REMEDIAL DESIGN PLAN FOR FINAL CLEANUP

WALLKILL NEW YORK

APRIL 1990

by

ENVIRONMENTAL TECHNOLOGY SERVICES
SHAKTI CONSULTANTS, INC.
JAMESBURG, NEW JERSEY - CHARLESTON, WEST VIRGINIA

US v General Switch Corporation, 87 civ.8789 (RJW)

John Bee
Senior Geologist, Shakti Consultants, Inc.
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Area Code 914-342-5801

GENERAL SWITCH CORPORATION
20 Industrial Place • P.O. Box 640 • Middletown, New York 10940

April 20, 1990

Chief, New York/Caribbean Superfund Branch
Office of Regional Counsel
U.S. Environmental Protection Agency, Region II
26 Federal Plaza, Room 437
New York, New York 10278

Att: Bernice I. Corman, Esq.
Wallkill Well Field Site Attorney

Re: U.S. v. General Switch Corporation
87 Civ. 8789 (RJW)

Subject: Submission of Remedial Design Plan;
Document Submissions

Dear Ms. Corman:

Enclosed is the Remedial Design Plan, which is submitted pursuant to Section IX of the Consent Decree in the above-captioned matter.

After having consulted with our counsel, we read the language of Section XIV.E. of the Consent Decree, which requires the signature of a "responsible corporate officer" on submissions by General Switch Corporation ("General Switch"), to apply only to submissions documenting acts of compliance with the Consent Decree, and not to submissions which themselves constitute compliance with the Consent Decree. Because of this, the first technical documents, submitted pursuant to Sections VII and VIII of the Consent Decree, were not signed by a "responsible corporate officer" of General Switch.

Our counsel have advised us that you have indicated that the EPA interprets Section XIV.E. to apply generally (with certain narrow exceptions) to documents submitted in compliance with the Consent Decree.

Without waiving the right to our interpertation of Section XIV.E., this and future submissions will be accompanied by a transmittal letter signed by an appropriate officer of General Switch. You have indicated that EPA will consider such submissions to be in compliance with Section XIV.E. of the Consent Decree.

You have already received copies of five technical documents prepared for General Switch by Shakti Consultants: the Pump Test Plan, the Sampling and Monitoring Plan, the Site Managament/Operation and Maintenance Plan, the Quality Assurance/Quality Control Plan, and the Health and Safety Plan, in addition to the Remedial Design Plan submitted today. These previously submitted plans were prepared for, and submitted by, General Switch pursuant to Section VII and VIII of the Consent Decree. We believe all of the plans comply with all reguirements of the Consent Decree.

Very truly yours,

GENERAL SWITCH CORPORATION

BY [signature] Pres.

Walter S. Stern, President

cc: Chief, New York Caribbean/Site Compliance Branch
U.S. Environmental Protection Agency,
Region II

Chief, Environmental Enforcement Section
Land & Natural Resources Division
U.S. Department of Justice
RE: DOJ# 90-11-3-221

Chief, Environmental Protection Unit
Office of the United States Attorney
Southern District of New York

SHAKTI CONSULTANTS INC.

185, Gatzmer Avenue
Jamesburg, NJ 08831
(201) 521-2322

March 15, 1990

Mr Walter Stern
General Switch Co.
Middletown, New York 10940

Martin Baker, Esq. and Gregory Belcamino
Stroock, Stroock and Lavan
Seven Hanover Square
New York, New York 10004

RE: United States v General Switch Corporation
S.D.N.Y. (87 Civ. 8789)

Dear Mr. Walter Stern, Martin Baker and Gregory Belcamino,

Attached is the Remedial Design Plan for Cleanup at General Switch Corporation, that includes details of the remedial work to be undertaken as discussed in the USEPA consent order.

The documents we have supplied to the USEPA are:

Pump Test Plan	Completed
Schedules	Completed
Sampling and Analysis Plan	Completed
Health & Safety Plan	Completed
QA/QC Plan	Completed
Combined Overall Site Management Plan and Draft O and M Plan	Completed
Remedial Design Plan	Attached
Connection of Wells Plan	Attached

The Initial Testing Program is included in the Pump Test Plan and Sampling Plan

The tasks we will complete are:

Fabrication of the Air Stripper	Begun 4/5/90
Pump Test	Following USEPA authorization
Field Testing of the Soil Treatment Method	" " "

Sincerely,

John Bee
President, Shakti Consultants, Inc.

Certified Professional Geologist # 6173
American Institute of Professional Geologists

REMEDIAL DESIGN PLAN FOR FINAL CLEANUP, APRIL 1990

WALLKILL NEW YORK

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REMEDIAL DESIGN PLAN FOR FINAL CLEANUP

WALLKILL NEW YORK

1.0 Introduction

Shakti Consultants has been retained by General Switch to completee the cleanup for the Wallkill site to remedy the soil and groundwater contamination at the site (Figure 1).

This submission is a Remedial Design Plan for Final Cleanup. A summary of the proposed program is a follows:

Summary

- The groundwater from the Parella (now Cuison) well will be pumped through a merry-go-round air stripper that will reduce the contaminant concentration from 250 ppm in the influent water to below 5 ppb in the effluent.

  In addition, contaminants will be drawn from the vapor space in the well above the the water level to collect soil vapors.

  It is the conclusion of Neil Isabel, Regional Air Pollution Engineer for New York State Department of Environmental Protection (NYDEC), that the emission of hydrocarbons from the air stripper will require a permit. A pump test will be conducted during which the efficiency of the groundwater recovery system will be determined and that the air flow leaving the air stripper is below acceptable air criteria effective at that time. Neil Isabel has indicated that he will grant permission to conduct the pump test and will use the data obtained to issue an operating permit. Caesar Manfredi, NYSDEC Division of Water has indicated he will grant temporary authority to conduct the pump test contingent upon review of the air stripper Remedial Design Plan.

- Solvent-contaminated soil will be treated by excavation of heavily contaminated soils in the areas detailed in the attached site map Figure 9, and by soil treatment by mechanical rotor tilling.

- Purging of the contaminants from the soil will then be completed by dispersion of the treated groundwater through the glacial till, leaching out the solvent in each of the three areas of soil contamination. The treated effluent from the air stripper will infiltrate into the tetrachloroethylene contaminated soils on site to induce cleaning of the soils and leaching of the contaminants that will be intercepted by the cone of depression of the Parella well. Groundwater interception using the Parella well will control and recover the flow of contaminants to downstream receptors and cleanup the aquifer in a closed cyclic process.

2.0. Proposed Remedial Methods

Based on previous experience with contaminated soil and groundwaters, several technologies were identified for minimizing the impact of on-site soil contamination and to address groundwater recovery and treatment. These alternatives are described in the document "Proposal for Final Clean-up, Wallkill, NY" previously submitted. The feasibility of these alternative has been discussed at some length in that document and with the USEPA Region II, Technical Staff. Inappropriate methods were culled from these alternatives and the following remedial methods are presented for final cleanup.

2.1 Soil Cleanup

o PARTIAL SOIL TREATMENT	TREAT SOIL TO 4 FEET, WITH EXCAVATION TO 6 FEET IN HEAVILY CONTAMINATED AREAS*.
o FLUSH REMAINING SOLVENT	PURGE REMAINING SOLVENT FROM THE DEEPER SOIL HORIZONS BY INFILTRATING WATER FROM THE PARELLA WELL THROUGH THE GLACIAL TILL FOR RECAPTURE AT THE PARELLA WELL.

* Where the General Switch manufacturing building foundations are not undermined.

PROPOSED METHOD IN-SITU SOIL TREATMENT

The Problem - Infiltration of Contaminants to the Groundwater

At present the infiltration of volatile contaminants in the soil into the groundwater is considered to be one of the prime potential impacts of the contaminants at General Switch. At present the soil is surcharged with run-off water from the site, a seasonal perched water condition is observed and the resultant leachate production is infiltrating the groundwater beneath the site.

The remedy of in-situ soil treatment is dictated by the requirements of the Land Ban, preventing excavation and landfill disposal of solvent-contaminated soils.

Description of Alternative

In the soil cleanup we propose to be guided by the soil sampling data presented in Figures 9 through 15. We propose to treat soil contaminated with more than 50 ppm of tetrachloroethylene in the following manner:

o Design Plan for Excavation: Three soil hot spots have been identified as being contaminated by solvents including tetrachloroethylene: in areas TPA, TPD and TP6. We propose to excavate and treat the contaminated soils inside the limits of the contaminated soil areas at the three hot spots detailed in the plan view and cross-section previously submitted to you in September 1988 (Figures 9 through 13). Excavation that will undermine the General Switch manufacturing building will not be considered. A Photovac GC 10S50 will be operating on site during the investigation to guide the excavation and treatment. Field decisions will be made regarding the depth of the excavation based on Photovac analysis of the soil and footing foundation security. The decision will be made jointly by the On-Scene Coordinators of the USEPA and NY State DEC and Shakti Consultants once the depth of the footings in areas TPA and TPD are exposed in the two areas adjacent to the building. In any regard, the excavation will not proceed below the level of the foundation base within 10 feet of the footings.

The excavations shall be completed using a backhoe to remove the soil from the excavations and a front-end loader that will stockpile the soil on 8-mil plastic adjacent to the excavations except at location TPD: this soil will be stockpiled at location SS on the northern side of the General Switch building and the excavation backfilled with clean fill tested with the Photovac. The soil will be covered with 8-mil plastic and tarpaulins when not being treated to reduce run-off from the pile. After treatment, at the USEPA's discretion, the soil will remain at the stockpiles or be returned to the excavations.

TPD: At the hot spot located adjacent to the loading dock contaminated soils within the area of TPA will be excavated to 4 feet depth. The soil at four feet will be tested with the Photovac for the volatile content of these soils. If the soil is contaminated to less than 50 ppm tetrachloroethylene, a confirmatory laboratory sample will be analyzed by USEPA Method SW846 (Method 624 modified for soils analysis). If the Photovac indicates levels of soil contamination above 50 ppm, the soil will be excavated to 6 feet depth in an area 5-feet in radius surrounding soil boring locations T-7, T-8, T-9, T-10 and T-11. General Switch will excavate the soil and distribute it to location SS for rotor tilling treatment.

The soil in the base of the excavation will be analyzed in the laboratory.

If soil is encountered in the bottom of the excavation at a concentration more than 50 ppm, an underground drain system will be put into place at this location and used to infiltrate treated groundwater into the till, to flush the remaining tetrachloroethylene to the recovery well. This excavation next to the loading dock will be backfilled with clean consolidated soil.

Further cleaning of the soil beneath the excavation will be by infiltration of groundwater, flushing the contaminants to capture at the Parella well. This area is the loading area of the building and in this location the treated groundwater will infiltrate into the glacial till through the system of under drains below the loading area. The drains will be 6 inch in diameter and separated by ten feet and stretch across the limits of the excavation. The drains will be capped with a concrete pad to support the delivery trucks. The purpose here is to allow continued use of the loading bay, consistent with the goals of the cleanup.

TPA: Area TPA is at the rear of the building in a natural depression adjacent to the building footings, sandwiched between the building and the property fence. At this hot spot, high-level contamination of the soil will be excavated to 6 feet depth in an area 5 feet in radius surrounding soil boring locations T-20, T-17, T-16 and T-15, where soil contamination is expected to be above 50 ppm tetrachloroethylene, provided the building foundations are not undermined. General Switch will excavate the soil and stockpile it adjacent to the excavation for rotor tilling treatment.

TP6: Soil will be excavated at TP6 to a maximum depth of 4 feet as denoted in Figure 10, based on the Photovac, OVA and Laboratory data presented in that figure. General Switch will excavate the soil and stockpile it adjacent to the excavation for rotor tilling treatment.

Treated groundwater from the Parella well will be introduced into the two open excavation TP6 and TPA and into the under drain system at TPD in order to flush the remaining volatile organics through the glacial till to the Parella well for recapture and treatment. Routine maintenance will be completed to keep the excavations and drains in a manner suitable for receipt of treated water to recharge the aquifer and flush the contaminated soils beneath the excavation areas. If during the time of the cleanup, the foundation adjacent to TPA is threatened with collapse, an under drain for infiltration of treated groundwater similar to area TPD will be installed. This decision will be made jointly by Shakti Consultants and the On-Scene-Coordinators of the USEPA.

The soil removed from the excavations will be spread in 8" lifts adjacent to the excavations and rotor tilled to reduce the volatile concentration of Tetrachloroethylene by 95-99.9% in accordance with the guidance " Interim Treatment Levels for Soil and Debris" June 1, 1988 USEPA Office of Emergency and Remedial Response.

Applying the guidance, we are proposing the treatment levels in Tables 1A for Organics. The table data on contaminants are divided into chemical groups. Tetrachloroethylene is a halogenated aliphatic compound. Each group has two types of treatment levels. The first is a concentration range for lower levels of contamination; these concentration ranges are similar to residual concentrations being proposed by OSW in setting BDAT standards for RCRA-listed waste codes. The second is a percent reduction range for higher concentrations of contamination. When the indicated threshold concentration is exceeded for a particular constituent in the untreated soil or debris, then the treatment level for that constituent is to achieve a reduction of the contamination in the untreated waste within the range of the corresponding percent reduction.

Laboratory analysis will be completed during soil treatment to determine the reduced soil contaminant concentration.

For example, a soil with 200 ppm of tetrachloroethylene, a halogenated aromatic compound, would have a goal to achieve of 95% reduction for a maximum residual level after treatment of 10 ppm. For untreated wastes which significantly exceed the threshold concentration, the percent reduction may approach the upper end of the range. For example, as the concentration of tetrachloroethylene increases significantly above the 200 ppm level, the reduction may approach 99.9% to approach the residual goal of 10 to 50 ppm.

5/27/88

Table 1A
Treatment Levels for Treatability Variances
for Contaminated Soil and Debris*
Organics
(concentration based on total waste analysis)

Structural Functional Group		Trtmt.Rng (ppm)	Thresh'd Conc.(ppm)	Percent Reduc.Rng.
W01	Halogenated Non-Polar Aromatics	0.5-10	100	90-99.9
W02A	Dioxins, Furans	0.00001-0.05	0.5	90-99.9
W02B	PCBs	0.1-10	100	90-99.9
W02C	Herbicides	0.002-0.02	0.2	90-99.9
W03	Halogenated Phenols, Cresols & Ethers	0.5-40	400	90-99
W04	Halogenated Aliphatics	0.5-2	40	95-99.9
W05	Halogenated Cyclics	0.5-20	200	90-99.9
W06	Nitrated Aromatics & Aliphatics	2.5-10	10,000	99.9-99.99
W07	Non-Polar Aromatics & Heterocyclics	0.5-20	200	90-99.9
W08	Polynuclear Aromatics	0.5-20	400	95-99.9
W09	Other Polar Organics	0.5-10	100	90-99.9

* When the untreated concentration is between the treatment level and the threshold concentration, the treatment should reduce the concentration in the residuals to no more than the maximum of the treatment range (in this case, the percent reduction does not apply). When the untreated concentration is above the threshold concentration, the treatment should achieve at least the minimum of the percent reduction range.

After the soil is rotor tilled and reduced to the required residual tetrachloroethylene concentration, the soil will then be stockpiled, covered with plastic and tarpaulins.

Disposition of the Treated Soils: After soil rotor tilling is completed and after completion of groundwater treatment, at the discretion of the USEPA, the treated soil that was stockpiled will be placed into the excavations at TPA and TP6. The soil will be replaced in the excavations in 8" lifts. The soil lifts will be spread across the floor of the excavation and compacted.

The contaminated soil areas will be closed in a manner that minimizes the need for further maintenance and controls. The finished closure of stabilized soil at TP6 to the south of the truck yard and at TPA will be seeded to minimize erosion. The truck area will be covered with a concrete pad.

There will be a final quality control inspection and certification by an Professional Engineer or Professional Geologist.

Advantages:

The site will be closed in a manner that:

- Reduces the concentration of contaminants to an acceptable level in the upper soil horizons.

- Reduces post-closure release of leachate, contaminated run-off and waste decomposition products to ground waters of the state or to the atmosphere.

- Minimizes or eliminates threats to human health and the environment. Protects public health and the environment through control of transport pathways.

Pathways of Dispersion at the Site

The major pathways of dispersion of contaminants at this site are by production of leachate that infiltrates the groundwater and by air dispersion by volatilization. Contaminants in the soil represent a potential long-term threat in the soil environment and groundwater quality, but this threat can be reduced considerably if the contaminants can be removed from the soil. The use of soil treatment envisaged in this alternative will minimize leachate produced and infiltrating into the groundwater. Once the soil contamination area is treated, further leachate production and the impact of downward percolation of leachate into this contaminated aquifer from this soil will be minimized.

Disadvantages

Air Emissions: The loss of contaminants from the soil during treatment via vapor phase transport will be significant. Concerns over the air impact of some uncontrolled release of volatiles during soil cleanup are warranted. Protective respirators will be used by remedial workers during soil treatment. The sites in the parking area are remote from residential dwellings. Access to the sites will be restricted during soil tilling. The area near location TPA is adjacent to a residential dwelling. Soil tilling will be conducted 200 feet from the fenceline of the residence. Air monitoring will be conducted to determine the fence line exposure. This exposure will be kept below the OSHA time weighted average for tetrachloroethylene.

Potential Receptors

Once the soil is treated, the remaining significant pathway of dispersion will be by infiltration of any contaminant to the groundwater and contaminated groundwater flow to a receptor. The groundwater will be captured by pumping that well to treatment.

Residual Problems

At this site the anticipated leaching of contaminants that are not treated or removed are to be captured by the groundwater recovery operation. Thus, the methods proposed complement each other to address the overall site remedy.

An undefined amount of vaporization of the solvents from the soil will occur after the soil treatment is completed.

Commercial Availability & Previous Applications

Soil treatment has been used extensively in civil engineering for the soil moisture control in the foundations for airport runways and at NPL sites.

Schedule for Excavation of Hot Spots

The excavation of the Hot Spots is planned from the summer of 1990, provided the USEPA gives authorization of the plans. A test of the method will be scheduled 21 days after USEPA's acceptance of the remedial plan and the full scale excavation one month later provided the operation can be completed in the months between June and September.

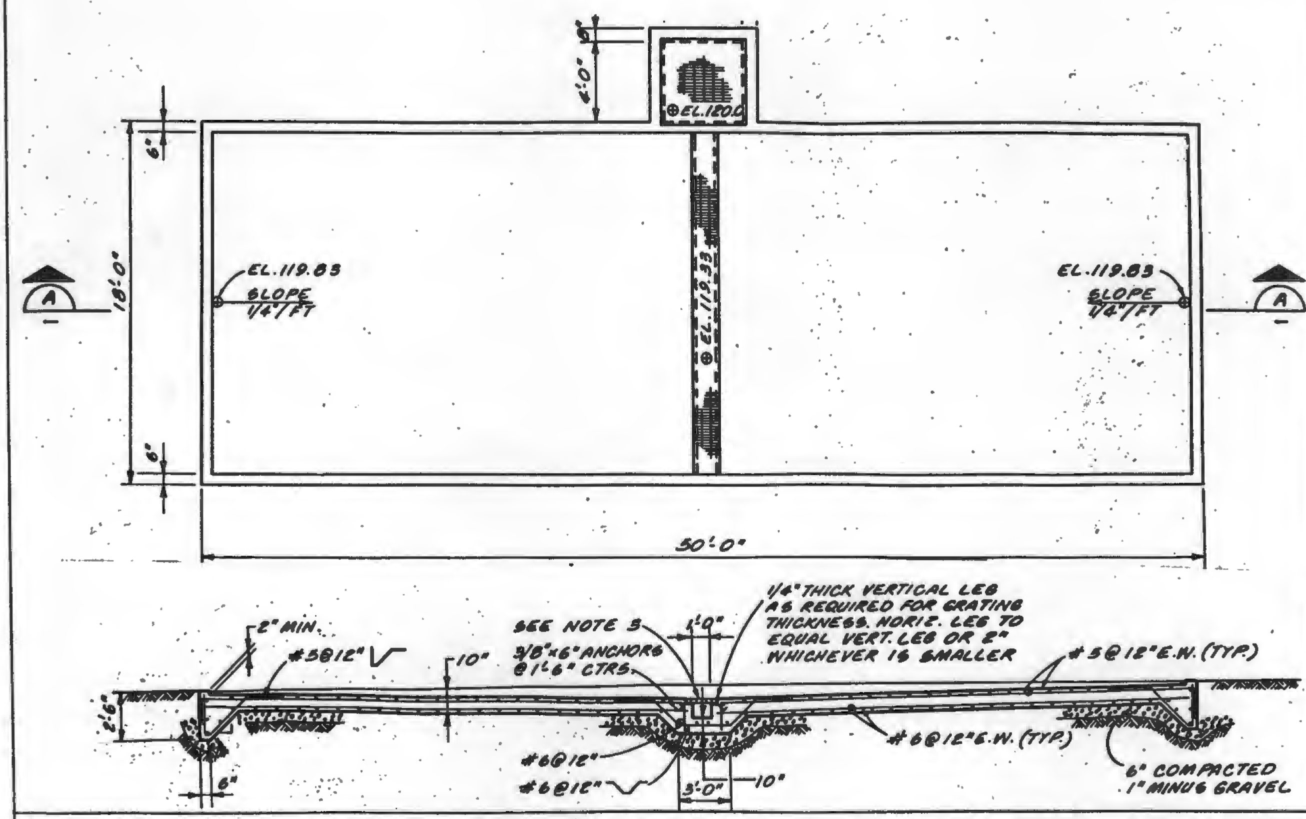

Figure 23. Soil Decontamination Pad

SECTION (A) SS
1/4" = 1'-0"

Shakti Consultants, Inc
185 Gatzmer Avenue
Jamesburg, NJ 08831

Costs

TABLE 1. CAPITAL COST FOR SOIL EXCAVATION AND ROTOR TILLING

Revised 8/8/89

Equipment		
Excavation (Backhoe -10 days @$500)	$5,000	
(Bulldozer -20 days @$320)	6,500	
Mixing (Farm Tiller -10 days @500)	5,000	
Compaction (Roller -20 day @$175)	3,500	
Soil Testing	4,000	
QA/QC Final Inspection	4,000	
Subtotal	$28,000	$28,000
Contingency at 25%		7,000
TOTAL CAPITAL COST		$35,000

TABLE. ANNUAL COST ESTIMATE - SOIL TREATMENT

Maintenance at 4% of Capital Cost	$2,500
TOTAL ANNUAL COST	$2,500

2.2 Groundwater Capture

o	PUMP PARELLA WELL	FOR GROUNDWATER PLUME CAPTURE
o	PUMP ADDITIONAL WELLS	IF REQUIRED TO CAPTURE THE PLUME

PROPOSED METHOD INTERCEPTOR WELL FOR GROUNDWATER CAPTURE

The Problem:

A plume of tetrachloroethylene contaminated groundwater has been demonstrated in the fractured bedrock aquifer in the vicinity of the Parella well

Description of Alternative

Based on available data, presented in the proposed cleanup, the Parella well pumping at 4 gpm has a radius of influence of at least 350 feet along the fractures in the shale and controls the hydrology of the area. Pumping the Parella well will pull down the potentiometric head in the shale at this well by 40 feet (allowing for an 80% efficient well). The well is situated upon a major fracture in the area and will intercept the flow of groundwater contaminants flowing past the well to Highland Avenue.

Data Needs

A pump test of the Parella well will be conducted to demonstrate the zone of influence of the well and define the effect of pumping for an extended period of time on the hydrology of the site in order to provide reliable drawdown predictions. A pump test using an electropiezometer system is scheduled for the Parella well to demonstrate the zone of influence of the well (Figure 16). The transmissivity and storativity of the fractured bedrock aquifer will be obtained along with the concentration of contaminants in the effluent required for final treatment system design.

Feasibility

The method proved successful in 1984 under the removal action of USEPA at Sarnay Farm, in New York State, during which an estimated 20.7 pounds of tetrachloroethylene were removed from the aquifer. The Parella well has proven to be the most prolific well in the area in terms of yield and has been consistently contaminated. The efficiency of the well may be increased by hydrofracturing of the shale.

Advantages

The well will act as an interceptor well for contaminants flowing southwards along Highland Avenue and minimize contamination of supply wells downgradient.

The plume will be captured by physically altering the potentiometric pressure in the aquifer, altering the regional direction of groundwater flow and providing a drawdown cone under the site. According to data presented by Fred C. Hart, the aquifer in the fractured bedrock may affect the water levels in wells in the base of the glacial till. Within the zone of influence of the pumping well, the contaminated groundwater flows to the well where it is permanently removed from the aquifer. If the Parella well does not perform to the anticipated efficiency in capturing the contaminant plume, additional wells will be used.

Disadvantages

Additional wells may need to be pumped if the Parella well is not sufficient to speed up the aquifer rehabilitation. Water will be removed from the aquifer. However, the effect on local water resources is expected to be minimal. Up to 1988, over 30 wells were drawing water from the aquifer - the regional water table was pulled down twenty feet. Many of these households are now on municipal supply and thus the demand for groundwater is very much reduced. Thus pumping the Parella well again will not effect the available water resources appreciably. The zone of influence of the Parella well may be affected by the increase in available water. A well survey of the remaining homes on Highland Avenue that are still using groundwater has been conducted. The residences of Wood, Seeley and Gilbert remain unconnected to municipal supply. There was no significant contamination of these wells during the last sampling round. If the water from these wells is analyzed at more than the drinking water criteria for priority pollutant volatile organics, additional hook-up to municipal supply will be undertaken by General Switch. Pumping the Parella well will produce a local drawdown cone that will change the groundwater flow direction to a net inflow to the Parella well, and water to those wells that remain in use will draw water from the hillside at the back (north) of Highland Avenue (Figure 6). Existing abandoned wells will be used to demonstrate sufficient drawdown to capture the contaminant plume.

Time Frame

The Parella well is already drilled, but will need to be uncovered and a new pump installed. A new pump will need to be installed in the Parella well and the Air stripper installed on the well discharge.

Further information on scheduling and costs will be presented about this course of action following the pump test.

TABLE 2. CAPITAL COST FOR WELL PUMPING

TABLE. CAPITAL COST FOR WELL PUMPING

Well Construction	$0	
Well rehabilitation	1,000	
Easement for well use	2,000	
Excavation	2,000	
Submersible pump for 4"-diameter	750	
Replacement pump	750	
Electrical at 12%	1250	
Piping and controls	4,000	
Site Work	2,250	
Subtotal	$14,000	$14,000
Contingency at 25%		3,500
TOTAL CAPITAL COST		$17,500

TABLE. ANNUAL COST ESTIMATE - WELL PUMPING

Labor	$3,000
Power at $0.05/kWh	1,000
Maintenance at 4% of Capital Cost	2,500
TOTAL ANNUAL COST	$6,500

(Costs are not inclusive of treatment: see treatment alternatives)

2.3 GROUNDWATER TREATMENT

o TREAT THE GROUNDWATER WITH AN AIR STRIPPER

Aquifer Restoration

The US Attorney has proposed the following requirements with regard to aquifer restoration

- Aquifer restoration to 5 ppb of tetrachloroethylene (PCE), 5 ppb of trichloroethylene, 7 ppb of 1,1-dichloroethylene, and 2 ppb of vinyl chloride.
- Cleanup of groundwater by air stripper at 99.9% efficiency if levels of vinyl chloride concentration in all exhaust gas discharged to the atmosphere do not exceed 10 ppm.

PROPOSED METHOD **MERRY-GO-ROUND AIR STRIPPER**

Description of Alternative

The groundwater from the Parella well will be pumped through a merry-go-round air stripper that will reduce the anticipated groundwater contaminant concentration from 250 ppm in the influent to the system to 5 ppb in the effluent. Thus, we will treat the groundwater to the NY State revised standard of 5 ppb (New York State MCLs, effective January 9, 1989).

The innovative merry-go-round system, designed by Robert Cobiella, the past USEPA on-scene-coordinator (OSC) for the site, will in many respects supersede the conventional packed column air stripper design. The packed column air stripper is a single air lift while the merry-go-round air stripper is a series of air stripping lifts. At each air stripping lift, air is entrained into the water stream and volatilizes the contaminant at a rate proportional to the Henry's Constant of the volatile contaminant and the temperature of the air and water.

The treated water will then be infiltrated into the tetrachloroethylene contaminated soils on site to induce cleaning of the soils and leaching of the contaminants that will be intercepted by the cone of depression of the Parella well. There is the added opportunity to draw contaminants from the vapor space in the well - particularly if the well is not cased (open hole) above the the water level.

Data Needs

The data required to design, size and permit the equipment will be supplied by the planned pump test.

Feasibility

The system has been operated with success at Pompey, New York at a National Priority Listed (NPL) site by the USEPA Emergency Response Division, Site Mitigation Section, Edison, New Jersey. The system was moved after 9 months upon completion of this groundwater cleanup. The air stripper reduced the contaminants from 700 ppb to non detectable in three months. There was a rebound in concentration to 240 ppb upon shut down at three months that required the further six months of treatment to address.

Since 1989, the system has operated at the American Thermostat NPL site in South Cairo, New York about 1-hours drive from the Wallkill site. The system is operating in the same fractured bedrock type of aquifer. A videotape of this operation is available upon request.

Air stripping efficiency depends on the transfer rate of the contaminant from water to air. A measure of the resistance to mass transfer from water to air is the Henry's Law Constant, H (Mackay, et al, 1979). The larger the Henry's Law Constant, the greater will be the equilibrium concentration of the contaminant in the air. Thus, contaminants with large Henry's Law Constants are more easily removed by air stripping (Kavanaugh and Trussell, 1980).

The Henry's Law Constants for each of the organic contaminants identified by the U.S. Attorney is presented in Table 3 and Figure 19. In this table are vapor pressure and water solubility for each compound. Mackay and Wolkoff (1973) and Mackay and Leinonen (1975) suggested that these two parameters be combined to give an effective Henry's Law Constant for organic materials in water:

In general, it can be said that the combination of high Henry's Law Constant, high vapor pressure, and low solubility indicate a potential for successful air stripping. McCarty, et al (1979) noted that those compounds such as tetrachloroethylene, with a Henry's Constant value greater than 10-3 atm m3/mole are good candidates for removal by air stripping (Figure 19).

TABLE 3. HENRY'S CONSTANT

	Tetrachloro ethylene (PCE)	Trichloro ethylene	1,1-Dichloro ethylene	Vinyl chloride.
Henry's Law Constant (atm:m3/mole)	28.7 $x\ 10^{3}$	11.7 $x\ 10^{-3}$	15 $x\ 10^{-3}$	640 $x\ 10^{-3}$
Vapor Pressure (torr,25%C)	14	57.9	591	2660
Solubility in Water (mg/l, 25%C)	150	100	5000	1.1
Effective Henry's Law Constant	10^{2}	10^{-2}	10^{-2}	10_{-1}
Evaluation of Stripping Efficiency	Very Good	Very Good	Very Good	Excellent

The evaluation row in Table 3 summarizes the Henry's Law Constant, vapor pressure, solubility of the compounds of concern at the site to indicate the amenability of each compound to removal by air stripping. The evaluations for the compounds presented range from Excellent to Very Good and indicate that air stripping is feasible for these compounds.

Such systems have been demonstrated to achieve 99+ % removal efficiency with tetrachloroethylene.

The proposed system will consist of a series of 10 air lifts (Figure 21) that in series air strip the volatile contaminants from the well water. The yield of influent water from the Parella well is no more than 4 gpm and based on past sampling is expected to be initially at 260 ppm tetrachloroethylene, stabilizing at 95 ppm. However, as the contribution from soil leaching begins to affect the groundwater captured, the contaminant strength may increase to its initial value.

The air lift units will be piped in a merry-go-round arrangement that will take water from the well and from a 250 gallon storage tank and discharge into a second 250 gallon holding tank. The water will be circulated through the series of air lifts and at each air lift experiences air stripping at approximately 65% removal efficiency.

TABLE 4. SUMMED REMOVAL PERCENTAGES

Number of Air Lifts	Summed Removal Percentage	Concentration
1	67.75%	250,000 ppb
2	71.54	
3	82.15	
4	88.39	
5	92.46	
6	95,10	
7	96.82	
8	97.93	
9	99.125	
10	99.43	
11	99.64	
12	99.76	
13	99.84	
14	99.9	
15	99.93	17.5 ppb On first pass

The air stripping lifts sum up to 99.9% removal of the volatile contaminant from the groundwater. The 10 air lifts will drain from the first 250 gallon storage tank. This air lifts will overflow into the second 250 gallon tank with overflow to the distribution system.

The removal percent follows a diminishing return curve, while the removal efficiency remains the same, the amount of contaminant removed decreases in proportion to the reduced total concentration to be treated such that the largest expense is incurred in reducing the concentration below 65% of the initial concentration.

To enhance removal of the volatile the air lifts will circulate water through them at twice the influent and over flow rate of 4 gpm. Thus, the Merry-Go-Round air stripper, revolving at 8 gpm, will be more efficient and complete the cleanup quickly.

In iron-rich shale formations above 0.5% iron content, a practical limit of removal of 99.8% removal is determined by the entrainment of Tetrachloroethylene in iron flocculate that forms and fouls the system. This, apparent practical limit for air stripping can be overcome by allowing the iron floc to settle out by pH adjustment.

Nutrients of basal salts and glucose in the form of Epsom salts and pellet fertilizer at 0.1% of the flow and Karo Syrup at 0.01% of the flow may be added to the second tank. The first tank is seeded with treatment plant sludge. The microbes in turn assimilate the tetrachloroethylene and iron and precipitate magnesium salts that are filtered out with two down-draining sand filters arranged in parallel to allow for cleaning and maintenance.

Transmission Pipes: The water recovered from the Parella well will be conveyed to the General Switch property where the air stripper will be operated. The lines will be constructed of 2"-diameter schedule 40 PVC and installed during the reconditioning of the Parella well indicated in the Pump Test plan, and laid in a trench 3 feet deep; below the frost line. Similar pipes will be laid to the infiltration points at each excavation.

The thrust of this method is to also treat the contaminated soils on site by leaching and biological activity. The glacial till is only moderately to poorly permeable. A simple french-drain leaching field will be employed in the area of the loading dock to disseminate the leaching water. Two open pools will be used to surcharge the soil in the less trafficed areas: TPA and TP6.

It is advantageous to establish and disseminate a bacterial colony into the contaminated soil by adding nutrients and oxygenation to the overflow. But, care must be taken to avoid a nutrient/bacteria rich discharge from the treatment plant that will cause an impermeable algal gel growth in the surface soils, leaching field and the bottom of any infiltration lagoon. Provision will be made to prevent the formation and allow breakup of such an impermeable coating.

If nutrients are not added to the second tank the remaining bacteria will consume the remaining tetrachloroethylene in the tank and the population will decline. An established nutrified and aerated bacterial colony will infiltrate into the soil in the same manner that the solvent did and will digest the tetrachloroethylene in the soil. A cap on the site will not be employed and surface water infiltration will be encouraged during treatment. Additional water for soil infiltration and plume capture may be obtained as needed by hydrofracturing the Parella well.

To operate the merry-go-round air stripper with 10 lifts, at 8 gpm, a 120 scfm air supply is required. Throughput capacities for multistage systems are slightly lower than the calculated flow capacity of a single airlift (12 to 15 times the cross-sectional area of the riser pipe in square inches = gpm), at least in the smaller size strippers. This system can be operated at about 10 gpm per square inch of riser pipe area. Air flow capacity per stage operates at about 1 scfm per gpm per lift, yielding an air to water ratio per stage of 7.48 to 1. Laboratory reported removal rates for single lifts at this ratio are 62-68%.

TABLE 5. REQUIRED AIR SUPPLY FOR AIR STRIPPER

Lifts	Water Flow (gpm)	Air Flow scfm
1	4	4
2	4	8
3	4	12
4	4	16
15	4	60
15	8	120

The airlift stripping system at American Thermostat has been fully operational since February 24, 1987. The current operation is unattended, running at a flow rate of about 3000 gpd (2 gpm). The proposed Wallkill project will treat groundwater at 5700 gpd. Flows, pressures and vacuum controls will be in a manually set balance. An automatic shutoff will be installed to prevent overflow in the event of transfer pump failure. For the first two weeks the system initially will be checked twice a week by Shakti Consultants. Then the system will be checked once per month and winterized in December.

Samples will be taken periodically according to the approved sampling plan and analyzed by a commercial laboratory.

The initial data for American Thermostat indicated raw water at 10,300 ppb tetrachloroethylene, and effluent water treated with a seven stage air stripper averaging 48 ppb, for a removal rate of 99.53%. Data from September 1988 indicated groundwater at 12,000 ppb was being captured in the pumping well and no Tetrachloroethylene was detectable to 10 ppb detection limit in the effluent, with the addition of a sprinkler system on the effluent pipe. Removal rates have ranged from 99.5 to 99.86% during the operation to date. With this system the influent groundwater concentration was reduced from 144,500 ppb to 2,000 ppb in 15 months. This system was not provided with the added enhancement of the secondary biological reactor.

To reach an effluent criteria of 5 ppb is a matter of increasing the number of air lifts, employing biological polishing and incurring slightly higher power and supervision costs. Multistage airlift stripping can easily be scaled up to meet the needs of any groundwater/surface water/aquifer volatile cleanup action. These multistage air strippers can be sized for flow rates up into the millions of gallons per day, and costs per gallon can reasonably be expected to be lower for larger systems than for the smaller ones, and also lower for longer remedial actions than for short term projects as the initial capital investment is offset by more gallons treated.

Robert Cobiella is available for clarification of the feasibility of the method. He and George Zachos, Section Chief of the Site Mitigation Section have offered their assistance to Mel Hauptman, the USEPA technical staff on this project, monitoring the remedial effort. This may begin when a letter of understanding exchanged between the two USEPA Sections.

Advantages

A full scale model has already been proven to be effective and has completed the treatment operation at an NPL site during which many design refinements were incorporated. The system will be cheaper to construct than a packed-column air stripper and operates unattended for long periods of time. An Air 100 Permit was not required for the American Thermostat system and meeting the air discharge criteria were not a problem. A permit was obtained for the Hicksville MEK spill. The NY State Air Permits branch is developing policy with regard to permitting air strippers.

Sufficient information is in hand at this time to evaluate the field performance of the multistage airlift stripping technology. It is a high efficiency, low cost technique for purging volatile organic chemicals from water. It is effective, practical, operable, flexible, reliable, amenable to fabrication in the field at a scale tailored to the problem of the site and simple enough to be fabricated by readily available construction-level skilled tradesmen. It can be fabricated of materials capable of withstanding high or low pH liquids. It will readily move viscous liquids or high solid content liquids. It has no moving parts in contact with the liquid being stripped and so is relatively free from the effects of abrasive materials.

Residuals Generated

No solids are generated as a result of air stripping of volatile organics.

Secondary Environmental Impact

Air stripping has a potential air pollution problem associated with it. Existence of an actual problem depends on the geographical location (state, air quality region, etc.) of the stripper, the efficiencies of the stripper and the expected concentration of contaminants in the influent water.

Previous Applications

Applications of air stripping to the removal of organic pollutants are numerous.

O&M Requirements

Air stripping requires minimal operator attention, maintenance of the pumps and blowers, and electricity. The stripper itself contains no moving parts. Attention to mineral deposition and biological matting of the column packing will be required.

Interferences

High iron content of the groundwater would interfere with packed column air stripping of volatile organics. This problem is avoided with an airlift system. Reliability of air stripper operation can be a problem for installations where cold weather operation is required. Cold weather would decrease the driving force for volatilization. Heating the influent water may be required for winter operation or a shut down for the months of January, February and March may be considered.

Disadvantages

State regulatory authorities may require air emission source registration and permitting. Requirement for vapor recovery may be imposed adding additional capital and operating expense.

Time Frame

The fabrication of the air stripper began on April 4, 1990. The equipment could be operational within a further 150 days.

We propose to treat groundwater at Wallkill by air stripping to below the acceptable drinking water criteria and discharge that groundwater into the ground. We request that the USEPA confer with the NY State DEC to define the terms under which infiltration of treated water will be allowed.

Costs

The system is not an expensive proposition. At American Thermostat the cost as of April 1, 1987 for the groundwater treatment was $55,000 for the construction, fabrication, running-in and operation of the airlift system for the first month. The cost included a shelter building and all its internal and external component items. Total treated throughput in the first month as of April 1, 1987 was over 150,000 gallons of contaminated groundwater. The capital and operating cost of the airlift stripping was 36¢ per gallon at this time. Projected system shut-down will be at the 300,000 gallons treated, and the cost at that time is forecast at $60,000 attributable to airlift stripping. Final cost per gallon for the completed action is thus expected to be about 20¢ per gallon.

For comparison purposes, the purification of 5.7 million gallons of groundwater at the Hicksville, L.I., New York site by a heated-feed, packed-column air stripper, admittedly a much more difficult to strip material (MEK), but also a much larger system used for an extended period of time, cost about 18¢ per gallon. At the Wallkill site, after 18 months of operation, 3 million gallons of water will have been treated and recycled.

We are in the process of building the air stripper so that it may be used for the air stripping of the water from the pump test. Neil Isabel, the Regional Air Pollution Engineer for Region III, NYDEC, has given verbal permission to conduct the pump test on the Parella well without a permit in order to obtain hard data on the removal efficiency and exhaust vapor concentration. Caesar Manfredi, NYSDEC Division of Water, will give a temporary authority to conduct a pump test contingent upon review of the air stripper Remedial Design Plan.

TABLE 6. CAPITAL COST ESTIMATE
MERRY-GO-ROUND AIR STRIPPING

For 18 month operation:

Multistage Stripper	$11,500	
2 x 6,000 gallon tanks (Rental $200/mo plus 500 x 2 liners)	4,500	
Flow Meter	3,000	
Pipes, Valves, Specialties	1,000	
Feed Pumps (2 blowers, 1 vac*, 1 turbine)	7,000	
Electrical at 12%	3,500	
Piping at 8%	2,500	
Instrumentation at 5%	1,500	
Insulated Trailer/Sumps @ $15/ft^2	12,000	
Site Work at 5%	1,500	
Excavation	3,000	
Subtotal	$51,000	$51,000
Contingency at 25%		13,000
TOTAL CAPITAL COST		$64,000

TABLE. ANNUAL COST ESTIMATE - AIR STRIPPING

Labor ($500/month discounted in house)	$3,000
Power at $0.10/kWh ($300/mo)	5,500
Chemicals ($50/mo)	1000
Maintenance at 4% of Capital Cost	2,500
TOTAL ANNUAL COST	$12,000
At double (8 gpm operation)	

$/gallons-$0.20-35

Suppliers

Fabrication - Local
Piping - Kimax, Amsco Sales, Fairfield NJ.(201) 575-8350
Pumps - Ring Compressor, Fuji, NY (212) 697-0116
Impeller - Wright-Austin, Detroit, Michigan
(dealer Koechlein, NJ 201 652-6274)

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                                                                  Vapor out
                                                                  |
                                                                  |
                                         Vapor Collection Header  |
                                   ___________________________________
                                   |______   _______   _______   __________
                                   |      | |      | |      | |         |
              Air pump             |      | |      | |      | |         |
              @++++++++++++++++++++|+++++++|+|+++++++|+|+++++++|+|++      |
                 Air lift series _a| +    | | +    | | +    | | +       |
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                                 | |<b      |<b      |<b      |<b Air inject |   General Switch
                                 |                                      |_ Treated Water to injection
Ground surface___________________|________________________________________________|______
          Contaminated Water |                                                    |
       25'           from well |                                   |||||||||||||||||||
Water table ---------------------|------------------------------------- \\Leaching Field\\\+
       +                         |                    +  Contaminated soil //////////////////
       20' Drawdown +            |          +                         \\\\\\\\\\\\\\\\\\
                         +       |    +                     ///////////////////////////////
       --                        +     \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
                                 |  ////////////////Plume //////////////////////////////////
              Plume Capture      @ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\

Pump 10'Submergence below Drawdown Cone for Turbine Pump
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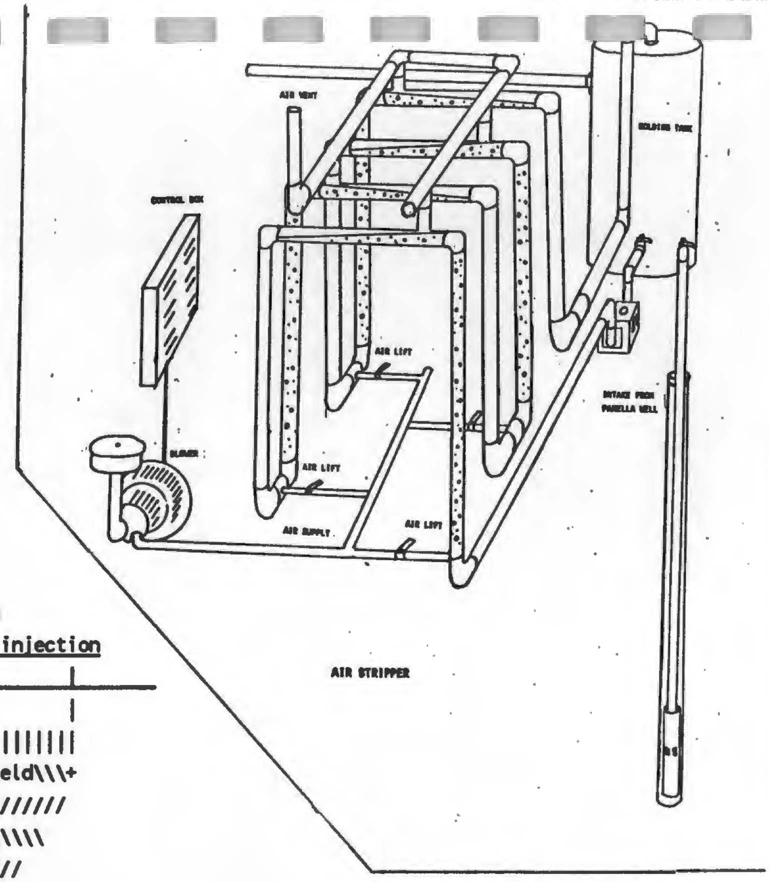

Figure 20: Multistage Airlift System

3.0 Sampling and Analysis

General Switch agreed to analyze all soil and water samples using a Photovac Portable Gas Chromatograph and, in addition, to analyze in an independent, mutually acceptable laboratory one of every ten water samples for all priority pollutant volatile organics (Method 624) and to analyze one in ten soil samples for all priority pollutants volatile organics (Method 8240). The sampling protocol for this procedure is described in the Appendix D and appended to the consent decree.

3.1 Well Testing

General Switch will test the well water for those homes identified in the consent order. These homes are the Seeley, Wood and Gilbert residences on Highland Avenue. The sampling protocol for these homes is detailed in the Appendix B and discussed in Section 4.1. Those wells that yield water that contains 5 ppb or more of tetrachloroethylene will be connected to public water supply by General Switch.

3.2 Quality Control of the Treatment Process

For quality control of the treatment process the following samples will be required according to the Sampling and QA/QC Plan.

- o Sample of raw water from the Parella well
- o Sample of system discharge
- o Duplicate and Blank Quality Control (QC).

Table. PUMP TEST SAMPLING PLAN SUMMARY TABLE - Sampling Parameters and Analytical Methods

Location/Matrix	Analytical Parameter	Sample Number	Method Reference	Sample Preservn	Analytical Holding Time	Unit Cost	Cost
Water							
Influent samples from Parella well	Photovac	2/day for 3 days	Region I USEPA	Cool/4C	2 days	$500/day rental	$2000
	Priority Volatile Organics	1/day for 3 days	Method 624	Cool/4C	7 days	$150	$450
Internal QA/QC: Influent to Tank #1	Photovac	2/day	Region I USEPA	Cool/4C	2 days	included in rental	
Discharge from Tank #1	Photovac	2/day	Region I USEPA	Cool/4C	2 days	included in rental	
Effluent samples Exit from Tank #2	Photovac	2/day	Region I USEPA	Cool/4C	2 days	included in rental	
Field Blank	Priority Volatile Organics	1/day for 3 days	Method 624	Cool/4C	7 days	$150	$450
Quality Control (QC). spiked sample duplicate sample	Priority Volatile Organics	3 per batch	Method 624	Cool/4C	7 days	$100	$100
Air							
Air samples of exhaust	Photovac	2/day	Region I USEPA	Cool/4C	2 days		
	Priority Volatile Organics	1/day	Method 1003	Cool/4C	7 days	included in rental	
Electropiezometer	Water levels	20/day	Terra 8 SOP	N/A	N/A	$1500/day	$6000
						Total	$9000

Footnote

Analytical Methods
o EPA Methods 624 Methods for Chemical Analysis of Water and Wastewater (EPA-600/4-79-020)

Table. SAMPLING and ANALYSIS PLAN SUMMARY TABLE

LOCATION REFERENCE	MATRIX PRESERVN	SAMPLE DEPTH TIME	ANALYTICAL PARAMETERS	SAMPLE NUMBER	MATRIX	SAMPLE METHOD	HOLDING
Excavated Soil							
S1, S2, S3, S4	Soil samples from	4, 6 feet	Volatile screening	50	soil	Region I EPA	Immediate Analysis
at five feet	each soil excavation		Photovac 10S50			Water bath @ 30C	
increments	four sides of floor		Priority Pollutant				
	and center-line		Volatile Organics	18	soil	SW 846	Cool/4C 14 days

To determine vertical and horizontal distribution of volatile organics: Soil from each soil excavation at four feet and six feet horizons will be screened for volatile organics with the Photovac 10S50. Of these samples one in ten will be submitted to the Lab for confirmatory Priority Pollutant Volatile organic

Treated Soil							
T1, T2, T3	Soil samples from	4, 6 feet	Volatile screening	50	"	"	"
T4, T5	the treated soil		Photovac 10S50				
	prior to return		Priority Pollutant	5	"	"	"
	to the excavation		Volatile organic				

To determine the final soil concentration after treatment: Soil will be screened for volatile organics with the Photovac 10S50. Of these samples one in ten will be submitted to the Lab for confirmatory Priority Pollutant Volatile organic

Water							
Parella Well	Water samples	Evacuated	Volatile screen Photovac	72	water	Region I EPA	"
Water		well	Priority Pollutant				
			Volatile Organics	12	water	Method 624	" 7 days

Compare Parella well water sample results to indicate water quality of the Aquifer, trends in the groundwater cleanup. Samples analyzed for Priority Pollutant volatiles.

Water							
Private Wells	Water samples	Evacuated	Volatile screen Photovac	34	soil	USEPA Region I Lab	Immediate
Wood (ne Ogden)		well	Priority Pollutant	34			
Seeley			Volatile Organics				Cool/4C 14 days
Gilbert							

Compare well water sample results to indicate acceptable water quality in the wells, water quality of the Aquifer, trends in the groundwater cleanup. Samples analyzed for Priority Pollutant volatiles.

Effluent Water	Water samples	Treatment	Volatile screen Photovac	70	"	"	"
		system	Priority Pollutant	7	"	"	"
			Volatile Organics				

Determine effectiveness of treatment system. Confirm that effluent is less than 5 ppb Tetrachloroethylene for discharge to ground. Samples analyzed for Priority Pollutant volatiles.

Table. SAMPLING PLAN SUMMARY TABLE (Continued)

LOCATION	MATRIX	SAMPLE DEPTH	ANALYTICAL PARAMETERS	SAMPLE NUMBER	MATRIX	METHOD REFERENCE	SAMPLE PRESERVN	HOLDING TIME
Quality Control Treatment system	Water samples		Volatile organic screening Photovac	70		Region I EPA	Immediate analysis	
Tune the operation of the stripper: internal QC using the Photovac.								
Air Stripper stack	Air		Volatile organic screening Photovac	20		Region I EPA	Immediate analysis	
			Priority Pollutant Volatile Organics	6		NIOSH Method 1003	Iced 4C	
Determine the concentration of solvents in the exhaust stack. Samples analyzed for Priority Pollutant volatiles.								

Additional details of the analytical methods are presented in the QA/QC plan: in a table and in the Appendix

4.0. Operation and Maintenance

The Combined Overall Site Management Plan and Draft O and M Plan previously submitted addresses the operation and maintenance of the site equipment and is included in this remedial plan by reference.

4.1. Cost of Analyses:

Various laboratories in the area, such as Camo Laboratories of Poughkeepsie, are capable of conducting single compound volatile analyses for tetrachloroethylene (Method 601/602) and full priority pollutant volatile scans (Method 624/8240).

The range of analysis costs per sample are $70-$120 for water analysis of volatile organics Purgeable Halocarbons by GC Method 601 and $130-170 for soil. These same labs can run a full priority pollutant volatile scan GC/MS Method 624/8240 at $180-240 for water and $200-250 for soil.

The Portable GC Photovac 10S50 will be used for analysis. As per the requirements of the USEPA, one in ten water samples and one in ten soil samples will need to go for full volatile scan in a laboratory (Method 624/8240). After six months of sample analysis under this order, when the complement of contaminants is well established, one in ten soil and water samples screened using the Photovac will be tested in the laboratory by methods 601/602 for the indicator compound tetrachloroethylene and one in forty of the Photovac samples will be tested by method 624/8240. The cost of a sample round of the treatment system using a laboratory for all samples would be approximately $500 per round.

4.2. Institutional Requirements

Regulations under the the Resource Conservation and Recovery Act (RCRA), the Safe Drinking Water Act (SDWA), and the Federal Water Pollution Control Act (Clean Water Act or CWA), and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) have the broadest applications to remedial actions. As part of the Consent Order we ask that the USEPA and New York State provide letters detailing the exact regulation requiring the permits required by the government agencies: to enumerate the required permits.

4.3. Permits

The results of the continuing institutional analysis for the site are presented, as part of the non-cost considerations of the remedial actions proposed. Federal programs such as the Clean Water Act, the Clean Air Act and various Resource Conservation and Recovery Act programs have been authorized by the USEPA to be administered by New York State. Various State regulations may apply to the site cleanup operations.

New York State Permits and Regulations

For Federally supervised sites and for sites that produce plumes from hazardous waste disposal sites, NY State supervision is conducted by the Division of Hazardous Waste Remediation. The Regional Engineer for Environmental Quality, Harry Agarawal for the NY State DEC has responsibility for administering both the Water and Hazardous Waste regulation and is the point of contact in obtaining a decision on the required State permits. Harry Agarawal reports to Al Klaus, the Regional Director of Environmental Quality Engineering. Ronald Pergardia, in Albany, has special responsibility for sites involving PRPs (Potentially Responsible Parties). The Regional Air Pollution Engineer, Neil Isabel, also reports to Al Klaus. The NYSDEC lawyer for this site is Lou Evans. Permits that may be required for this site include:

- NPDES Permits

Discharge of pollutants or contaminants from a point source into U.S. waters requires a National Pollutant Discharge Elimination System (NPDES) permit pursuant to CWA section 402.

Discharge of pollutant contaminants into a publicly owned treatment works (POTW) may require permits issued by the local POTW, however, this alternative was previously dismissed.

- Groundwater Reinjection Permit, NYSDEC: Division of Water:

The injection of treated water from the Parella Well into an underground formation may require a Groundwater Reinjection Permit under the NPDES program administered by Caesar Manfredi of the NYSDEC: Division of Water. The reinjection of treated groundwater as a means of site cleanup is an acceptable policy of the NY State DEC detailed in two documents: Groundwater Policy Statements on the Reinjection of Groundwater. The Division of Hazardous Waste Remediation has the choice of administering NY State regulations either through a Division of Water Permit or through an Administrative Order.

According to Caesar Manfredi, as the site is being administered under CERCLA, the discharge of treated water into the ground may not require a permit but will have to meet the conditions of a permit (NYC Regulation Part 750). According to NY State regulations, under a permit, the discharge will meet the NY State Groundwater Quality Standard that is now 5 ppb for tetrachloroethylene, except in an area of containment such as a slurry wall or injection into a drawdown cone of recovery wells. In a decision on the appropriate groundwater requirements, the Division of Hazardous Waste Remediation will contact the Division of Water.

Caesar Manfredi has agreed to allow us to discharge the water to the ground during a pump test provided that we demonstrate to his satisfaction that the effluent criteria will be met. This demonstration may be in the form of a description of the air stripper operation in terms of discharge rate and time and anticipated effluent concentration. Whereupon Caesar Manfredi will issue us with a letter of temporary authorization to conduct the pump test.

o Clean Air Act Permits

Air Emissions: Regarding the air emission levels from site activity, General Switch has agreed to meet air emission levels permitted by existing permits granted by the State of New York. The air stripper will be located on the General Switch property and not at the Parella well. The water will be pumped out of the Parella well for treatment by the stripper on the General Switch site and the treated water discharged in the excavated holes formed during soil cleanup at the three hot spots.

According to the USEPA, a permit may not be required for such on site remedial activity though the NY State air criteria will be observed.

According to Neil Isabel, NYSDEC Regional Air Pollution Engineer, emissions of pollutants to the air from the air stripper will require a New York State Air Permit (Air Resource Regulations 211.13 & 211-14). The criteria exhaust levels that will be permitted depend on the substance emitted, its quantity, and the air quality classification of the area. The NYSDEC will assess the impact of the exhaust. Based on past experience Neil Isabel does not envisage any problems in permitting the air stripper. The stripper must be separated from the exhaust from other manufacturing process operations.

Section 6 NYS RR 212 details the regulations for process and exhaust systems. An Air 100 Form will need to be completed that details the geographic location and chemical emissions from the site along with the emission rate potential (the emission rate without any controls) and the emission rate with controls. Neil Isabel requires an estimate of the rate of emission of solvent from the soil during soil treatment.

New York State DEC is reviewing hydrocarbon emissions from sites because of the ozone exceedences experienced in the State this last summer. It is noted that Orange County is in attainment for ambient ozone levels. John Davis of the Bureau of Source Control (518) 457-5618 is reviewing policy in regard to air strippers and will probably define the rate of emissions from a site above which controls are required. This policy may ask for an evaluation of the anticipated air emissions from the soil treatment and may either prevent the application of rotor tilling and evaporation of hydrocarbons as a remedial measure for spill sites or for the control of these emissions

According to Neil Isabel we do not need a temporary air permit to conduct the pump test. We can conduct the pump test with the air stripper to provide hard data on the air emissions for the Air 100 Permit and he anticipates no problems in permitting the system.

The NY State DEC has not been issuing permits for land treatment of volatile contaminated soil. Neil Isabel requires an estimate of the rate of emission of solvent from the soil during soil treatment by rotor tilling. He has informed Shakti Consultants that this rate will most likely be acceptable.

o RCRA Program Permits

Transportation of hazardous waste to an off-site treatment, storage, or disposal facility (TSDF) requires RCRA manifests and TSDF permits but will not be required for on-site treatment.

4.4. Community Wells - Plan to Connect Private Wells to Alternative Water Supply

The Sampling Plan (SAMP) includes a plan for identifying all wells that are not connected to the alternative water supply system during and subsequent to the 1983-'84 Removal Action which are or may be affected by releases of PCE at or from the Site and which contain or which may in the future contain PCE levels of at least 5 ppb.

- General Switch proposes to connect to the alternative water supply all private wells with well water containing more than 5 ppb or more PCE located within 1/4 mile from the General Switch plant, specifically the wells of Gilbert, Wood (Ogden) and Seeley.

As part of the Pump Test Plan, a door to door survey will be completed of the houses and facilities on Highland Avenue, Watkins Avenue, Commonwealth Avenue and Industrial Place and the intersecting street of Electric Avenue: to identify those wells within 1/4 mile of General Switch not yet hooked up to city water. The survey will also update the well data obtained in 1983 and including the depth of well, pumping system, well use and previous sampling. The results will be portrayed in a table and presented to the USEPA, one month after completing the survey.

The report entitled "Community Wells" will be submitted with the Pump Test Report and will include a map depicting the location of such wells. All wells in the above named streets not connected to city water will be sampled once for volatile organics by USEPA Method 624. These homes include the Seeley, Wood and Gilbert residences on Highland Avenue, last tested in August 1989 and found to have less than 5 ppb Tetrachloroethylene content. The sampling protocol for drinking water well sampling of these homes is detailed in the Appendix C. Those wells that yield water that contains 5 ppb or more of tetrachloroethylene will be offered the opportunity to connect to city water within two weeks of submission of the Community Wells Report. A local plumber will be employed to run connecting lines from the street to the houses in question.

Historically, we have in 1983-84 been able to identify a circle of clean wells outside the affected wells. One month after the sample results of the unconnected wells are made available to the USEPA, we will submit a plan to identify a circle of clean wells around any contaminated well that in the judgement of the USEPA may be considered to be at risk and that will be added to the community well sampling.

5.0 Completion of Cleanup

Groundwater:
The completion of the groundwater cleanup will be achieved when the groundwater that is recovered during the pumping from the Parella well yields readings below the adopted criteria of 5 ppb of PCE and remains below that level for six months.

After the influent concentration reaches 5 ppb, in order to confirm that the clean-up standard is maintained, General Switch will then proceed to monitor the well water in the Parella well for two quarters. If the well water remains at less than 5 ppb, six months after the initial shut down, the cleanup will be deemed complete, (i.e., the achievement of the stated criteria) If the groundwater tested at that time exceeds the stated criteria, then treatment will be resumed.

Soil Cleanup:
The completion of soil cleanup will be when the agreed upon volume of soil is excavated, rotor tilled thereby reducing the soil solvent concentration by 95-99.9% and replaced and the site will be given a release from the order at the end of groundwater pumping after the deeper soil horizons have been treated by leaching with the treated water from the Parella Well when the groundwater from the Parella well has maintained a concentration at or below 5 ppb for a period of six months.

5.1. Dismantling of Equipment

The air stripper will be mounted in a mobile trailer and at the completion of the cleanup will be disconnected from the piping from the Parella well.

The piping from the Parella well will be disconnected and the Parella well will be sealed. The excavations will be backfilled either with clean fill or, at the discretion of the USEPA, with the treated soil. The attached information and drawings constitute the Design Plans and Specification called for in Section E.3. (page 28 of the consent order and are hereby submitted.

Within 42 days of General Switch's receipt of approval by the USEPA of the Design Plans and Specification (incorporated into this Remedial Design Plan) General Switch will submit a Remedial Design Report consisting of the Remedial Design Plan, with updated time schedules and the final construction cost estimate, the approved O & M plan, Site Health and Safety Plan and Site Management Plan.

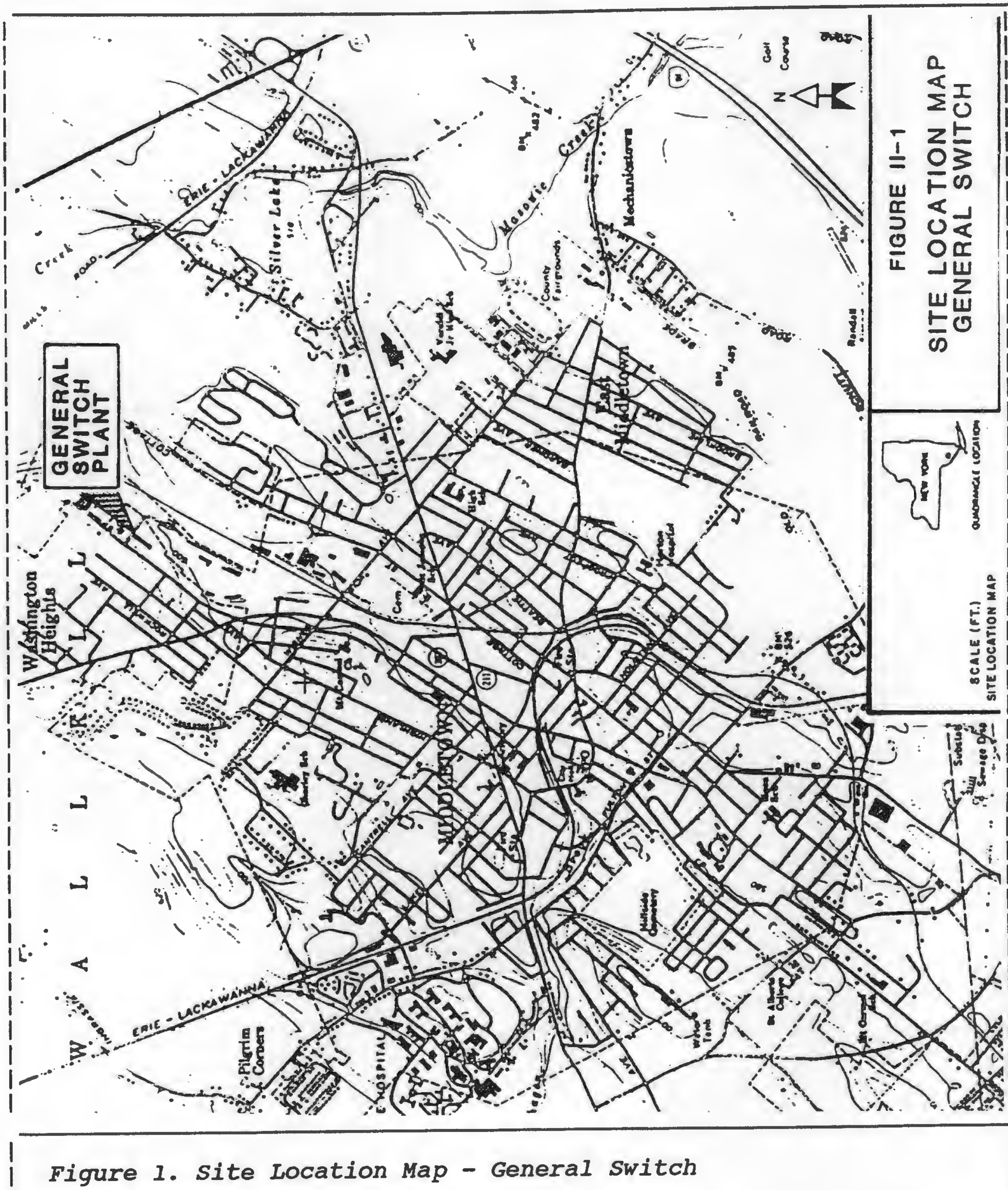

Figure 1. Site Location Map - General Switch

Shakti Consultants, Inc.

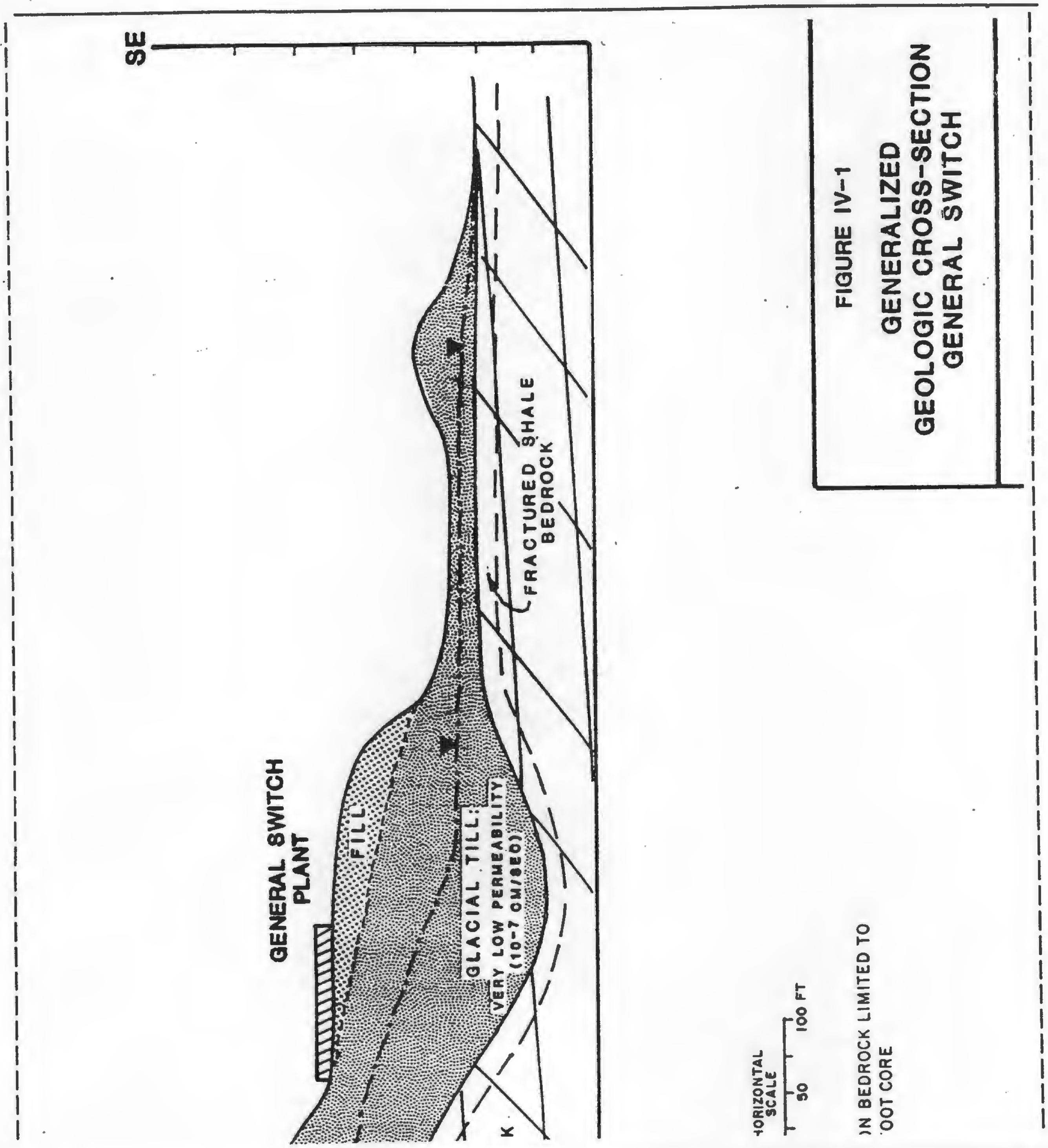

Figure 2. Generalized Cross Section - General Switch

Shakti Consultants, Inc.

Figure 3. Water Table Elevations in the Glacial Till, Jan 1984

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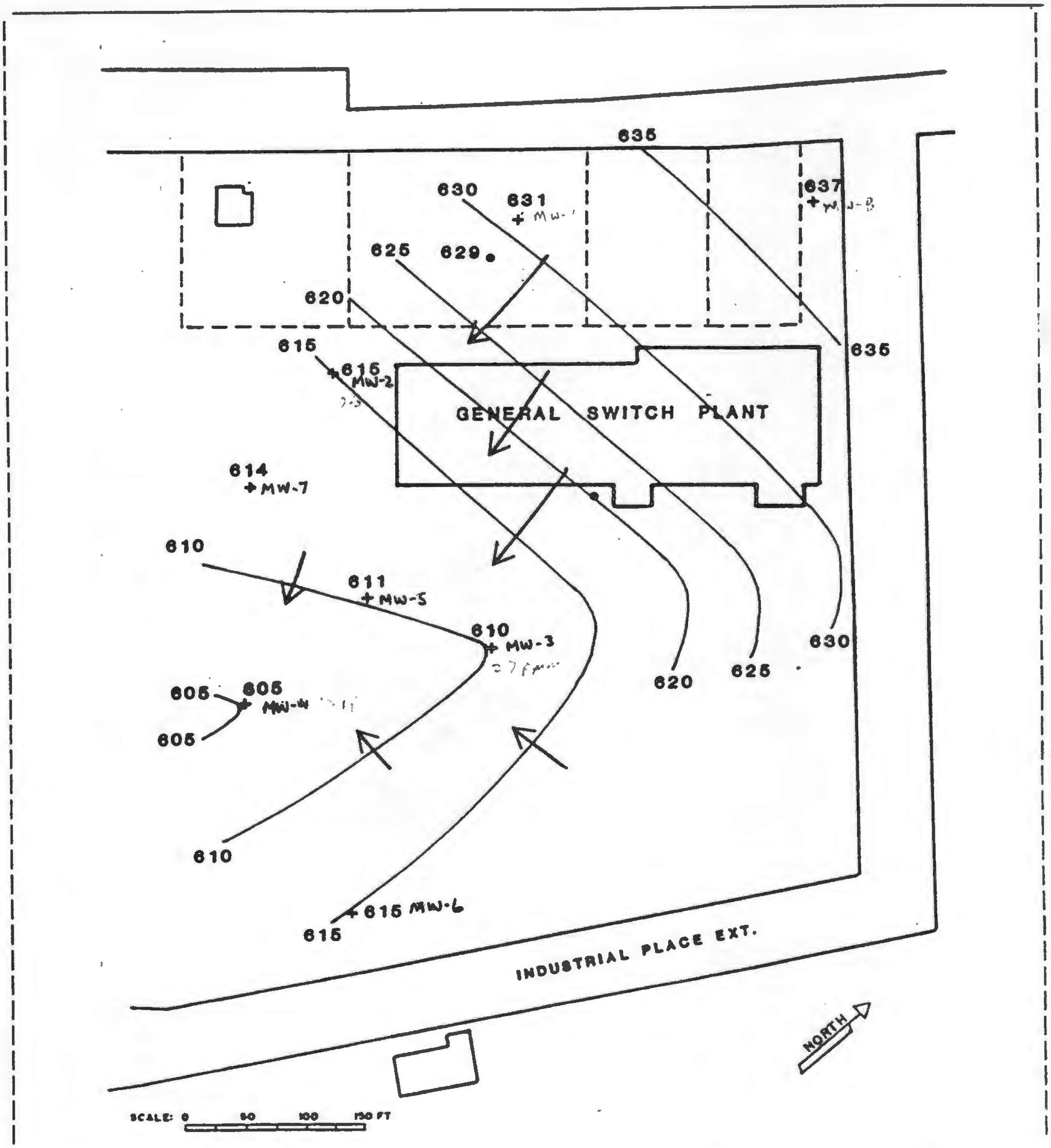

Figure 4. Contour Map of Water Levels - General Switch

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LEGEND

- • WATER LEVELS MEASURED IN WELLS OPEN TO BASE OF SHALLOW TILL AND TOP OF SHALLOW BEDROCK
- 610 ——— 610 CONTOUR OF WATER LEVELS MEASURED 9-14-84
- ——→ POTENTIAL FLOW DIRECTION

CONTOUR INTERVAL = 5'

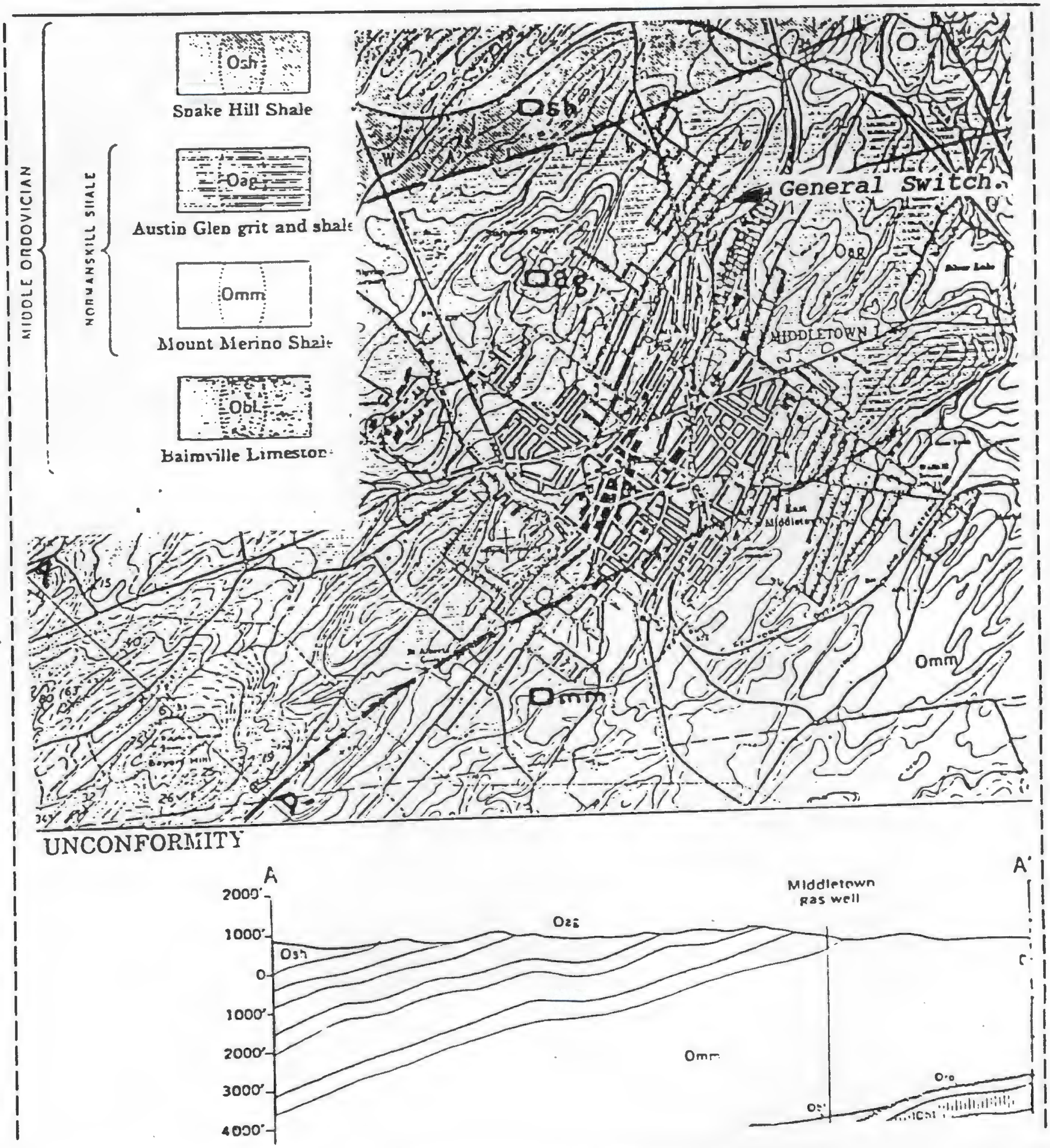

Figure 5. Geologic Map and Cross Section

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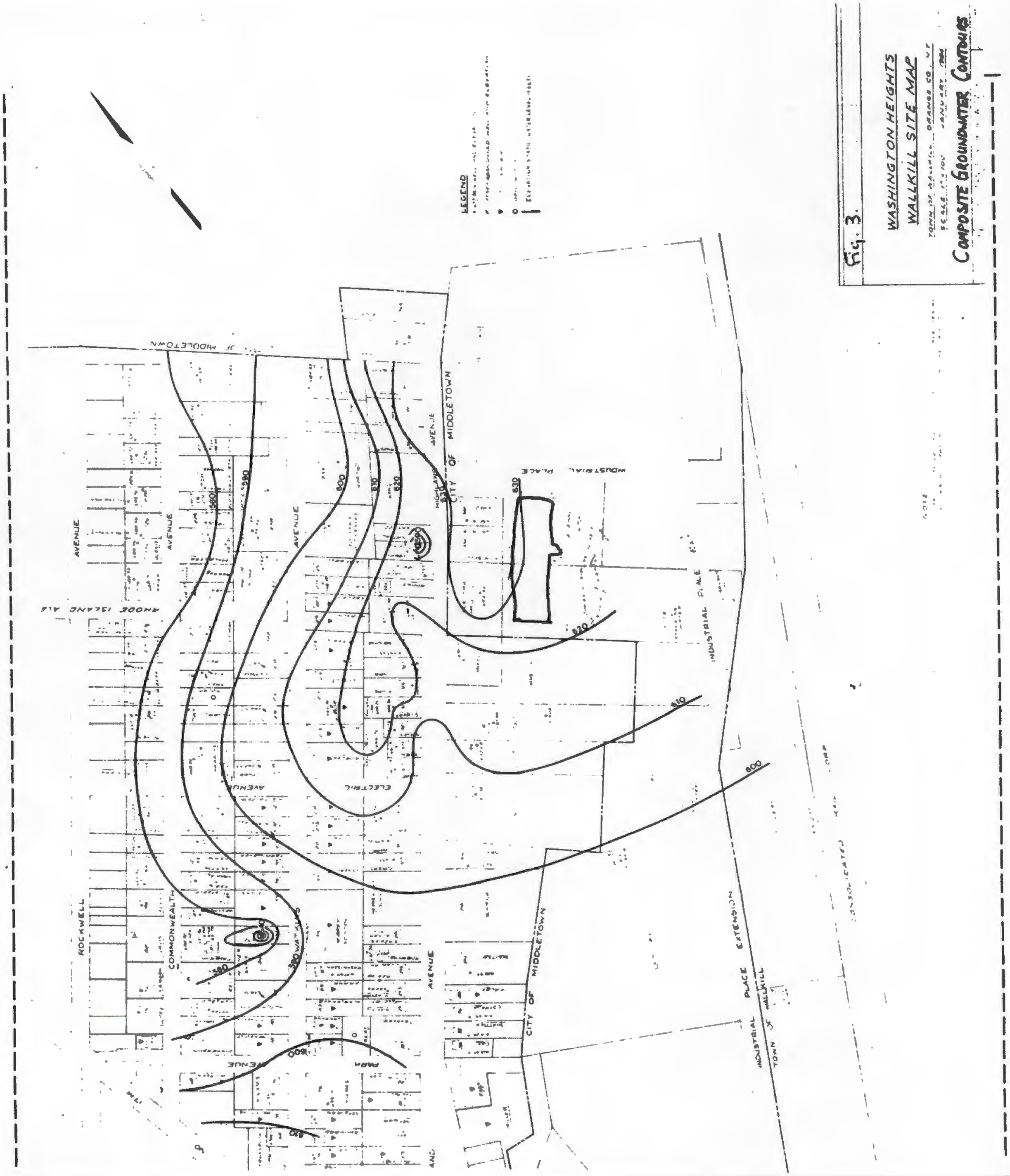

Figure 6. Composite Groundwater Contours - Washington Heights

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Figure 1. Levels of Tetrachloroethylene (ppb) in the Parella Well during Pumping. Oct. 17-Dec. 26, 1983

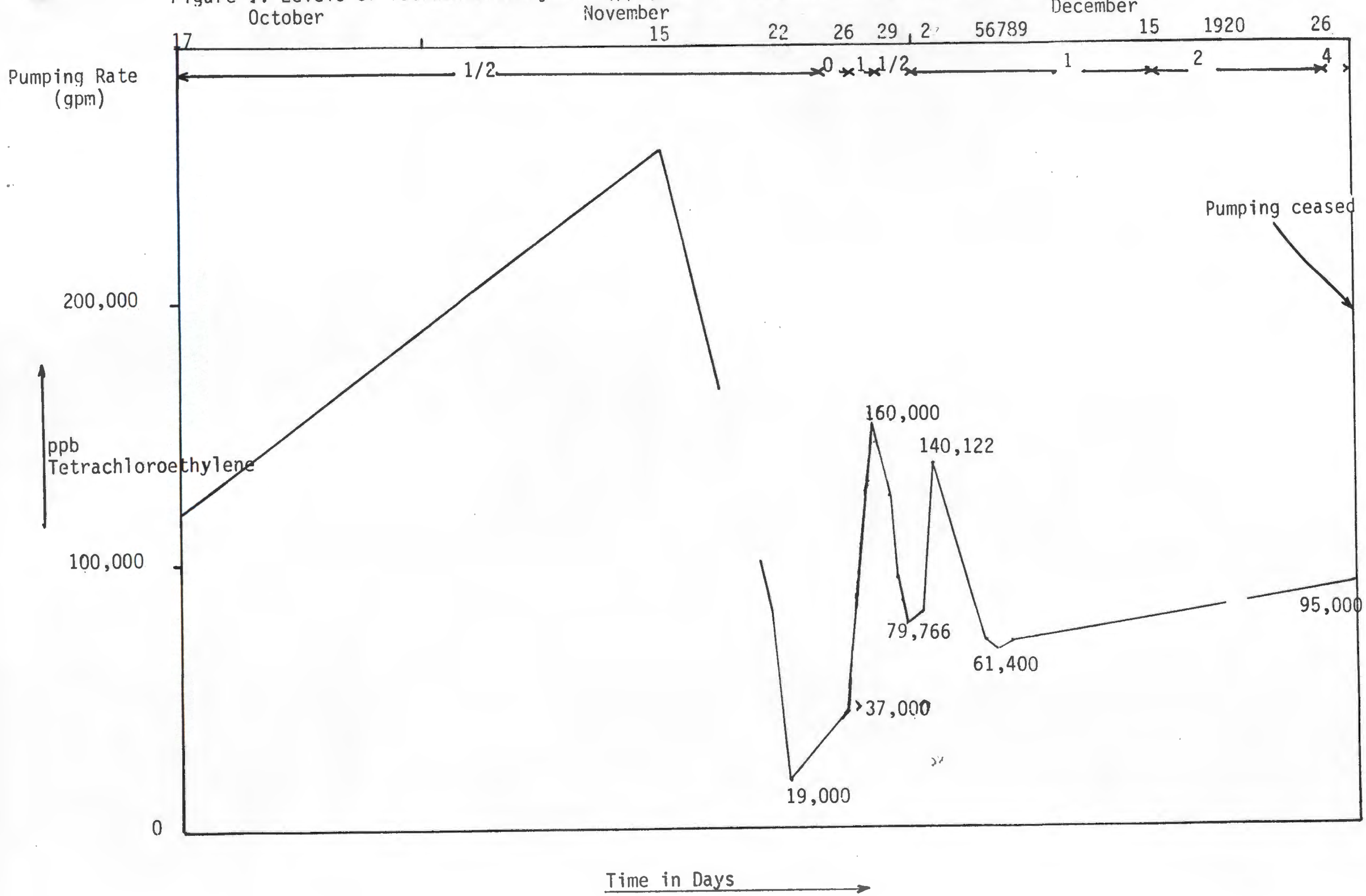

Figure 2. Plot of Data from Pump Test 1. Parella Well

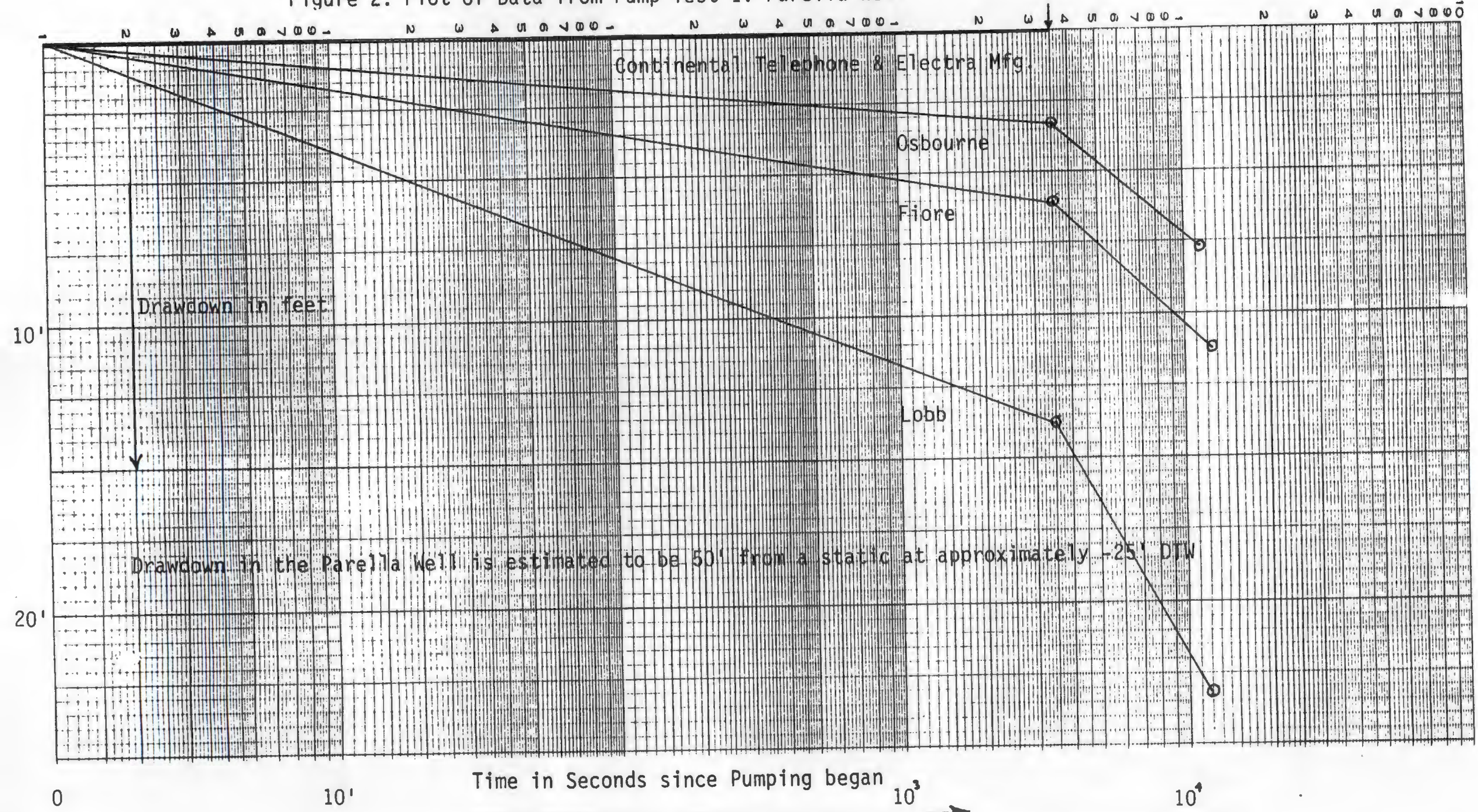

Figure 8. Plot of Data from the Pump Test 1. Parella Well
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Table 1: Parella Pump Test #1

Time Of Reading / Flow Rate		1495-1500 hr. Static	1610-1630 hr. 4 gpm	1656-1730 hr. 4 gpm	End Of Test
Residences/Well	Distance In Feet From Parella Well	Water Levels Measured In Ft. From Top Of Casing			Total Draw-Down
Parella Well					50'*
Osbourne	185'	26.94'	30.33'	34.55'	7.61' = 34.55-26.94
Lobb	144'	25.81'	39.68'	49.00'	23.19' = 49.00-25.81
Fiore	150'	22.28'	28.37'	33.45'	11.17' = 33.45-22.28
Electra Mfg.	194'	10.38'	10.36'	10.40'	.02 = 10.40-10.38
Continental Telephone	350'	21.35'	21.37'	21.53'	.18 = 21.53-21.35

Table 2: General Switch Pump Test #1

2/2/84

Time Of Reading / Flow Rate		Static t_o = 12:13 2 gpm	13:53 - 14:21 2 gpm	16:26 - 16:40 2 gpm	End Of Test
Residences/Well	Distance In Feet from General Switch	Water Level In Feet From Top Of Casing			Total Draw-Down
General Switch	0	13.79'	>300'	>300'	>286'
Parella	370'	23.58'	23.92'	26.16'	-2.58
Osbourne	490'	32.61'	32.94'	34.56'	-1.95
Electra Mfg.	210'	13.70'	13.61'	13.59'	+ .11**
Perry	370'	65.72'	62.04'	59.13'	+6.59
Continental Telephone	670'	23.13'	23.1'	23.13'	0
Wand	650'	79.97'	79.15'	78.83'	+1.14
Pitt	580'	33.98'	33.98'	34.05'	-.07
Perez	260'	15.82'	15.80'	16.02'	-.2
Guild Molders	1040'	7.96'	7.94'	7.94'	+.02

*Estimated at the elevation of the pump when the Parella well lost suction.

**Positive values indicate a well that is recovering.

Table 3: Ruppert Pump Test #1

Time Of Reading Flow Rate		Static E0=11:15 11:05-11:15	12:00-12:35 11 gpm-6gpm	13:46-14:18 2 gpm	End Of Test
Residences/Well	Distance In Feet From Ruppert Well		Water Level In Feet From Top Of Casing		Total Draw-Down
Ruppert	0	Approx 33'	180'	180'	-147'
Barry	50'	32.78'	37.95'	42.05'	-42.05'
Continental Telephone	290'	23.07'	23.55'	23.70'	-.63'
Knapp	250'	43.40'	42.32'	42.62'	+.78'
Van Pelt	310'	30.27'	29.2'	28.87'	+1.4'
Stout	400'	18.00'	18.00'	18.26'	-.26'
Robaina	270'	37.26'	37.55'	37.76'	-.5'
Estrada	480'	24.21'	24.21'	24.33'	-.12'
Morse	420'	111.13'	109.17'	107.94'	+3.19'
Rassmussen	360'	44.47'	44.50'	44.74'	-0.27'
Winner	480'	73.98'	70.16'	67.85'	+6.13'
Palermo	600'	81.53'	79.44'	77.94'	+3.59'

*Water levels at pump intake by assumption when pump broke suction: Well annulus blocked preventing direct water level measurement.

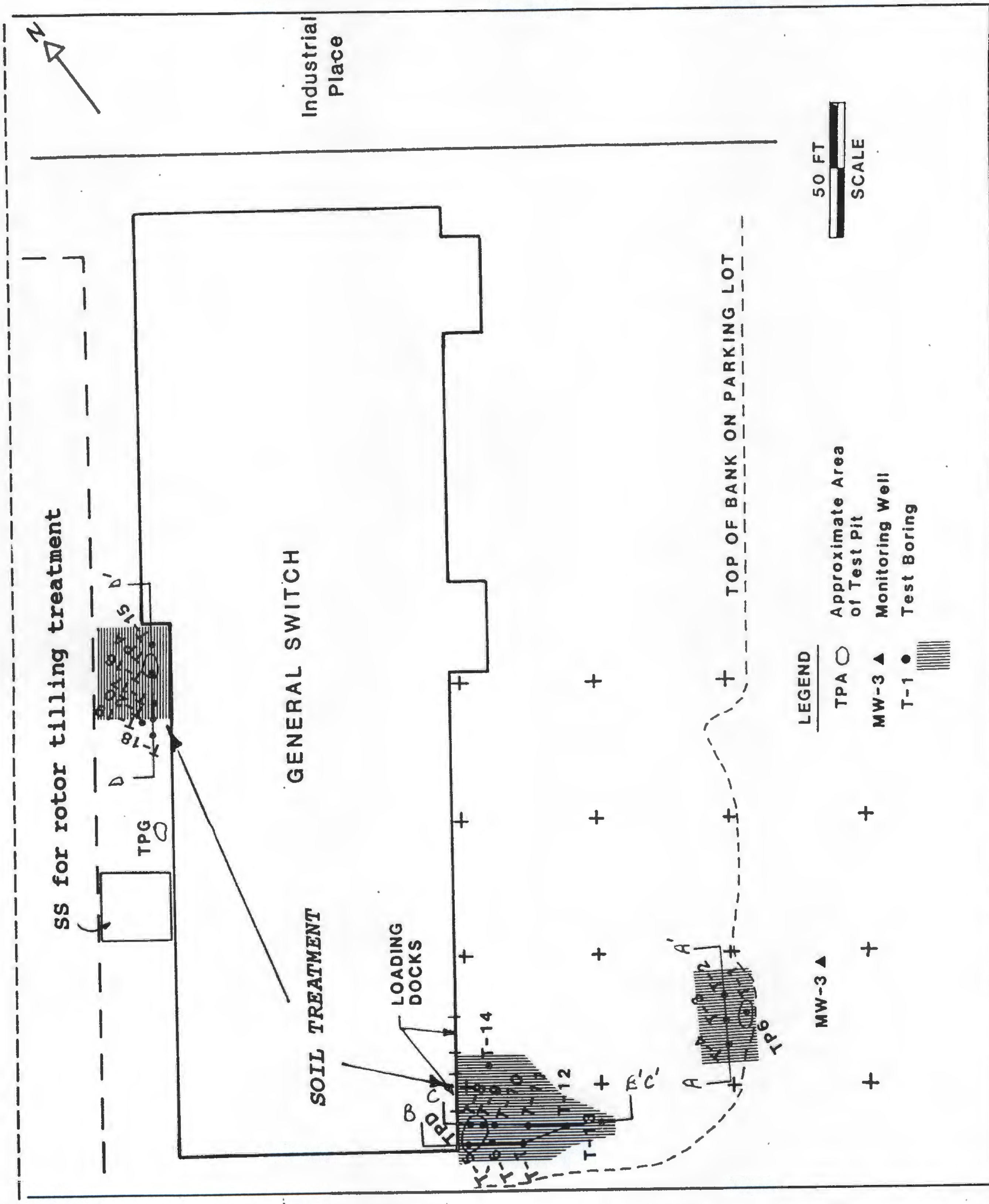

Figure 9. Location of Test Borings and Areas for Soil Treatment

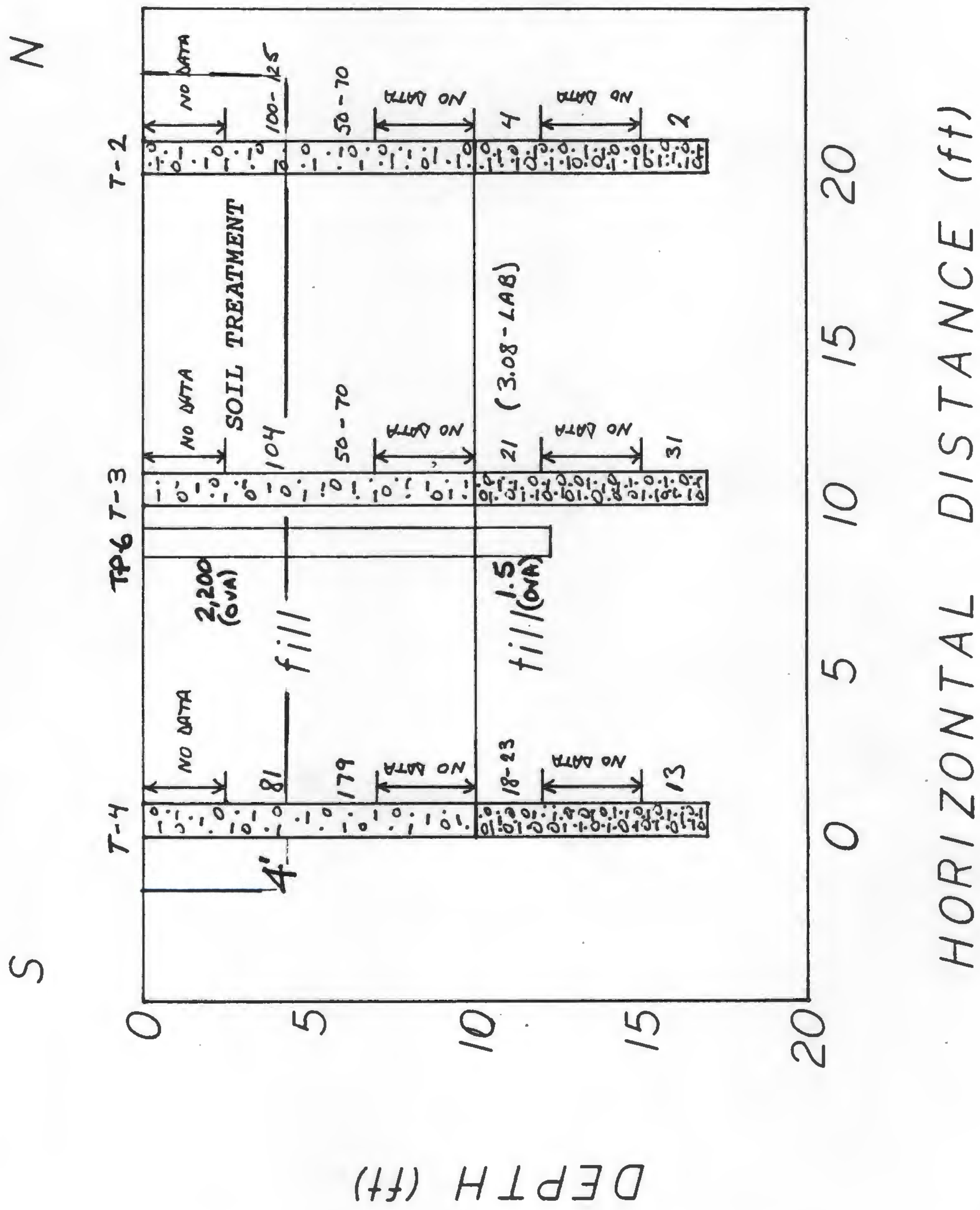

Figure 10. Cross-Section: Analytical Data & Depths for Soil Treatmen

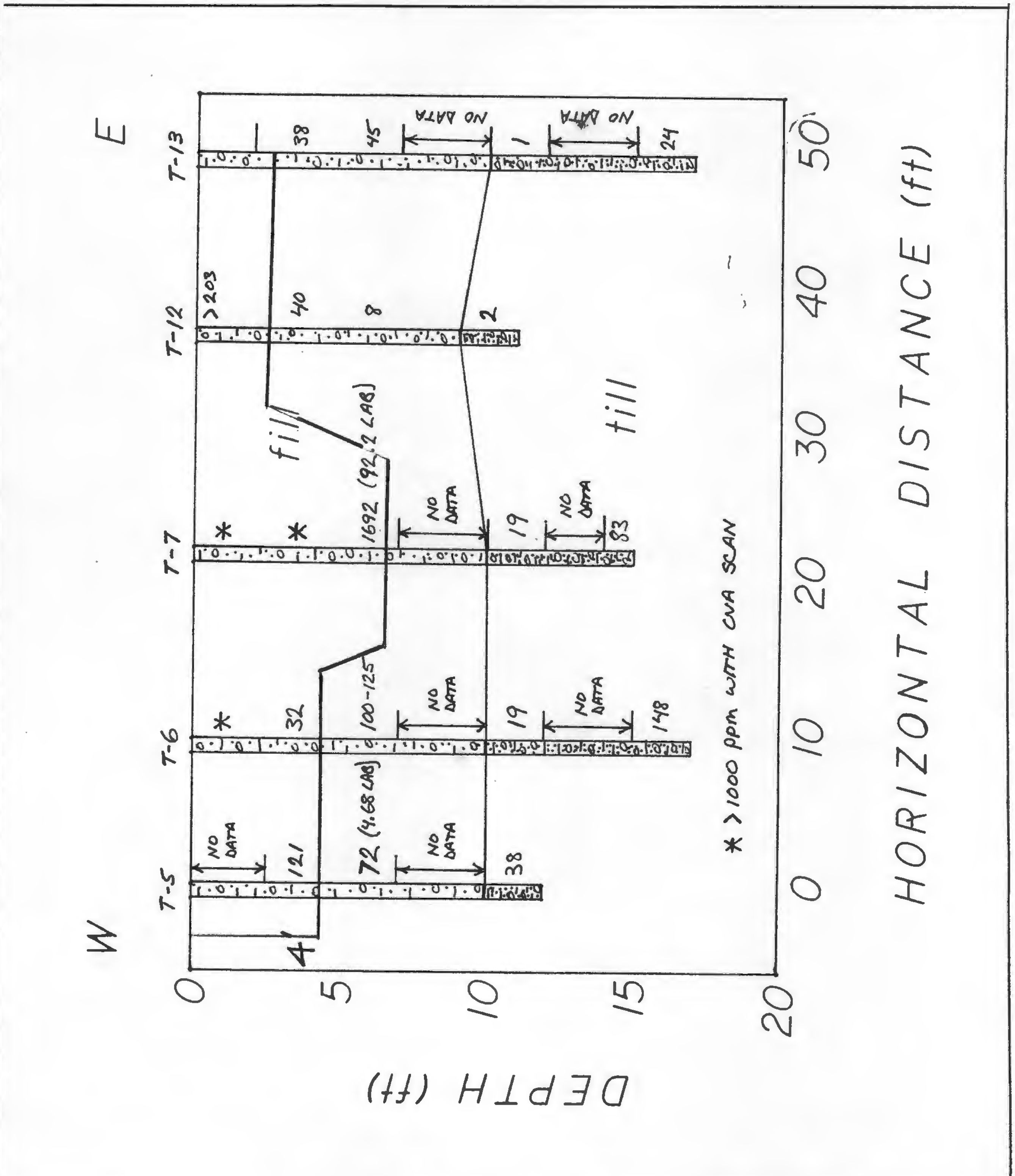

Figure 11. Cross-Section: Analytical Data & Depths for Soil Treatmen

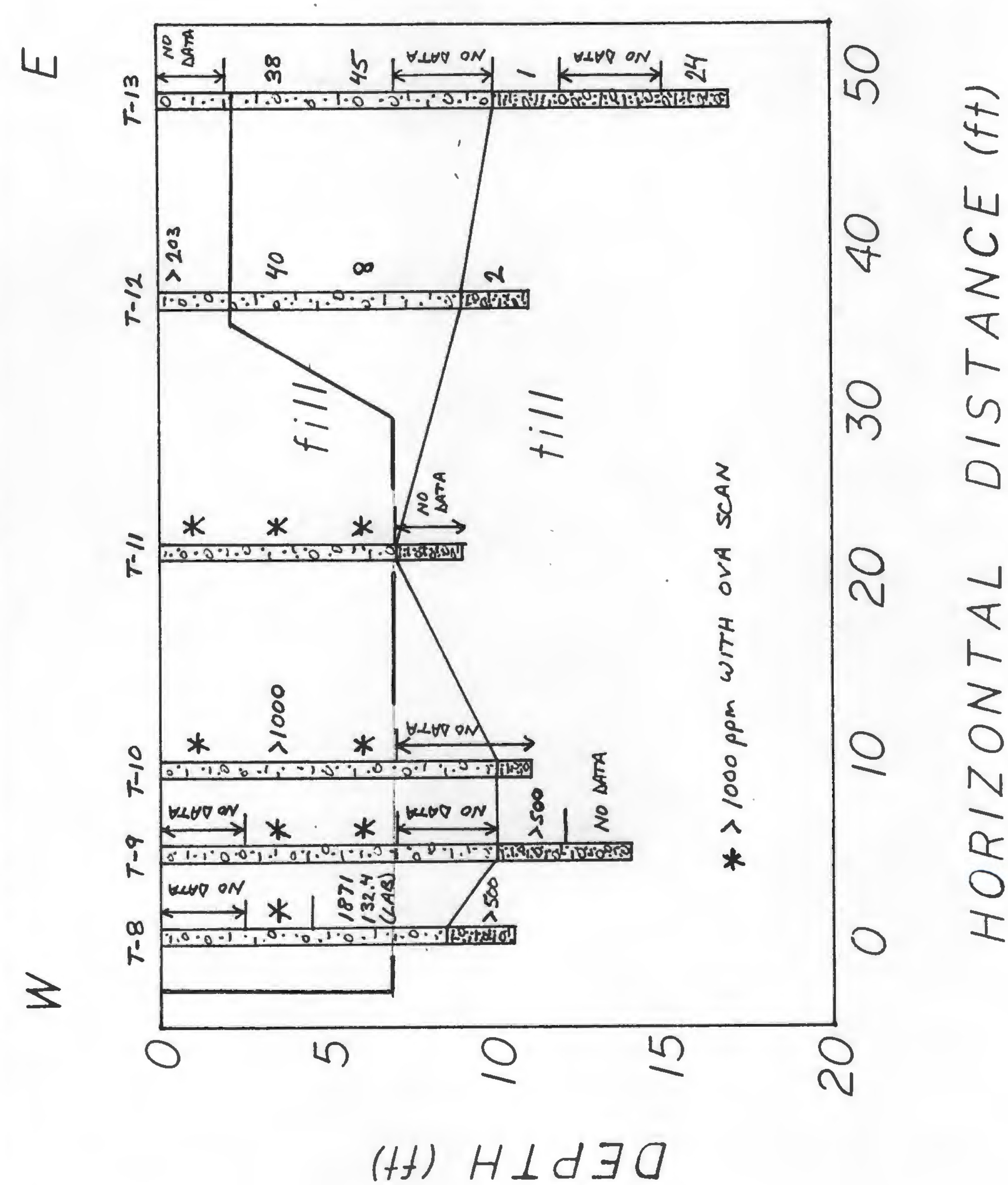

Figure 12. Cross-Section: Analytical Data & Depths for Soil Treatment

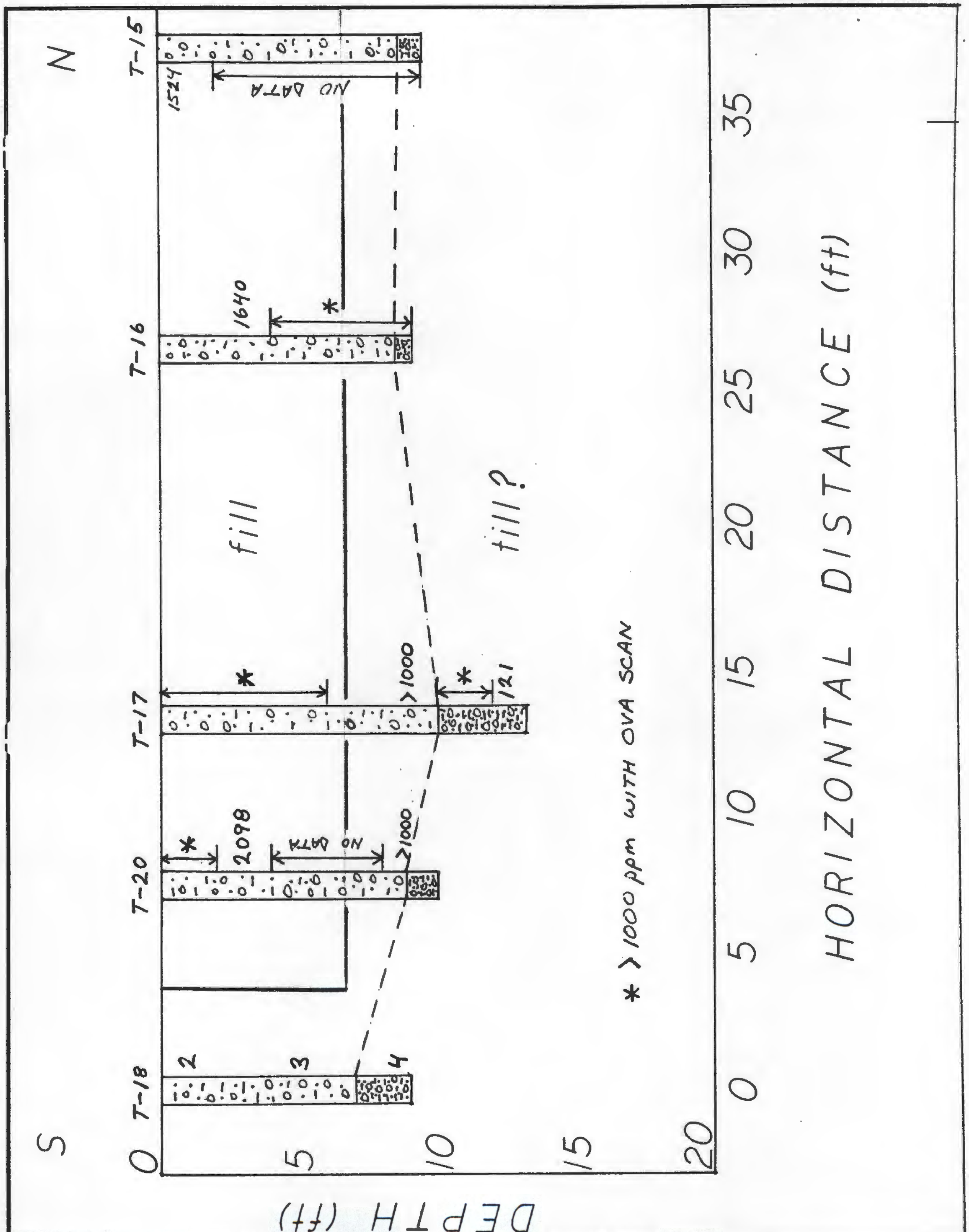

Figure 13. Cross-Section: Analytical Data & Depths for Soil Treatment

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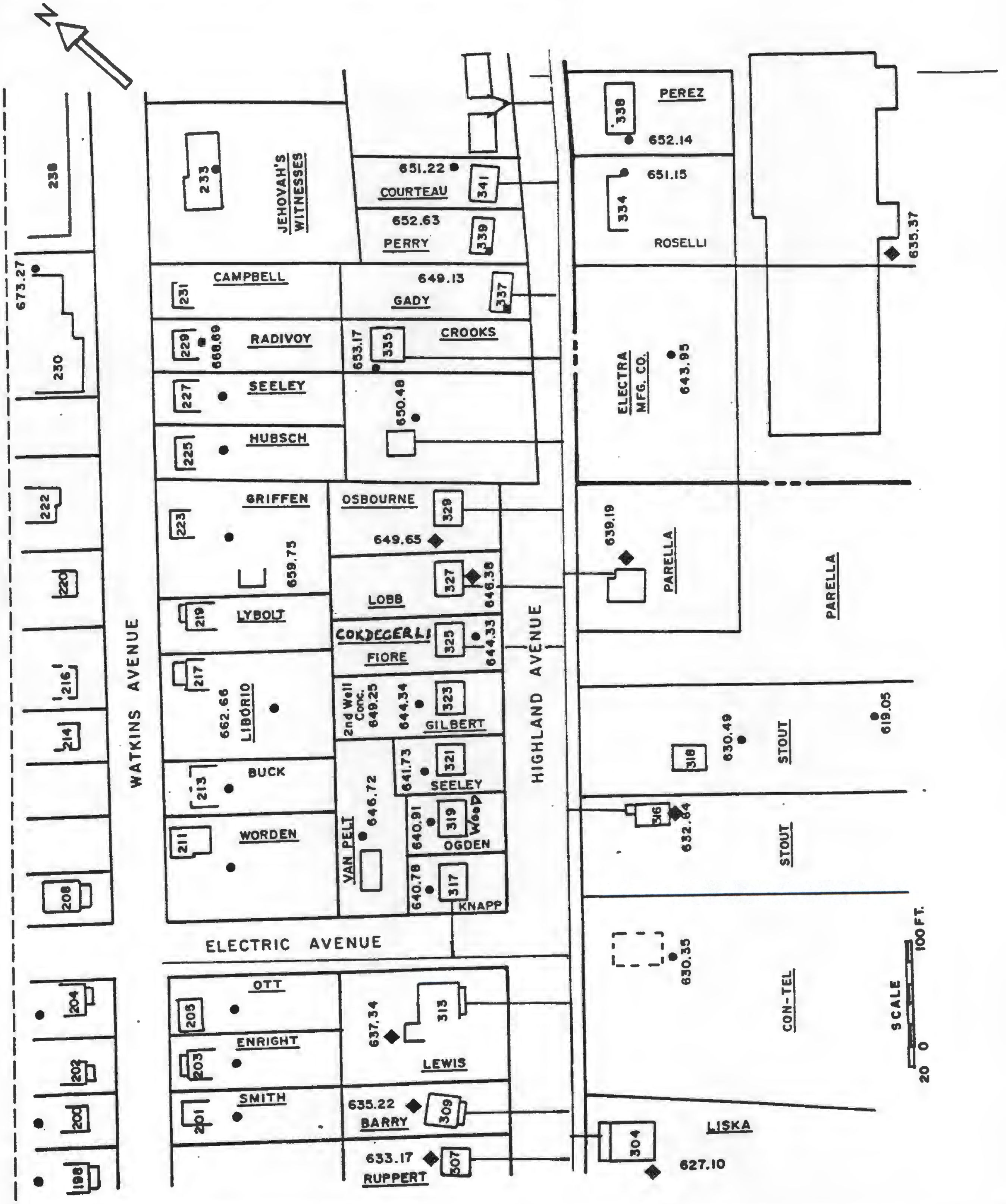

Figure 14. Location of Contaminated Wells & Water Supply Lines

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LEGEND

◆ WELLS CONTAINING GREATER THAN 50 PPB PCE
● UNCOMTAMINATED WELLS

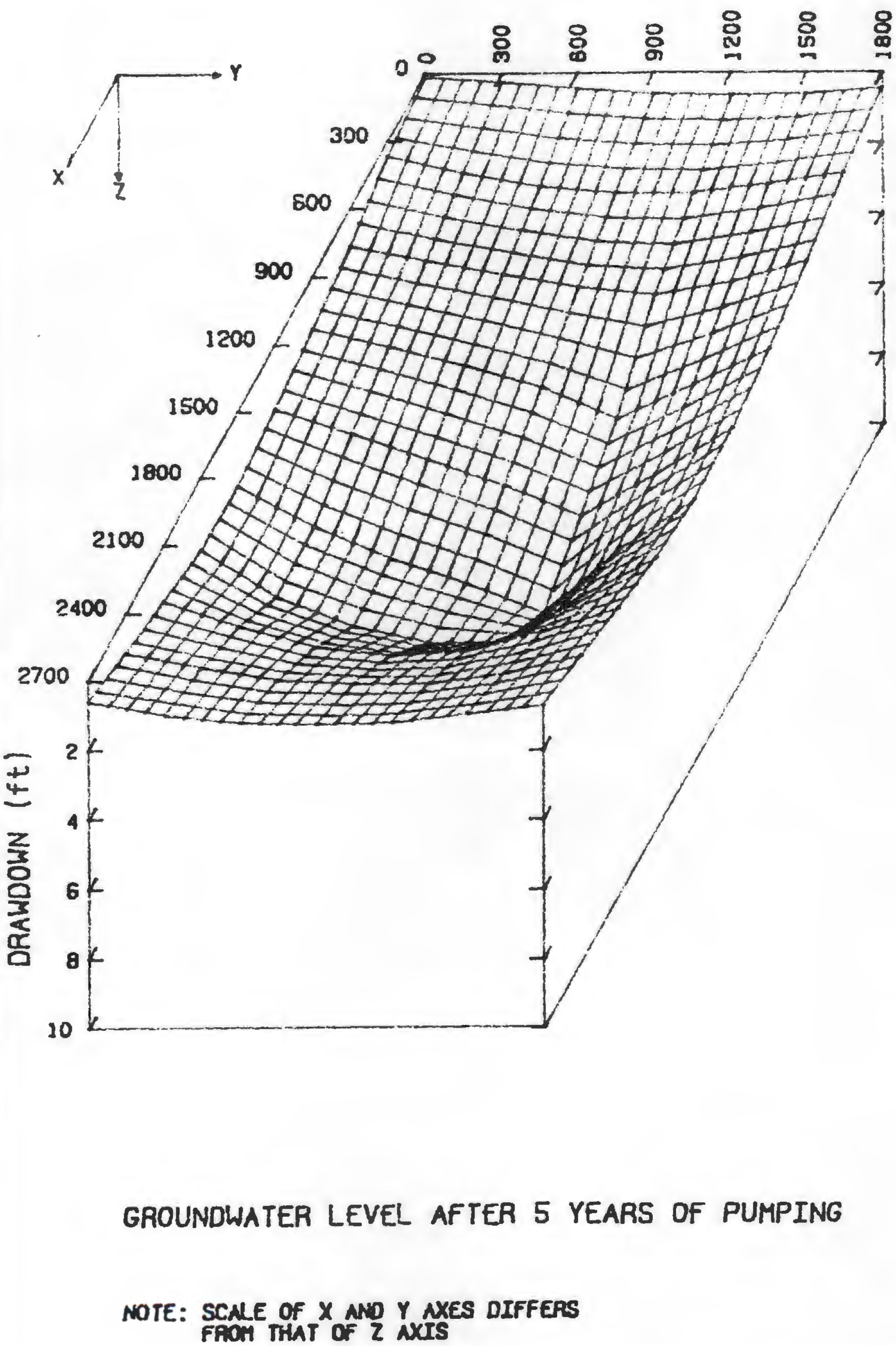

Figure 15. Zone of Influence of a Pumping Well

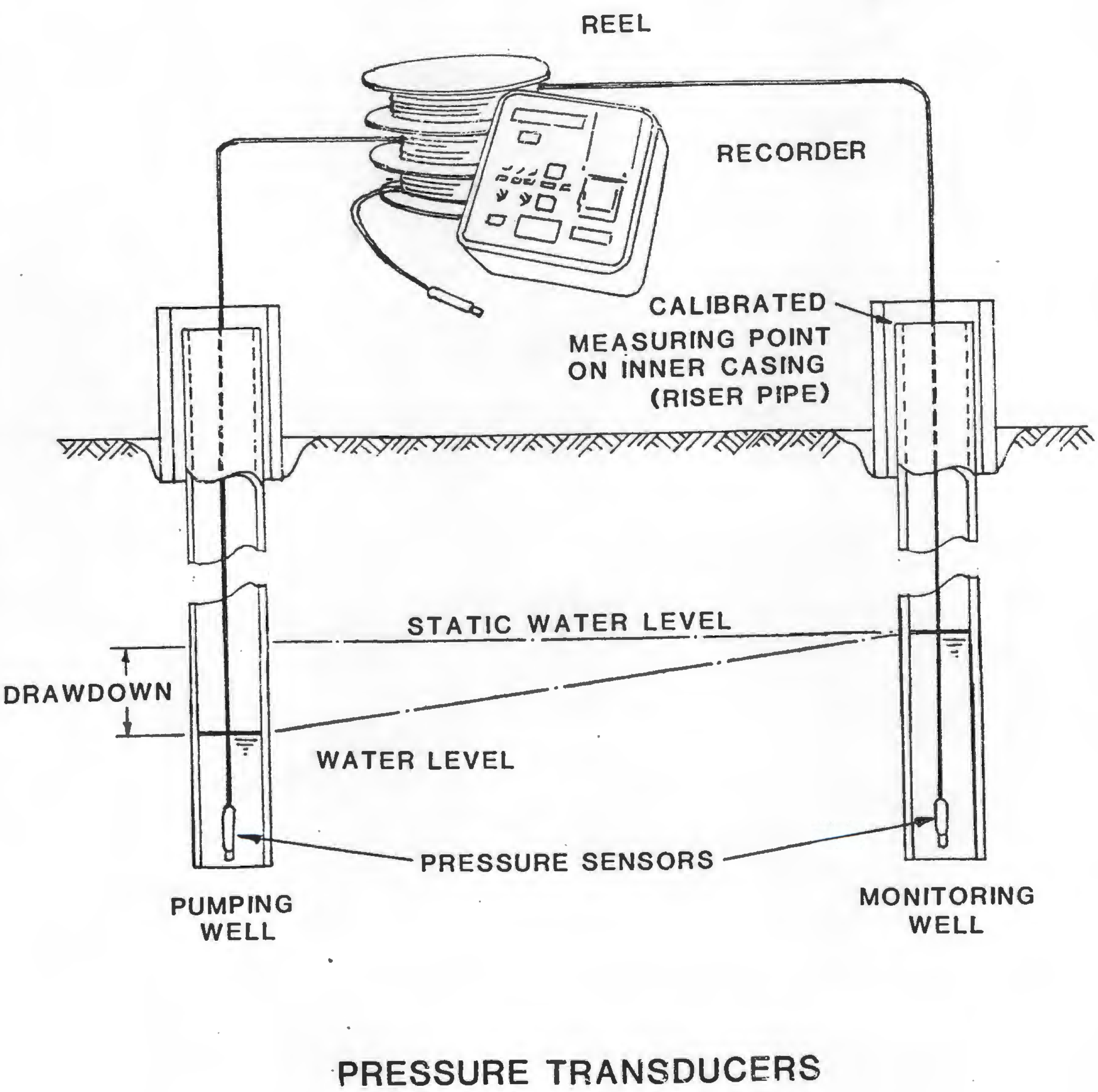

Figure 16. Pressure Transducer System

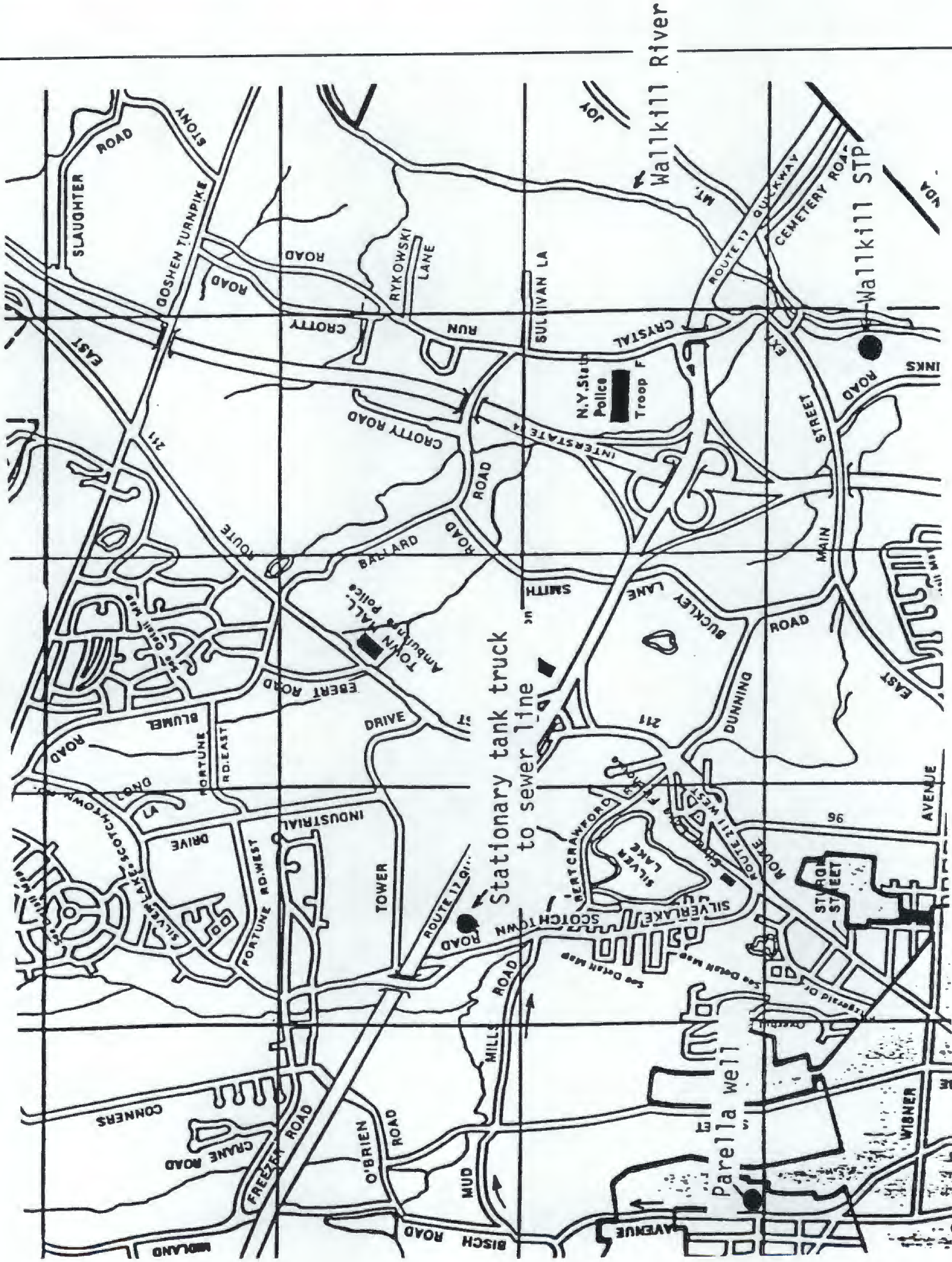

Figure 17. The Parella Well in Relation to the Wallkill STP

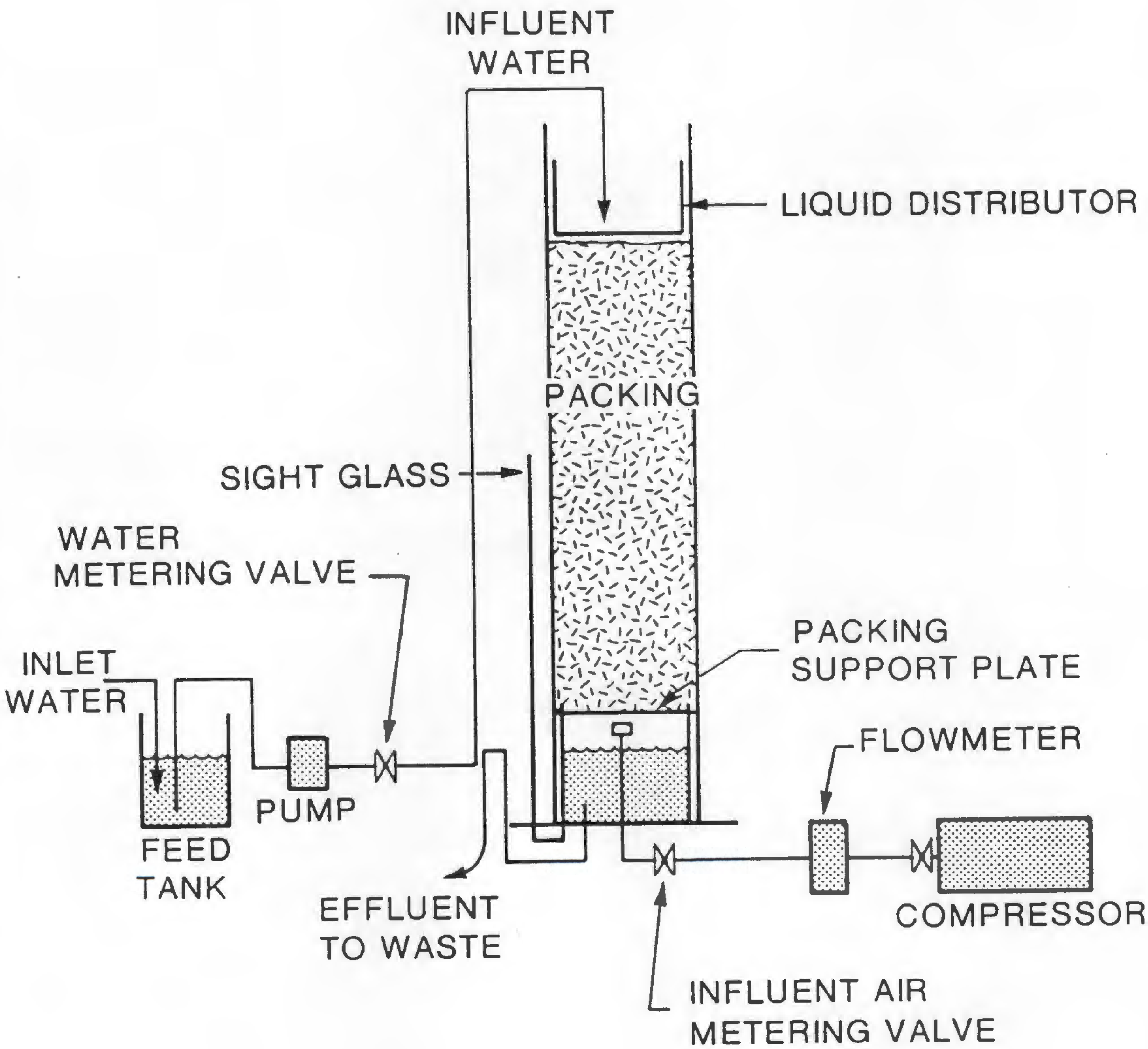

Figure 18. Packed Tower Air Stripper

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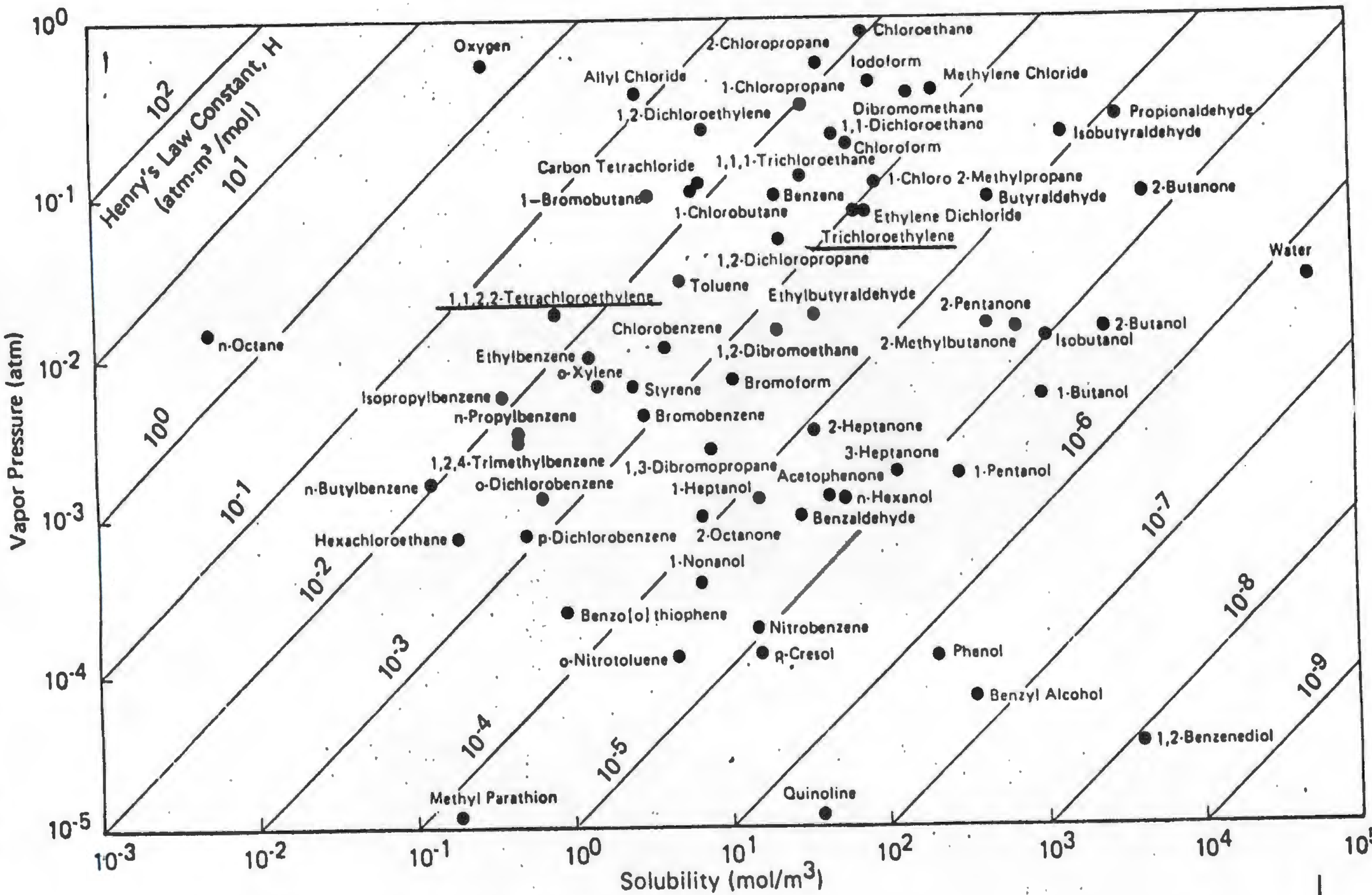
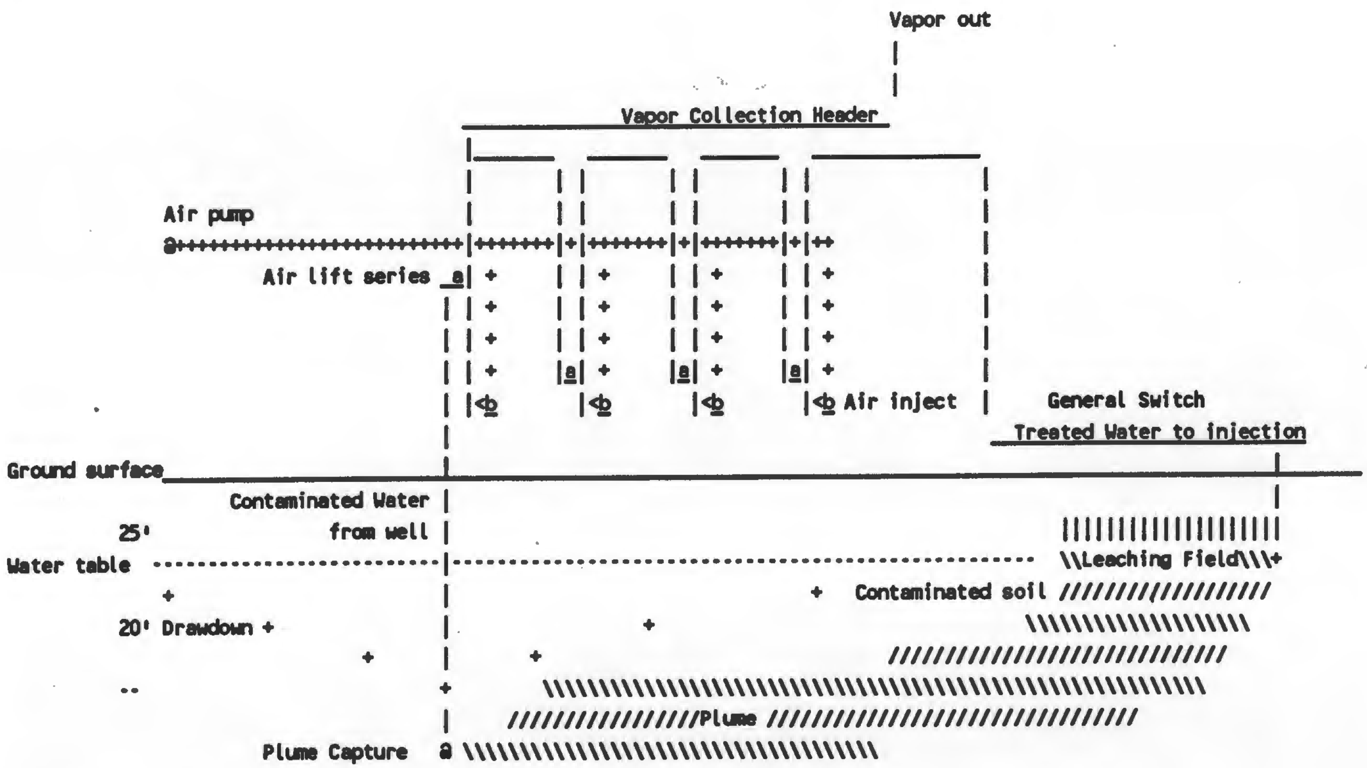
Figure 19



Source: Mackay and Yuen [15]. *(Reprinted with permission from the authors.)*

FIGURE 15–2 Solubility, Vapor Pressure and Henry's Law Constant for Selected Chemicals

Figure 20. Merry-Go-Round Air Stripper



Pump 10' Submergence below Drawdown Cone for Turbine Pump

Figure 20: Multistage Airlift System

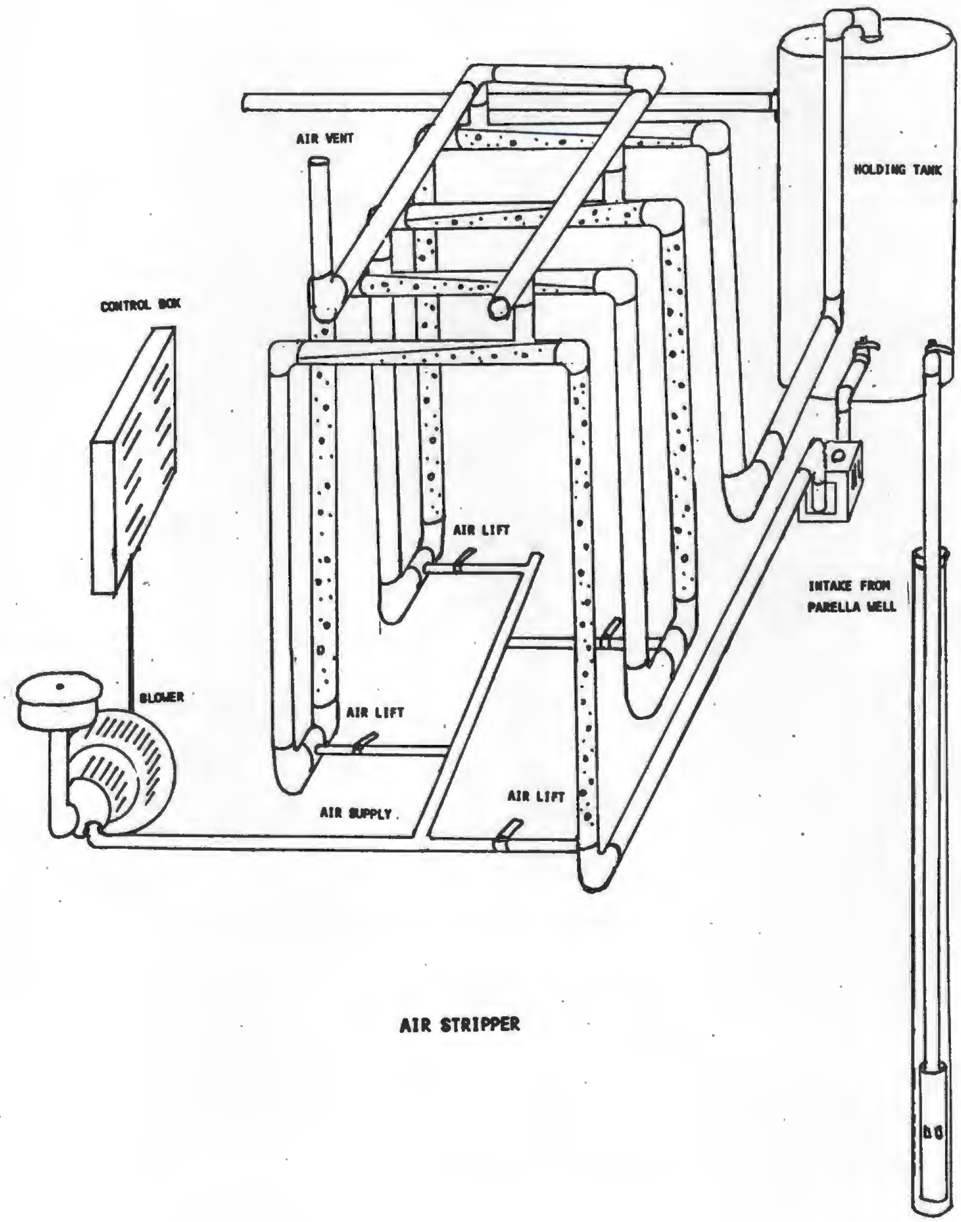


Figure 21. Merry-Go-Round Air Stripper

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Figure 22. Trench Layout in Excavation

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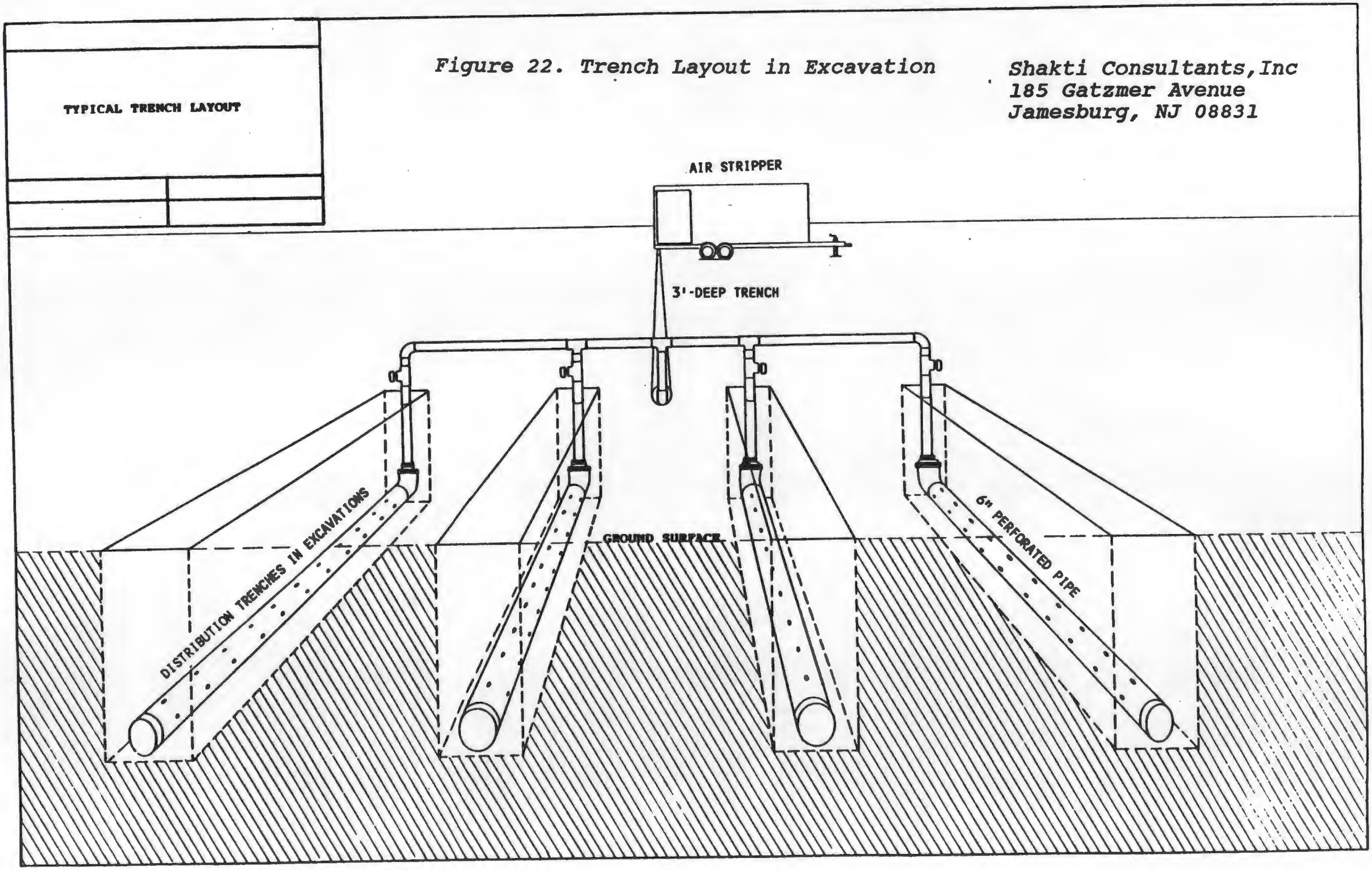
Jamesburg, NJ 08831



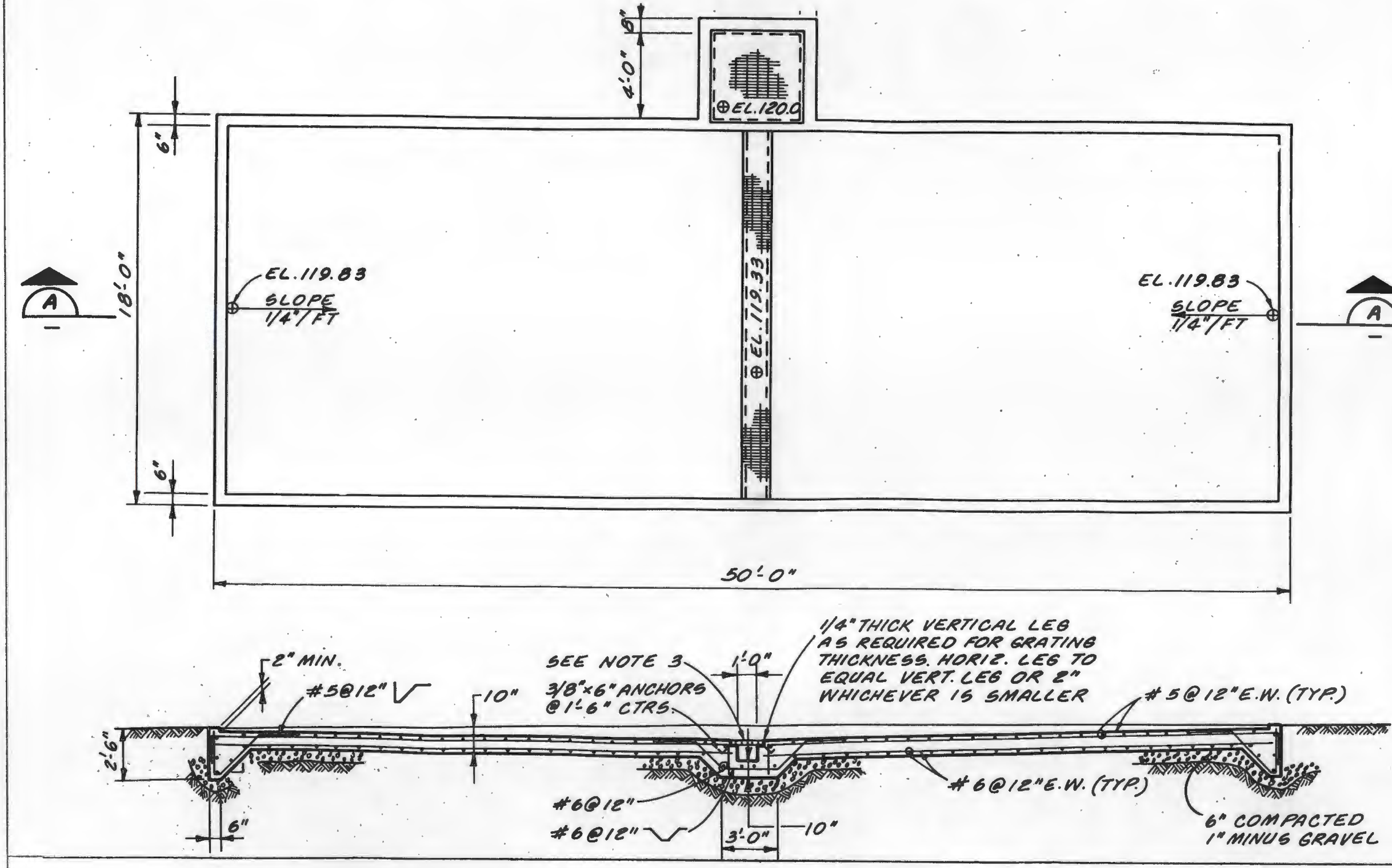


Figure 23. Soil Decontamination Pad

SECTION A
1/4" = 1'-0"

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Appendix A

STANDARD OPERATING PROCEDURE FOR PHOTOVAC AND LABORATORY CHEMICAL SAMPLING AND ANALYSIS

Standard Operating Procedure for Photovac and Laboratory Chemical Analyses

Purpose

As part of the Consent agreement between the U.S. Justice Department and General Switch, details of the proposed operating procedures for the Photovac Portable GC that will be used are detailed.

The purpose of a Photovac and laboratory chemical analyses program is to provide information regarding the lateral and vertical extent of volatile organic (VOC) contamination in the excavated soils and groundwater at the site of this investigation and to provide data with which to assess the efficiency of the treatment system. There are various techniques that can be used to relate the Photovac analysis results to standards of known composition and concentration and thus to extend the usefulness and reliability of the field investigation technique:

This procedure is based on site analysis conducted by Shakti Consultants, the USEPA Region I and the USEPA National Team. The following standard operating procedures describes the field sampling methodology, the normal operation of the portable gas chromatograph, interferences and QA/QC.

HEADSPACE ANALYSIS OF SOIL GAS AND WATER SAMPLES

Purpose

The concentration of volatile organics in soil and water may be determined by analysis of the headspace over a soil or water sample. During the survey the Photovac portable gas chromatograph and Laboratory analysis program is used as a basis for correlating the Photovac results to laboratory derived volatile organics analysis results for soil or water samples.

Method

Sampling Procedures - Headspace analysis

Samples of soil are obtained by subcoring soil from a split spoon sampler or tube sampler. A volume of 30 cu mm of soil is are placed in a 40 ml vial such that the vial is three quarters full. The vials are then placed in a warm water bath held at 20 degrees C and heated for 20 minutes to drive the volatiles into the headspace of the vial. A 100 ul injection is then drawn from the headspace of the vial with an airtight syringe and introduced into the Photovac.

Dry soil samples are prepared for analysis by the addition of 10 ml of distilled water to the VOA vials.

Water samples are obtained either as grab samples or from a precleaned bailer. The 40 ml vial is filled 3/4 full leaving a headspace from which the injection volume is drawn.

VOA samples destined for laboratory analysis are obtained in duplicate VOA vials with no headspace. The VOA vials are stored upside down on ice prior to the Photovac analysis, and prior to and during shipment for laboratory analysis.

Sample Analysis

The Photovac analysis is conducted using a Photovac Model 10S50 portable gas chromatograph (GC). The Photovac GC utilizes photoionization at a stable temperature maintained by the inboard GC column oven. The sample is injected through a model # SA1020 encapsulated capillary column, nine feet in length, with a packing material of CPsil 19CB.

The 10S50 gas chromatograph contains a built-in integrator and 4 libraries enabling the computer to interpret a chromatogram qualitatively and quantitatively when comparing the sample to a standard of known concentrations that is run and programmed into the Photovac library.

QA/QC - Calibration

As part of the field analytical procedure, the Photovac is calibrated with a volatile organics standard. A standard is injected at the beginning, after every 10 sample runs and at the end of the daily analysis program to confirm positive identification and determine variation in the detector response.

The standard is supplied by the contract Laboratory. The standards are made up under controlled conditions by the testing laboratory from priority pollutant standards supplied and guaranteed by Supelco.

A 100 ul aliquot of the headspace from the standard is injected into the Photovac. The GC prints out the specific peaks for the compounds at the retention time for the volatile organics at the specific column temperature and carrier gas flow.

Chromatograms display the library listing and show the analysis conditions including the gain setting used. The data from this chromatogram of the standard is retained in the on board computer and used to evaluate other chromatograms of the standards for the calibration range and to establish a lower detection limit. For example from experience, the detection limit for Benzene in water is 10 ppb.

Standards: The standards are composed of volatile organics in water that have high sensitivity and well defined peak separation, such as Benzene, Toluene, Ethylbenzene and Xylene (BTEX) or Tetrachloroethylene.

Preparation of Water Standards

The accuracy of the standards is dependent on the precautions taken in the transfers of liquids and care is taken to prevent headspace loss. Cross contamination by using contaminated syringes is avoided and checked by blank injections prior to standard preparation.

Procedure

Standards are prepared according to EPA method 624 protocols. Standards are made using analytical balances. The preferred method of making standards is to weigh small quantities of the volatile organic compounds in gas-tight syringes. These quantities are transferred to 20 ml of methanol and the whole reweighed (See Appendix A, Photovac Technical Bulletin #27 and Procedure For Weighing Liquids With A Syringe").
The concentration is then calculated directly on a wt/wt basis (ppm = ug/g).

Results of Calibration Range Injections:
xxx

	LOWER LIMIT		CENTER LIMIT		UPPER LIMIT	
Chromato-grams	#3	#4	#2		#1	
	calculated ppm	actual	calculated	actual	calculated	actual
Benzene	.875	.624/.608	10.5	10.24	105	98.49
TCE	.666	.549/.549	8.0	7.56	80	71.76
Toluene	.875	.949/.906	10.5	9.69	105	105.8
Tetra	.666	.718/.761	8.0	8.59	80	93.75

Injections

A 100 ul injection of the standard is introduced into the Photovac to obtain the retention time for the volatile organics at the specific column temperature and carrier gas flow.

The peaks derived from the standard is labelled by the inboard computer and integrated according to the peak size. The specific peak for a compound is then identified for the computer and assigned the known concentration of the standard. This chromatogram is then retained by the inboard computer and may be recalibrated at any time.

The computer identifies the sample peak with the retention time of the standard of the identified compound. All other peaks for the identified compound obtained during the Photovac analysis are assigned concentrations based on, and with respect to, the standard peak size. Once per week, a sample of the standard is included in the samples for Laboratory analysis to monitor any standard drift.

Duplicate Samples

Selected duplicate samples are retained in VOA vials from the split spoon samples. Equal volumes of soil are placed in the VOA vials so that a reasonable comparison of volatile organic contamination between samples is made. Based on the results of the Photovac analysis, duplicate samples are identified for laboratory analysis.

One in ten duplicate water samples and one in twenty soil samples are chosen for laboratory analysis. Water samples are placed in 2 duplicate VOA 40 ml glass vials with teflon sealed lids and sent to the Laboratory. Soil samples are placed in 950 ml amber glass jars with Teflon seals. The samples identified for laboratory analysis are chosen to cover a range of volatile organic concentrations from approximately 100 ppb to 100 ppm. The laboratory analysis is conducted to provide quantitative data for the selected duplicate samples. This information is used as a basis for developing a correlation between the volatile organics concentration in the soil identified through Laboratory analysis and the Photovac data.

Interferences

The following precautions are taken to minimize the possibility of contamination influencing results:

A field blank of distilled water accompanies samples throughout the sampling effort and is analyzed at the time that samples are analyzed. This field blank analysis protocol identifies inaccuracies introduced during soil and water sample collection and transport.

Blank runs: At the beginning of each day ultra zero air is injected into the gas chromatograph to determine if any internal contamination is present. Each day syringes used in the analyses are screened for contamination by injecting ultra zero air into the GC. Blank runs are conducted after analyzing samples containing compounds at substantial concentrations. This screens for the possibility of contamination carry-over.

Background samples are taken on-site and analyzed periodically during the daily sampling effort. In addition, samples are taken from an area on or off-site that has been designated to be uncontaminated.

Duplicate injections of samples and standards are processed through the gas chromatograph for approximately 10% of the total samples analyzed.

Decontamination of Sampling Tool and Sample Container Cleaning Procedures:

The sampling tools used in a soils investigation, may include a drill rig and split-spoon components, stainless lab spatulas and a 3/8" diameter stainless steel rod. These tools are required to obtain the soil sample and transfer and tamp the contents of the split-spoon into the 40 ml amber glass, teflon-capped septum vials or the 950 ml amber glass bottles.

Water samples are collected using the VOA vial to grab a sample or a teflon bailer to obtain a water sample from a properly developed and evacuated well.

Hand tools are cleaned in the following manner:

- Thorough washing with non phosphate detergent and tap water, utilizing a scrub brush
- Distilled water rinse (pressure-type sprayer)
- Acetone rinse (Reagent grade)
- Air dry
- Distilled water rinse (twice)

Sample Containers

The sample containers used in this collection program are prepared by the analytical laboratory selected to perform all of the analysis.

Bottles are prepared by the laboratory in accordance with current "organic-cleaned" protocol, as follows. The bottles are acetone rinsed, methylene chloride rinsed and oven-dried at 100 degrees C for one hour.

The containers for the Photovac analysis of volatile organics soil samples are identical to the water sample vials, and are provided with the same laboratory prep. The field blanks (aqueous) samples are collected in two 40 ml vials "preped" as previously described.

Documentation

Field notebooks are maintained by assigned field personnel. In addition, a printout of the analysis (chromatographic data) is maintained. This analysis documentation includes a listing of the certified gas standards of the compounds, chromatograms, the time of analysis, a summary of analysis parameters, the retention times and concentrations of identified compounds, and a details of the sampling and precolumn/backflush analysis annotated on the computer printout.

Results

The results of the Photovac and laboratory analyses are displayed in a comparison table. A correlation between the laboratory data and the Photovac data is established.

Conclusion - Detection Limits;

Using the lower limit as the detection limit allows for adequate sensitivity for analysis of contaminants in groundwater and soil. A 100 ul injection of sample at an instrument gain of 100 will show 20 ppb Tetrachloroethylene.

Appendix B

STANDARD OPERATING PROCEDURES FOR POTABLE AND MONITORING WELL SAMPLING

STANDARD OPERATING PROCEDURES
POTABLE AND MONITOR WELL SAMPLING

Purpose. Representative groundwater samples can be collected from potable water supply wells or monitoring wells located within close proximity to a spill site. These wells are sampled to detect the presence and degree of contamination in the groundwater in the vicinity of each well at the time of sampling. If the results from this sampling campaign indicate groundwater contamination, then additional potable or monitoring wells located over a larger area may be sampled.

This standard operating procedure provides information on the following:

- Sample collection/preservation;
- Analytical requirements;
- Chain-of-custody control; and
- Summary Checklist (Appendix A)
- Data sheets (Appendix B)
- Calculation of saturated well volume (Appendix C)
- Test procedures (Appendix D)
- Equipment (Appendix E)

Introduction

A detailed approach to well sampling is developed after complete review of the construction of the existing well and groundwater data. See survey sheets in Appendix B and Background Review Section.

The question of conducting interviews with home owners or public water supply officials and the extent of such interviews, is determined in the context of a public relations plan. Permission to enter property is obtained for all private well locations. For each sample location, a supplementary data sheet is completed (see Appendix B and SOP for sampling and instituting analysis).

The information required prior to sampling of potable wells is as follows:

- *Precise location of well on property in relation to septic system or other contaminant sources*
- *Accessibility to well*
- *Name of driller and date installed*
- *Depth of well*
- *Well construction details*
- *Pump type and setting*
- *Access to the well*
- *Is water pumped into a holding tank before household distribution?*
- *Are any water treatment systems used?*
- *Well use data. Pumping rate, incidence and duration of use*

Once the well information is obtained, the precise location and method of sample collection is detailed.

In order for valid representative groundwater samples to be collected from monitor wells, it is very important to properly prepare the well prior to sample collection. This preparation entails developing groundwater flow to the well (well development), removing all the water which is standing in the casing (evacuation) and taking the sample from water which has recently been recharged from the aquifer.

If the wells can be accessed directly, an attempt is made to remove at least 3-5 well volumes prior to sample collection. If the wells cannot be reached, and the home or facility utilizes a holding tank or water treatment system, every attempt is made to grab a sample before it enters the holding tank or is treated. If this is not possible, then several holding tank volumes are evacuated prior to sample collection, and the collection method used is noted on the sample sheet. The samples are drawn directly from the tap or spigot into the sample bottles.

NOTE: *A special case is when sampling for a floating layer, which requires procedures to minimize mixing and emulsification of the separate layer or in obtaining samples at discrete depth intervals in a well.*

SAMPLING PROCEDURES

1. Water Height Measurement

After unlocking and removing the well cap, the position of the pump assembly is observed. If the pump is suspended at the top of the casing, it is lifted out of the casing. If it is submerged in the well, the pump is left in the well or measurement of the height of the water, or the static water level will be lowered and inaccurate. If the surface of the well water is below the top of a pump assembly which has been lowered into the well, the pump is partially removed and allowed to drain into the well. The pump is removed from the casing once it has drained completely. Time is allowed for the recovery of the static water level. Note this occurrence when recording the well water height.

The height of the water in the well is measured using a steel tape calibrated in decimal feet (See Water Level Measurement Section) or an equivalent method.

2. Removing Standing Water

The volume of well water to be evacuated prior to sampling is determined by subtracting the water surface measurement from the well depth. The difference is then multiplied by the appropriate gallons/foot of well volume, a factor found in the Appendix D. A bucket and stop watch or equivalent may be used to measure the rate of pumping from the well.

The method of evacuation should be pertinent to the goals of the sampling effort. In fractured rock or limestone or where the contaminant plume is at some distance or depth from the well intake, the evacuation of 3-5 well volumes may not duplicate the demands upon an aquifer caused by peak-load pumping. After extensive clothes washing, during sprinkling of gardens or extensive municipal supply pumping, the contaminant plume may temporarily be drawn upwards or sideways into the well resulting in higher health risks.

The pump location is critical to subsequent representative sampling and should be specified for each well. During evacuation, the pump should be located immediately below the water table or drawdown level in the well. Thus, all stagnant water in the borehole will be evacuated. If the pump is located at the well screen depth then stagnant water can remain in the well at the water table, and samples should only be taken at the well screen depth.

For product lighter than water, a protocol of well evacuation and 1 week of resting the well may be indicated so that floating product may again accumulate. In either case, the well screen should be located above and below the current water table to allow for seasonal fluctuations of the water table.

In cases where a well is emptied until dry and is very slow to recover, the volume required for evacuation may be reduced to two or three standing water volumes.

During the pumping of a groundwater well to take a sample, the drawdown with time may be noted to obtain the hydraulic characteristics of the aquifer involved.

Additional Considerations The nature of the pollutant parameter being monitored is the primary factor for specifying well evacuation and sampling methods. These specifications are most conveniently based on the general class of pollutant or parameter which requires monitoring in a particular program.

Physical properties include such parameters as conductance, color, pH, temperature, and turbidity. In general, most sampling methods are acceptable to monitor these parameters, provided they allow a thorough rinsing between sampling events. However, studies by Gibb, et al., (see reference below) have clearly shown that methods which affect gas composition of the sample will affect pH and volatiles concentration. Consequently, since gas lift pumping methods may leave water in the well in a disturbed and aerated condition, these methods are not suitable for well evacuation when volatiles or pH are a parameter of interest.

**Gibb, S.P.; R. M. Schuller; and R. A. Griffin. 1981. Procedures for the Collection of Representative Water Quality Data from Monitoring Wells. Illinois State Water Survey and Illinois State Geological Survey, Cooperative Groundwater Report, Champaign, Illinois.*

Similarly, since concentration of metals can be significantly influenced by changes in pH, sampling for metals should not be allowed with gas lift or suction methods. The guidance provided above for well evacuation when pH is the parameter of interest also applies for metals. In addition, equipment used for monitoring metal concentrations should be metal free. Consequently, bailers and positive displacement pumps are most suitable for sampling metals provided they are constructed of appropriate materials. The methods acceptable for well evacuation are less restricted, but gas lift methods or equipment that alter the metal concentration of water remaining in the well through leaching or adsorption should be avoided.

Inorganic, non-metallic constitutent or parameters include acidity, alkalinity, bromide, chloride, fluoride, nitrate, etc. Most of the sampling and well evacuation methods described above are generally acceptable when considering the inorganic, non-metallic parameters. However, for parameters affected by pH or dissolved-gas changes, such as alkalinity, methods that minimize changes in dissolved gas composition are recommended for sampling. These methods include bailers, squeeze pumps, piston pumps; gas lift techniques are not recommended for well evacuation.

Generalized organic parameters include parmeters such as oil and grease, COD, TOC, TOX. Most sampling and well evacuation methods are suitable for these parameters, with the exception of the more sensitive parameters such as TOX. These sensitive parameters require methods suitable for sampling volatile organics.

It is appropriate that sampling for volatile organics be done with a glass or Teflon bailer after flushing with a non-aerating pump or bailer. Positive displacement pumps may be acceptable in sampling, provided they are constructed with suitable materals (Teflon or glass in most cases).

A well with a low yield may require a waiting period so that sufficient water reenters the well to provide a sample.

Once the required volume has been purged from the well, the sample to be analyzed may be collected.

3. Sample Collection, Preservation & Field Analyses

Wells may be sampled only after the water has been sufficiently recharged to obtain the needed amount of sample. All wells included in a given program are sampled within a one week time interval, weather permitting. Once the well is adequately evacuated, actual sampling may be performed using 1) steam cleaned bailers rinsed in distilled water, 2) dedicated bailers or 3) peristaltic pumps.

The bottom-loading bailers used are fitted with a teflon check valve at their base. Each bailer is fitted with a stainless steel wire leader and a new piece of nylon cord. A different pre-cleaned bailer is devoted to each well. If the bailer has not been used for well evacuation, the first 3 bails of water are wasted to rinse off any cleaning agents which might still be present on the bailer. The samples are poured directly from the bailer to sample jars. If filtering or chemical preservation of the samples is required these steps are followed immediately the water is removed from the well. For filtration, the use of a 0.45 micron filter is generally considered appropriate.

If dedicated bailers are not available, the bailers are steam cleaned and rinsed with distilled water. In addition, those wells which are suspected of being contaminated are sampled last in the sequence. It is prudent to avoid sampling highly contaminated wells on the same day as those wells anticipated to be clean.

For peristaltic pumps, suction tubing is dedicated to a particular well and is cleaned with distilled water between samplings.

Data relating to samples are recorded on a uniquely numbered sample documentation form. Each sample is defined with the following entries:

Date and time sample is collected
Sample I.D. number
Location of sampling point
Type of sample (e.g., soil, groundwater, surface water)
Field measurements

In addition, information regarding shipment of samples is recorded on the chain of custody forms.

Analyses of pH, temperature, and specific conductance are made in the field at the time of sampling because these parameters change rapidly and a laboratory analysis might not be representative of the true groundwater quality. Enough water from the well is removed to determine temperature of water, specific conductivity, and pH. Values for the parameters are recorded on field data sheets and the water discarded in a manner so as to avoid potential contamination.

All groundwater samples are carefully packed on ice for shipment to the R/D Lab. Proper chain-of-custody procedure is followed when transferring the samples from the field to the lab.

After each sample is obtained and placed in its container:

The sample bottle is capped and the bottle labelled. Labels show the sample number, date, sample source, preservative added, if any, and analysis to be performed.

All pertinent information is entered on field data sheets and chain-of-custody forms. Observations as to the odor or color of the water sample are included on the data sheets.

Samples are transferred to an ice chest for shipment to the laboratory.

All equipment is cleaned thoroughly between samples.

For VOA or VOX sampling:

The samples are collected in approximately 50 ml airtight, glass pharmaceutical vials with plastic caps lined by teflon septa. Each sample is clearly labeled as to location and number before the sample is collected.

Each sample consists of two 50 ml vials. Each vial is filled completely and checked to insure that no air is entrained once the cap is in place.

Each vial is wrapped to minimize the possibility of breakage during shipment.

For base neutrals/acid extractables:

Two liter jugs of water are taken and filled 2/3 full and the fill level marked on the outside of the bottle.

All analytical work is completed in compliance with standard USEPA requirements. (see Appendix D)

III. Chain of Custody Procedures

1. Sample Custody

The field sampler is personally responsible for the care and custody of unused, empty or sample filled containers until they are transferred or properly dispatched. Sample containers are kept under the custody of one designated person at any given time. A sample is under custody if:

a. It is in the samplers actual physical possession; or
b. It is in view, after being in the samplers physical possession; or
c. It is locked up to prevent tampering; or
d. It is in a designated secure area.

2. Field Log Book

Information pertinent to field sampling and measurements is recorded in a bound log book or a log book composed of the serially numbered data sheets filed in a three ring binder. The field sampling plan is appended to the log book as partial documentation of the sampling program. Specific entries that are included in the log book include at least, the following:

a. Each page dated and signed;
b. Date and time of sampling;
c. Sample identification number;
d. Location of sampling point;
e. Type of sample (e.g., grab, composite, groundwater, wastewater, sludge, soil, etc.)
f. Deviations from sampling plan;
g. Field measurements (e.g., pH, conductivity, temperature, etc.);
h. Field observations;
i. Photographs; and
j. Sample custody transfer and transport.

3. Sample Labels

Every sample container is uniquely labeled to prevent misidentification. Labels are attached to containers as they are generated in the field. The labels include the following:

a. Date and time sample collected;
b. Sample identification number;
c. Place of collection; and
d. Signature of collector.

4. Sample Seals

Sample seals are used to prevent unauthorized tampering from the time samples are collected until containers are opened in the laboratory. The seals may be attached over the sample container cap in such a way that the seal must be torn in order to open the container. The following information is recorded on each seal:

a. Date of sampling;
b. Signature of collector.

5. Chain-of-Custody Record (Field Activities)

Samples are accompanied by a Chain-of-Custody Record whenever possession of custody is transferred or relinquished. Each Chain-of-Custody Record sheet is filled out with a carbon paper duplicate before the field sample custodian relinquishes possession or arranges for shipment. The original record accompanies the samples relinquished. Each record sheet includes the following information (see Appendix B):

a. Signature of field sampler/sample custodian;

b. Beginning date-time of possession;

c. Final date-time of possession; and

d. For each sample:

e. Date-time of collection;

f. Sample identification number;

g. Location of sampling point; and sample type.

6. Transfer of Custody and Shipment

The following are guidelines for shipping non-hazardous samples:

a. Samples are sealed in containers marked with name and address of laboratory;

b. Samples are placed in a strong outside container such as a picnic cooler. Ice, dry ice or "blue ice" may be used inside plastic bags between the containers and box.

c. The outer container is sealed completely with tape or glue and the sample dispatcher signs across the tape or glue joints at several locations on the package to serve as an "outer seal."

d. The container is properly addressed and a shipping list affixed.

e. Samples may be transported by rented or common carrier air, truck, bus, railroad, and entities such as Federal Express. If sent by mail, the package registered with return receipt requested. If sent by common carrier, a Bill of Lading is used. Receipts from post offices and Bills of Lading are retained as part of the permanent documentation. A convenience is to take the sample shipment to the nearest UCC shipping department.

Appendix C

PERMITS FOR SITE OPERATION

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-3505

Henry G. Williams
Commissioner

April 1, 1987

MEMORANDUM

TO: Regional Water Engineers, Bureau Directors, Section Chiefs

SUBJECT: Division of Water Technical and Operational Guidance Series (2.1.1)
GROUNDWATER CONTAMINATION REMEDIATION STRATEGY
(Originator: Mr. Halton)

I. PURPOSE

To establish strategies for source control and remediation of groundwater contamination.

II. DISCUSSION

This document applies to chronic groundwater contamination incidents for which the Division of Water (DOW) has lead responsibility for source control and groundwater remediation. These cases are identified in the August 14, 1984 MOU between DOW and the Division of Solid and Hazardous Waste (DSHW). The MOU says that DOW has lead responsibility if the source of the groundwater contamination is:

1. Any recurring point source discharge.

2. Petroleum or chemical products which, if leaked or spilled, would not constitute a hazardous waste under RCRA/Part 370.

3. Leaks or spills of waste materials other than hazardous wastes.

4. Unknown.

This document does not apply to immediate or short-term response to spills, or to cases for which DSHW has lead responsibility.

DOW is responsible for the site investigation, at least until the source is identified. However, this document assumes that a site investigation has already taken place. It considers two issues; the control of continuing sources of contamination and the remediation of contaminated groundwater plumes (see figure 1).

III. GUIDANCE

1. Step I deals with on-going sources of contamination (see figure 2). "Source Control"[1] will be required if there is a violation of water quality standards (ground or surface). A source control program must eliminate the violation if technologically feasible. If not, the program must accomplish all that is technologically feasible. Cost will not be considered.

Responsibilities

1. The RWE, in consultation with BSPR, has the following responsibilities:

   a. Final selection/approval of source control and plume management programs.

   b. To determine when an impairment exists.

   c. To decide if termination of a plume management program can be considered, or, if not, to decide if there are any acceptable alternatives to continuing.

   d. To provide overall supervision and coordination for all site investigations, monitoring, negotiations with the owner, assemblage of case reports, and liaison with the Regional Attorney on enforcement cases.

2. BSPR, in consultation with the RWE, has the following responsibilities:

   a. To conduct detailed hydrogeologic evaluations of the site at the request of the RWE and to identify sources of contamination where possible.

   b. To advise on all hydrogeologic technical issues, including site monitoring, evaluation of consultant reports, and options for plume management and source control. Review of cost/benefit data.

   c. To render the decision on when a plume management effort has reached a technical "dead end".

3. BWFD/BMA, in consultation with the RWE, are responsible for the regulation of any point source discharge from the site to ground or surface waters.

4. NYSDOH shall be consulted by the RWE regarding:

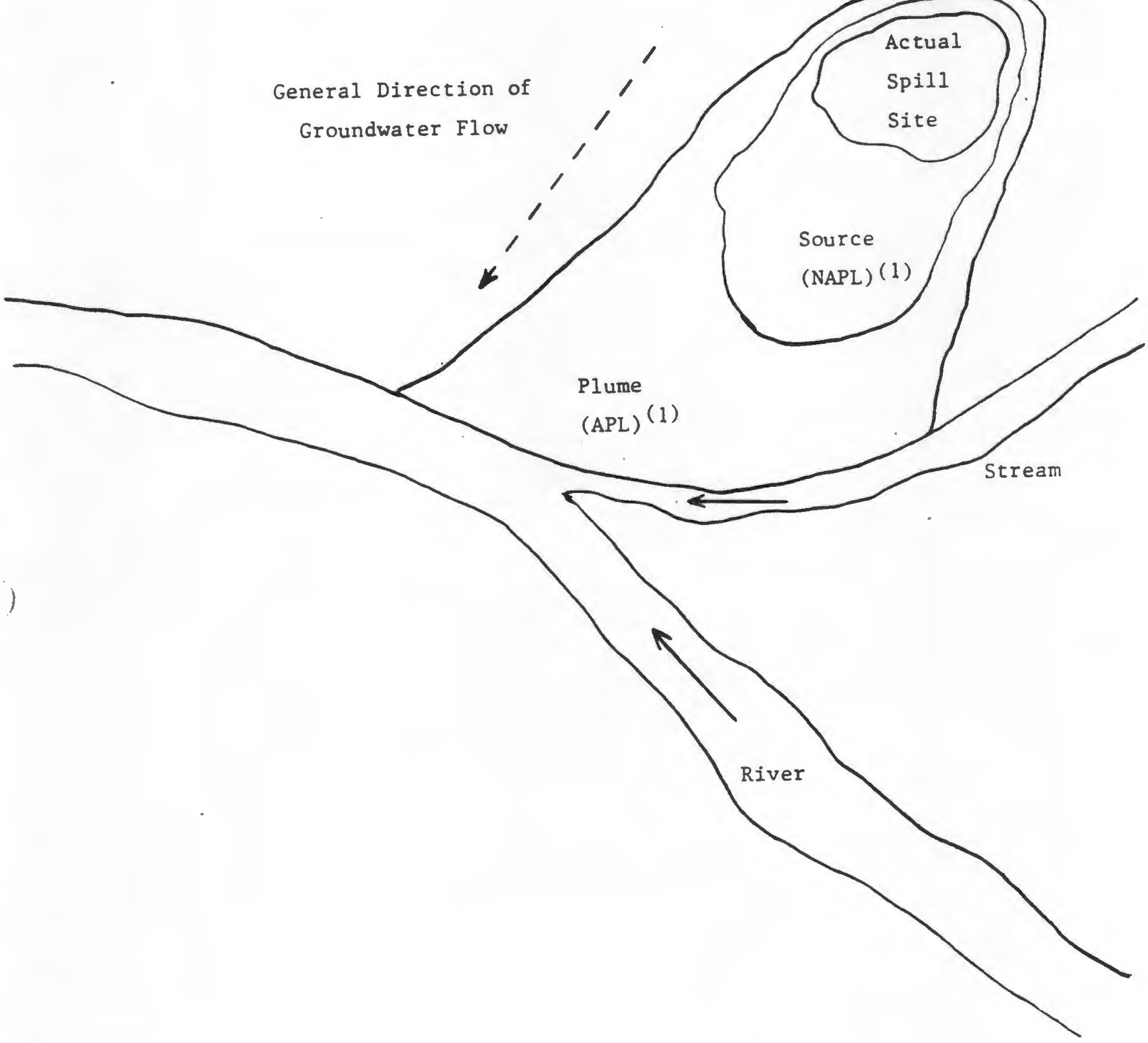
   a. Acceptable levels of chemicals in drinking water, if not covered by existing water quality standards.

   b. Acceptability of public water supplies.

   c. Risk assessment regarding residual contamination.

Figure 1

Groundwater Contamination by Past Chemical Spill



(1) - See Glossary

Figure 2

Step I - Source Control

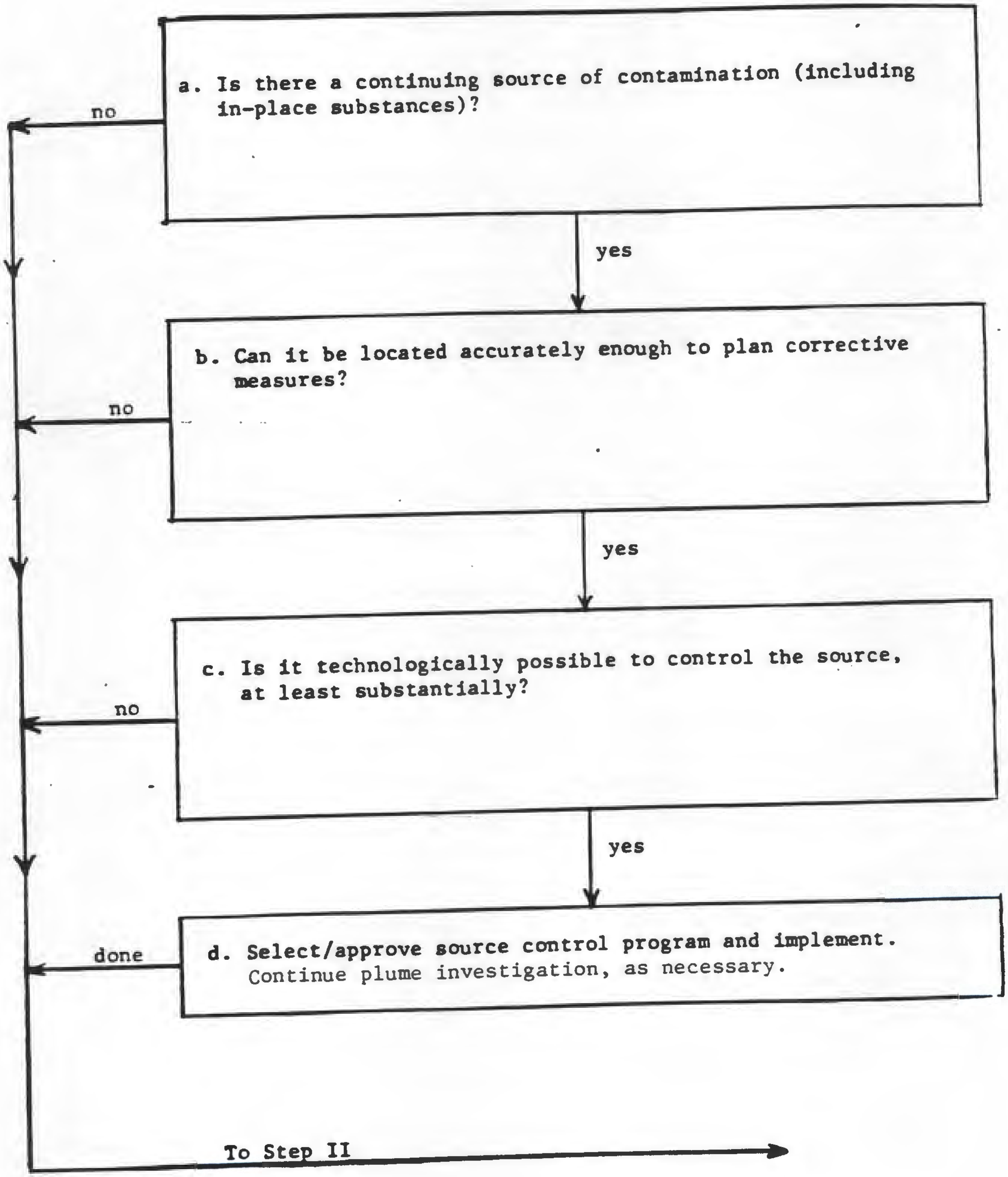


Figure 3

Step II - Plume Management

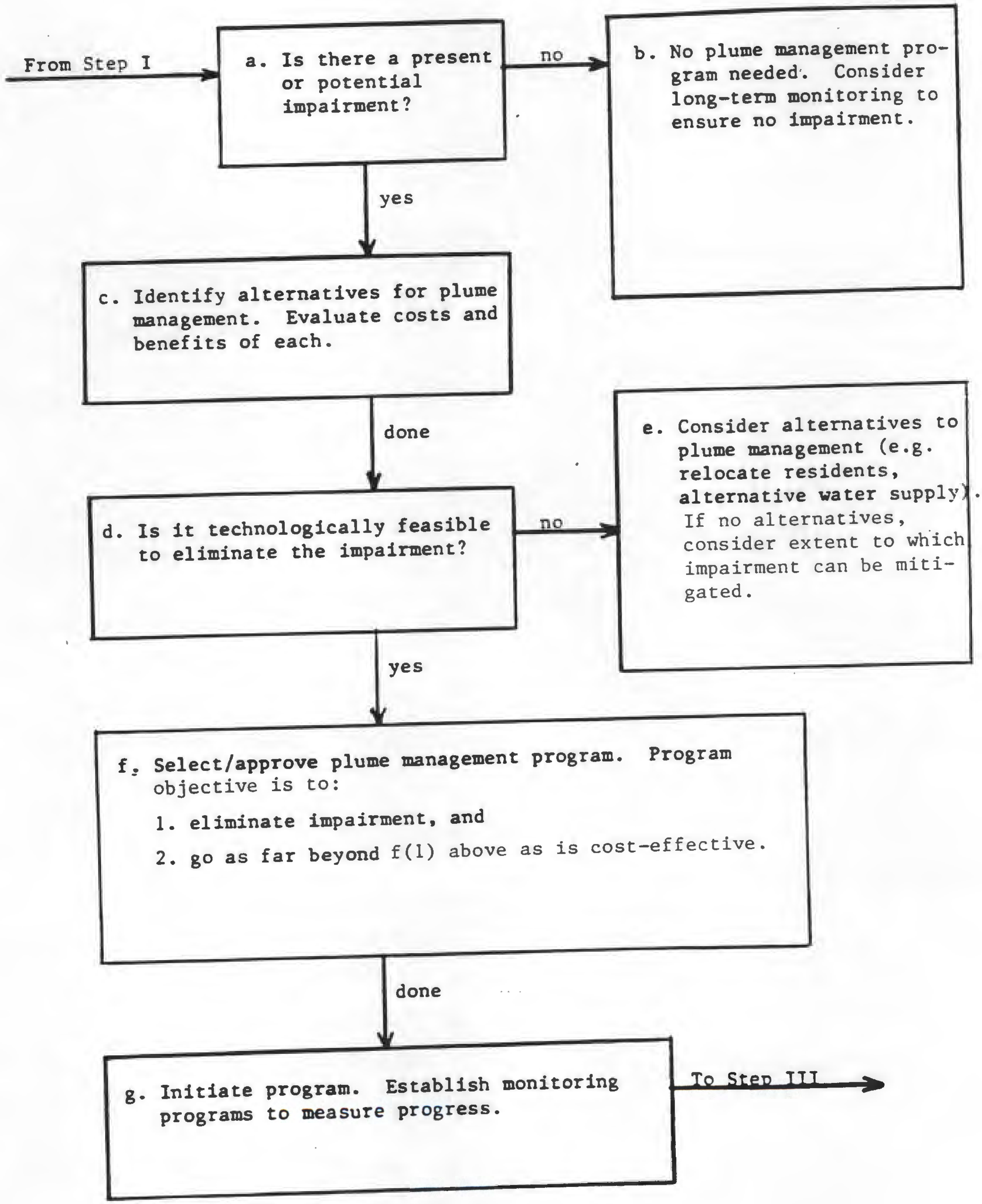
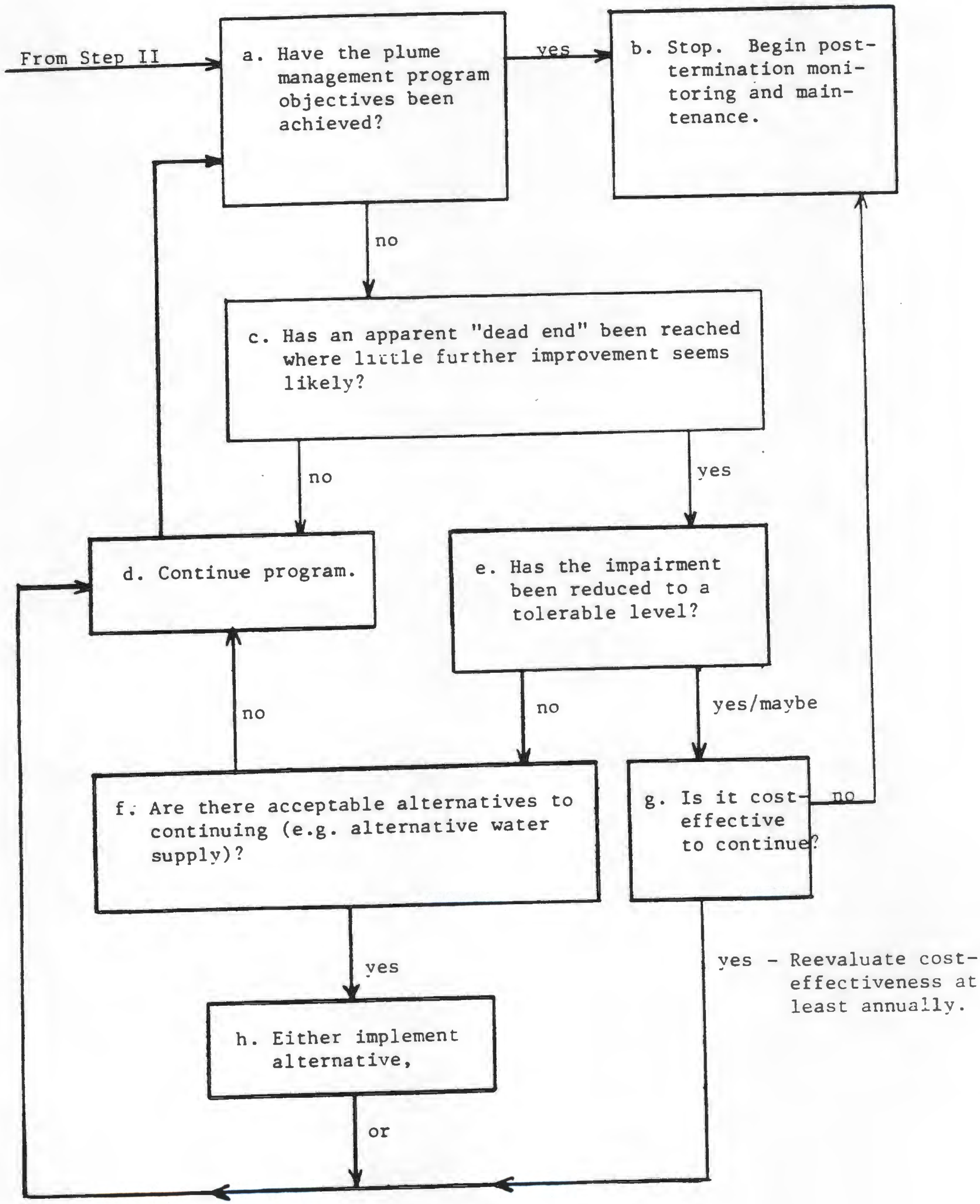


Figure 4

Step III - Termination



SUMMARY OF CODE REVISION

STANDARDS

General MCLs

The New York State Department of Health has adopted standards to limit organic chemical contamination of public drinking water supplies. The code revision (to Part 5 of the State Sanitary Code) establishes maximum contaminant levels (MCLs) or standards for:

Principal Organic Contaminant (POC) - 0.005 mg/l (5 ug/l)
Unspecified Organic Contaminant (UOC) - 0.050 mg/l (50 ug/l)
Total of POCs and UOCs - 0.10 mg/l (100 ug/l)

POCs would be defined as any organic chemical belonging to any of six general chemicals classes:

Halogenated Alkanes
Halogenated Ethers
Halobenzenes and Substituted Halobenzenes
Benzene and Alkyl- or Nitrogen-Substituted Benzenes
Substituted, Unsaturated Aliphatic Hydrocarbons
Halogenated Non-aromatic Cyclic Hydrocarbons

POCs, by definition, exclude trihalomethanes and other organic chemicals with a specific MCL of their own.

UOCs would be defined as any organic chemical not covered by another MCL.

The Department recognizes the possible need for exceptions from the proposed MCLs for POCs and UOCs if the presence of a specific organic chemical does not represent contamination and sufficient, valid scientific information demonstrates that they do not pose an unreasonable risk to human health. When justified, the regulation contains provisions to allow for the establishment of a more lenient (higher) MCL.

The regulation also allows a water supplier to submit justification for a higher MCL for up to 60 days following application of a paint or lining to a potable water appurtenance. The Commissioner may allow the higher MCL if he determines that no unreasonable risk to human health would result.

The Department recognizes the need to use a stricter (lower) interim guideline value for a contaminant which lacks a chemical-specific MCL but for which the available toxicological data are judged sufficient to warrant more stringent control. The regulation allows for consideration of lower interim guidelines when justified. The Department believes that, from a public health perspective, the benefits associated with the broad nature of the general MCLs outweigh the fact that interim guidelines may have to be used in some cases. For example, the existing guidelines for PCBs - 1 ug/l; aldicarb - 7 ug/l; carbofuran - 15 ug/l; atrazine - 25 ug/l will be retained until a specific MCL for each chemical is developed.

Individual MCLs

The code revision includes a specific MCL of 0.002 mg/l (2 ug/l) for vinyl chloride and lowers the existing MCLs for two organic chemicals. The revised MCLs are 0.050 mg/l (50 ug/l) for both methoxychlor and 2,4-D.

Implementation Dates

The effective date of the MCLs in this code revision is January 9, 1989. Monitoring and other requirements are effective as of publication in the State Register.

MONITORING

Contaminants

The code revision requires monitoring for certain organic chemicals and allows State discretion to require monitoring of other organic chemicals when the State believes that contaminants have been or may be present in concentrations which exceed the MCL. All community water systems are required to monitor for the 52 POCs listed on Table 1 and for vinyl chloride. The code uses the same nomenclature of the Environmental Laboratory Approval Program, so chemical names used previously in the proposal are listed in parentheses on Table 1.

The monitoring requirement also extends to noncommunity systems that regularly serve at least 25 of the same persons, four hours or more per day, for four or more days per week, for 26 or more weeks per year. These systems are called nontransient, noncommunity water systems.

The contaminants must be analyzed by EPA methods 502.2, 524.1, 524.2 or a combination of 502.1 and 503.1. The analysis must be capable of detecting the contaminants as low as 0.0005 mg/l (0.5 ug/l). All systems that serve 150 or more service connections from groundwater sources also must analyze at least one sample from each source for 1,2-dibromoethane (EDB) and 1,2-dibromo-3-chloropropane (DBCP). EPA Method 504, with a detection level of 0.00002 mg/l (0.02 ug/l), must be used for EDB and DBCP.

Since POCs are defined by the chemical class above, the standard applies to many more chemicals than those listed on Table 1. The regulations allow the State to require monitoring for other contaminants (POCs or UOCs) when the State believes they might exceed the MCL or present a risk to public health.

Location of Sample Collection

The regulations require each source to be sampled at specific locations dictated by ground or surface sources. The location of sampling for each groundwater source is at or before the first service connection and prior to mixing with other sources. The regulations allow the State to specify another location. This provision can be used to require monitoring following treatment to remove organics or to accept certain sources as representative of other nearby sources in the same aquifer under certain conditions at State discretion.

The regulations require systems with surface sources to sample at points in the distribution system representative of each source or at entry point or points to the distribution systems after any treatment plant.

Initial Sampling

The initial monitoring requirement for each source depends on the type and size of the system as scheduled below:

System Type/Size	Required Samples per source
Community serving 10,000 or more persons	One per quarter for one year by 12/31/88
Community serving 3,300-9,999 persons	One per quarter for one year by 12/31/89
Community serving fewer than 3,300 persons and more than 149 service connections	One per quarter for one year by 12/31/90
Community serving fewer than 150 service connections	One by 6/30/91
Nontransient, Noncommunity	One by 6/30/92
Noncommunity	State Discretion

Systems serving over 10,000 persons were notified by mail in October 1987 to perform the required sampling under existing Code, Section 5-1.75, and EPA regulations.

As with other contaminants, the State may use Section 5-1.51(e) to require a system to monitor sooner or more frequently whenever the potential exists for an MCL violation. Consequently, systems with sources that have been shown by previous monitoring to be contaminated may be required to monitor before the above schedule.

Vulnerability to Contamination

The State will assess the vulnerability to contamination of all sources of water supply based on:

a. previous monitoring results

b. number of persons served by the public water system

c. proximity of the system to a larger system

d. proximity to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals; and

e. the degree of protection afforded the source of water supply.

Detailed guidance in determining vulnerability will be developed similar to EPA's as presented in the Federal Register, November 13, 1985, Volume 50, No. 219.

For systems serving fewer than 150 service connections, more than one sample will be required for those sources that are determined to be vulnerable. Following a determination of nonvulnerability, the State may reduce initial and some of the repeat sampling described below for intermediate sized systems (more than 150 service connections, but population less than 3,300 persons). It is unlikely that systems serving 3,300 or more persons would have monitoring reduced since EPA's guidance considers all systems this large to be vulnerable to contamination. Statewide surveys show that volatile organic chemicals are more than twice as likely to be found in sources of these larger systems.

Repeat Monitoring

At those sources where contaminants are detected, (at 0.0005 mg/l or above) monitoring would be required to continue on quarterly intervals. Systems with 150 or more service connections for which contaminants are not detected would be required to repeat monitoring every three years. Systems with fewer than 150 service connections would not be required to repeat monitoring unless they are determined to be vulnerable.

DETERMINATION OF COMPLIANCE

If the results of a sample exceed the MCLs, the supplier of water would be required to collect one to three confirmation samples as soon as practical but no later than 30 days. If the average of all samples (monitoring sample plus confirmation sample(s)) exceeds the MCL, a MCL violation occurs. Those systems with sources that exceed the MCLs after the effective date will be put on a compliance schedule and required to provide public notification. Both short and long-term compliance strategies will be developed. The long-term strategy in most cases, would be to develop alternative sources or provide treatment. Potential short-term strategies include an alternative water source, minimal use of a contaminated source, such as stand-by for peak demand, conservation measures, temporary treatment, and consumer advisories.

Persistent violators of MCLs, or monitoring and reporting requirements will be subject to enforcement actions as for other contaminants regulated in the code.

NOTIFICATION

The supplier of water must make State, consumer and public notification for MCL or other violations according to requirements similar to those existing for other contaminants.

The regulations also require systems to notify its consumers as to the availability of monitoring results for volatile organic chemicals. Notification will be included in the first set of water bills issued by the system after the receipt of the result or by other written notice within three months. The State would accept as written notice, a one-time publication in a daily newspaper of general circulation in the area served by your system. The notice should:

1. identify a person and supply the telephone number to contact for information on the monitoring results, and
2. where appropriate, state that quarterly monitoring will continue for the remainder of the year.

A legal notice is acceptable provided it is conspicuous and does not contain unduly technical language, unduly small print or similar problems that frustrate the purpose of the notice.

TABLE 1
ORGANIC CHEMICALS IN REQUIRED MONITORING
VINYL CHLORIDE AND 52 PRINCIPAL ORGANIC CONTAMINANTS
(AS PER ENVIRONMENTAL LABORATORY APPROVAL PROGRAM)

CHEMICAL NAME ELAP NOMENCLATURE	CHEMICAL NAME USED PREVIOUSLY IN PROPOSAL
benzene	
bromobenzene	
bromochloromethane	
bromomethane	
n-butylbenzene	
sec-butylbenzene	
tert-butylbenzene	
carbon tetrachloride	
chlorobenzene	
chloroethane	
chloromethane	
2-chlorotoluene	(o-chlorotoluene)
4-chlorotoluene	(p-chlorotoluene)
dibromomethane	
1,2-dichlorobenzene	(o-dichlorobenzene)
1,3-dichlorobenzene	(m-dichlorobenzene)
1,4-dichlorobenzene	(p-dichlorobenzene)
dichlorodifluoromethane	
1,1-dichloroethane	
1,2-dichloroethane	
1,1-dichloroethene	(1,1-dichloroethylene)
cis-1,2-dichloroethene	(cis-1,2-dichloroethylene)
trans-1,2-dichloroethene	(trans-1,2-dichloroethylene)
1,2-dichloropropane	
1,3-dichloropropane	
2,2-dichloropropane	
1,1-dichloropropene	
cis-1,3-dichloropropene	
trans-1,3-dichloropropene	
ethylbenzene	
hexachlorobutadiene	
isopropylbenzene	
p-isopropyltoluene	(p-cymene)
methylene chloride	(dichloromethane)
n-propylbenzene	
styrene	
1,1,1,2-tetrachloroethane	
1,1,2,2-tetrachloroethane	
tetrachloroethene	(1,1,2,2-tetrachloroethylene)
toluene	
1,2,3-trichlorobenzene	
1,2,4-trichlorobenzene	
1,1,1-trichloroethane	
1,1,2-trichloroethane	
trichloroethene	(1,1,2-trichloroethylene)
trichlorofluoromethane	(fluorotrichloromethane)
1,2,3-trichloropropane	
1,2,4-trimethylbenzene	
1,3,5-trimethylbenzene	
m-xylene	
o-xylene	
p-xylene	

OP LOCATION FACILITY EMISSION POINT I

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
PINK - FIELD REP
YELLOW - APPLICANT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 76-11-12 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1 NAME OF OWNER/FIRM
2 NUMBER AND STREET ADDRESS
3 CITY-TOWN-VILLAGE | 4 STATE | 5 ZIP
6 OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ EDUC INST H ☐ HOSPITAL I ☐ RESIDENTIAL J ☐ OTHER
7 NAME & TITLE OF OWNERS REPRESENTATIVE | 8 TELEPHONE
9 NAME OF AUTHORIZED AGENT | 10 TELEPHONE
11 NUMBER AND STREET ADDRESS
12 CITY-TOWN-VILLAGE | 13 STATE | 14 ZIP
15 NAME OF P.E. OR ARCHITECT PREPARING APPLICATION | 16 N.Y.S. P.E. OR ARCHITECT LICENSE NO | 17 TELEPHONE
18 SIGNATURE OF OWNERS REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT
19 FACILITY NAME (IF DIFFERENT FROM OWNER/FIRM)
20 FACILITY LOCATION (NUMBER AND STREET ADDRESS)
21 CITY-TOWN-VILLAGE | 22 ZIP
23 BUILDING NAME OR NUMBER | 24 FLOOR NAME OR NUMBER
25 START UP DATE MO / YR | 26 DRAWING NUMBERS OF PLANS SUBMITTED
27 PERMIT TO CONSTRUCT: A ☐ NEW SOURCE B ☐ MODIFICATION
28 CERTIFICATE TO OPERATE: A ☐ NEW SOURCE B ☐ MODIFICATION C ☐ EXISTING SOURCE

SEC. B

29 EMISSION POINT ID	30 GROUND ELEVATION (FT)	31 HEIGHT ABOVE STRUCTURES (FT)	32 STACK HEIGHT (FT)	33 INSIDE DIMENSIONS (IN)	34 EXIT TEMP (°F)	35 EXIT VELOCITY (FT/SEC)	36 EXIT FLOW RATE (ACFM)	37 SOURCE CODE	38 HRS/DAY	39 DAYS/YR	40 % OPERATION BY SEASON Winter Spring Summer Fall

SEC. C

DESCRIBE PROCESS OR UNIT

1	2
3	4
5	6
7	8

SEC. D

EMISSION CONTROL EQUIPMENT I.D.	CONTROL TYPE	MANUFACTURER'S NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
42	43	44	45	46 /	47
48	49	50	51	52 /	53

SECTION E

CALCULATIONS

SECTION F

CONTAMINANT NAME	CAS NUMBER	INPUT OR PRODUCTION	UNIT	ENV. RATING	EMISSIONS ACTUAL	UNIT	HOW DET	PERMISSIBLE	% CONTROL EFFIC'CY	HOURLY EMISSIONS (LBS/HR) ERP	ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	10^x	PERMISSIBLE
54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	111	112	113
114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142	143

SEC. G

SOLID FUEL TYPE	TONS/YR	%S	LIQUID FUEL TYPE	THOUSANDS OF GALLONS/YR	%S	GAS TYPE	THOUSANDS OF CF/YR	BTU/CF	APPLICABLE RULE	APPLICABLE RULE
144	145	146	147	148	149	150	151	152	153	154

Upon completion of construction sign the statement listed below and forward to the appropriate field representative

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS.

155 SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT | DATE

AGENCY USE ONLY

156 LOCATION CODE	157 FACILITY ID. NO.	158 U.T.M. (E)	159 U.T.M. (N)	160 SIC NUMBER	161 DATE APPL. RECEIVED	162 DATE APPL. REVIEWED	163 REVIEWED BY:
					/ /	/ /	

PERMIT TO CONSTRUCT

164 DATE ISSUED	165 EXPIRATION DATE	166 SIGNATURE OF APPROVAL	167 FEE
/ /	/ /		

168.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169 DATE ISSUED	170 EXPIRATION DATE	171 SIGNATURE OF APPROVAL	172 FEE
/ /	/ /		

173.
1. ☐ INSPECTED BY________________ DATE________
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED ________ DATE ________ INITIALED

174. SPECIAL CONDITIONS:

1	2
3	4.
5	6.
7	8.