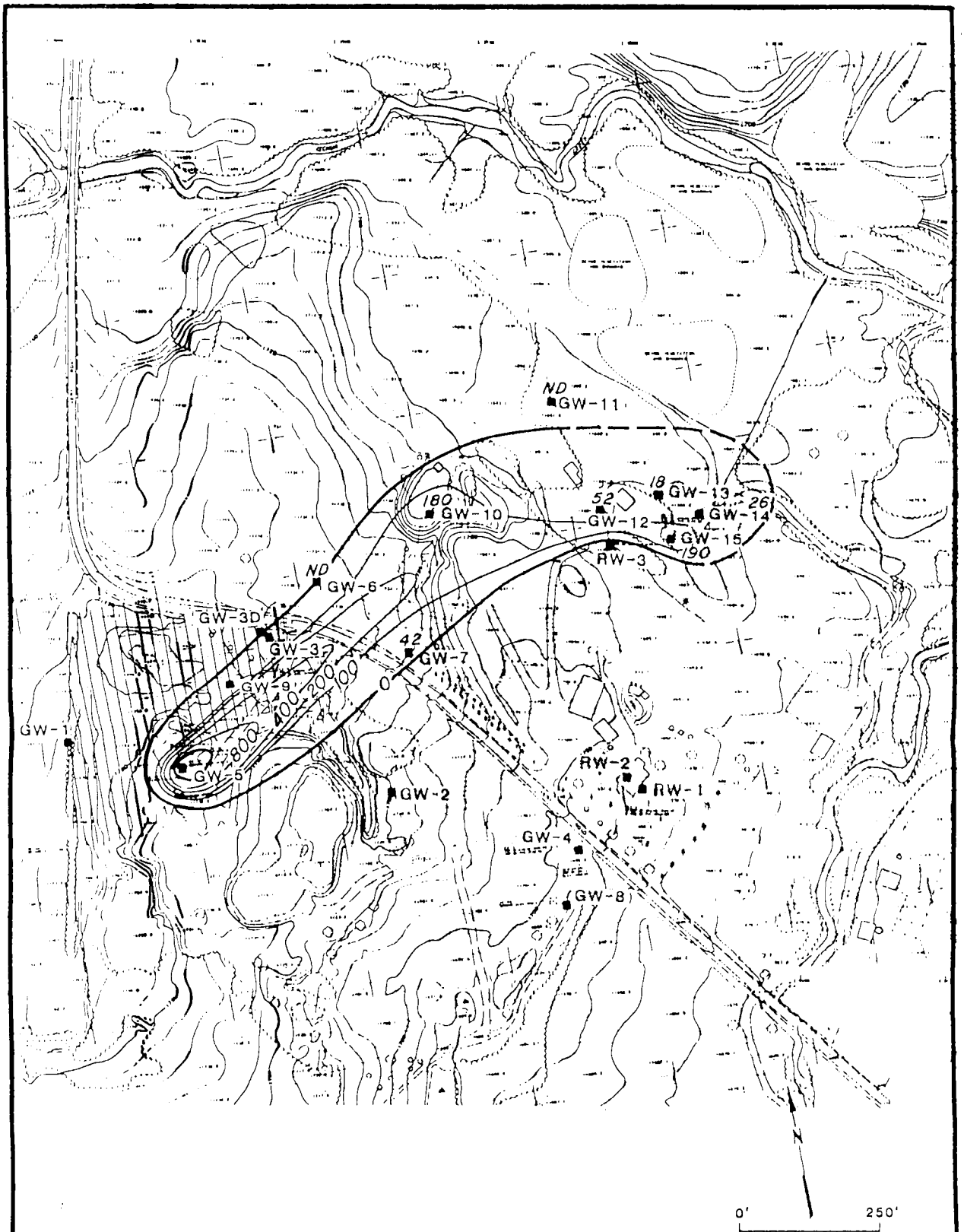


FIGURE 4

ISOCONCENTRATION MAP OF TCE

Concentration (ug/l)

PROJECT 428116402

REVISIONS

DATE 3/92

NOTE: ELEVATIONS BASED ON NGVD 1929 APPROXIMATE

CONTOUR INTERVAL: 5 FEET

McINTOSH & McINTOSH, P.C.

CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS

LOCKPORT, NEW YORK

BUFFALO, NEW YORK

Hydro-Search, Inc.

CONSULTING HYDROLOGISTS GEOLOGISTS

RENO DENVER MILWAUKEE IRVINE

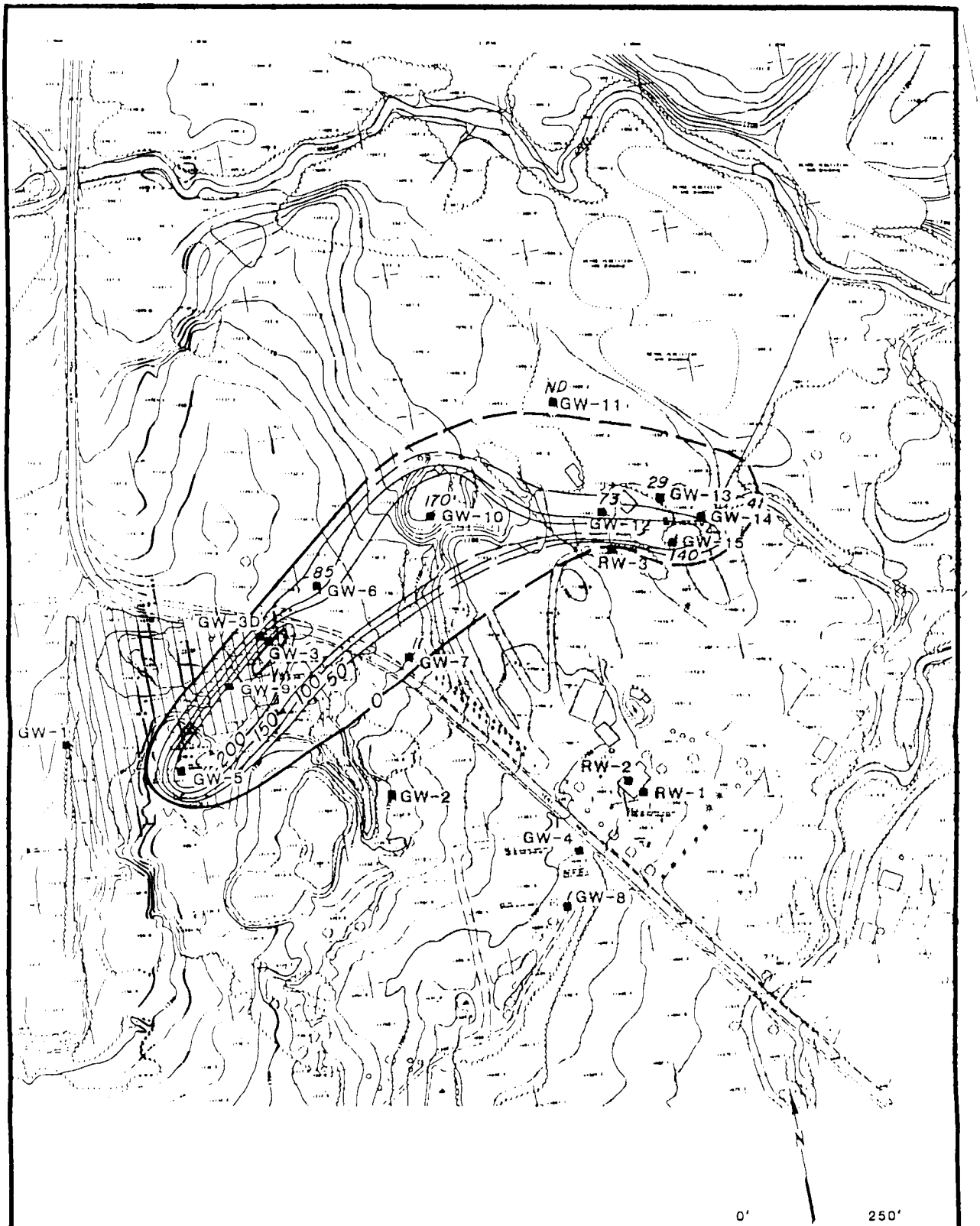


FIGURE 5

ISOCONCENTRATION MAP OF TCA

Concentration (ug/l)

PROJECT 426116402

REVISIONS

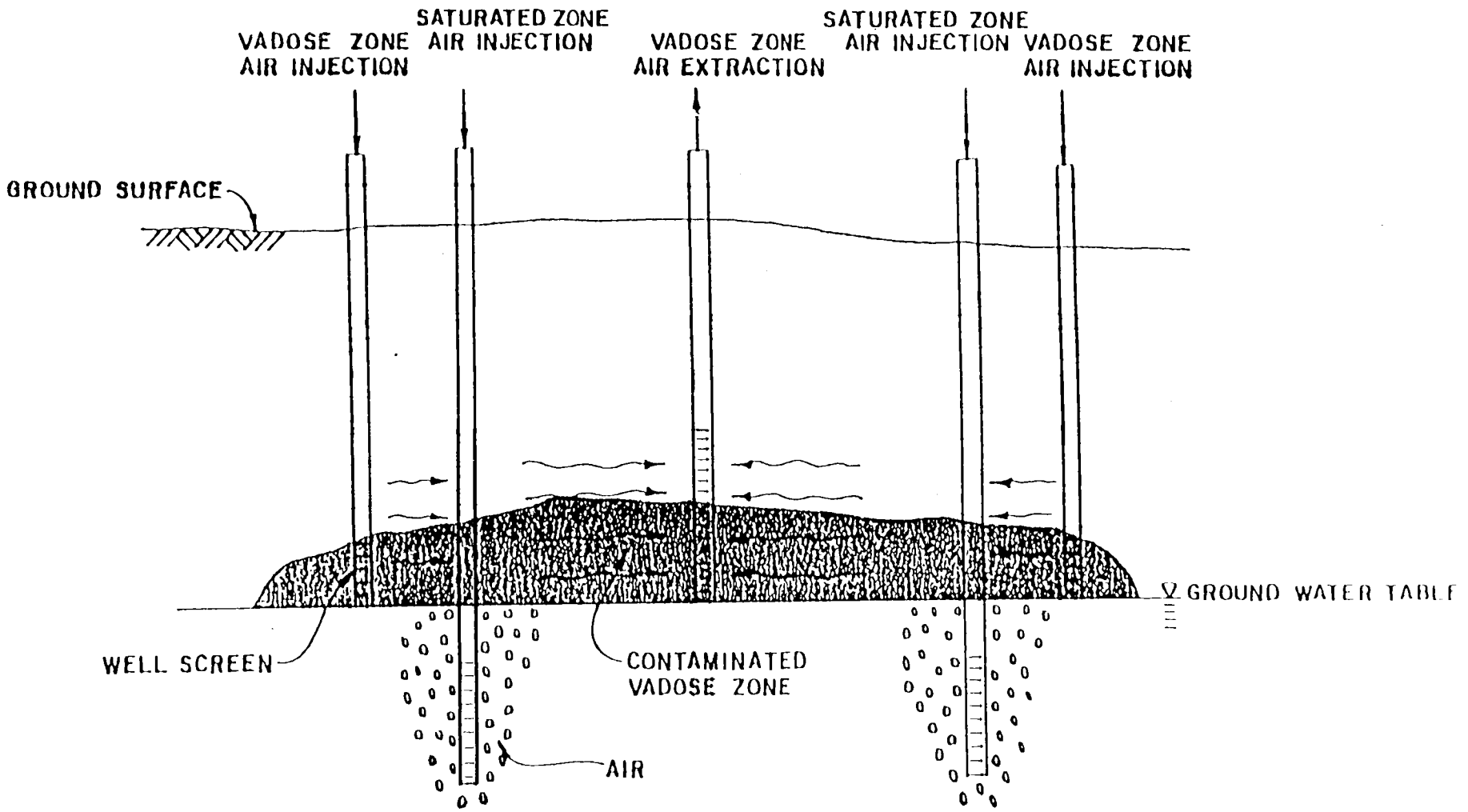
DATE 3/92

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

NOTE: ELEVATIONS BASED ON NGVD 1929 APPROXIMATE

CONTOUR INTERVAL: 5 FEET

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS LAND SURVEYORS PLANNERS
LOCKPORT, NEW YORK PHONE [illegible]
BUFFALO, NEW YORK PHONE 839-5400



NOT TO SCALE

PROJECT 426116032

DATE 4/92

REVISIONS

Hydro-Search, Inc.
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Milwaukee • Denver • Reno

CROSS-SECTION OF AN AIR SPARGING / SOIL VAPOR EXTRACTION SYSTEM

FIGURE 6

SUMMARY OF SOIL SAMPLE VOLATILE ORGANIC COMPOUND ANALYSES
Machias, New York

SAMPLE DESIGNATION	TP01-01		TP02-01		TP02-01-DP		TP03-01		TP04-01		TP05-01	
MATRIX (ppb)	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
VOLATILE ORGANIC COMPOUNDS	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
1,1,1-Trichloroethane	ND		ND		ND		ND		ND		ND	
Trichloroethene	ND		ND		ND		ND		ND		ND	

SAMPLE DESIGNATION	SS01-01		SS02-01		SS03-01		SB01-01		SB02-01	
MATRIX	SOIL		SOIL		SOIL		SOIL GW-5		SOIL GW-8	
VOLATILE ORGANIC COMPOUNDS	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
1,1,1-Trichloroethane	ND		ND		ND		27		ND	
Trichloroethene	ND		ND		ND		291		ND	

Notes:
- ND - Not detected.
- TP - Test pit.
- SB - Soil boring.
- SS - Surface soil.
- DP - Duplicate.

TABLE 1

SUMMARY OF POLYAROMATIC HYDROCARBON ANALYSIS
Machias, New York

SAMPLE DESIGNATION	TP01-01		TP02-01		TP02-01DP		TP03-01		TP04-01		TP05-01	
MATRIX (ppb)	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
SEMI-VOLATILE ORGANIC COMPOUNDS	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Acenaphthylene	ND		ND		ND		ND		ND		280	J
Fluorene	ND		ND		ND		ND		ND		220	J
Phenanthrene	ND		ND		ND		ND		ND		1900	
Anthracene	ND		ND		ND		ND		ND		220	JX
Fluoranthene	ND		ND		ND		340	J	ND		1500	
Pyrene	ND		ND		ND		260	J	ND		1100	
Benzo(a)anthracene	ND		ND		ND		ND		ND		490	J
Benzo(b)fluoranthene	ND		ND		ND		ND		ND		570	
Benzo(k)fluoranthene	ND		ND		ND		ND		ND		410	J
Benzo(a)pyrene	ND		ND		ND		ND		ND		470	J
Indeno(1,2,3-cd)pyrene	ND		ND		ND		ND		ND		400	J
Benzo(g,h,i)perylene	ND		ND		ND		ND		ND		250	JX

SAMPLE DESIGNATION	SB01-01		SB02-01		SS01-01		SS02-01		SS03-01	
MATRIX	SOIL		SOIL		SOIL		SOIL		SOIL	
SEMI-VOLATILE ORGANIC COMPOUNDS	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Acenaphthylene	ND		ND		ND		ND		ND	
Fluorene	ND		ND		ND		ND		ND	
Phenanthrene	ND		ND		ND		ND		ND	
Anthracene	ND		ND		ND		ND		ND	
Fluoranthene	ND		ND		ND		ND		ND	
Pyrene	ND		ND		ND		ND		ND	
Benzo(a)anthracene	ND		ND		ND		ND		ND	
Benzo(b)fluoranthene	ND		ND		ND		ND		ND	
Benzo(k)fluoranthene	ND		ND		ND		ND		ND	
Benzo(a)pyrene	ND		ND		ND		ND		ND	
Indeno(1,2,3-cd)pyrene	ND		ND		ND		ND		ND	
Benzo(g,h,i)perylene	ND		ND		ND		ND		ND	

Notes:
- ND - Not detected.
- TP - Test pit.
- SB - Soil boring.
- SS - Surface soil.
- DP - Duplicate.
- J - Estimated value.
- X - Mass spectrometer does not meet EPA CLP criteria for confirmation, but compound presence is strongly suspected.

TABLE 2

– SUMMARY OF SOIL SAMPLE INORGANIC ANALYSES

Machias, New York

SAMPLE DESIGNATION	TP01-01		TP02-01		TP02-01DP		TP03-01		TP04-01		TP05-01	
MATRIX	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
METALS (ppm)	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Chromium	3.7		5.0		4.8		6.5		8.2		5.5	
Lead	•		•		•		•		•		•	
Nickel	11.0		13.2		13.3		14.0		23		17.3	

SAMPLE DESIGNATION	SB01-01		SB02-01		SS01-01		SS02-01		SS03-01	
MATRIX	SOIL		SOIL		SOIL		SOIL		SOIL	
METALS	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Chromium	ND		3.1		2.5		4.6		6.0	
Lead	5.5		•		608		19.7		13.6	
Nickel	9.6		13.3		11.7		10.2		13.3	

Notes:
- ND – Not detected.
- TP – Test pit.
- SB – Soil boring.
- SS – Surface soil.
- DP – Duplicate.
- • – Analyzed but results rejected by third party data validation due to spike recovery problems.

TABLE 3

SOIL SAMPLING RESULTS
SAMPLE DATE 11/91

Sample Location	Location	Lead (mg/Kg)
SS04-02	Inactive Pit	27.1
SS05-02	Inactive Pit	101.0
SS06-02	Inactive Pit	58.6
SS07-02	Inactive Pit	11.7
SS08-02	Background	14.6
SS09-02	Fill Area	16.5
SB03-02	Well GW-9, 20 feet below ground surface	7.3
SB04-02	Well GW-10, 5 feet below ground surface	5.2

SS Surface soil
SB Subsurface soil

TABLE 4

SUMMARY OF DETECTED GROUND WATER VOLATILE ORGANIC COMPOUNDS (VOCs)
MACHIAS, NEW YORK
SAMPLE DATE 11/91

Sample Designation Matrix	GW-01 Water	GW-02 Water	GW-03 Water	GW-03D Water	GW-05 Water	GW-5DUP Water	GW-06 Water	GW-07 Water	GW-09 Water	GW-10 Water	GW-10DUP Water	RW-01 Water	RW-03 Water
VOCs	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Methylene chloride	7 B	5 B	6 B	ND	5 B	ND	4 BJ	4 BJ	22	4 BJ	9 B	ND	11
1,1-Dichloroethene	ND	ND	25	28	19	23	4 J	ND	16	14	14	ND	ND
1,1-Dichloroethane	ND	ND	ND	8	10	9	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3 J	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	6	5	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	280 D	360 D	240 D	280 D	65	17	230	170	170	ND	ND
Acetone	ND	ND	ND	ND	8 J	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	34	ND	1400 D	1500 D	ND	51	33	120	120	ND	ND

Notes:
ND - Not detected
RW - Residential Well
GW - Ground water
DP - Duplicate
J - Estimated Value
B - Analyte found in lab blank
D - Value calculated from a dilutio

Sample Date 2/92
All Values in µg/l

	GW-06	GW-07	GW-10	GW-11	GW-12	GW-13	GW-14	GW-15	Field Blank
Trichloroethene	ND	42	180	ND	52	18	26	190	ND
1,1,1-Trichloroethane	85	11	170	ND	73	29	41	140	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	4 J	ND
Total Xylene	ND	ND	ND	9	ND	ND	ND	3 J	ND

ND Not Detected
J Detected below method quantitation limit but above instrument detection limit. The value provided is an estimated concentration.

SUMMARY OF GROUND WATER INORGANIC RESULTS (TOTAL AND DISSOLVED)
Machias, New York

SAMPLE DESIGNATION	GW01-01		GW02-01		GW02-01DP		GW03-01	
MATRIX	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER
METALS	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Chromium	54.4 J	ND	53.5	ND	47.4	ND	ND	ND
Lead	69.0	ND	131.0	ND	154.0	ND	21.3	ND
Nickel	41.3	ND	155.0	ND	161.0	ND	ND	ND
Iron	53700.0 J	23.3 J	120000.0	N/A	125000.0	N/A	16500.0	N/A
• Hardness	546.0	N/A	680.0	N/A	730.0	N/A	399.0	N/A

SAMPLE DESIGNATION	GW03D-01		GW04-01		GW05-01		GW06-01	
MATRIX	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER
METALS	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Chromium	37.6 J	7.3 J	50.0	ND	37.8 J	ND	51.2 J	ND
Lead	124.0	ND	16.4 S	ND	75.7	ND	54.9	ND
Nickel	133.0	ND	96.8	ND	120.0	ND	83.9	ND
Iron	150000.0 J	41.3 J	120000.0	N/A	137000.0 J	86.2 J	85400.0 J	83.1 J
• Hardness	913.0	N/A	635.0	N/A	643.0	N/A	682.0	N/A

SAMPLE DESIGNATION	GW07-01		GW08-01		FIELD BLANK	
MATRIX	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER	TOTAL WATER	DISSOLVED WATER
METALS	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Chromium	31.3 J	ND	7.2 J	ND	ND	ND
Lead	82.9	ND	29.0	ND	ND	ND
Nickel	90.5	ND	ND	ND	ND	ND
Iron	106000.0 J	27.2 J	61700.0 J	68.5 J	36.7 J	26.4 J
• Hardness	616.0	N/A	569.0	N/A	0.78	N/A

Notes:
- • – Hardness = mg equivalent CaCO3/l.
- ND – Not detected.
- DP – Duplicate.
- GW – Ground water.
- S – Value presented was calculated using method of standard addition.
- J – Estimated value.
- N/A – Not applicable.

TABLE 01

SUMMARY OF SOIL DATA FOR MACHIAS GRAVEL PIT

Chemical	Minimum	Maximum	Background	USEPA Soil Criteria
Volatiles (µg/kg)				
1,1,1-Trichloroethane	27	27	NA	NA
Trichloroethylene	291	291	NA	NA
Semi-Volatiles (µg/kg)				
Acenaphthylene	280J	280J	NA	NA
Anthracene	220J	220J	NA	NA
Benzo(a)anthracene	490J	490J	169-59,000 *	NA
Benzo(b)fluoranthene	570	570	15,000-62,000 *	NA
Benzo(k)fluoranthene	410J	410J	300-26,000 *	NA
Benzo(a)pyrene	470J	470J	165-220 *	NA
Benzo(g,h,i)perylene	250J	250J	900-47,000 *	NA
Fluoroanthene	340J	1500	200-166,000 *	NA
Fluorene	220J	220J	NA	NA
Indeno(1,2,3-c,d)pyrene	400J	400J	8,000-61,000 *	NA
Phenanthrene	1900	1900	NA	NA
Pyrene	260J	1100	145-147,000 *	NA
Inorganics (mg/kg)				
Chromium	2.5	8.2	100 **	NA
Lead	5.5	608	10 **	500-1000
Nickel	9.6	23.0	40 **	NA

NA Not available.
J Estimated value.
* (ATSDR, 1990).
** (Bowen, 1966).

Source: ESE, 1991.

TABLE 7

SUMMARY OF GROUND WATER DATA FOR MACHIAS GRAVEL PIT

Chemical	Maximum (µg/L)	USEPA MCL (µg/L)	New York State Ground Water Quality Standards (µg/L)	Lifetime Health Advisory (µg/L)
Organics				
Acetone	13	–	50	–
Benzene	9J	5	ND	–
Total Phenols	60	–	1	4000
1,1,1-Trichloroethane	390	200	5	200
Trichloroethylene	720J	5	5	–
Inorganics				
Chromium	54.4J	100	50	100
Iron (total)	150,000J	300s	300	–
Lead	154	5p	25	–
Nickel	161	–	–	100

ND = Not Detectable
J = Estimated Value
p = Proposed MCL
s = Secondary MCL

Source: ESE, 1991.
New York Division of Water resources, 1991.

TABLE 8

TOXICITY CRITERIA FOR THE POTENTIAL CONTAMINANTS OF CONCERN AT THE MACHIAS GRAVEL PIT SITE

Contaminant	Ingestion Route		Inhalation Route	
	RfD (mg/kg/day)	CSF $(mg/kg/day)^{-1}$	RfD (mg/kg/day)	CSF $(mg/kg/day)^{-1}$
Benzo(a)pyrene	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Nickel	2.0E-02	NA	NA	8.4E-01
1,1,1-Trichloroethane	9.0E-02	NA	3.0E-01	NA
Trichloroethylene	NA	1.1E-02	NA	1.7E-02

NA = Not available.

Source: USEPA, 1990.

TABLE 9

ESTIMATED NONCARCINOGENIC RISKS ASSOCIATED WITH THE GROUND WATER EXPOSURE PATHWAY (RISK TO 1,1,1-TRICHLOROETHANE)

Exposure Route	Noncarcinogenic Hazard Indexes	
	Adult	Child
Drinking Water	1.41 E-02	1.92 E-01
Dermal Absorption	1.64 E-02	8.47 E-02
Inhalation	4.60 E-03	6.30 E-02
Total	3.51 E-02	3.40 E-01

Source: ESE, 1991.

TABLE 10

ESTIMATED CARCINOGENIC RISKS ASSOCIATED WITH THE GROUND WATER EXPOSURE PATHWAY (RISK TO TRICHLOROETHYLENE)

Exposure Route	Carcinogenic Risk Level	
Drinking Water	7.50 E-06	7,500,000
Dermal Absorption	8.82 E-06	
Inhalation	1.27 E-05	127,000
Total	2.90 E-05	

Source: ESE, 1991.

TABLE 11

TABLE 12

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.
New York State, Department of Health, State Sanitary Code	Pub. Health Law § 225	
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, September 25, 1990	---	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.

NEW YORK STATE AND FEDERAL MAXIMUM CONTAMINANT LEVELS

Compound	NYS MCL	Federal MCL	NYS Ground Water Standards
Acetone	0.05 mg/L	N.A.	–
Benzene	0.005 mg/L	0.005 mg/L	ND
1,1,1-Trichloroethane	0.005 mg/L	0.20 mg/L	5 ug/l
Trichloroethene	0.005 mg/L	0.005 mg/L	5 ug/l
Total Phenols	0.001 mg/L	N.A.	1 ug/l
Chromium	0.05 mg/L	0.05 mg/L	50 ug/l
Lead	0.05 mg/L	0.05 mg/L	25 ug/l
Nickel	N.A.	0.10 mg/L*	–
Iron	0.3 mg/L	N.A.	300 ug/l**

N.A. - Not Available
– - Standard Not Estimablished
*MCLG - Maximum Contaminant Level Goal
** - Standard for Iron and Manganese is 500 ug/l

ALTERNATIVE	CAPITAL COST	O & M COST	PRESENT WORTH
No Action	$0	$15,000/yr	$215,000 (20 year life)
Air Stripping/Pipeline Discharge	$162,000	$65,000 - $75,000	$603,000 - $671,000 (8 year life)
(with Vapor Phase GAC)	($197,000)	($75,000 - $85,000)	($706,000 - $773,000)
Air Stripping/Injection Well Discharge	$161,000	$65,000 - $75,000	$602,000 - $670,000 (8 year life)
(with Vapor Phase GAC)	($196,000)	($75,000 - $85,000)	($705,000 - $772,000)
Air Sparging/Soil Vapor Extraction	$190,000 - $1,000,000	$15,000/yr	$220,000 - $1,000,000 (1 to 5 year life)

TABLE 14