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Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-89/072
June 1989

EPA

Superfund Record of Decision:

Kimberton, PA

50272-101

REPORT DOCUMENTATION PAGE

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SUPERFUND RECORD OF DECISION
Kimberton, PA
Second Remedial Action - Final

5. Report Date June 30, 1989

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U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered 800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Kimberton site is in Chester County, Pennsylvania, near the Philadelphia metropolitan area. The site encompasses an industrial production plant currently owned by Monsey Products Company, Inc., and adjacent properties within the neighboring Village of Kimberton. Water quality testing since 1981 has revealed numerous area domestic and commerical potable well water supplies contaminated with VOCs. A portion this contamination originated from the onsite industrial production plant, which sposed of wastes in several lagoons during the 1950s. An EPA investigation in the spring of 1982 revealed the presence of organics, including TCE and DCE, in local ground water, surface water, and soil. In mid 1982, fifty seven, 55-gallon drums from an abandoned onsite septic system were excavated, removed, and disposed of offsite. In 1984 a remedial action program was initiated to excavate, remove, and dispose of approximately 2,050 yd^3 of soil from three former lagoon areas that were highly contaminated with VOCs. These lagoons are in proximity to numerous private water supply wells and less than 1 mile from French Creek, which is used for public recreation and fishing. VOCs are believed to ultimately discharge to surface waters to the north and east in the Village of Kimberton via the ground water. In 1985, 67 residential and commercial wells were sampled and found to contain various
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - Kimberton, PA
Second Remedial Action - Final
Contaminated Media: gw, sw
Key Contaminants: VOCS (TCE)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

vailability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 108

22. Price

(See ANSI-Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

16. Abstract (Continued)

concentrations of TCE, DCE, and vinyl chloride. As a result of these findings, the former and current owners of the plant agreed to provide 23 residential and commercial locations with an alternate source of drinking and contact water as an interim solution under the first operable unit. This second operable unit addresses the contaminated plume and the source of contamination. The primary contaminants of concern affecting the ground water and surface water are VOCs including TCE and DCE.

The selected remedial action for this site includes the continued provision of alternate water supplies through GAC treatment system and/or potable water supply storage tanks; pumping and treatment of ground water using an air stripping system with onsite discharge to an adjacent stream; long-term ground water monitoring; collection and treatment of surface water at the local ground water discharge point using an air stripping system; and institutional controls to restrict ground water use. The estimated present worth cost of this remedial action is $2,630,000, which includes annual O&M costs of $175,000.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Kimberton Superfund Site
Village of Kimberton, Chester County, Pennsylvania

Statement of Purpose

This decision document presents the final selected remedial action for the Kimberton Superfund Site (Site) developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. Section 9601 et seq., and to the extent practicable, the National Contingency Plan (NCP), 40 C.F.R. Part 300.

Statement of Basis

This decision is based upon and documented in the contents of the Administrative Record. The attached index identifies the items which comprise the Administrative Record. The Commonwealth of Pennsylvania has reviewed, commented and concurred on this Record of Decision.

Description of the Selected Remedy

The remedial alternative presented in this document is the second operable unit of a permanent remedy for the Kimberton Site. The first operable unit provided a reliable interim solution for the prevention of health risks to area residents associated with exposure to contaminated groundwater. The alternative selected for the first operable unit required continued monitoring and treatment of contaminated wells on an individual basis until a permanent water line can be established in the community. Treatment consists of filtration utilizing granular activated carbon adsorption. Potentially threatened wells continue to be monitored and will be provided treatment if appropriate. The contaminant plume and source or sources of contamination are the subject of this second operable unit. Pumping of the groundwater and treatment of both ground and surface water by airstripping will be the final remedies for the effective remediation of this Site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare or the environment.

Declaration

The selected remedy is protective of human health and environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective as set forth in Section 121(d) of CERCLA, 42 U.S.C. Section 9621(d). This remedy satisfies the statutory preferences as set forth in Section 121(b) of CERCLA, 42 U.S.C. Section 9621(b), for remedies that employ treatment that reduce toxicity, mobility or volume as a principal element. As a result of soil sampling conducted during a preliminary site assessment three former lagoons were identified within the site with elevated concentrations of volatile organic compounds (VOC). The lagoon areas were excavated in 1984. Analytical results of post-excavation soil samples indicate that lagoon excavation activities successfully removed potential source materials for ground water contamination from Lagoons 6, 7, and 9. Data obtained during and after the excavation indicate a minimum of 95 percent reduction in total VOC concentrations. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This remedy will be reevaluated during the course of this remediation to ensure an effective and timely completion of this remedial action.

6/30/89
Date

Edwin B. Erickson
Edwin B. Erickson
Regional Administrator

Table of Contents
for
Decision Summary

I. Introduction

The Village of Kimberton is located in the northeastern portion of Chester County, Pennsylvania near the Philadelphia metropolitan area (Figure 1). Numerc domestic and commercial potable well water supplies have been sampled by the Chester County Health Department (CCHD) and analyzed by Pennsylvania Department of Environmental Resources (PADER) since January 1982. High levels of chlorinated hydrocarbon chemical contamination have been detected in many of the sampled wells. A portion of this contamination has originated from the property currently owned by the Monsey Products Company, Inc. (Monsey) which contained several buried lagoons that were operated by the CIBA-GEIGY Corporation (CIBA-GEIGY) during the 1950's. The Kimberton Superfund Site (Site) was evaluated through the Federal Hazard Ranking System (HRS) and subsequently placed on the National Priorities List (NPL), a list of hazardous waste sites targeted for action under the Superfund program, in 1982.

Three of the lagoons have been excavated, and contaminated soils were removed to an off-site. The lagoons are in close proximity to numerous private water supply wells and less than one mile from French Creek, which is used for public recreation and fishing. CIBA-GEIGY sampled 67 residential and commercial establishments in August, 1985, and found various concentrations of trichloroethylene (TCE), 1,2-dichloroethylene (DCE) and vinyl chloride (VC) in some wells. These compounds, are all considered hazardous substances for purposes of the Comprehensive Environmental Response, Compensation and Liability Act, as amended (CERCLA). CIBA-GEIGY and Monsey signed a Consent Order and Agreement with PADER to provide certain residential and commercial locations with an alternative source of drinking and contact water in December 1986. In addition, CIBA-GEIGY and Monsey continue to monitor these and other designated locations periodically according to prescribed sampling and analytical procedures outlined under the terms of this Consent Order. This is a Potentially Responsible Party (PRP) funded, Statelead enforcement site.

II. Site Location and Description

The Site (Figure 2) encompasses both the Monsey property and adjacent properties within the surrounding town of Kimberton and the area-wide groundwater contamination. The Monsey property is located within the northeast section of Chester County, on the U.S.G.S. Phoenixville 7.5 minute quadrangle at approximately 75^{O} 34' 30" longitude 40^{O} 07' 3" latitude. The Site is geographically located within the eastern portion of a triangle formed by Route 113 (to the South), Coldstream Road (to the east) and Hares Hill Road (to the north and west). The town of Kimberton is located near the cross roads of Hares Hill Road and Old Kimberton Road, less than 0.2 miles from the Monsey property.

Local physiography is characterized by rolling countryside generally comprised of small hills and valleys. Site area surface water drains toward French Creek, which generally flows from west to east approximately 0.75 miles to the north of the Site. The ultimate regional drainage basin, of which French Creek is a tributary, is the Schuylkill River located approximately 3.5 miles to the northeast.

The Site is underlain by graphitic gneiss to the southwest and clastic sedimentary rocks (shales, sandstones, and siltstones) to the northeast.

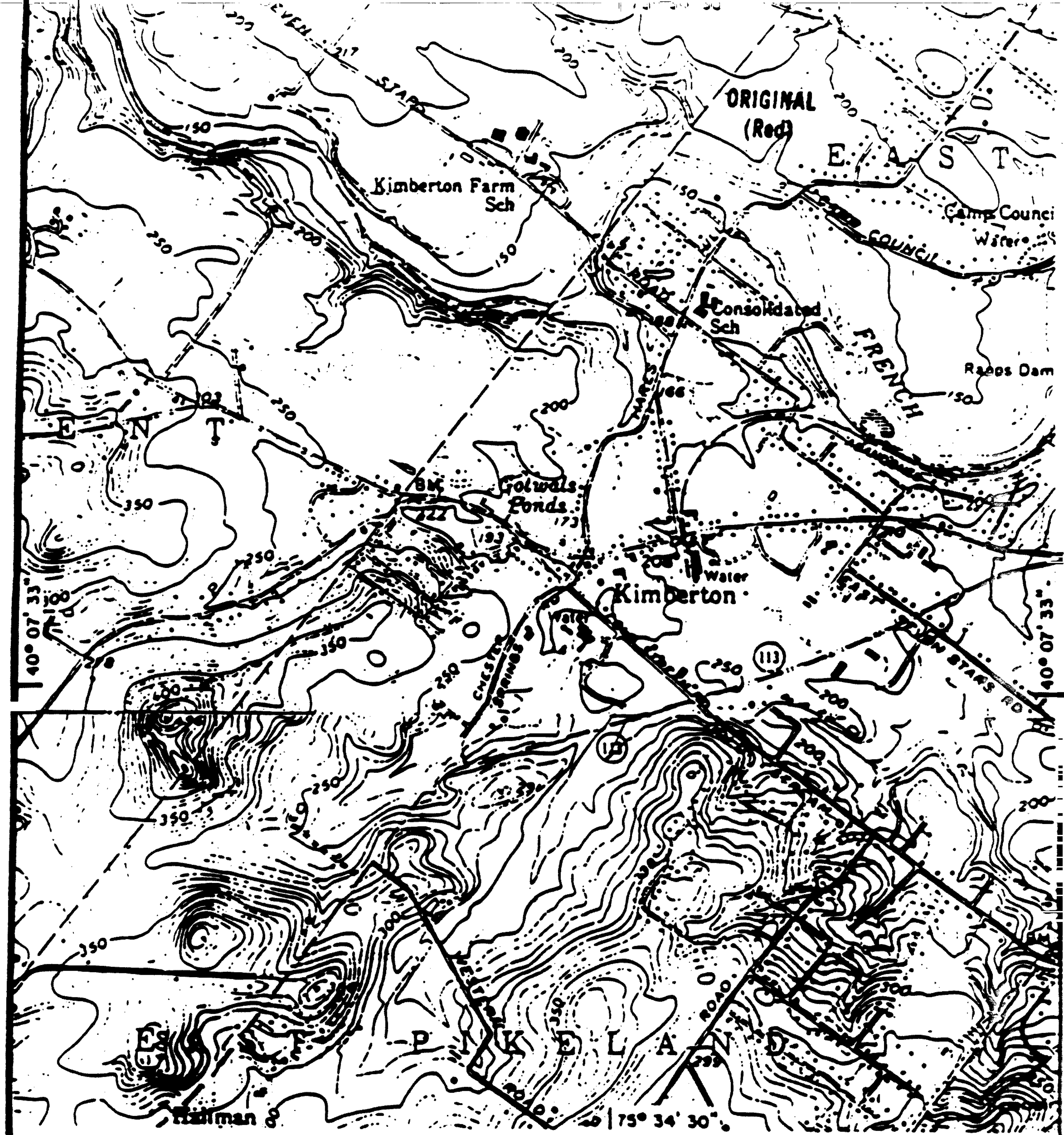


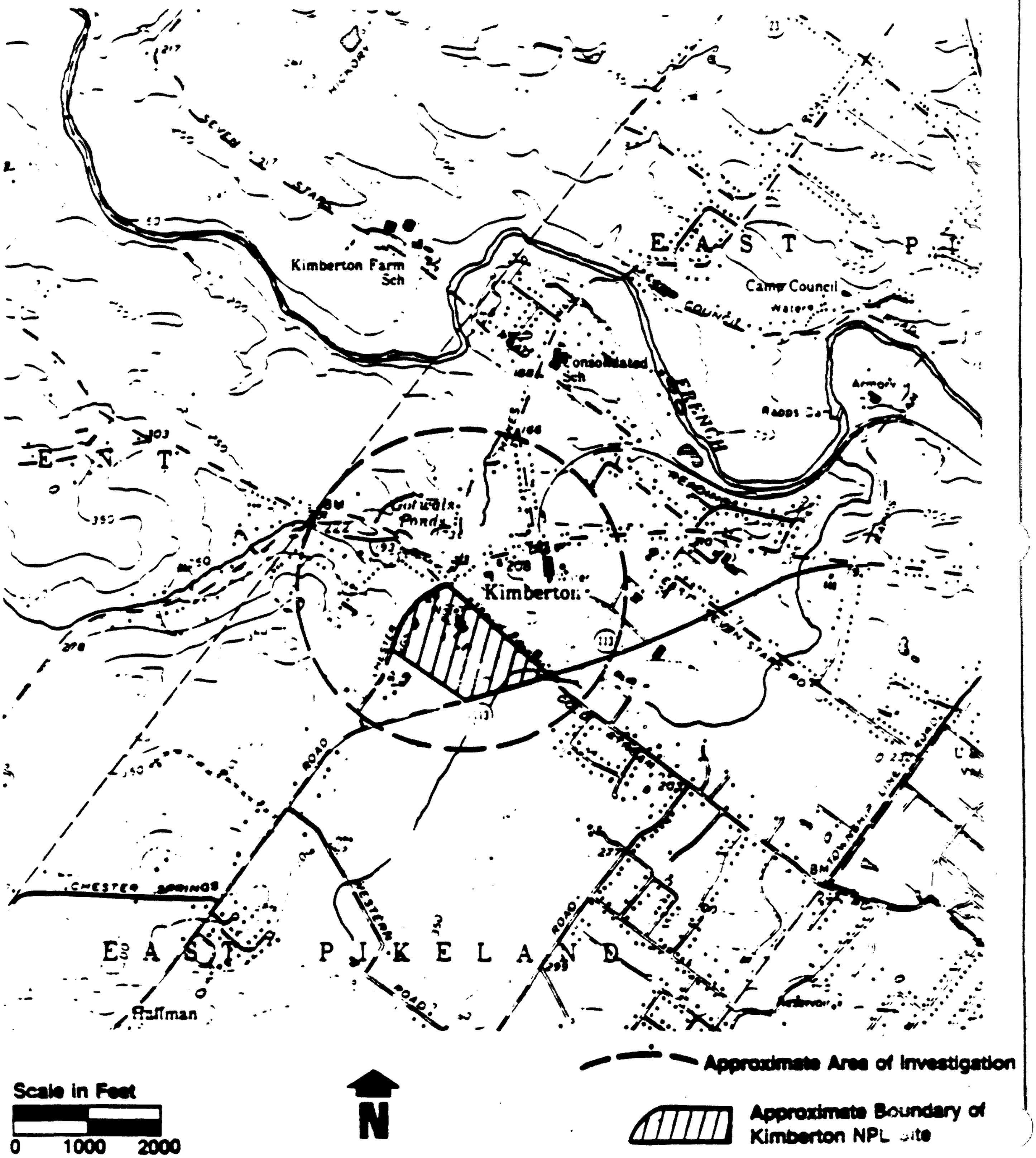
FIGURE 1
SITE LOCATION
MONSEY / CIBA-GEIGY
KIMBERTON, PA.

SOURCE: USGS MALVERN AND PHOENIXVILLE, PA. QUADS

GROUNDWATER TECHNOLOGY
CONSULTING GROUNDWATER GEOLOGISTS

Figure 1

Figure 2
Area of Investigation
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania



Source: USGS 7.5 Minute Topographic Quadrangles, Phoenixville and Malvern, PA

Local hydrogeology primarily consists of a water table aquifer discharging into local surface streams at topographic lows through a system of springs and seeps. As would be expected, ground water movement through deeper, bedrock zones appears to occur primarily through secondary porosity (fractures and bedding plane partings).

III. Site History

The property known as the Kimberton site appears as parcel #194 on the Chester County Tax map shown in Figure 3. The property is currently owned by Monsey Products Company, Inc. and was purchased by Monsey in 1968 from Firmenich Incorporated.

The chain of title search indicates that three companies have held title to the property presently known as the Kimberton site:

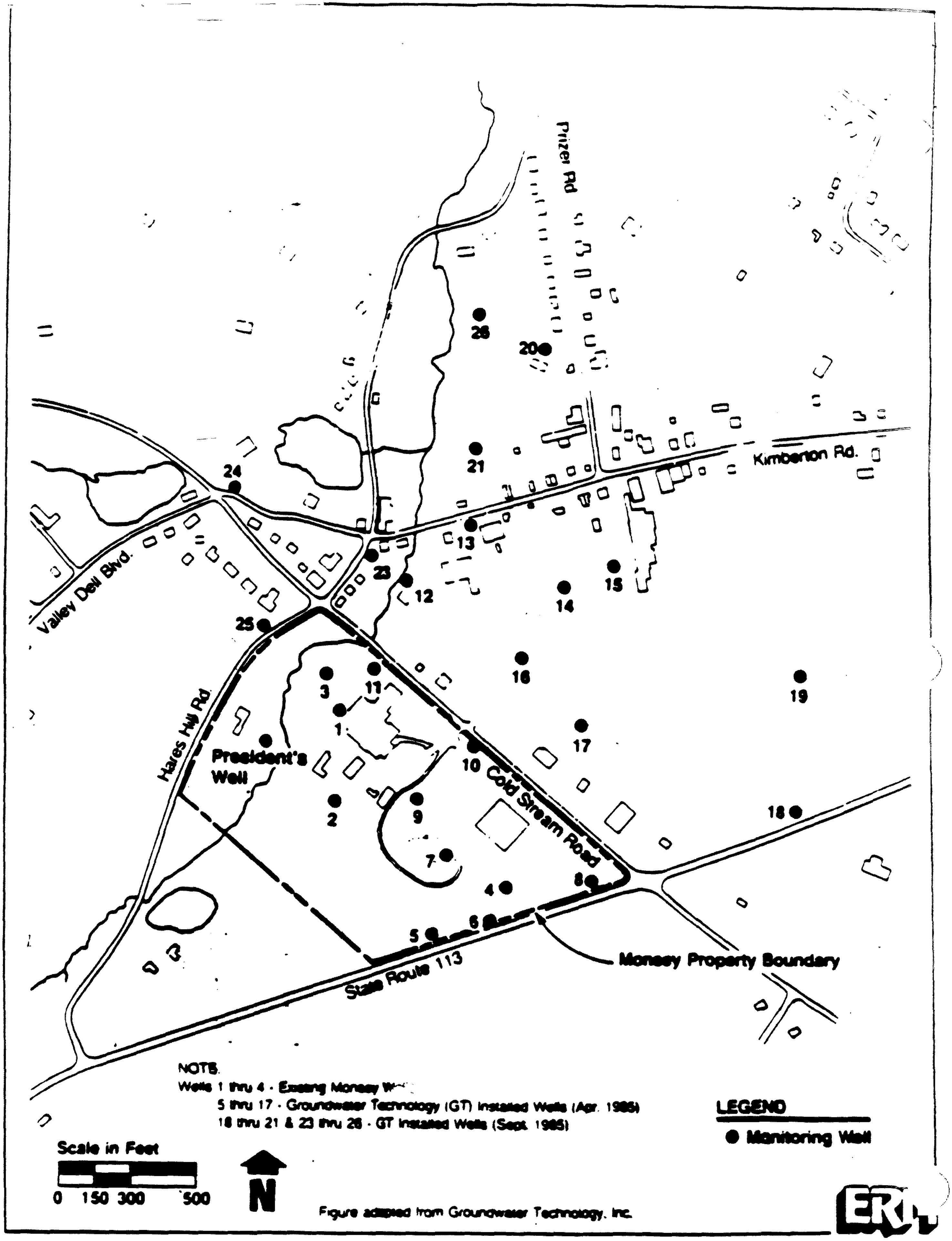
- Ciba Products Corporation
- Firmenich Incorporated
- Monsey Products Company, Inc.

Corporate research on these three companies indicates that they are all involved in industrial production. Ciba Products Corporation (now CIBA-GEIGY Corporation) produces pharmaceuticals, contact lenses, herbicides and fungicides, and seeds. Firmenich Incorporated is involved in the production of chemicals and synthetic perfumes and Monsey Products Company, Inc. produces asphalt, coal tar roofing, driveway sealer and automotive undercoatings.

During the period of Site ownership by a predecessor of CIBA-GEIGY (Ciba Products Company) from 1947 to 1959, a series of eight lagoons were operated on the Site. These lagoons, which received various residues from the manufacturing operations at that time, were ultimately abandoned and closed. Several of these lagoons were subsequently backfilled or otherwise regraded.

Volatile organic compounds were first detected in the groundwater at Kimberton during routine water quality testing of a private well on the Monsey property by CCHD in August 1981. Subsequent testing of 24 additional local wells by PADER from January through March of 1982 detected levels of a number of volatile organic compounds in twelve of the wells sampled.

In response to the groundwater contamination in the Kimberton, EPA conducted a field investigation of local groundwater, surface water, and soil contamination in the Spring of 1982. This investigation revealed the presence of organic chemicals, including trichloroethylene (TCE) and trans2-dichloroethylene (DCE), in local groundwater, surface water, and soils sampled from the site. As a result of the field investigation team's (FIT) report of July 23, 1982, the Site was placed on the NPL by the EPA.



NOTE.
Wells 1 thru 4 - Existing Moncey W
5 thru 17 - Groundwater Technology (GT) Installed Wells (Apr. 1985)
18 thru 21 & 23 thru 26 - GT Installed Wells (Sept. 1985)

Figure adapted from Groundwater Technology, Inc.

Figure 3

Investigations conducted by CIBA-GEIGY and Monsey since the initial detection of organic compounds in water and soil samples have indicated a gradual release of volatile organic compounds through the subsurface to the local water table. These compounds gradually migrate with the local groundwater gradient and discharge to surface waters to the north and east in the Village of Kimberton. Volatile organic compounds have been detected in a number of private wells in an apparent downgradient direction from the current Monsey property. Limited, low level surface water contamination has also been detected in local receptor streams.

IV. Enforcement History

Past disposal practices, involving hazardous substances, which occurred between 1947 to 1959, have resulted in groundwater and soil contamination at this site. In September 1986 PADER, which is the lead agency for enforcement for this Site, sent to CIBA-GEIGY and Monsey letters informing these companies that they were Potential Responsible Parties (PRPs) and liable for the contamination at this Site. In addition, these letters sought their participation in the Remedial Investigation and Feasibility Studies (RI/FS) process. Both companies agreed to conduct a RI/FS at this Site, to provide an alternate source of drinking and contact water to those residential and commercial locations whose water supply was contaminated by the Site, and to continue to monitor specified locations for the identified contaminants. These provisions were formally documented in two Consent Order and Agreements with PADER in 1986 and 1987.

V. Site Characteristics

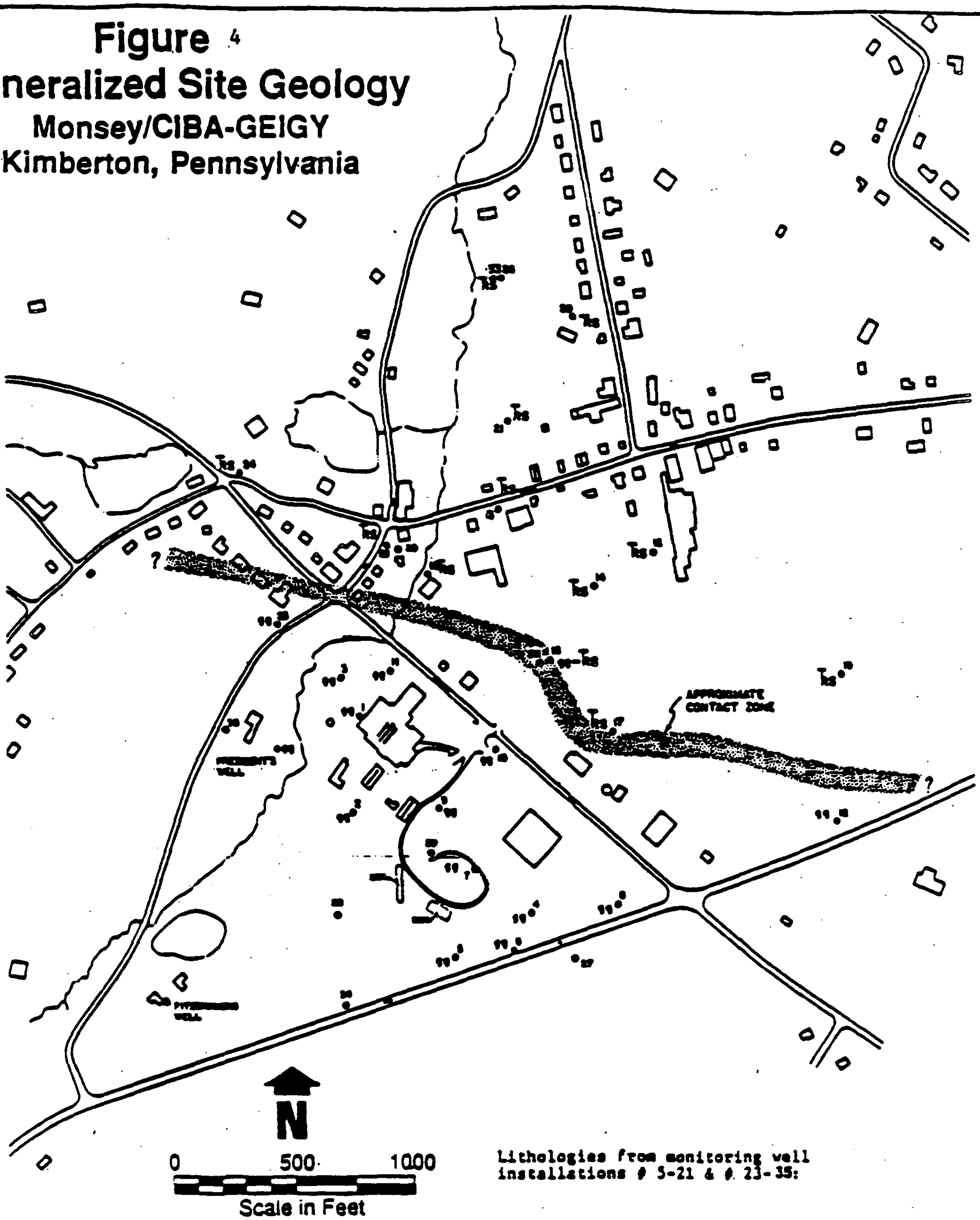
A. Geology/Hydrogeology

1. Site Geology

There are two predominant geologic formations in Kimberton: a graphitic gneiss which is a metamorphic rock of Precambrian age described as a medium-grained gneiss and schist characterized by the presence of graphite; the other, the Stockton Formation, a sedimentary unit of Triassic age and consisting locally of gray and red siltstones, red shales, fine to medium gray and reddish gray sandstones and arkosic sandstones (Figure 4). The shales and siltstones are sometimes thinly interbedded with impure carbonate rock. The contact zone between the graphitic gneiss and the Stockton Formation lies to the northeast of Coldstream Road and in an approximate WNW to ESE orientation. It is, for the most part, ill-defined and has been mapped using drilling logs of the monitoring wells installed by Groundwater Technology Inc., (GTI) (a contractor employed by CIBA-GEIGY). As determined through drilling of the monitoring wells, the graphitic gneiss has undergone significant mechanical and chemical breakdown (weathering).

The weathering has worked progressively downward from the surface, creating an upper unconsolidated weathered zone of decomposed rock and soil which grades vertically into a crumbly, gravel-like material where pieces of sand-to boulder-size rocks remain in place in a clayey matrix. The weathered zone was found to be between 50 feet and 75 feet in thickness, except in one area where it was only 30 feet thick. Groundwater is located almost exclusively within the weathered portion of the graphitic gneiss (locally on the Monsey

Figure 4
Generalized Site Geology
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania



Lithologies from monitoring well installations # 5-21 & # 23-35:

LEGEND

● [illegible]

[illegible]

Ꞁs Consists locally of grey & red siltstones & red shale; fine to medium grained grey & reddish-grey sandstones & arkosic sandstones. Shale & siltstones are sometimes thinly interbedded with impure carbonate rock.

gg Dominantly quartz & feldspar with varying amounts of mafics & graphite: [illegible] property).

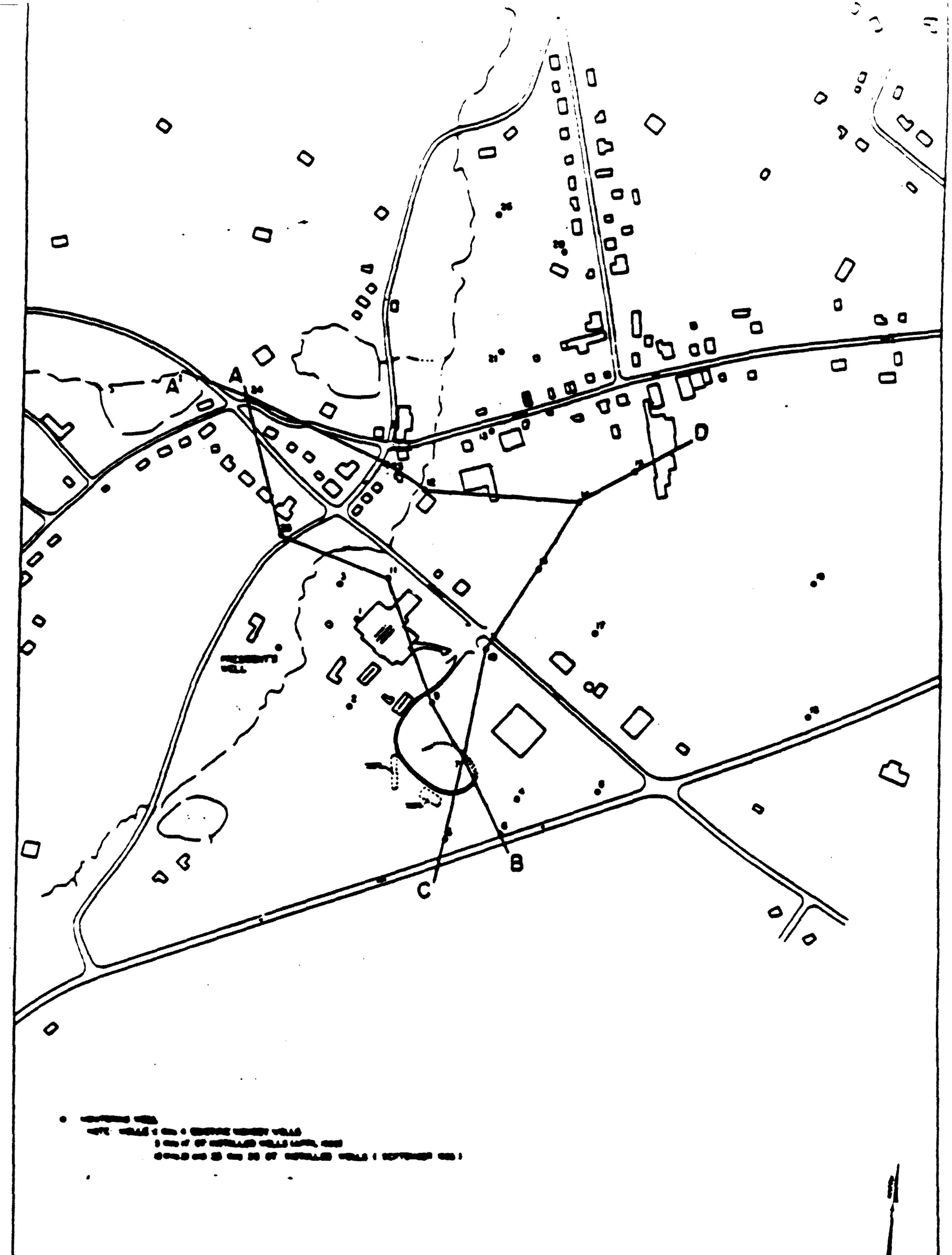
Weathering within the Stockton Formation was far less severe with the weathered layer generally ranging in thickness from 5 feet to 15 feet (Figure 5).

2. Hydrogeology

The hydrogeology of the Kimberton area is typical of the Chester County region as a whole. Water levels fluctuate in response to seasonal precipitation and evapotranspirational trends. The water table closely mimics topography, with the dominant recharge areas lying in the higher elevations and discharge zones consist of springs and streams at low elevations.

Within the area of concern, water table conditions exist within two contrasting (lithogically derived) water-bearing units: The metamorphic graphitic gneiss (encompassing the Monsey property) and the Stockton Formation (comprising the downtown Kimberton area and surrounding properties). As discussed previously, the graphitic gneiss is highly weathered to a median depth of 50 feet to 75 feet. The unconsolidated upper part of the graphitic gneiss generally has moderate to low permeability, but contains a considerable amount of water in storage. Below the unconsolidated zone the rock is generally solid; however, some minerals are heavily weathered, particularly along fractures. Permeability and storage capacity of the solid fractured rock generally decrease with depth as the degree of weathering decreases. The highest permeability probably occurs where the unconsolidated and solid rock merge. In this transitional area, openings in rock are formed or enlarged by the weathering process. Storage capacity, however, is low because the rock has limited porosity.

Groundwater movement through the gneiss tends to migrate in response to elevational changes in the water table (Figure 6). The subsurface zone of primary movement is noted within the highly weathered and fractured upper portion of the gneiss. Deeper water-bearing zones are reported to occur at fracture traces (dominantly vertical to subvertical in profile), and generally receive recharge via vertical infiltration from the overlying horizons. Local well yields within the graphitic gneiss range from 4 - 25 gallons per minute (gpm) in wells which draw water from the weathered zone, with over 200 gpm reported in several of the deeper wells (existing Monsey wells # 1-4) which may penetrate deeper fractures within the bedrock gneiss. Groundwater movement locally within the graphitic gneiss and suspect fracture zones are regionally interpreted in a north-north easterly direction from the Monsey property and downtown Kimberton area, toward French Creek.

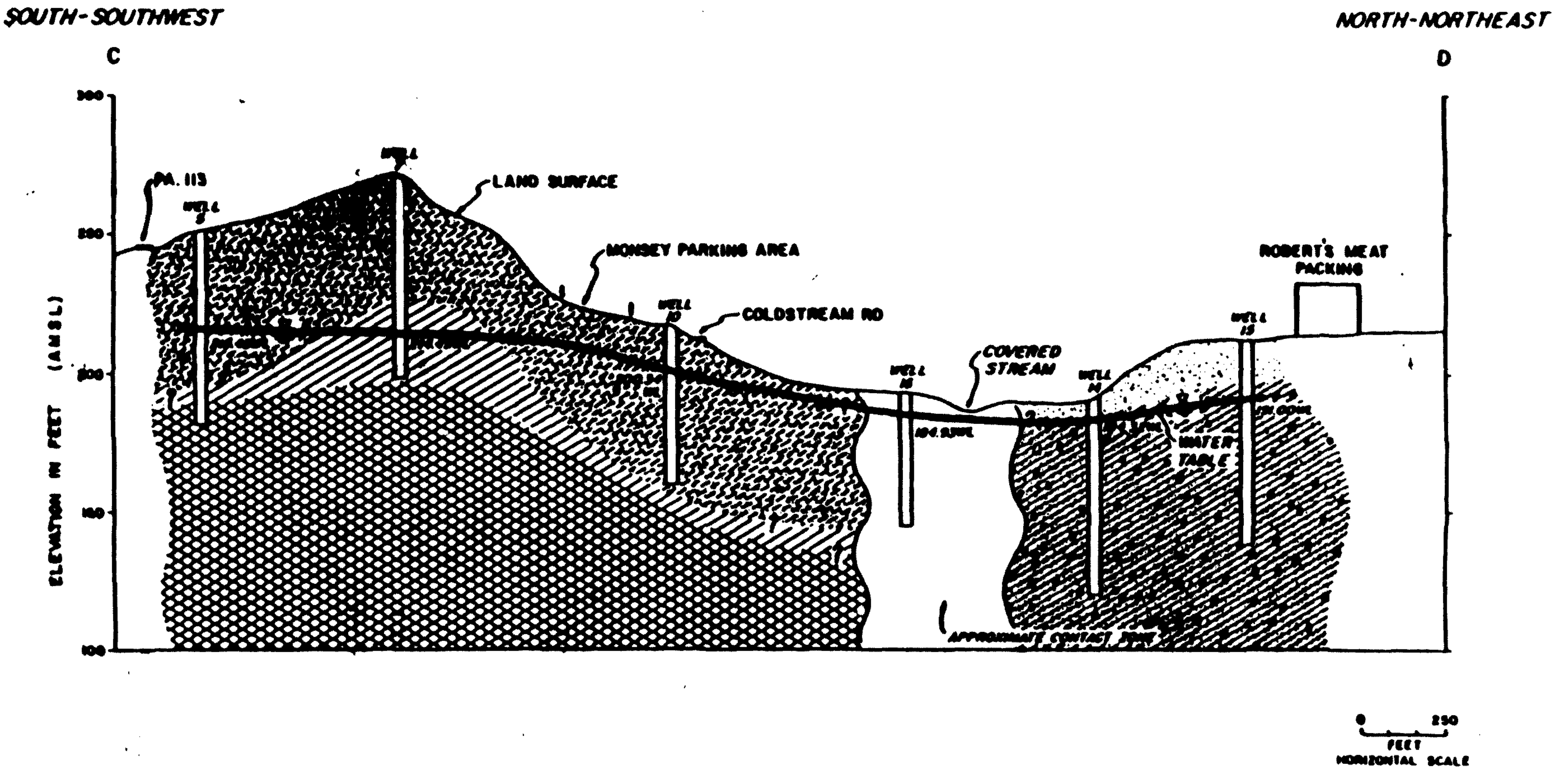


LOCATION OF GEOLOGIC PROFILES

A-B, C-D, A'-D

GROUNDWATER TECHNOLOGY

Figure 5



WL	WATER LEVEL (in feet) 30 SEPT 1988
▨	HIGHLY WEATHERED METAMORPHIC GNEISS
▨	MOSTLY WEATHERED METAMORPHIC GNEISS
▩	UNWEATHERED METAMORPHIC BEDROCK GNEISS
▨	STOCKTON FORMATION (UNDIFFERENTIATED)
▒	WEATHERED ZONE STOCKTON FORMATION

NOTE: VERTICAL SCALE IS FIVE TIMES HORIZONTAL SCALE

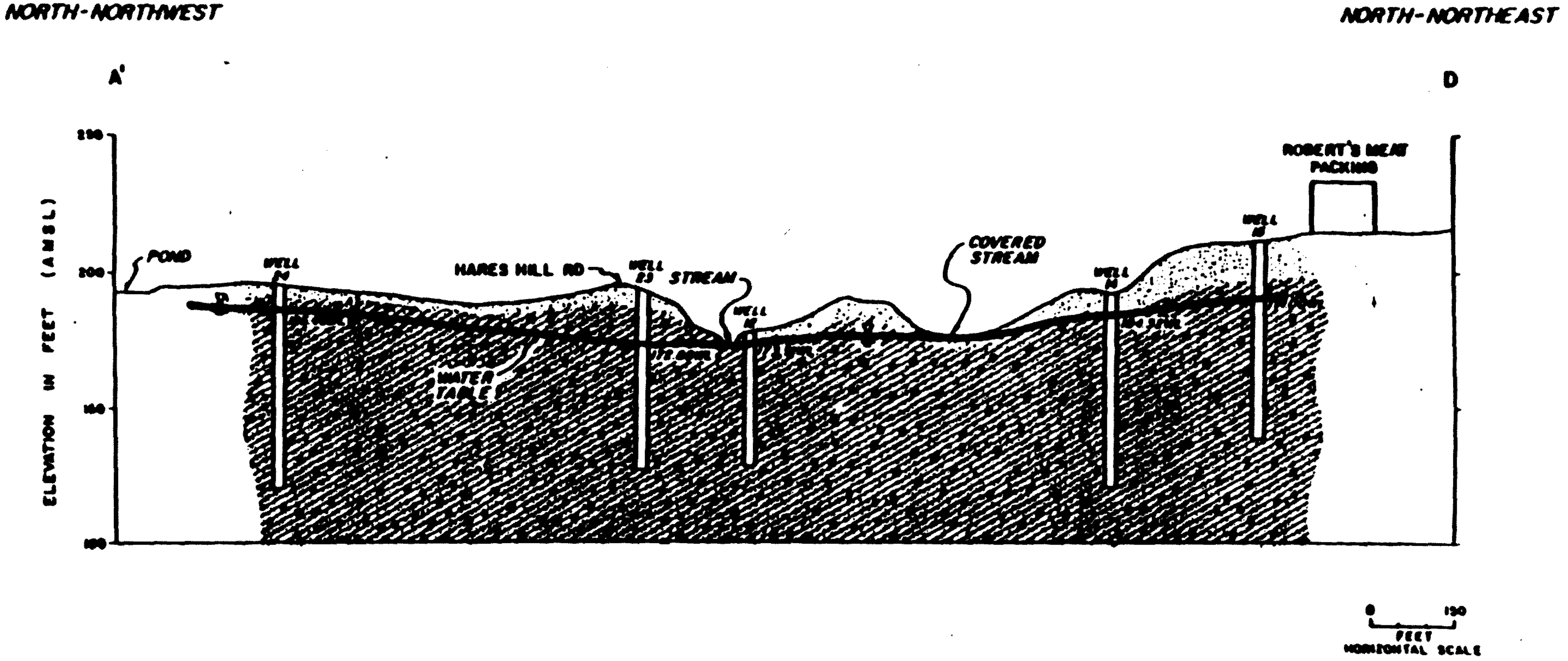
Stockton Formation: consists locally of grey and red siltstones and red shale; fine to medium grained grey and redish-gray sandstones and arkosic sandstones. Shales and siltstones are sometimes thinly interbedded with impure carbonate rock.

Metamorphic Gneiss: Dominantly quartz and feldspar with varying amounts of mafics and graphite; exhibits zones of preferential weathering.

GEOLOGIC PROFILE
SECTION C-D

GROUNDWATER TECHNOLOGY

Figure 5 (cont'd)



GEOLOGIC PROFILE
SECTION A'-D

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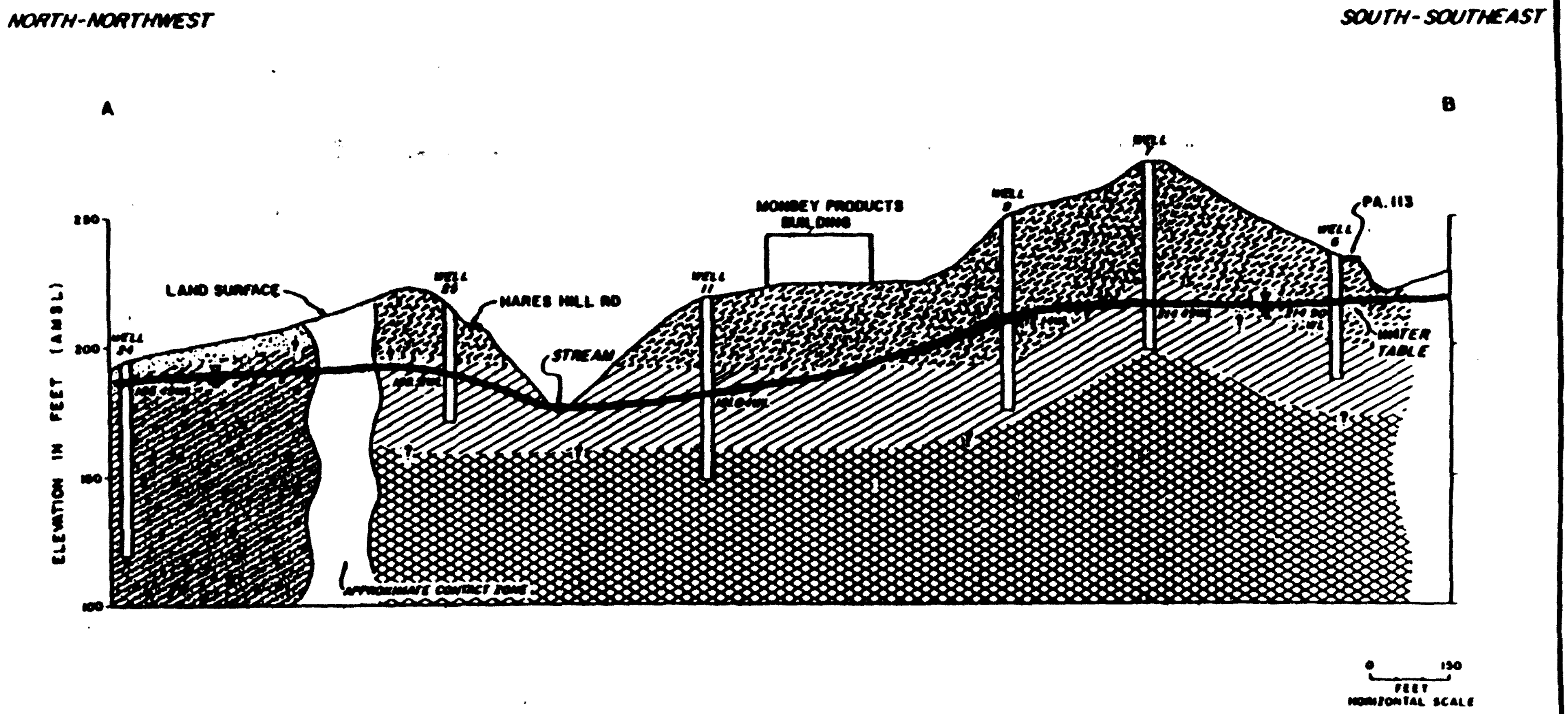
WL WATER LEVEL (in feet) 30 SEPT 1988

▨ STOCKTON FORMATION (UNDIFFERENTIATED)

░ WEATHERED ZONE STOCKTON FORMATION

NOTE: VERTICLE SCALE IS FIVE TIMES HORIZONTAL SCALE

GROUNDWATER TECHNOLOGY



WL WATER LEVEL (in feet) 30 SEPT 1988

▨ HIGHLY WEATHERED METAMORPHIC GNEISS

▨ MOSTLY WEATHERED METAMORPHIC GNEISS

▨ UNWEATHERED METAMORPHIC BEDROCK GNEISS

▨ STOCKTON FORMATION (UNDIFFERENTIATED)

▨ WEATHERED ZONE STOCKTON FORMATION

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Metamorphic Gneiss: Dominantly quartz and feldspar with varying amounts of mafics and graphite; exhibits zones of preferential weathering.

GEOLOGIC PROFILE
SECTION A-B

GROUNDWATER
TECHNOLOGY

WATER TABLE ELEVATION (in feet above sea level)
30 JULY 1986

GROUNDWATER
TECHNOLOGY

The Stockton Formation generally consists of interbedded sandstones, siltstones, and shales. The interbedding and fracturing has caused extremely anisotropic and heterogeneous hydraulic characteristics associated with this formation. Groundwater is largely transmitted along bedding planes, fractures and joints. Water withdrawal rates noted for wells locally penetrating the Stockton Formation have yielded between 2 and 20 gpm, depending upon the nature, location, and depth of wells.

a. Groundwater

Groundwater elevations of monitoring wells both on and off the site were measured from the top of secure casings using electrical water level detectors (Figure 7). Field surveys were performed to determine accurately the horizontal coordinates and vertical elevations (tied into U.S.G.S. bench mark datum located in downtown Kimberton) of well casings. Respective field data transposed onto prepared base maps provided a basis for the following interpretative correlations relative to groundwater movement within the Monsey property and adjacent Kimberton area:

- The occurance of groundwater is under water table conditions at depths ranging from approximately 2 feet to 50 feet below land surface.

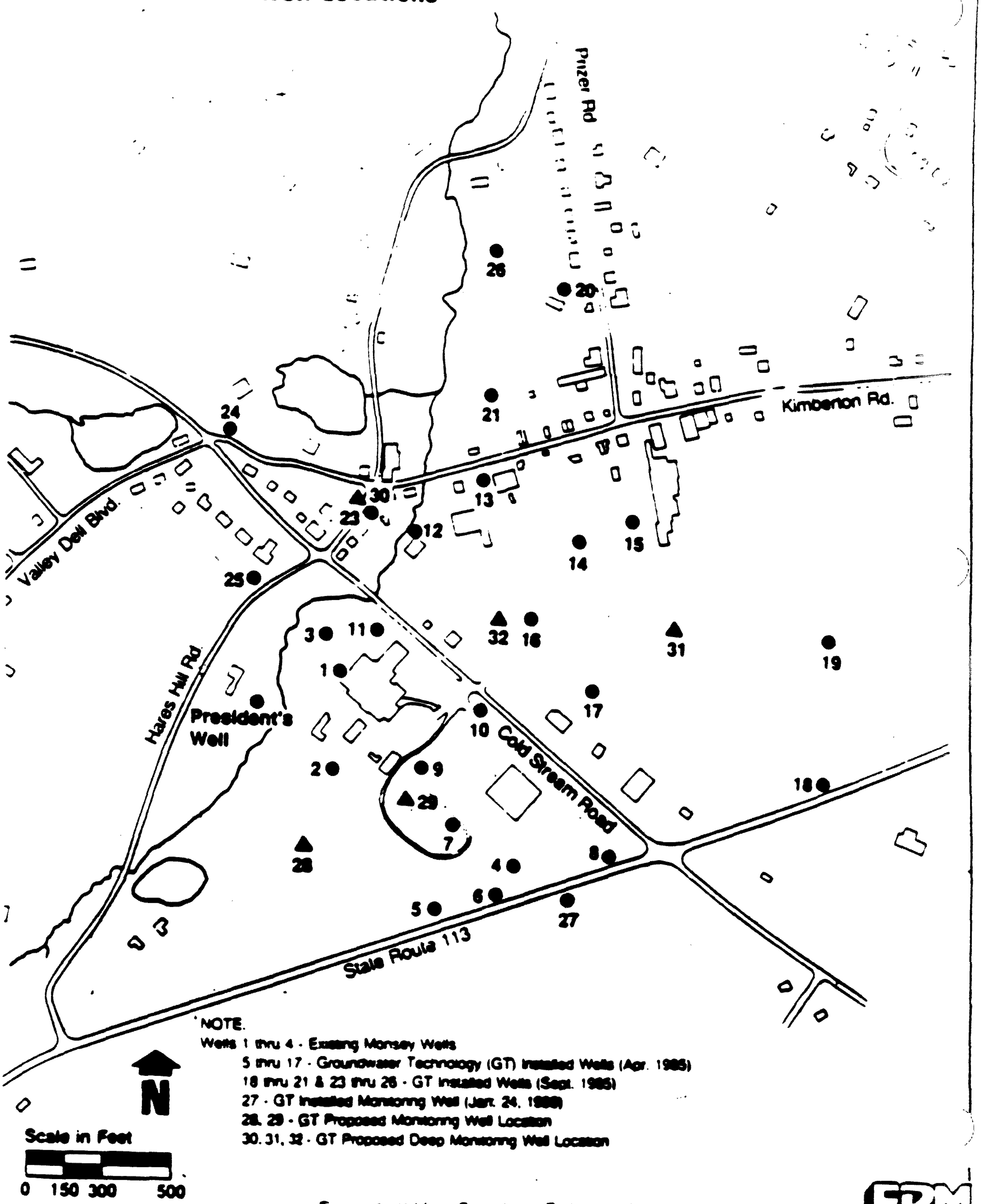
- Water table elevations mimicking a subdued version of surface topography: increased groundwater elevations correlating to areas of high topographic elevations such as ridges and knolls; reduced groundwater elevations occurring dominantly in topographically low areas characterized by streams, creeks, and springs.

- Local groundwater recharge to the Monsey property and adjacent Kimberton area occurs from both vertical infiltration onto related surface areas and directionally from adjacent topographic high areas; dominantly from the south of route 113, from the north of Hares Hill Road, and from the east of downtown Kimberton (up topographic gradient from the easterly direction of the unnamed creek/marsh area).

- Ground water discharge locally occurs through surface springs, seeps, and creeks to small streams located within local topographic lows. One such discharge area is located adjacent to the northwest boundary of Monsey's property as an unnamed creek flowing to the northeast through the center of Kimberton (Stream "A"; Figure 8). Another such discharge area exists to the northeast of the Monsey property as a minor unnamed creek flowing to the northwest and eventually converging with Stream "A" (Stream "B"; Figure 8). A third local groundwater discharge occurs to the southeast of the Monsey property, again as an unnamed minor creek in this case flowing generally southeast from the site area (Stream "C"; Figure 8).

- Ground water gradient and ground water flow are directionally controlled in response to elevational changes in the water table. Under natural, non-pumping conditions, the predominant ground water gradient from the Monsey property ranges directionally from the northwest clockwise through the southeast,

Well Locations



NOTE.

Wells 1 thru 4 - Existing Monsey Wells
5 thru 17 - Groundwater Technology (GT) Installed Wells (Apr. 1986)
18 thru 21 & 23 thru 26 - GT Installed Wells (Sept. 1986)
27 - GT Installed Monitoring Well (Jan. 24, 1988)
28, 29 - GT Proposed Monitoring Well Location
30, 31, 32 - GT Proposed Deep Monitoring Well Location

Figure adapted from Groundwater Technology, Inc.

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Figure 7

Site Area Stream Flow and Spring Locations

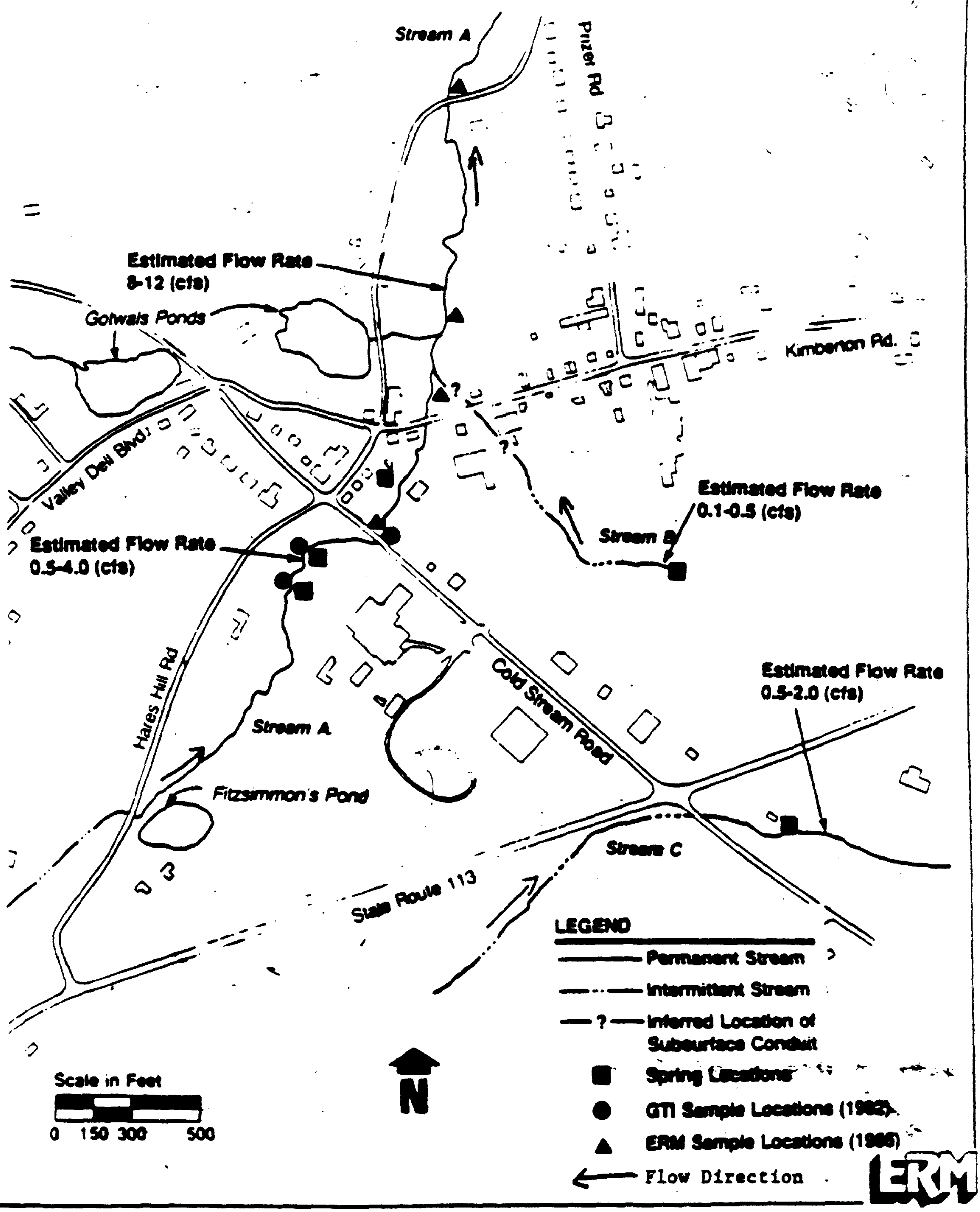


Figure 8

toward the above noted groundwater discharge zones.

- Physiochemical parameters measured from area monitoring wells as baseline water quality characteristics (pH, TDS, and chloride) appear to fall within background ranges.

b. Surface Water

The local surface waters can be divided into three unnamed streams (Figure 8) emanating within and/or flowing through the central Kimberton area. For clarity, the streams have been designated as follows:

- Stream A: A small, permanent stream (the primary stream in the center of Kimberton) flowing generally south to north, adjacent to the northwestern boundary of the Monsey property. This stream is primarily spring fed west of the Site from sources at and upstream of the gneiss/clastic contact zone. Estimated average stream flow in this area ranges seasonally from 0.5 to 4 cubic feet per second (cfs). A significant increase in stream volume occurs upon its confluence with the outfall from Gotwals Ponds. Estimated flow downstream of this confluence ranges from 8 to 12 cfs.

- Stream B: An apparent minor intermittent stream which appears to originate from a spring near the location of the Kimberton town dump as of 1950. The terminus of this stream is not visible on aerial photographs but it is believed to become confluent with Stream A. Estimated flow down the headwaters is 0.1 to 0.5 cfs. Downstream flow has not been observed but is not anticipated to be significant.

- Stream C: A tributary of French Creek which flows south of the intersection of Route 113 and Cold Stream Road. This stream derives a major volume of its flow from topographically high areas to the south of the study area. Stream flow appears to be intermittant upstream of Cold Stream Road. However, a significant increase in stream flow results from a major spring located roughly 300 feet downstream from Cold Stream Road with flows estimated at 0.5 to 2 cfs.

B. Extent of Contamination

1. Drum Removal

In mid 1982 CIBA-GEIGY and Monsey supervised the excavation and removal of 57, 55-gallon drums from an abandoned, on-site septic system formerly used to serve the plant's wastewater storage needs. These drums contained off-specification asphaltic materials which had been used as partial backfill for the collapsed septic pit sometime earlier. The drum removal program, conducted in conjunction with PADER, consisted of removal of all drums from the pit area, procurement of samples from five representative drums for analysis, procurement of post-excavation soil samples for analysis, and appraisal of possible casual relationship between the buried drums and the groundwater contamination.

The drum excavation, removal, and disposal program was successfully completed in November, 1982. Soil samples at a level beneath the excavation floor indicated no extensive migration of organic compounds from the area.

The preliminary hydrogeologic assessment conducted by CIBA-GEIGY and Monsey recommended a more definitive off-site investigation of the groundwater surrounding the site. This is currently being completed.

2. Lagoon Excavation

As a result of soil sampling conducted during preliminary site assessment activities, three areas were identified within the Monsey property with relatively high levels of organic compound contamination. Study of available historic aerial photographs confirmed that the three areas were former treatment lagoons. These three areas, identified by GTI as Lagoons 6, 7, and 9, were characterized by materials of similar chemical composition and physical appearance.

Upon review of this information and at the request of PADER, a program was undertaken by the CIBA-GEIGY and Monsey to excavate, remove, and dispose of soils from the three former lagoon areas as part of a site remedial action program.

The excavation program was finalized during August and early September 1984. Actual site excavation was initiated on September 17 and completed on September 25. Site backfilling and restoration were completed on October 8.

Upon completion of the excavation program on September 25, 1984, a total of 143 truckloads of contaminated soil had been excavated from the site representing approximately 2,050 cubic yards of material. All excavated materials were confirmed as received at the licensed TSD facility operated by CECOS International, Inc., in Niagara Falls, New York.

Excavation limits were determined in the field by visual assessment and through photoionizer measurements procured along the base and sides of each excavation. Upon completion of the excavation program, representative soil samples were obtained from pit floors and walls in the presence of PADER or EPA, and sample splits were provided to PADER for analysis. Subsequent to this process, marker horizons were placed in each excavation and backfilling was initiated. Site backfilling and restoration were initiated on September 26, 1984, and completed on October 8, 1984, with the application of vegetative cover material.

The combination of visual assessment, low-level recorded photoionizer readings, and analytical results of post-excavation soil samples all indicate that the lagoon excavation remedial action program was successful in removing potential source materials of ground water contamination from the Site. Data obtained during and subsequent to the excavation program indicate a minimum of 95 percent reduction in total volatile organic compound concentration in these former lagoons.

To more completely define the representative concentrations of the chemical compounds within each of the former lagoon areas, a program of discrete soil sampling was implemented from January 11-19, 1988. Soil samples were collected from former Lagoons 1, 2, 3, 4, 8, and Area 5 in accordance with the Work Plan for Completion of the Remedial Investigation and Feasibility Study; Kimberton, Pennsylvania (RI Work Plan) (July 1987). Locations of the former lagoons and sample points are depicted in Figure 9.

Conclusions from the Lagoon Investigation

- The average accumulation of silty clay overburden, observed beneath the former lagoon areas, was approximately 8 feet in thickness. In light of the fact that no distinct lithologic differentiation was observed between lagoon fill material and the indigenous overburden, it is assumed that the former lagoons were filled by regrading adjacent soils. In all cases, directly beneath the silty clay horizon a distinct graphitic gneiss saprolite was encountered.

- Former Lagoon 1 was comprised of approximately 5 to 7 feet of silty clay overlying the weathered graphitic gneiss. With the exception of the 8 to 10 foot sample interval of boring C (10.0 ppm), no significantly elevated field OVA readings were observed.

- Former Lagoon 2 contained approximately 7 to 8 feet of overburden. Due to the detection of elevated Organic Vapor Analyzer OVA readings in soil boring B (50 ppm), this boring was advanced approximately 3 to 4 feet below the lagoon/saprolite interface, at which point field OVA readings had decreased to 9 ppm.

- Former Lagoon 3 was characterized by the greatest accumulation of silty clay overburden, averaging 11 feet in thickness. No elevated field OVA readings were observed during the soil boring program. It is presently believed that a semi-continuous layer of dark gray brittle material exist at a depth of approximately 6 feet, proximal to borings C and E.

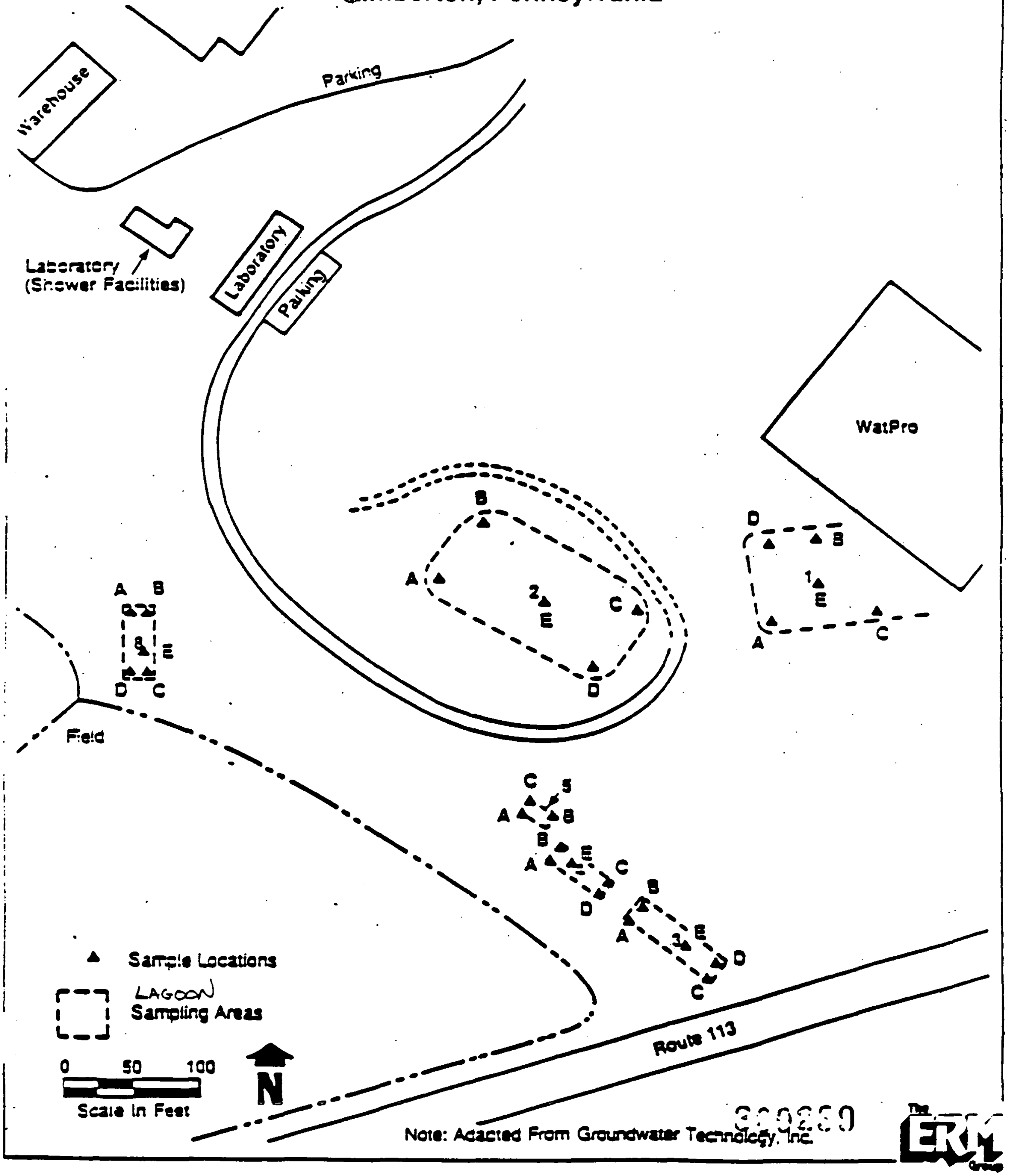
- Former Lagoon 4 demonstrated 6 to 8 feet of overburden, characterized by the absence of elevated field OVA readings. A semi-continuous anomalous layer (1/4 inch thick dark gray brittle layer) was encountered at a depth of approximately 6 feet below boring locations E and D.

Figure 9

Supplemental Soil Sample Locations

Monsey/CIBA-GEIGY

Kimberton, Pennsylvania



Note: Adapted From Groundwater Technology, Inc.

- Area 5 demonstrated the presence of a distinct top soil horizon and a 7 to 8 foot thick silty clay unit overlying the graphitic gneiss saprolite. An anomalous occurrence of a 3/4-inch thick gray/blue brittle layer was observed near the surface in boring B. No elevated field OVA readings were observed during the soil boring program.

- Former Lagoon 8, unlike the other lagoon areas, has not been completely regraded and is, therefore characterized by a distinct depression with the ground surface. Approximately 5 to 7 feet of overburden was encountered above the saprolite horizon in this area. With the exception of the four to six foot sample interval of boring C (7.2 ppm) no elevated OVA readings were observed during the sampling program. A 3-inch thick "beige paste" layer was observed consistently at a depth of three to four inches below grade in borings A, B, and E.

- With the exception of former Lagoons 1 and 2, only trace concentrations of a limited number of Target Compounds List (TCL) volatiles were detected in lagoon soil samples.

- Lagoon 2 was characterized by the presence of four volatile compounds: trichloroethene, chlorobenzene, ethylbenzene and xylenes at concentrations of 410 ug/kg, (microgram/Kilogram) 96 ug/kg, 11 ug/kg, and 25 ug/kg, respectively.

- Former Lagoon 1 demonstrated the presence of trichloroethene at a concentration of 70 ug/kg and chlorobenzene at 9 ug/kg.

- With the exception of Area 5, six TCL semivolatile compounds were recorded in various combinations at trace to low concentrations in the former lagoon areas.

- Area 5 was characterized by the presence of eight TCL semivolatile compounds ranging in estimated concentrations from a low 290 ug/kg (2-methylphenol) to a high of 5700 ug/kg (phenol).

3. Groundwater Contamination

The highest concentrations of volatile organic components (VOC) monitoring wells were found in those adjacent to, and directly down hydraulic gradient from the site of the former lagoons. Although wells #5, #14, and #21 are reasonably close to wells having high VOC concentrations (wells #7, #16 and #13, respectively) they remain uncontaminated because of their upwater table gradient positions within the hydraulic regime. VOC's were in detected in shallow ground water west of the lagoon areas (at well #28) but based on water table gradient maps and chemical analysis of samples from wells #34 and #35, in addition to the Fitzsimmon well (no VOC detected in all three wells), ground water in this are appears to be discharging to Stream A, northeast of the Fitzsimmons property (Figure 12 and Tables 1 and 2).

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TABLE 1
DETERMINATION OF VOC CONCENTRATIONS WITHIN VARIOUS AQUIFER ZONES AND IN SPRING A-10

Zone**	Well	Average Concentration (ppb)*				Total VOCs (ppb)
		Trichloroethene	1-1,2-Dichloroethene	Vinyl Chloride	1,1-Dichloroethene	
1 > 3,000 ppb VOCs	2	254	6,117	183	5	
	7	6,300	4,215	278	39	
	9	6,313	1,050	–	–	
	Maximum	6,313	6,117	278	39	12,747
2 2,000 - 3,000 ppb VOCs	10	1,232	1,102	–	–	
	29	2,100	700	–	–	
	Maximum	2,100	1,102	–	–	3,202
3 1,000 - 2,000 ppb VOCs	1	250	540	690	–	
	11	747	937	164	25	
	13	594	637	–	10	
	16	1,045	964	315	21	
	32	433	530	–	7	
	Maximum	1,045	964	690	25	2,724
4 Trace - 1,000 ppb VOCs	President's	48	1,053	–	–	
	3	197	603	–	–	
	4	96	62	49	–	
	5	–	–	–	–	
	6	13	–	–	–	
	8	27	6	–	–	
	12	563	1,050	–	–	
	17	608	323	–	7	
	23	16	21	–	13	
	25	–	3	–	–	
	28	397	147	–	–	
	30	4	4	–	–	
	Maximum	608	1,053	49	13	1,723
Spring A-10	–	800	790	–	9	
	Maximum	800	790	0	9	1,599

*Based on all samples analyzed from 5/85 henceforth.

**Zones were established based upon the approximate total VOC isoconcentration contours developed from the most recent monitoring well data (June 1986 & March, June, August 1988).

TABLE 2

Comparison of Analytical
Data from June 23-26, 1986
and June 21-27, 1988
Sampling Periods for
Selected Wells.

Well #	Total VOC (ppb) June 23 - 26, 1986	Total VOC (ppb) June 21 - 27, 1988
5	7	ND
8	9	ND
11	1730	2180
13	1222	1210
14	ND	ND
16	606	1343
18	ND	ND
19	ND	ND*
21	ND	ND
23	70	40

ND - Non Detectable

* Sample Collected March 28-31, 1988

Conclusions From The Groundwater Investigation (Figures 10 through 13)

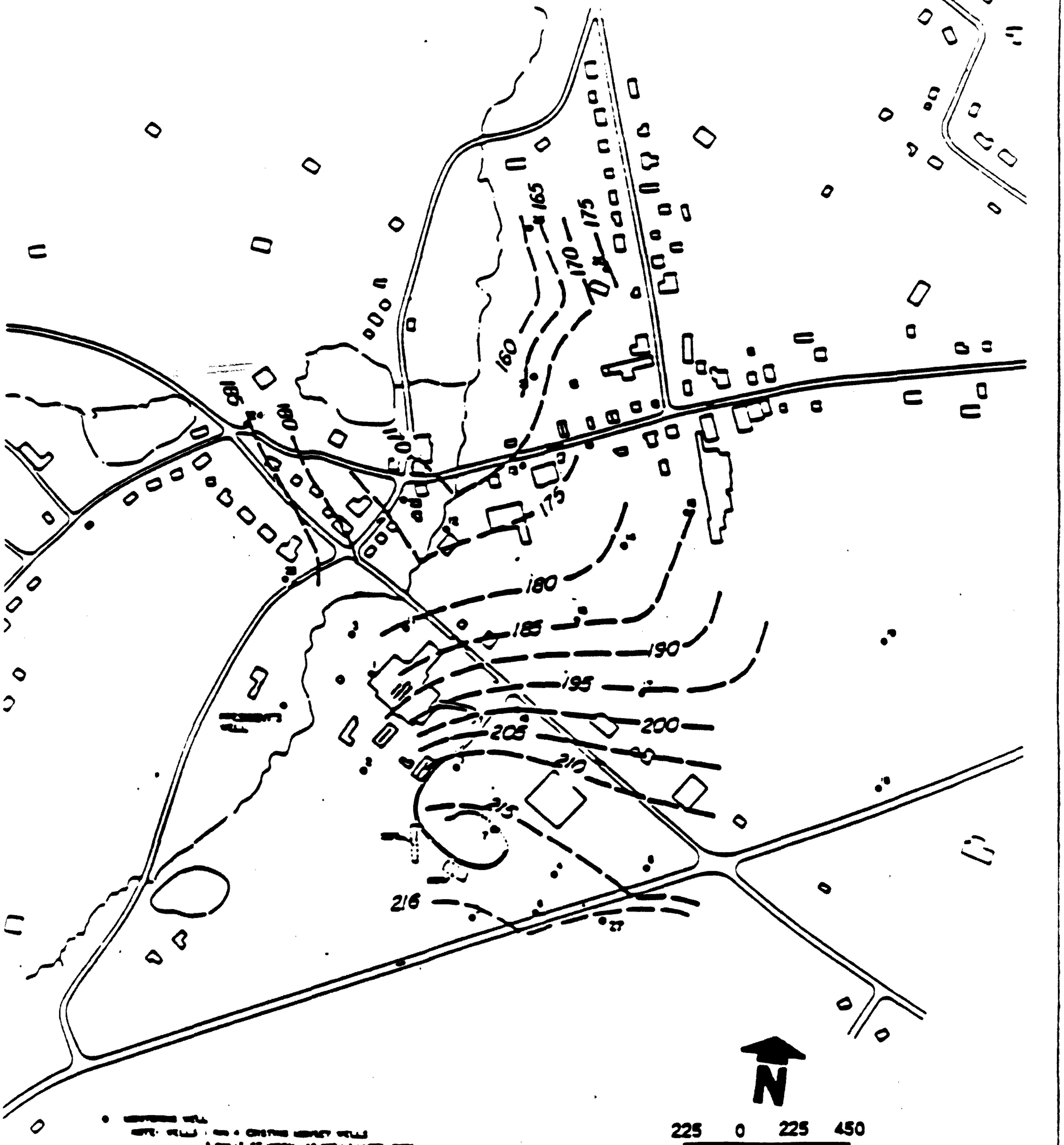
- The Kimberton Site is characterized by the occurrence of two distinct geological units, the Stockton Formation and the Graphitic Gneiss, which have different hydrological properties.

- Groundwater occurs under water table conditions at depths ranging from 2 feet to 50 feet below grade. Water table elevations generally mimic local topographic expression but at lesser gradients.

- Local groundwater recharge occurs dominantly as directional recharge from adjacent topographic high areas and also via surface infiltration of precipitation onto related areas.

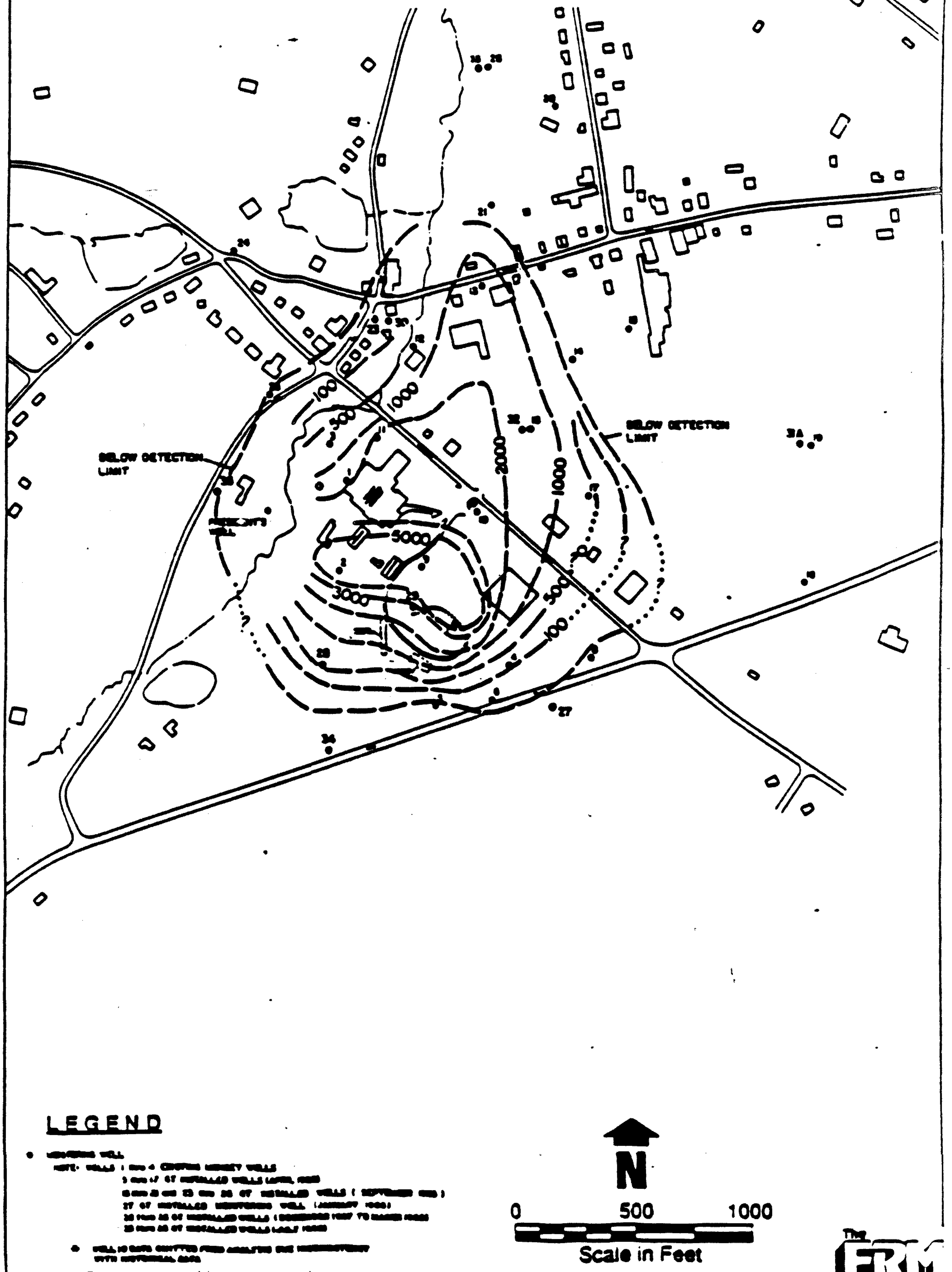
- Groundwater discharge occurs via surface springs, creeks and streams in low topographic areas. The dominant local ground water discharge zone is manifested by the creek to the north of the Monsey property (designated Stream B). Stream B lies to the east of the Monsey property and converges with the above noted zone slightly to the north of Kimberton.

Figure 10
Water Table Gradient
(7-30-86)
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania



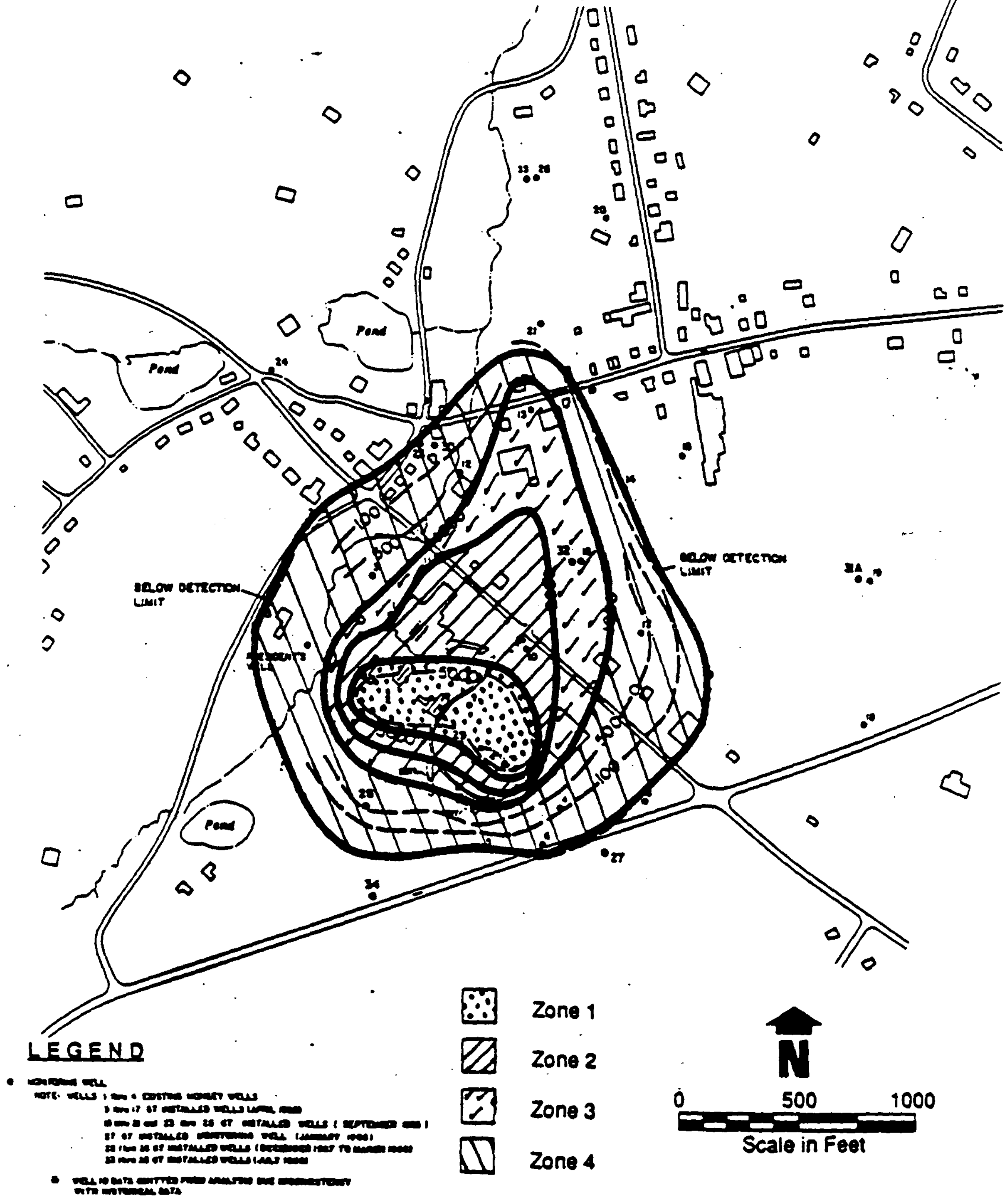
Source: Groundwater Technology

Figure 11
Total Volatile Concentrations (ppb)
June 1986 & March, June, August 1988
Monsey/CIBA-GEIGY
Kimberton, Pa.



Source: Groundwater Technology, Inc.

Figure 12
Total Volatile Concentrations (ppb)
June 1986 & March, June, August 1988
Monsey/CIBA-GEIGY
Kimberton, Pa.



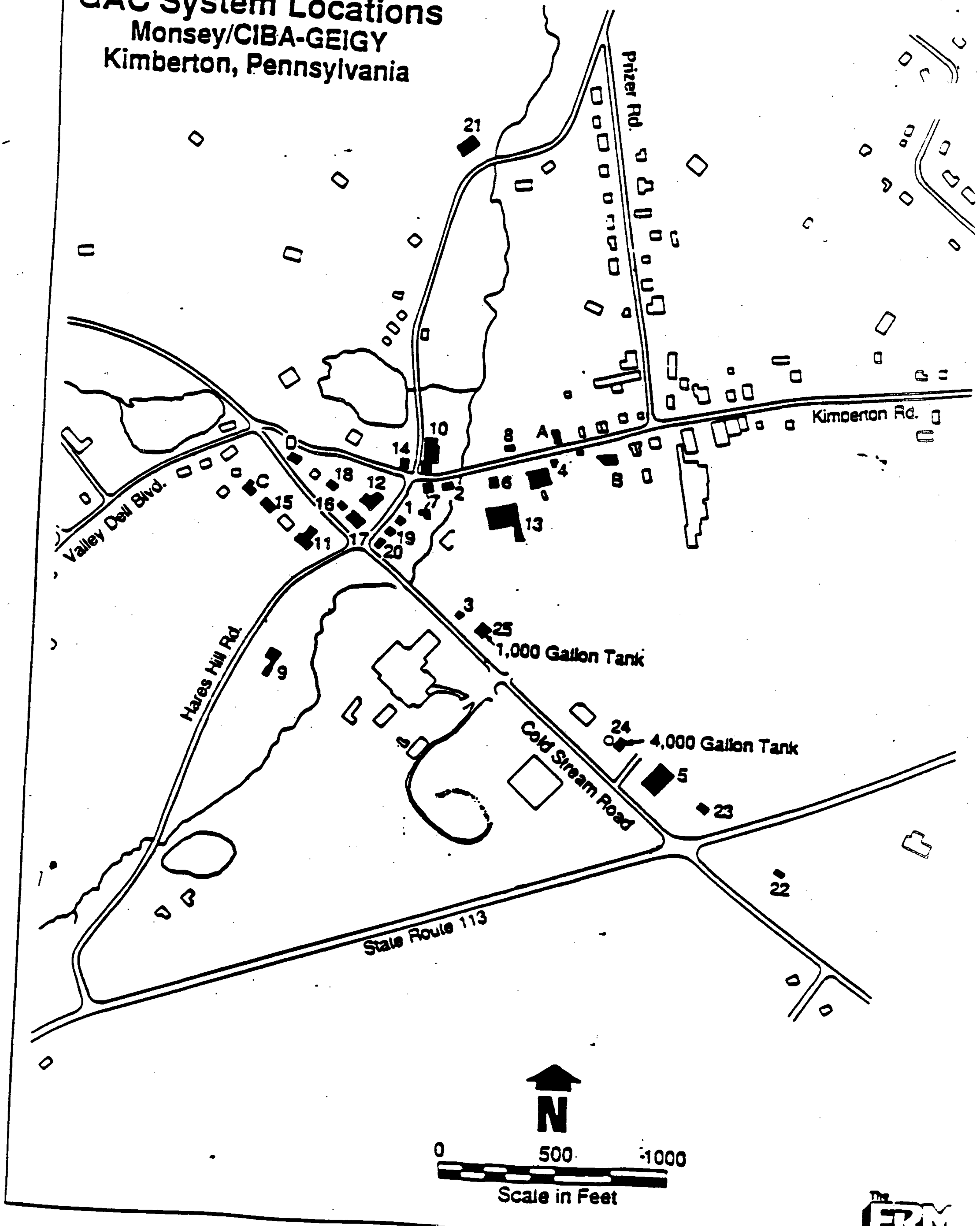
Source: Groundwater Technology, Inc.

(See Table 4-1 for explanation of zones)

WO# 27215 06 01	Drawn by / Date: EJK 1/89	Checked by / Date: D. Watkins 1/89	The ERM Group
	Revised by / Date:	Checked by / Date:	

Revised 5/10/89

Figure 13
GAC System Locations
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania



- Ground water gradient and flow within the Site area are directionally controlled by elevational changes in pressure head. Under natural, non-pumping conditions, the direction of ground water flow is oriented toward the northeast, north and northwest toward the above noted local ground water discharge zones.

- An upward hydraulic gradient has been determined in discharge areas to the north of the Site along Stream A. A downward hydraulic gradient has been determined in the recharge area to the east of the site.

- Transmissivity and storage coefficient values of the graphitic gneiss in the former lagoon area were determined to be on the order of 17,000 gpd/ft and .01, respectively.

- Hydraulic properties of the graphitic gneiss are highly directional. Increased hydraulic communication in the north to northeast direction is attributed to fracturing and preferential weathering in that direction.

- The highest interstitial ground water velocity has been determined to be 1905 ft/year to the north-northeast in the graphitic gneiss. The lowest groundwater velocity was calculated to be 113 ft/year in the Stockton Formation.

- Laboratory analyses of ground water samples secured from all Site monitoring wells indicate that 17 different VOCs were detected during the monitoring period and appear below:

Toluene
Chlorobenzene
Vinyl Chloride
Chloroethane
Methylene Chloride
1,1-Dichloreothene
1,2-Dichloroethane
Trans-1,2-Dichlorethene
Chloroform
1,2-Dichlorethane
1,1,1-Trichloroethane
Carbon Tetrachloride
1,2-Dichlorpropane
Trans-1,3-Dichloropropene
Trichloroethene
Tetrachloroethene
Acrolein

- Of these, Trichlorethene and Trans-1,2-Dichloroethene collectively accounted for 90% to 100% of the total VOC's present, if any, in a given sample.

- Vinyl Chloride was found to be present at six monitoring wells (1,2,4,7,11, and 16). 1,1Dichlorethene, 1,2-Dichloroethane and 1,1,1-Trichloroethane were repeatedly reported within monitoring wells at less than approximately 50 ppb concentrations levels.

- Migration of volatile organic components is controlled to a high degree by local groundwater gradient which produces a north, northwesterly, and northeasterly flow (and contaminant transport) toward two local discharge areas which converge to the north of Kimberton. The primary direction of VOC movement also coincides with the direction of increased aquifer permeability and interstitial ground water velocity.

- No deep movement of VOC's along bedding planes in the Stockton Formation was detected to the north or east of the Site.

- The upward vertical hydraulic gradient in the Stockton Formation in the discharge area to the north of the known VOC plume will deter the downward movement of VOC's. As previously concluded, VOC movement has been determined to be in the direction of decreased hydraulic head.

- Deep VOC migration in the graphitic gneiss to the northwest of the Site, across the ground water divide, has not been detected and should not occur under normal hydraulic conditions.

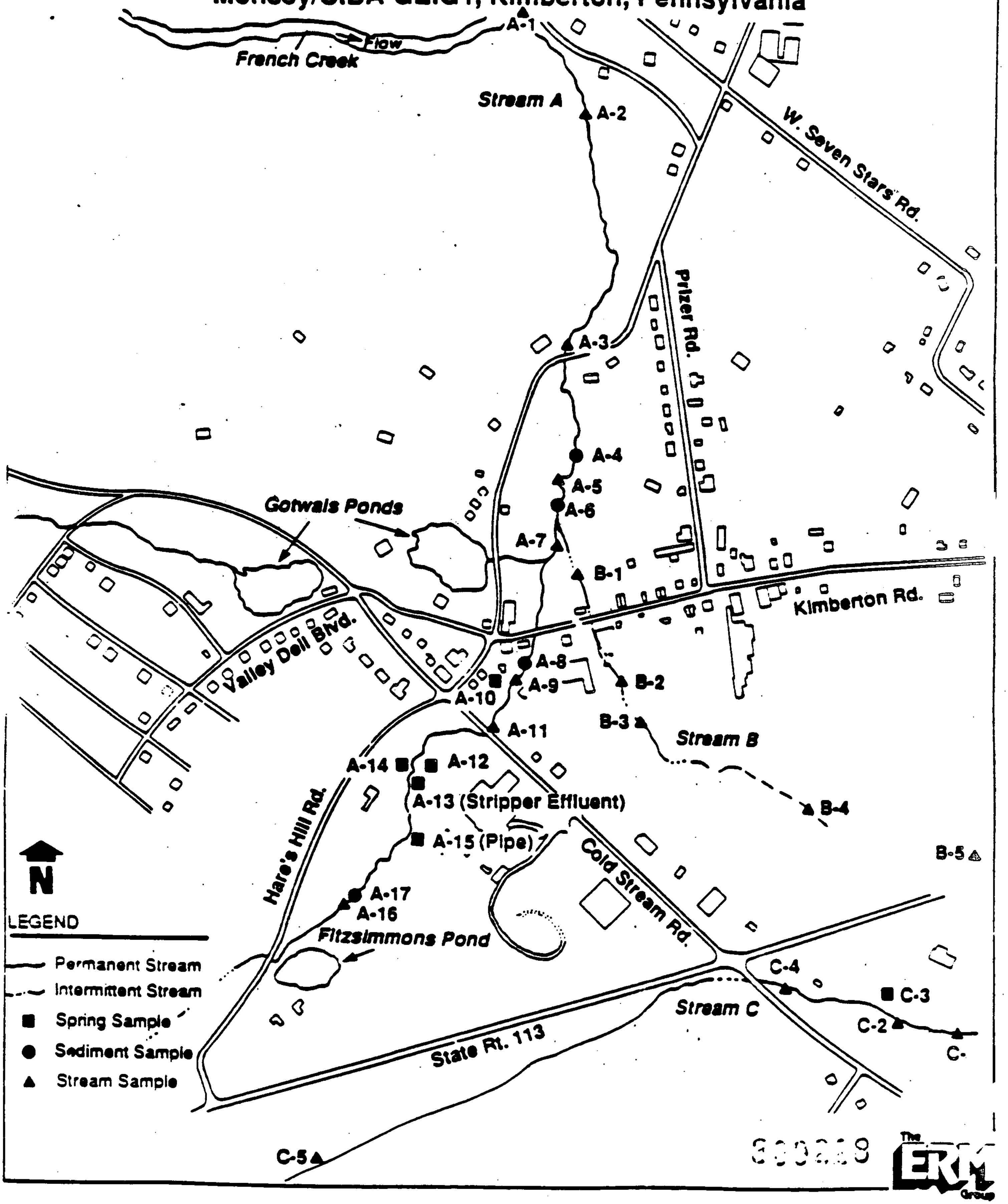
- VOC's occur at intermediate depths in a vertical mixing zone within fractured bedrock gneiss in the central plume area.

- VOC's present in shallow ground water to the west of the Site in a lateral down gradient direction are believed to discharge to Stream A.

- The extent of the VOC contamination in shallow ground water has been defined to the north, south, and southwest of the former lagoon area. To the north of the Site, pumping at the Kimberton Country House has altered the configuration of the contaminant plume but the extent of the VOC contamination has been defined by Granular Activated Carbon (GAC) system and monitoring well sampling north and west of the Kimberton Country House. Commercial and/or residential pumping to the southeast of the Site near the intersection of Route 113 and Coldstream Road has also altered the extent of the VOC contaminant plume. However, VOC concentrations measured in commercial and residential wells decreased away from the Site in this area to a minimum of approximately 20 ppb total VOC at Phillips spring (locations 22). The occurrence of VOC at this spring may be a residual effect of past largescale water withdrawal by Roberts Meat Packing.

- No VOC levels were detected in deep monitoring wells located northwest, north and east of existing VOC plume.
- No hydrogeologic data collected suggests the preferential VOC movement against hydraulic gradient or potentially along the Graphitic Gneiss/Stockton Formation contact zone.
- Site hydrogeologic data indicates that the water bearing zones of the Graphitic Gneiss and Stockton Formation represent a single aquifer system with varying water transmitting capacities. Specific areas of ground water recharge and discharge have been shown to exist through the acquisition of data from several deep and shallow monitoring well pairs. Hydrologic data indicates that ground water gradient and flow from the former lagoon areas is oriented toward the northwest, north and northeast toward the identified local ground water discharge zones that converge just north of Kimberton Road. Groundwater transmission in the Stockton Formation has been determined to occur dominantly along bedding planes and along bedding strike in response to hydraulic gradient. Regional geologic mapping evidence indicates that both the beds of the Stockton Formation and the geologic contact strike approximately NW-SE and dip towards the NE. Deep and shallow monitoring wells (#31A and #19 completed to depths of 200 feet and 59 feet, respectively) placed in strategic down dip locations within the Stockton Formation (i.e., placed at locations to monitor potential down dip vertical migration) report no detection of VOC's, indicating a lack of down dip vertical migration in the Stockton Formation associated with the Stockton/Graphitic Gneiss contact.

Figure 14
Streams Investigation Sampling Locations for Laboratory Analysis
Monsey/CIBA-GEIGY, Kimberton, Pennsylvania



b. Residential and Private Wells

In August 1985, a program of residential and private well sampling in the central Kimberton area was initiated by Groundwater Technology Inc. Results of this initial sampling program indicated the presence of volatile organic compounds, primarily trichloroethylene (TCE), dichloroethylene (DCE), and vinyl chloride (VC), within the water supply of a number of local residences and commercial establishments. As a result of this sampling program, alternative water supplies were provided to a total of 25 locations within the Borough of Kimberton. Currently 23 locations receive alternative water supplies (Figure 13).

The collection of data through the ongoing sampling program has and continues to provide useful information on groundwater plume definition and migration pattern.

4. Conclusions From the Surface Water Investigation

- Three unnamed streams designated A, B, and C flow through the central Kimberton area.

- Stream C generally flows from west to east, with its source being a small spring house located within a farm pasture approximately two miles southwest of sample location C-5.

- The major contributing source to Stream C is the Phillip's Spring (sample location C-3).

- Stream B is an intermittent stream which originates from the discharge of a subsurface concrete pipe. The source of the stream is presently unknown, but the orientation of the pipe indicates that the source area would be located east to southeast of sample point B-4.

- Downstream of sample point B-1, Stream B discharges into Stream A.

- Stream A, which is the primary stream in the center of Kimberton, flows generally from south to north and originates proximal to Fitzsimmons Pond and coalesces with French Creek approximately 3,000 feet north of the Monsey Property.

- Sediment sample analytical results obtained from Stream A indicate low concentrations of volatile organic compounds trichloroethene and trans-1,2 dichloroethene, at sample locations A-4, A-6, and A-8.

- Several positively and tentatively identified semivolatile compounds were observed in sediment sample A-8 downstream from the Monsey Property. These compounds have been attributed to a documented release of asphalitic material from the Monsey Property.

- Several semivolatile compounds were observed in the background sediment sample (A-17).

- Sample point A-10, which is a primary contributory source to the baseline flow of Stream A, demonstrated the presence of trans-1,2-dichloroethene (790 ug/l), trichloroethene (800 ug/l), and 1,1-dichloroethene (9 ug/l).

- Sampling points downstream from spring A-10 (A-9, A-7, A-5, A-3, A-2, and A-1) indicate decreasing concentrations of trans-1,2-dichloroethene and trichloroethene.

- Both quantitative Gas Chromotography/Mass Spectrography (GC/MS) and semi-quantitative (GC) analysis of Stream B samples, B-3 and B-4, demonstrated the absence of volatile organic compounds.

- Stream B samples, B-1, B-2, and B-3, were only analyzed by the portable Gas Chromatograph (GC). B1 demonstrated the presence of trans(cis)-1,2-dichloroethene, 1,1-dichloroethene, and trichloroethene, and B-2 demonstrated the presence of trans(cis)-1,2,-dichloroethene and trichloroethene while sample B-3 demonstrated the absence of VOCs.

- Five surface water samples were collected along Stream C and analyzed by both GC/MS and GC methodology. Samples C-4 and C-5 were characterized by the absence of VOCs whereas sample C-3, which is a major contributory source for Stream C, demonstrated the presence of trichloroethene (17 ug/l).

- Sample points C-2 and C-4, located downstream from C-3, indicated decreasing trichloroethene concentrations.

- Stream C samples, obtained upstream from location C-3, were characterized by the absence of VOCs. Sample C-3, which represents the major contributory source for Stream C, demonstrated the presence of trichloroethene (17 ug/l).

The compounds that have been detected in surface water are:

Volatiles

1,1-Dichlorethene
Trans-1,2-Dichloroethene
Trichloroethene

Water solubility is an important factor affecting a constituent's release and subsequent migration and fate in the surface water environment. Highly soluble contaminants are easily and quickly distributed within the hydrologic cycle. These contaminants tend to have relatively low bioconcentration factors in aquatic life and relatively low adsorption coefficients for soils and sediments. All the detected compounds in Kimberton surface waters have high solubilities in water.

Henry's Law Constant indicates the relative tendency of a constituent to volatilize from aqueous solution to the atmosphere based on the competition between its vapor pressure and water solubility. Constituents with high values of the Henry's Law Constant will tend to volatilize to the atmosphere faster than constituents with low values and, therefore, will predominantly occur in low concentrations in surface waters. The detected compounds in surface waters of the Kimberton area have high Henry's Law Constants.

5. Wetland Assessment

a. Assessment of Potential Impact

The areas where vegetative stress may be apparent, (Figure 15) such as stream banks and ground water discharge points, were examined during the qualitative inventory. Typical indicators of vegetative stress that were looked for included denuded areas, stunted growth, chlorosis (yellowing), excessive dead wood (trees and shrubs), and canopy density (overstory).

A total of seven surface soil samples (0-3 inches) were collected from representative vegetative assemblages within Wetland Area A (Figure 16).

Figure 15
Wetland Boundary Locations
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania

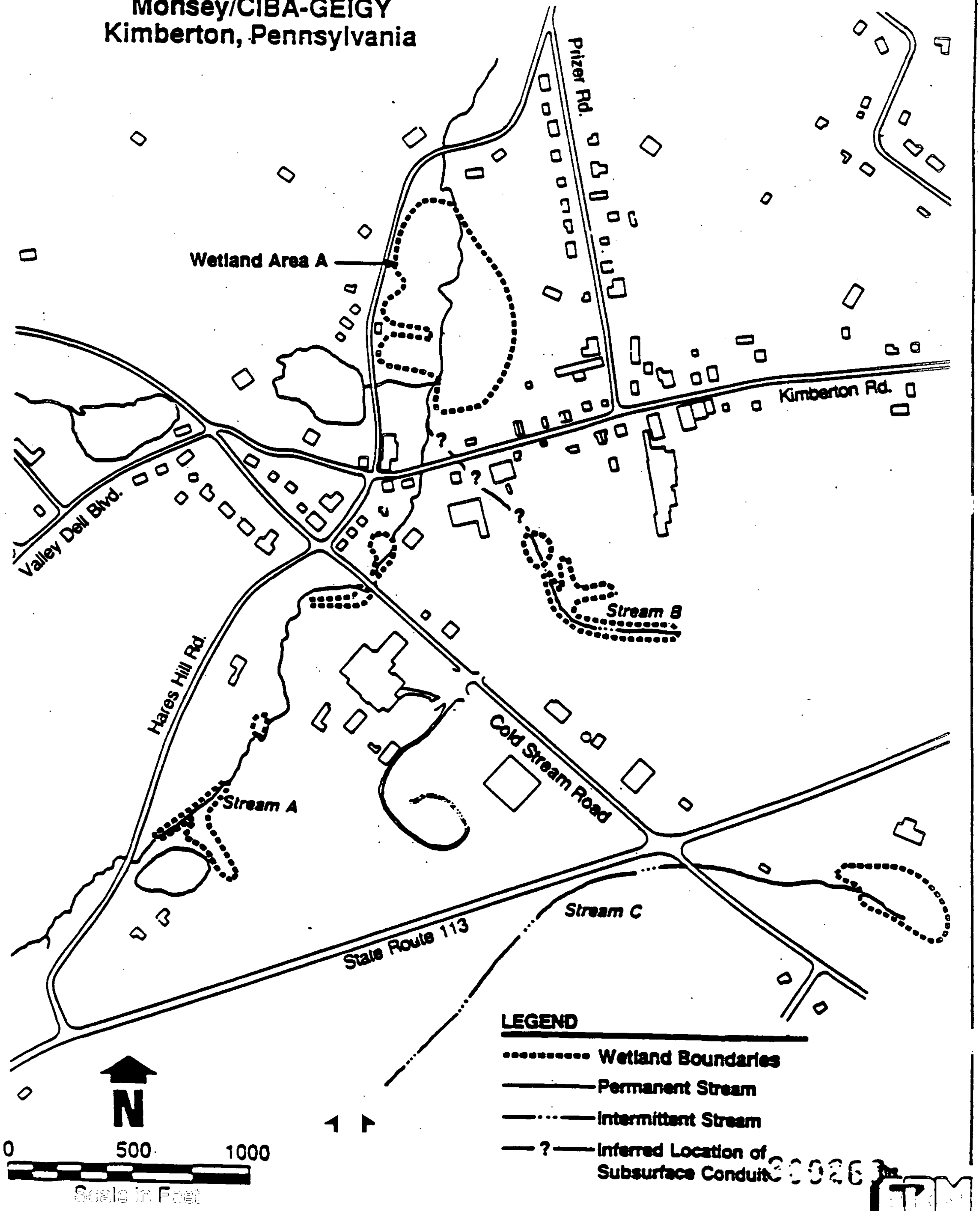
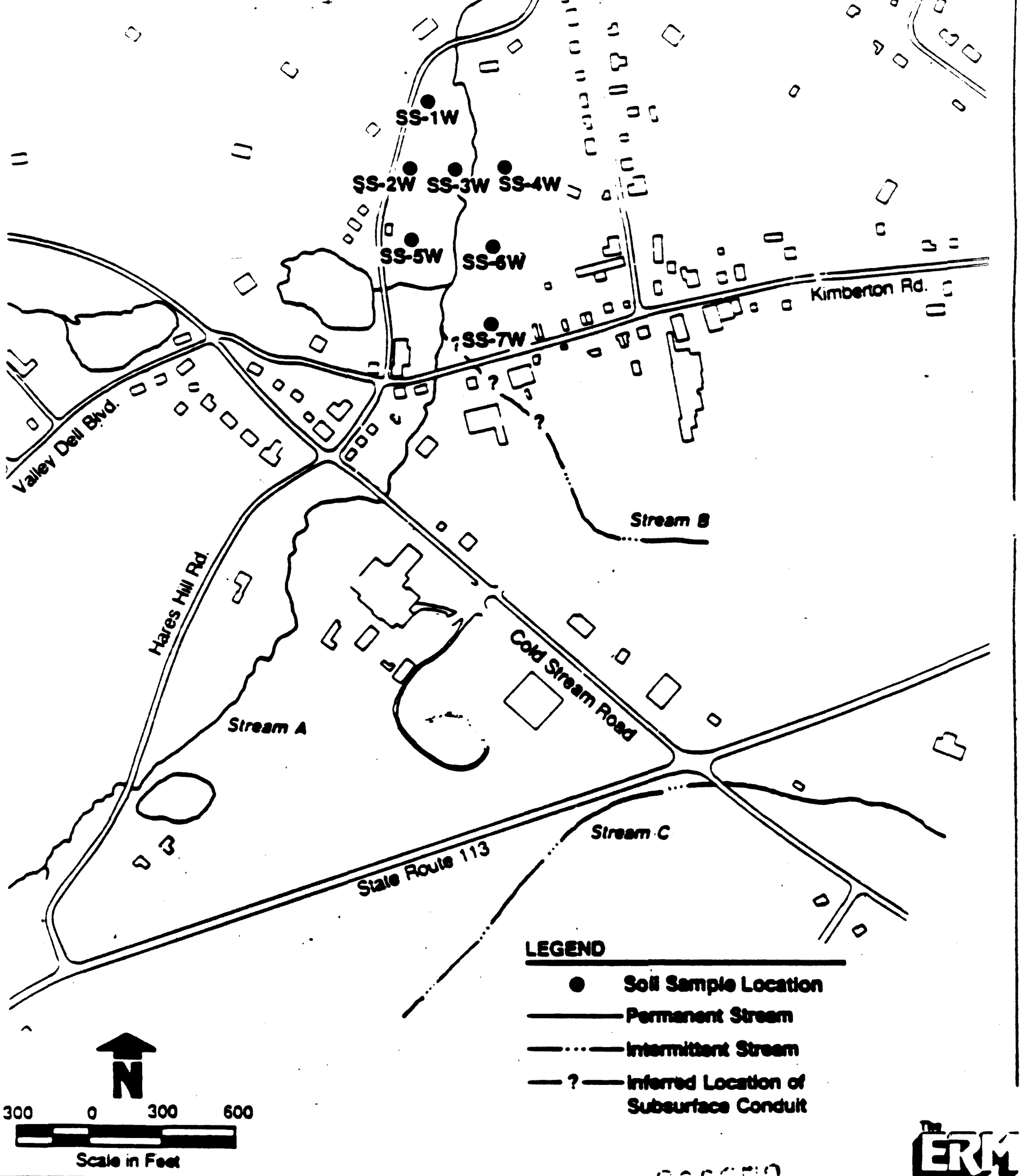


Figure 16
Wetland Soil Sample Locations
(15 April 1988)
Monsey/CIBA-GEIGY
Kimberton, Pennsylvania



No areas of vegetative stress were observed along Streams A, B, C or adjacent to any ground water discharge points. OVA readings of zero were observed during the collection of each soil sample. Acetone was detected in all samples including the travel blank. Sample SS2W contained an estimated value of 14 ppb of methylene chloride. Acetone and methylene chloride are commonly used chemical in the laboratory and therefore suggest laboratory contamination.

b. Water Quality Criteria for the Protection of Aquatic Life

On March 28 and 29, 1988, 19 surface water samples were collected and analyzed for priority pollutant VOCs from Streams A, B, and C. Sample locations are presented in Figure 14. Results of the analyses are presented in Table 3. Sample locations upstream of the Monsey facility on Stream A (A-16 and A-15) did not reveal the presence of volatile organic compounds. Springs adjacent to the Monsey facility and sampling points downstream indicated the presence of trans-1, 2dichloroethene and trichloroethene. Sampling point A-10, a major contributory source to the baseline flow of Stream A, contains the highest levels of trans-1, 2dichloroethene (790 ug/l) and trichloroethene (800 ug/l). A-10 was the only station to contain 1,1-dichloroethene at a concentration of 9 ug/l.

Samples taken sequentially farther downstream from A-10 indicate a progressive decrease in concentration of trans-1,2-dichloroethene and trichloroethene as a result of dilution.

Two sampling points (B-3 and B-4) along Stream B did not indicate the presence of volatile organic compounds. Five sampling points along Stream C show the upper two stations (C-5 and C-4) devoid of volatile organic compounds while the downstream stations (C-3, C-2 and C-1) contain trichloroethene at concentrations of 17 ug/l, 9 ug/l and 7 ug/l, respectively. Sampling point C-3 (Phillips Spring) is a primary contributory source of Stream C as indicated from the chemical results. The detection of trans-1, 2-dichloroethene and trichloroethene in Stream A and trichloroethene in Stream C indicates that the highest concentration of both pollutants occurs in conjunction with springs. This observation is similar to the observation made by GTI in April 1982 from spring samples draining into Stream A, which indicated that the VOCs may be entering the streams primarily from ground water discharge points.

TABLE 3
KIMBERTON, PA
SURFACE WATER ANALYTICAL RESULTS
LANCASTER LABORATORY
SAMPLED 3/28-3/29 1988

MPLE	1.1-Dichloroethene (ug/L)	trans-1.2-Dichloroethene (ug/L)	Trichloroethene (ug/L)
-1		9	8
2		11	9
3		22	20
-5		31	25
-7		71	59
A-9		280	270
A-10	9	790	800
A-11		27	
-12		180	14
A-14		120	8
A-15			
A-16			
B-3			
B-4			
C-1			7
-2			9
-3			17
-4			
C-5			

Blank spaces indicate the compound was not detected.

Data available for dichloroethene (DCE) and trichloroethene (TCE) indicate that the level of acute toxicity for freshwater aquatic life occurs at a concentration of 11,600 and 45,000 ug/l, respectively (US EPA 1986). The LC_{50} values for two freshwater invertebrates (Daphnia magna and Daphnia pulex) when exposed to trichloroethene are 64,000 ug/l and 45,000 ug/l, respectively. Neither Daphnid showed chronic effects when exposed to 10,000 ug/l of trichloroethene. Acute toxicity tests performed on fathead minnows (Pimephales promelas) to TCE in flow-through and static test systems yeilded LC_50's of 40,700 ug/l and 66,800 ug/l, respectively. A loss of equilibrium was observed in fathead minnows exposed to 21,900 ug/l of TCE. The 96-hour LC_50 for bluegills (Lepomis macrochirus) was obtained at a TCE concentration of 44,700 ug/l. The calculated bioconcentration factor for bluegills (L. macrochirus) was 17. According to the EPA Quality Criteria for Water, 1980, the occurrence of chronic toxicity in aquatic organisms caused by TCE is questionable, since the half-life of TCE in tissues is less than one day (USEPA 1980).

The maximum DCE and TCE concentrations found in spring A-10 790 ug/l and 800 ug/l, respectively are well below those listed in to the available literature on the acute and chronic effects of DCE and TCE. The observed levels of DCE and TCE do not appear to be of concern to the indigenous aquatic community. This appearance is further substantiated by the inherent low bioaccumulation factors of 5.6, 1.6 and 10.6 for 1,1-dichloroethene, trans-1,2-dichloroethene and trichloroethene, respectively.

c. CONCLUSIONS OF THE ENDANGERMENT ASSESSMENT

The Endangerment Assessment (EA) for the Kimberton Site has examined the existing data, identified compounds of concern, evaluated potential exposure pathways, and approximated potential risks to human and other environmental receptors. The EA report evaluates both present risk under existing conditions and the hypothetical risk should existing conditions change. The hypothetical risk calculated in the EA report is representative of the worst case assumptions (Table 4).

The hypothetically exposed population includes all residences in which well water quality has been affected. The potentially exposed population has been provided with individual point-of-use carbon treatment systems. Therefore, there is currently no exposure to public through ingestion of contaminated ground water, dermal contact while bathing or through inhalation of VOC while bathing. If the current water treatment system is maintained, there will be no risk to the potentially-exposed population. If current conditions change (i.e., no carbon treatment system or no alternate source of drinking water), then there would be a risk to the potentially exposed population.

Table 4

Summary of the Risks at the Kimberton Site

CONDITIONS	DESCRIPTION	LIFETIME WEIGHTED CARCINOGENIC RISK *
CARCINOGENIC RISK		
Actual (carbon systems)	- ground water only	approximately 0
	- all pathways	2 E-08
Hypothetical	- dermal contact and inhalation at streams - ground water use and seeps/springs (child 6-12) - dermal contact with stream sediments (child 6-12)	**1 E-02**

CONDITIONS	DESCRIPTION	LIFETIME WEIGHTED NONCARCINOGENIC HAZARD INDEX **
NONCARCINOGENIC HAZARD		
Actual (carbon systems)	- ground water only	approximately 0
	- all pathways	8.36E-06
Hypothetical	- ground water use	**1.67E+00**
	- dermal contact with sediments (child 6-12)	0 ***
	- inhalation of VOCs in stream (child 6-12)	1.21E-06
	- inhalation of VOCs in seeps/springs (child 6-12)	2.35E-06

Bold values indicate that the calculated risk is outside the US EPA's recommended ranges.
Carcinogenic recommended guidelines - 1.00E-04 to 1.00E-07 (US EPA)
Hazard index - less than one (US EPA)

* Indicators are trichloroethene, 1,1-dichloroethene, and vinyl chloride (benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene in sediments)

**Indicator is trans-1,2-dichloroethene.

***Noncarcinogenic PAHs were not evaluated since AISs and RfDs were not available.

Revised 5/10/89

The conclusions that can be inferred from the results of the Endangerment Assessment are as follows:

Actual

- risks from compounds detected in ground water is approximated to be zero (carbon treatment systmes in place),
- carcinogenic risks and hazard indices for surface water exposure (i.e, dermal contact with and inhalation of VOCs in surface water and dermal contact with PAHs in stream sediments) to children are within US EPA's recommended guidelines, and
- no drinking water levels are exceeded at the point of use (after carbon treatment);

Hypothetical

- noncarcinogenic hazard indices from trans-1,2,DCE exposure in untreated ground water exceed one,
- carcinogenic risk from trichloroethene and vinyl chloride exposure in untreated ground water is 1 x 10^{-2} which exceeds US EPA's recommended guidlines of 1 x 10^{-4} to 1 x 10^{-7} for CERCLA sites,
- carcinogenic risk from PAH exposure in stream sediments in 2 x 10^{-8} which is an order of magnitude lower than US EPA's recommended guideline.
- applicable or relevant and appropriate requirements for untreated groundwater use are exceeded.

There are no special habitants or species at the site and no indication of stressed vegetation at ground water discharge points. The wetlands appear to be healthy and functional, non-impacted by compounds detected at the site.

Comparison of aquatic life criteria with the actual concentrations in the stream and stream sediments shows that the aquatic criteria are not exceeded.

It should be noted that the carcinogenic risk at the site was estimated based on people using ground water from drinking and bathing purposes. This exposure scenario is no longer plausible since the residents were supplied with carbon treatment systems.

The hypothetical exposure scenario and subsequent risk calculations were addressed only to determined the degree of risk posed by chemical compounds into the ground water so that various remedial alternatives could be ranked. Thus, the calculated carcinogenic and noncarcinogenic risk posed by compounds in the groundwater to the residential areas does not exist at this time.

VI. Community Relations History

The main community concerns for the affected residents and businesses revolve around the issue of:

1. Groundwater contamination on and off-site,
2. Quality of alternate water supplies, and
3. Desire of affected residents to remain on private wells.

VII. Remedial Alternative Objectives

Based upon the information presented in the Remedial Investigation and Risk Assessment, the following remedial action objectives have been developed:

1. Hydraulic groundwater control should be established to contain the identified Site contaminants and to reduce the concentration and mass of these contaminants present in groundwater.

2. A local spring (Spring A-10) should be remediated to improve the water quality of a local stream designated as "A" (see Figure 16).

A five alternatives were specifically developed to address the ground and surface water contamination at the Site. These alternatives were identified and evaluated according to the previous described criteria required by CERCLA.

Appropriate general response actions for remediation of ground water and surface water at the Kimberton Site have been identified in Table 5. These general response actions are described in the following paragraphs.

VIII. Description of Remedial Alternatives

A. Identification of Potential Remedial Technology Types and Processes

Technology types and associated processes that are potentially appropriate for the Kimberton Site have been identified. Each of these technologies will be described and screened according to the following criteria:

- Effectiveness: Each remedial technology must be evaluated according to its effectiveness in protecting human health and the environment. Treatment technologies are evaluated on their effectiveness in removing site-specific constituents from the contaminated media.

- Ability to Meet Remedial Objectives: Remedial technologies will be evaluated based upon their ability to reduce the concentrations and mass of VOCs in the aquifer and/or their ability to mitigate the extent of VOCs entering the surface water.

TABLE 5
IDENTIFICATION OF APPROPRIATE GENERAL RESPONSE ACTIONS

	Contaminated Media	
General Response Action	Ground Water	Surface Water
No Action		X
Continued Provision of Alternate Potable Water Supplies	X	
Hydraulic Control	X	
Collection		X
On-Site Treatment	X	X
Off-Site Treatment	X	X
In Situ Treatment	X	

- Technology Feasibility: This evaluation includes consideration of the ability to construct, successfully operate, and maintain each system.

- Potentially Administrative Requirements: The administrative feasibility evaluation considers such factors as permitting and monitoring requirements.

B. Selection of Technologies for Groundwater

A summary of the criteria evaluations for ground water remediation technologies is presented in Table 8. The results of this selection process are described below.

- Continued Provision of Alternate Water Supplies: Retained because it is protective of public health and the environment.

- Extraction Wells: Retained for extraction of ground water for treatment.

- In Situ Bioreclamation: Eliminated because site-related contaminants are difficult to degrade and in situ treatment would be less reliable and controllable than on-site treatment.

- Air Stripping: Retained because it is a proven technology for removal of site-related constituents from water.

- GAC Adsorption: Eliminated because this technology exhibits limited effectiveness in removing vinyl chloride from water.

- Chemical Oxidation: Retained because it is a proven technology for removal of site-related constituents from water.

- Biological Treatment: Eliminated because it would not be practical for removal of low concentrations of constituents from water at the Kimberton Site.

- Treatment by a POTW: Retained because it would be an effective technology for removal of site-related constituents from water in combination with higher strength municipal wastewater.

In summary, the ground water remediation technologies that shall be retained for inclusion in the development of alternatives include the following:

- Continued Provision of Alternate Water Supplies,
- Extraction Wells,
- Air Stripping,
- Chemical Oxidation, and
- Treatment by a POTW

C. Selection of Technologies for Surface Water

A summary of the criteria evaluations for surface water remediation technologies is presented in Table 7. The results of this selection process are described below:

- No Action: Retained because it is protective of public health and applicable or relevant and appropriate requirements (ARARs) for surface water are not exceeded.

- Collection Sump: Retained for collection of Spring A-10 for treatment.

- Air Stripping: Retained because it is a proven technology for removal of site-related constituents from water.

- GAC Adsorption: Eliminated because this technology exhibits limited effectiveness in removing vinyl chloride (a breakdown product of spring-related constituents) from water.

- Chemical Oxidation: Retained because it is a proven technology for removal of site-related constituents from water.

- Biological Treatment: Eliminated because it would not be practical for removal of low concentrations of constituents from water from the Kimberton Site.

- Treatment by POTW: Retained because it would be an effective technology for removal of site-related constituents from water in combination with higher strength municipal wastewater.

TABLE 6
SELECTION OF REPRESENTATIVE REMEDIAL TECHNOLOGIES FOR GROUND WATER

Technology	Effectiveness	Ability to Meet Remedial Objectives	Technical Feasibility	Administrative Requirements	Conclusion
REMEDIAL TECHNOLOGIES					
Continued Provision of Alternate Potable Water Supplies	-Protective of public health and environment.	-None	-Implementable.	-Ground Water Monitoring -Potable Well Installation Restrictions	Retain
Extraction Wells	-Protective of public health and environment.	-VOC source could be controlled. Concentration and mass of VOCs would be reduced.	-Implementable.	-Property Easements -Delaware River Basin Commission Permit -Chester County Health Department Drilling Permit	Retain
In Situ Bioreclamation	-Protective of public health and environment.	-Limited performance data available for site-related constituents.	-Extremely difficult to construct, operate, and maintain.	-Property Easements -Delaware River Basin Commission Permit -Chester County Health Department Drilling Permit	Eliminate
TREATMENT TECHNOLOGIES					
Air Stripping	-Suited well for all contaminants of concern.		-Implementable.	-NPDES Permit -Air Discharge Permit	Retain
GAC Adsorption	-Poorly suited for vinyl chloride removal.		-Implementable	-NPDES Permit	Eliminate
Chemical Oxidation	-Suited well for all contaminants of concern.		-Implementable.	-NPDES Permit	Retain
Biological Treatment	-Concentrations of contaminants are too low for technology to be practical.		-Implementable	-NPDES Permit	Eliminate
Treatment by POTW	-Suited well for ground water combined with higher strength municipal wastewater.		-Dependent on ground water extraction rate.	-POTW approval -Quarterly monitoring	Retain

TABLE 7
SELECTION OF REPRESENTATIVE REMEDIAL TECHNOLOGIES FOR SPRING A-10

Technology	Effectiveness	Ability to Meet Remedial Objectives	Technical Feasibility	Potential Administrative Requirements	Conclusion
REMEDIAL TECHNOLOGIES					
No Action	-Protective of public health, but not protective of environment.	-No reduction of VOCs entering surface water.	-Implementable.	-None	Retain
Collection Sump	-Protective of public health and environment.	-Reduction of VOCs entering surface water.	-Implementable.	-Property Easements	Retain
TREATMENT TECHNOLOGIES					
Air Stripping	-Suited well for all contaminants of concern.		-Implementable.	-NPDES Permit -Air Discharge Permit	Retain
GAC Adsorption	-Poorly suited for vinyl chloride removal.		-Implementable.	-NPDES Permit	Eliminate
Chemical Oxidation	-Suited well for all contaminants of concern.		-Implementable.	-NPDES Permit	Retain
Biological Treatment	-Concentrations of contaminants are too low for technology to be practical.		-Implementable.	-NPDES Permit	Eliminate
Treatment by POTW	-Suited well for surface water combined with higher strength municipal wastewater.		-Implementable.	- POTW Approval -Quarterly Monitoring	Retain

In summary, the surface water remediation technologies that will be retained for inclusion in the development of alternatives include the following:

- No Action,
- Collection Sump,
- Air Stripping,
- Chemical Oxidation, and
- Treatment by a POTW.

Evaluation of Technologies for Remediation of Spring A-10 and the Groundwater

Alternatives for remediation of Spring A-10 and contaminated groundwater have been developed as shown in Table 8, and are listed below:

1. No Action,

2. Continued Provision of Alternate Water Supplies,

3. Continued Provision of Alternate Water Supplies and Collection and Treatment of Spring A-10,

4. Continued Provision of Alternate Water Supplies, Collection and treatment of Spring A-10, and On-Site Source Control and Ground Water Remediation, and

5. Continued Provision of Alternate Water Supplies, Collection and Treatment of Spring A-10, On-Site Source Control and Ground Water Remediation, and Off-Site Ground Water Remediation.

Alternatives 1 and 2 offer no remediation of the surface water or ground water at the Kimberton Site. Alternative 3 includes surface water remediation only, while alternatives 4 and 5 require the remediation of surface and ground water.

Alternative 4 requires the on-site extraction of the most contaminated ground water located in the center of the VOC plume. In addition, ground water would be extracted from wells located at the down gradient boundary of the site to prevent further off-site migration of VOCs.

Alternative 5 would require on-site and off-site extraction of ground water from extraction wells located in both the graphitic gneiss and Stockton Formation. This would provide an extensive ground water recovery program addressing all areas of the contaminant plume. Optimum ground water extraction rates for these two alternatives shall be approximated through the use of a numerical computer model.

Alternatives 3, 4, and 5 require treatment of the surface water and/or ground water. The following treatment technologies were evaluated for each

TABLE 8
DEVELOPMENT OF ALTERNATIVES FOR GROUND/SURFACE WATER REMEDIATION

Alternative	Continued Provision of Alternate Water Supplies	On-Site Source Control and Remediation	Off-Site Ground Water Remediation	Collection of Spring A-10	Treatment Technology
1					None
2	X				None
3	X			X	A. Air Stripping B. Chemical Oxidation C. Treatment by a POTW
4	X	X		X	A. Air Stripping B. Chemical Oxidation C. Treatment by a POTW
5	X	X	X	X	A. Air Stripping B. Chemical Oxidation C. Treatment by a POTW

of these alternatives:

A. Air Stripping
B. Chemical Oxidation, and
C. Treatment by a POTW.

IX. A. Applicable or Relevant and Appropriate Requirements

Section 121 of CERCLA requires that remedial actions achieve a level of cleanup of hazardous substances that 1) protects human health and the environment and 2) meets "legally applicable" standards promulgated by USEPA or a state for any hazardous substances or pollutants remaining on the Site. In addition, the remedial action must meet cleanup criteria and requirements that are "relevant and appropriate under the circumstances of the release or threatened release of such hazardous substances or pollutant or contaminant" (CERCLA, Section 121). The legally applicable standards and relevant and appropriate criteria at a CERCLA site are collectively referred to as "ARARs."

The water quality standards of PADER may be legally applicable for the portion of the French Creek Basin encompassing the Kimberton area (25 Pa. Code 93.7). There are no PADER water compounds at the Site. However, 25 Pa. Code Section 93.6 contains a general standard that surface waters may not contain substances from waste discharge that are in such concentrations or amounts as to be harmful to aquatic or other life or to be "inimical" to designated water uses. In order to determine whether this standard is potentially a limiting factor at the site, the ground water discharges to Stream A must be compared to USEPA's Ambient Water Quality Criteria (AWQC). The AWQC are not exceeded by the concentrations or compounds in the surface water, as is shown in Table 9.

Maximum Contaminant Levels (MCLs) have been promulgated by USEPA under the Safe Drinking Water Act (40 CFR Sections 141.1-141.62). MCLs are legally applicable to public water supplies serving twenty-five (25) or more persons. MCLs have been established for TCE and related organics (40 CFR 141.61(a)). These MCLs for indicator compounds and other compounds detected at the site are reported in Table 10.

Currently, the public water supply in Kimberton is not affected by the CERCLA releases, and therefore, MCLs are not legally applicable. However, MCLs may be relevant and appropriate for Class IIA aquifers even where no public water supply is affected. A Class IIA aquifer is a current or potential source of drinking water (USEPA) Ground Water Protection Strategy (1984) and Guidelines for Ground Water Classification under the USEPA Ground Water Strategy (1986)). The regional aquifer underlying the site is classified as a Class IIA aquifer. USEPA's Interim Guidance states that MCLs are generally relevant and appropriate for Class IIA aquifers and are fully protective of human health (USEPA Interim Guidance on Compliance with Other Applicable or Relevant and Appropriate Requirements, 52 Fed. Reg. 32496, 32499 (August 27, 1987)).

Notwithstanding the general policy that MCLs are appropriate for Class IIA aquifers, USEPA's Guidance provides that MCLs may not be relevant and appropriate where it is technically infeasible to achieve MCLs. In those

TABLE 9
RELEVANT AND APPROPRIATE REQUIREMENTS FOR SURFACE WATER
(all concentrations are in mg/L, ppm)

	Surface Water Concentrations		US EPA AWQC*	
Compound	Maximum	Average	Acute	Chronic
1,1-Dichloroethene	0.009	0.00283	11.6	-
1,2-Dichloroethene	0.79	0.0783	11.6	-
Trichloroethene	0.8	0.0633	45	21.9

* US EPA Ambient Water Quality Criteria 1986

TABLE 10
RELEVANT AND APPROPRIATE REQUIREMENTS FOR GROUND WATER
(all concentrations are in ug/L, unless otherwise specified)

Compound	Ground Water Concentration Maximum	Acceptable Drinking Water Level	US EPA Health Advisory (long-term adult)	Acceptable Intake Chronic (1) (ug/kg/day)	Acceptable Intake Subchronic (1) (ug/kg/day)
Vinyl Chloride	690	2 (a)	0.015 (2)	NA	NA
1,1-Dichloroethene	50	7 (a)	0.24 (2) 3,500 (3)	9	N/A
1,1-Dichloroethane	60	4,200 - 42,000*	N/A	120	1,200
trans-1,2-Dichloroethene	7,600	3,500**	3,500 (3)	10 (5)	270
1,1,1-Trichloroethane	150	20 (a)	125,000 (3) 22,000 (2)	540	N/A
1,3-Dichloropropene	11	87 (6)	N/A	N/A	N/A
Trichloroethene	11,000	5 (a)	2.8 (2)	NA	NA
Acrolein	110	540 (6)	N/A	N/A	N/A
Toluene	30	10,800**	10,800 (4)	300	430
Chlorobenzene	4	30,000**	30,000 (3)	27	270
Chloroethane	30	N/A	N/A	N/A	N/A
Methylene Chloride	40	5**	5 (2)	60	N/A
Chloroform	60	100 (a)	N/A	10	N/A
1,2-Dichloroethane	20	5 (a)	2,600 (3) 0.95 (2)	NA	NA
Carbon Tetrachloride	8	5 (a)	250 (3) 0.3 (2)	NA	NA
1,2-Dichloropropane	8	0.56 (2)	0.56 (2)	N/A	N/A
Tetrachloroethane	10	0.7**	6,800 (3) 0.7 (2)	NA	NA

(a) - US EPA MCL (final)
NA - Not applicable
N/A - Insufficient data to develop criteria
* Based on Acceptable Intake Chronic and/or Acceptable Intake Subchronic x 70 kg x 1(2L)
** Health Advisory
(1) Acceptable Daily Intake US EPA 1986
(2) Health Advisory-reference concentration for potential carcinogens based on 10E-06 cancer risk, US EPA 1986
(3) US EPA Health Advisory for long-term exposures for 70 kg adult
(4) US EPA Health Advisory for lifetime exposures for 70 kg adult
(5) -Calculated from Health Advisory
(6) US EPA Ambient Water Quality Criteria, adjusted for drinking water only (1E-06 cancer risk)

instances, "the cost-effective remedy may be to provide an alternative drinking water supply rather than restoring the contaminated aquifer."

Other potential ARARs are 1) Drinking Water Health Advisory Levels developed by the USEPA Office of Drinking Water (1987), and 2) values derived from the Superfund Public Health Evaluation Manual (EPA 54011-861060, October 1986) for noncarcinogens and carcinogens. These ARARs are also presented in Table 11.

Description of ARARs

Federal

Safe Drinking Water Act - MCLs

Clean Water Act - Ambient Water Quality Criteria

Clean Air Act, Part D

National Ambient Air Quality Standards

State

Pennsylvania Clean Streams Law - Section 402 - Ambient Water Quality Standards

Pennsylvania Rules and Regulations
Title 25 Chapter 93

Pennsylvania Scenic Rivers Act

French Creek State Park Scenic Rivers Act

Pennsylvania Air Resource Regulations

Pennsylvania Air Toxic Guidelines

Additional Requirements for Protectiveness

The selected site remedy is consistent with the following:

Federal Executive Order 11988, Floodplain Management 40 C.F.R. Part 6, Appendix A. - Action to avoid adverse effects, minimize potential harm, restore and preserve natural beneficial value.

Federal Executive Order 11990, Protection of Wetlands, 40 C.F.R. Part 6. Appendix A. - Action to minimize destruction, loss, or degradation of wetlands.

Additional Requirements for Protectiveness (Cont.)

Federal Clean Water Act	- Differential Groundwater Policy Class IIA aquifer.
Pennsylvania Scenic Rivers Act	
French Creek State Park Scenic River Act	
Pennsylvania Air Resource Regulations	
Pennsylvania Air Toxic Guidelines	
New Jersey Coastal Plain Sole Source Aquifer	- Action to minimize aquifer impacts

X. DETAILED ANALYSIS OF RETAINED REMEDIAL ALTERNATIVES AND COMPARATIVE ANALYSIS

This section includes a detailed evaluation of each of the alternatives that were retained after the preliminary screening process in the Feasibility Study.

The alternatives were screened on the basis of effectiveness, implementability and cost. Alternative 1, No Action, was eliminated from further consideration because it would not provide for continuation of point of use granular activated carbon systems provided in accordance with an Administrative Consent Order (ACO) with the Pennsylvania Department of Environmental Resources (PADER) and would not address the contaminated groundwater. Alternative 5, which includes groundwater pumping off site in the Stockton Formation, was eliminated from further consideration because:

1. It would not provide a significant increase in VOC removal from groundwater compared to Alternative 4.
2. It could adversely affect the water quality of uncontaminated off-site wells in the Town of Kimberton.
3. It would be technically difficult to construct due to the extensive piping and electrical networks required, which would extend under roads, over hilly terrain and through residential areas.
4. It would be disruptive to roads and private property during construction and subsequent operation and maintenance requirements.
5. It could adversely affect the water level off-site wells in the town of Kimberton.

Treatment technologies identified as potentially appropriate for the contaminants present in ground and surface water include: (a) air stripping, (b) chemical oxidation, (c) GAC adsorption, (d) on-site biological treatment, and (e) treatment by a Publicly owned Treatment Works (POTW). GAC adsorption was eliminated by the screening process because it is relatively ineffective for removal of vinyl chloride. Biological treatment on site was eliminated by the screening process because it is not practical for treatment of low concentrations of contaminants in ground and surface water at the Kimberton

TABLE 11
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
SHORT-TERM EFFECTIVENESS:			
Protection of community during remedial actions	Safely implemented without special precautions.	Safely implemented without special precautions.	Safely implemented without special precautions.
Protection of workers during remedial activities	Not applicable.	Worker protection during construction would include TYVEK paper suits and gloves.	Worker protection during construction would include TYVEK paper suits and gloves. Respiratory protection during well drilling could be required based upon air monitoring results.
Environmental impacts	No impact on environment.	No impact on environment.	Ground water table would be lowered, and could potentially affect water supply wells.
Time until response objectives are achieved	ARARs in the ground water and significant reduction in VOCs discharged to surface water would not be achieved for a long period of time.	Significant reduction of the amount of VOCs discharged into Stream A would be accomplished immediately. However, ARARs in the ground water would not be achieved for a long period of time.	Significant reduction of the amount of VOCs discharged into Stream A would be accomplished immediately. VOC concentrations and mass in ground water would be reduced more quickly. However, ARARs in the ground water would not be achieved for a long period of time.
LONG-TERM EFFECTIVENESS AND PERMANENCE:			
Magnitude of residual risk	Negligible risk at Stream A. Nonexistent risk associated with ground water usage because of alternate water supplies.	Negligible risk at Stream A. Nonexistent risk associated with ground water usage because of alternate water supplies.	Negligible risk at Stream A. Nonexistent risk associated with ground water usage because of alternate water supplies.

TABLE 11 (CONTINUED)
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
LONG-TERM EFFECTIVENESS (CONTINUED):			
Adequacy of controls	Long-term management would include servicing alternate water supplies. Long-term monitoring of the ground water would be required.	Air stripping is expected to meet performance requirements for the contaminants present. Long-term management would include: 1) servicing alternate water supplies and 2) operation and maintenance of treatment system. Long-term monitoring of the ground water would be required.	Air stripping is expected to meet performance requirements for the contaminants present. Long-term management would include: 1) servicing alternate water supplies and 2) operation and maintenance of treatment system. Long-term monitoring of the ground water would be required.
Reliability of controls	Careful monitoring of alternate water supplies would ensure the protection of public health.	Technical components are not expected to require replacement during implementation of remedial program. Careful monitoring of alternate water supplies would ensure the protection of public health.	Technical components are not expected to require replacement during implementation of remedial program. Careful monitoring of alternate water supplies would ensure the protection of public health.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME:			
Treatment process and remedy	Not applicable.	Air stripping is a demonstrated technology that is well suited for removing the contaminants of concern.	Air stripping is a demonstrated technology that is well suited for removing the contaminants of concern.
Amount of hazardous material destroyed or treated	There would be no destruction or treatment of hazardous material in the aquifer and entering Stream A except by natural degradation and flushing.	VOCs discharged via Spring A-10 at a current rate of 1#/day would be collected and treated. This rate would decrease with time. Natural degradation and flushing would gradually reduce VOC levels in the aquifer.	Approximately 15#/day of VOCs would be initially extracted from the aquifer and treated. Also, VOCs discharged at a rate of 1#/day via Spring A-10 would be collected and treated. The remaining VOCs would eventually be naturally degraded and flushed from the aquifer.

TABLE 11 (CONTINUED)
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME (CONTINUED):			
Reduction in toxicity, mobility, or volume	There would be no immediate reduction of hazardous materials in the aquifer and Stream A by this remedial method. However, natural degradation and and flushing would gradually reduce VOCs in the aquifer and entering Stream A.	There would be an immediate reduction of hazardous materials entering Stream A from Spring A-10. There would be no immediate reduction of hazardous materials in the aquifer. However, natural degradation and flushing would gradually decrease concentrations of VOCs in the aquifer.	There would be an immediate reduction of hazardous materials entering Stream A from Spring A-10. Also, there could be a significant reduction of VOCs in the aquifer by implementation of this remedial action. The remaining VOCs would gradually be degraded and flushed from the aquifer.
Irreversibility of the treatment	Not applicable.	Air stripping permanently removes VOCs from water.	Air stripping permanently removes VOCs from water.
Type and quantity of treatment residual	Not applicable.	Insignificant amounts of VOCs could be present in the treated effluent.	Insignificant amounts of VOCs could be present in the treated effluent.
IMPLEMENTABILITY - TECHNICAL FEASIBILITY:			
Ability to construct technology	Not applicable.	Construction would include the installation of up to 1,000 feet of pipeline across rolling terrain and under roads.	Construction would include the installation of approximately 4,000 feet of pipeline across rolling terrain and under roads. Also, 10 wells would have to be installed through 100 feet of saturated thickness.
Reliability of technology	Not applicable.	Air stripping is expected to consistently meet discharge requirements. Technical difficulties are not foreseen.	Air stripping is expected to consistently meet discharge requirements. Technical difficulties are not foreseen.

TABLE 11 (CONTINUED)
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
IMPLEMENTABILITY - TECHNICAL FEASIBILITY (CONTINUED):			
Ease of undertaking additional remedial action, if necessary	No future remedial actions would be anticipated.	No future remedial actions would be anticipated.	No future remedial actions would be anticipated.
Monitoring considerations	A continuing ground water monitoring program would sufficiently define any changes in the VOC plume, thus allowing the protection of the affected residences. Because of the installation of serial point-of-use carbon units, it is unlikely that the public would be exposed to any risk due to the failure of a monitoring program.	A continuing ground water monitoring program would sufficiently define any changes in the VOC plume, thus allowing the protection of the affected residences. Because of the installation of serial point-of-use carbon units, it is unlikely that the public would be exposed to any risk due to the failure of a monitoring program. An air stripper effluent monitoring program would be required.	A continuing ground water monitoring program would sufficiently define any changes in the VOC plume, thus allowing the protection of the affected residences. Because of the installation of serial point-of-use carbon units, it is unlikely that the public would be exposed to any risk due to the failure of a monitoring program. An air stripper effluent monitoring program would be required.
IMPLEMENTABILITY - ADMINISTRATIVE FEASIBILITY:			
Coordination with other agencies	-Ground water monitoring -Well installation restrictions	-Ground water monitoring -Well installation restrictions -Property easements -NPDES permit	-Ground water monitoring -Well installation restrictions -Property easements -NPDES permit -Chester County Health Department well drilling permit -Delaware River Basin Commission ground water extraction permit
IMPLEMENTABILITY - AVAILABILITY OF SERVICES AND MATERIALS:			
Availability of treatment, storage capacity, and disposal services	Not applicable.	Not applicable.	Not applicable.

TABLE 11 (CONTINUED)
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
IMPLEMENTABILITY - AVAILABILITY OF SERVICES AND MATERIALS (CONTINUED):			
Availability of necessary equipment and specialists	Not applicable.	Equipment required is readily available. Minimal operator training would be required.	Equipment required is readily available. Minimal operator training would be required.
Availability of prospective technologies	Not applicable.	Air stripping equipment is available and well-demonstrated. Several vendors supply each type of equipment required for air stripping.	Air stripping equipment is available and well-demonstrated. Several vendors supply each type of equipment required for air stripping.
COST:			
Probable construction cost	—	$162,000	$656,000
Annual O&M cost (not including quarterly ground water monitoring or maintenance of alternate water supplies)	—	$93,000	$175,000
Present worth analysis	—	$1.21 Million	$2.63 Million
COMPLIANCE WITH ARARS:			
Chemical specific	ARARs for surface water are met. However, ARARs for ground water would not be met for a long period of time.	ARARs for surface water are met. However, ARARs for ground water would not be met for a long period of time.	ARARs for surface water are met. However, ARARs for ground water would not be met for a long period of time.

TABLE 11 (CONTINUED)
DETAILED ANALYSIS OF ALTERNATIVES

Criteria	Alternative 2	Alternative 3	Alternative 4
COMPLIANCE WITH ARARS (CONTINUED):			
Action specific	Not applicable.	Full compliance with 40 CFR Part 262 (standards for generators) and 40 CFR Parts 264 and 265 (standards for owners and operators of hazardous waste treatment, storage, and disposal facilities). Emissions from air stripping in full compliance with Pennsylvania air toxics guidelines.	Full compliance with 40 CFR Part 262 (standards for generators) and 40 CFR Parts 264 and 265 (standards for owners and operators of hazardous waste treatment, storage, and disposal facilities). Emissions from air stripping in full compliance with Pennsylvania air toxics guidelines.
Location specific	Not applicable.	Not applicable.	Not applicable.
Appropriate waivers	- ARARs in the ground water are expected to gradually be attained through natural flushing and VOC degradation. - The public is presently not at risk. Future risk is not expected.	- ARARs in the ground water are expected to gradually be attained through natural flushing and VOC degradation. - The public is presently not at risk. Future risk is not expected.	Not applicable.
OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT:			
Methods to eliminate, reduce, or control risks	-Alternative water supplies	-Alternative water supplies	-Alternative water supplies
Methods to protect the environment	None.	-Collection of Spring A-10	-Collection of Spring A-10 -Extraction of ground water
STATE ACCEPTANCE:			
To be addressed following agency review.			
COMMUNITY ACCEPTANCE:			
To be addressed following agency review.			

Site. Chemical oxidation and treatment by a POTW were eliminated because neither process ~~is~~ cost effective.

Each of the alternatives received a detailed evaluation based upon the following criteria:

- Short-term effectiveness,
- Long-term effectiveness and permanence,
- Reduction of toxicity, mobility, or volume,
- Implementability,
- Cost
- Compliance with all applicable or relevant and appropriate federal or state requirements (ARARs)
- Overall protection of human health and the environment,
- State acceptance, and
- Community acceptance.

These criteria combine the specific CERCLA requirements that must be satisfied in a Record of Decision (ROD) with emphasis on evaluating long-term effectiveness and related considerations.

A. Description of Alternatives

Alternative 1 - No Action

All alternatives considered must be judged against a "No Action" alternative as required by CERCLA to provide a worst case for comparison with other alternatives. This alternative involves taking no actions at the Site to remediate the contamination. In addition, this alternative would not provide for continuation of point of use granular activated carbon systems provided by CIBA-GEIGY and Monsey in accordance with an Administrative Consent Order with PADER.

The no action alternative would not comply with the ARARs for a CERCLA cleanup.

Alternative 2 - Continued Provision of Alternate Water Supplies; Monitoring; Institutional Controls.

Alternative 2 provides for the continued provision of alternate water supplies through Granular Activated Carbon treatment system and/or potable water supply storage tanks. The ground water monitoring program would also continue to allow for periodic reassessment of the extent of contamination and the concentrations of hazardous substances contained in the ground water. In addition, administrative controls will be instituted to prevent the installation of new groundwater extraction wells for use within the area affected by groundwater contamination.

The contaminates in the groundwater would gradually meet the Maximum Contaminant Levels (MCLs) through natural flushing and volatile organic compounds (VOCs) degradation. The MCLs are promulgated pursuant to the Safe

Drinking Water Act (SDWA). These requirements are legally applicable to public water supplies serving twenty-five (25) or more persons or entailing 15 or more service connections. There are no public water supplies in Kimberton affected by Site releases, and therefore, MCLs are not legally applicable.

The aquifer beneath the Kimberton Community is classified as a Class IIA aquifer under the Clean Water Act. This classification indicates that it is utilized as a current or potential source of drinking water. The MCLs for indicator compounds and other compounds detected at the Site (Table 10) have been determined to be relevant and appropriate.

Alternative 3 - Continued provision of Alternate Water Supplies: Monitoring; Institutional Controls; Collection and Treatment of Spring A-10.

This alternative is the same as alternative No. 2 plus the collection of Spring A-10 and the treatment of the water by air stripping.

Water quantity standards promulgated by PADER for the portion of the French Creek basin encompassing the Kimberton area (25 Pa. Code 93.7).

There are no PADER water quality standards for TCE or any of the indicator compounds at the site. However, 25 Pa. Code Section 93.6 contains a general standard that surface waters may not contain substances from waste discharge that are in such concentrations or amounts as to be harmful to aquatic or other life or to be "inimical" to designated water uses. In order to determine whether this standard is potentially a limiting factor at the site, the ground water discharges to Tributary "A" must be compared to US EPA's Ambient Water Quality Criteria that are shown in Table 9.

The AWQC criteria do not have the legal effect of water quality standards; they are advisory and are subject to adjustment to reflect site-specific factors. AWQC values for the indicator compounds and other compounds detected at the site are reported in Table 9.

The site is in a non-attainment zone for ozone, therefore, the emissions from the air stripping will comply with Pennsylvania air toxics guidelines. A National Pollution Discharge Elimination System (NPDES) permit may be required for the surface water discharge from the air stripper.

Alternative 4 - Continued provision of Alternate Water Supplies, Collection and Treatment of Spring A-10 and On-Site Source Control and Groundwater Remediation

This alternative is the same as alternative No. 3 plus the collection and treatment on-site through groundwater pumping and air-stripping. The treated water from the air stripper will be discharged into Stream A. The extraction wells will pump a total of 100 gallons per minute (gpm) initially, with a capacity to pump a total of 200 gpm.

A permit from the Delaware River Basin Commission will be required to extract the groundwater. A drilling permit will also be required from the Chester County Health Department.

VOC concentrations and mass in the groundwater would be reduced. MCLs would be achieved over a long period of time. Air stripping and natural degradation and flushing of the acquifer will reduce VOC significantly.

Potential relevant and appropriate requirements include: Maximum Contaminant Levels (MCLs), Maximum Contaminant Level Goals (MGLGs), Drinking Water Health Advisory Levels developed by the office of Drinking Water (1987), values derived from the Superfund Public Health Evaluation Manual (EPA 54011-861060, October 1986) for noncarcinogens and carcinogens, and Ambient Water Quality Criteria (AWQC) for protection of Human and Aquatic Life.

B. Detailed Evaluation of Alternatives

Short-Term Effectiveness

The evaluation of the short-term effectiveness of each remedial action includes consideration of 1) the protection of the community during the remedial action(s), 2) the protection of the workers during the construction phase of the remedial action(s), 3) the environmental impacts of the remedial action(s), and 4) the length of time required to achieve the remedial response objectives.

Protection of the Community

None of the alternatives would generate short-term risk to the public health. Alternatives 3 and 4 involve treating ground and/or surface water by air stripping; however, the emissions generated have been determined to be within safe limits.

Protection of the Workers

Alternatives 3 and 4 require construction of a surface water collection system and/or a ground water extraction system. Workers constructing the surface water collection system (Alternatives 3 and 4) would require protection against dermal contact with surface water (e.g., tyvek coveralls and gloves). Workers drilling the extraction wells (Alternative 4) would not only require protection against dermal contact, but could require respiratory protection. This determination would be made in the field based upon air monitoring measurements.

Environmental Impacts

Construction activities for implementation of Alternatives 2 and 3 are absent or minimal, and thus would not generate adverse environmental impacts. However, implementation of Alternative 4 would include ground water extraction, which could adversely affect the ground water supply available to residents in the area.

Time Until Response Objectives are Achieved

Alternatives 3 and 4 would require the collection and treatment of Spring A-10. This would provide an immediate improvement in water quality in Stream A.

Alternative 2, however, would not provide any improvement in water quality in Stream A.

Alternative 4 is the only alternative that would provide ground water remediation. Ground water would be extracted and treated, thereby containing VOCs from migrating off site. It is presently anticipated that ground water extraction and treatment could be required for approximately 30 years. Refinement of this estimate would be possible subsequent to initiation of the remedial program.

Long-Term Effectiveness and Permanence

The evaluation of the long-term effectiveness and permanence of each remedial action includes consideration of 1) the magnitude of residual risks after implementation, 2) the adequacy of controls, and 3) the reliability of controls.

Magnitude of Residual Risks after Implementation

At present, use of ground water at the Kimberton Site poses no risk to public health because the affected residences have been provided with alternate water supplies. These residences would continue to use alternate water supplies until VOC concentrations in the ground water meet ARARs or until they are hooked up to public water line. Also, there is currently no significant risk associated with dermal contact with or inhalation of compounds detected in surface water. Therefore, residual risks remaining after implementation of any of the alternatives would be negligible.

Adequacy of Controls

Air stripping, as required by Alternatives 3 and 4, is expected to meet performance requirements for the contaminants present, provided that proper maintenance procedures are followed. Long-term management for any of the alternatives would include servicing of the alternative water supplies until ARARs are attained or public water is introduced to the community. Long-term monitoring of the ground water would be required until the ground water contaminant levels meet ARARs.

Reliability of Controls

For each alternative to be effective, careful monitoring of the alternate water supplies is required until ARARs are met in the aquifer or until public water service is made available to the community. Alternatives 3 and 4 require operation and maintenance of a water treatment system. Operational components are not expected to require replacement during implementation of these alternatives.

Reduction of Toxicity, Mobility, or Volume

The evaluation of the reduction in toxicity, mobility, or volume of the contaminants for each remedial action includes consideration of 1) the treatment process and remedy, 2) the amount of hazardous material destroyed or treated, 3) the extent of reduction in toxicity, mobility, or volume, 4) the irreversibility of the treatment, and 5) the type and quantity of treatment residual.

Treatment Process and Remedy

Air stripping, as required by Alternatives 3 and 4, is a demonstrated technology that is well-suited for removing the contaminants of concern.

Amount of Hazardous Material Destroyed or Treated

The amount of hazardous materials destroyed or treated varies according to the alternative. Alternative 2 would not promote the reduction of VOCs in the ground water and entering Stream A except by natural degradation and flushing of the VOCs in the aquifer. Alternatives 3 and 4 include the collection and treatment of water from Spring A-10. The VOCs are currently discharged from Spring A-10 at a rate of approximately 1 pound/day; this rate would decrease with time as the VOCs in the aquifer decrease with time. Like Alternative 2, Alternative 3 would not promote the reduction of VOCs in the ground water except by natural degradation and flushing. However, Alternative 4 would initially provide the extraction of approximately 15 pounds/day of VOCs. This mass removal rate would decrease with time. The remainder of low-level VOCs in the plume would eventually be degraded and flushed naturally.

Reduction in Toxicity, Mobility, or Volume

Alternative 2 would provide no immediate reduction in contaminant toxicity, mobility, or volume in the groundwater or surface water. However, natural degradation and flushing would gradually reduce the mass of VOCs in the aquifer and entering Stream A. Alternatives 3 and 4 would provide an immediate reduction of contaminants entering Stream A from Spring A-10. Alternative 4 is the only alternative that includes ground water extraction. This action should potentially result in a significant reduction of VOCs in the aquifer by the extraction and treatment of ground water. The remaining VOCs would also be naturally degraded and flushed from the aquifer over a period of time.

Irreversibility of Treatment

Air stripping, as required by Alternatives 3 and 4, permanently removes VOCs from ground and surface water.

Type and Quantity of Treatment Residual

For alternatives requiring treatment, Alternatives 3 and 4, insignificant amounts of VOCs could be present in the treated effluent.

Technically Feasibility of Implementation

The evaluation of the technical feasibility of implementing each remedial action includes consideration of 1) the ability to construct the equipment incorporating the technology, 2) the reliability of the technology, 3) the ease of undertaking additional remedial action, if necessary, and 4) monitoring requirements.

Ability to Construct Technology

Alternatives 3 and 4 would involve construction of a collection system for Spring A-10, including up to 1,000 feet of pipeline across rolling terrain and under roads. Alternative 4 would require the installation of another 3,000 feet of pipeline and ten wells for extraction and treatment of ground water. These wells would have to be installed through 100 feet of saturated soil. These construction activities may be difficult, but are technically feasible.

Reliability of Technology

Air stripping, as required by Alternatives 3 and 4, is expected to consistently meet discharge requirements. This technology is a proven treatment method for removing organic contaminants from a liquid waste stream or contaminated water supply. Technical difficulties are not foreseen.

Ease of Undertaking Additional Remedial Action

No future remedial actions are anticipated for any of the alternatives.

Monitoring Requirements

A continuing ground water monitoring program should sufficiently define any changes in the VOC plume, thus allowing the protection of the affected residences for each of the alternatives. Because of the installation of serial point of use carbon units, it is unlikely that the public would be exposed to unacceptable risk due to the failure of a carbon unit monitoring program. An air stripper effluent monitoring program must be implemented for Alternative 3 and 4.

Administrative Feasibility of Implementation

All of the remedial alternatives would require the continuation of ground water monitoring and placement of restrictions on the installation of new wells. In addition, Alternatives 3 and 4 would require an NPDES permit for surface water discharge. Alternatives 3 and 4 would require property easements for installation of pipelines, wells, and/or a surface water (Spring A-10) collection device. Alternative 4 requires the extraction range of 144,000 to 288,000 gpd of groundwater, thus requiring a permit from the Delaware River Basin Commission. This alternative may require a drilling permit from the Chester County Health Department.

Availability of Services and Materials

The evaluation of the availability of services and materials for implementing each remedial action includes consideration of 1) the availability of treatment, storage capacity, and disposal services, 2) the availability of necessary equipment and specialists, and 3) the availability of prospective technologies.

Availability of Treatment, Storage Capacity, and Disposal Services

None of the alternatives require off-site treatment, storage, or disposal services.

Availability of Necessary Equipment and Specialists

The equipment required for implementation of Alternatives 3 and 4 would be readily available. Minimal operator training would be required for operation and maintenance of an air stripper system.

Availability of Prospective Technologies

Air stripping systems, as required for Alternatives 3 and 4, are available and well-demonstrated. Several vendors supply each type of equipment required for air stripping.

Cost

The evaluation of the cost for implementing each remedial action includes consideration of 1) the probable construction cost, 2) the annual operation and maintenance cost, and 3) the present worth analysis. A summary of the cost analysis follows.

Probable Construction Cost

The probable construction costs for each of the alternatives are as follows:

Alternative 2: $ 0
Alternative 3: $ 162,000, and
Alternative 4: $ 656,000

Annual Operation and Maintenance Cost

The annual operation and maintenance costs for implementation of each of the alternatives are as follows:

Alternative 2: $ 0
Alternative 3: $ 93,000, and
Alternative 4: $ 175,000

These operation and maintenance costs do not include the universal requirement for ground water monitoring and maintenance of alternative water supplies.

Present Worth Analysis

The present worth analyses for each of the alternatives, based upon an annual discount rate of 8%, are:

Alternative 2:	$	0
Alternative 3:	$	1.21 million, and
Alternative 4:	$	2.63 million

Compliance with ARARs

The evaluation of the compliance with ARARs for each remedial action includes consideration of 1) chemical-specific ARARs, 2) action-specific ARARs, and 3) location-specific ARARs. Also, if ARARs cannot be attained by the remedial action, appropriate waivers justifying this deficiency must be cited.

Chemical-Specific ARARs

ARARs for surface water are met by all of the alternatives. However, ARARs for groundwater will be attained after as period of time.

Action-Specific ARARs

There are no action-specific ARARs for Alternative 2. Alternatives 3 and 4 must be in full compliance with the applicable provisions of 25 Pa. Code Section 75.262, (Generators of Hazardous Waste) and 75.264 (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities). Also, emissions from air stripping would be in full compliance with Pennsylvania air toxics regulations (Alternatives 3 and 4).

Location-Specific ARARs

There are no location-specific ARARs applicable to any of the remedial alternatives.

Appropriate Waivers

Waivers could be required for Alternatives 2 and 3 to justify the implementation of remedial actions that do not directly promote the overall attainment of ARARs in the ground water. Appropriate waivers for the Kimberton Site include:

- ARARs relating to the ground water are expected to be eventually met through natural flushing and VOC degradation, and
- The public is presently not at risk; future risk is not expected.

Overall Protection of Human Health and the Environment

The evaluation of the overall protection of human health and the environment includes consideration of 1) the methods to eliminate, reduce, or control risk, and 2) the method to protect the environment.

Methods to Eliminate, Reduce or Control Risks

Each of the alternatives include the continued provision of alternate water supplies to protect the public health from contact with contaminated ground water. There is presently no significant risk (i.e., well below EPA guidelines) associated with surface water.

Methods to Protect Environment

Alternative 2 does not offer protection to the environment. Alternatives 3 and 4 protect the surface water by collection and treatment of Spring A-10. In addition, Alternative 4 requires the extraction of ground water, which would hasten the reduction of VOC concentration and mass in the aquifer.

State Acceptance

Evaluation of this criterion is required following agency review.

Community Acceptance

Evaluation of this criterion is required following public comment.

Summary of Detailed Analysis of Alternatives

A summary of the detailed analysis of alternatives is presented in Table 12.

XI. Documentation of Significant Changes

No significant changes to the preferred alternative presented in the proposed plan have occurred.

XII. Selected Remedial Alternative

A. Evaluation Criteria

Section 121 of SARA and the current version of the National Contingency Plan (NCP) (50 Fed. Reg. 47912, November 20, 1985) establish a variety of requirements pertaining to remedial actions under CERCLA. The following nine criteria were used in the evaluation of the remedial action alternatives at Kimberton:

- Overall protection of human health and the environment refers to whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides ground for invoking a waiver.

- Long-term effectiveness and permanence refers to the ability of a remedy to furnish reliable protection of human health and the environment after cleanup goals have been met.

- Reduction of toxicity, mobility or volume is the anticipated performance of the treatment technologies a remedy may employ.

- Short-term effectiveness addresses the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goal are achieved.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital and operation and maintenance costs and net present worth costs.

- State Acceptance indicates whether, based on its review of RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative at the present time.

- Community Acceptance will be assessed in the Record of Decision following a review of the public comments received on the Administrative Record and Proposed Plan.

B. Determination of Preferred Remedial Alternative

The preferred alternative is Alternative 4. Alternative 4 (collection of Spring A-10 and extraction and treatment of ground water on site), as more fully described below, is recommended as the most technically feasible, practical, and effective remedial action for the Kimberton Site:

1. The extraction wells pumping a total of 100 gpm initially, with a capacity to pump a total of 200 gpm, should be installed for on-site hydraulic control and ground water remediation. The extracted ground water should be treated in an air stripping system and then discharged to an adjacent surface water stream (Stream A).

   The current goal of the groundwater remediation is to achieve natural background conditions. This goal will be periodically reassessed during remediation system and aquifer performance to determine if such goals are feasible.

2. The principal local ground water discharge point to Stream A (Spring A-10) should be collected and treated by air stripping to improve surface water quality.

3. The GAC point of use treatment systems and potable water supply storage tanks will be maintained until a public water supply is installed.

4. Administrative controls to prevent the installation of new ground water extraction wells for use within the area affected by ground water contamination should be implemented.

5. Long-term ground water monitoring in conjunction with remedial activities should be instituted to further assess contaminant plume configuration and dynamics. During this time period the performance of the Stockton Formation will be further evaluated to assess the validity of the assumptions groundwater model assumptions which involve the remediation of the Stockton formation. If this evaluation indicates that further groundwater remediation in the Stockton formation is a viable alternative, then such a program may be implemented for that area.

Implementation of these recommended remedial activities will meet the objectives of CERCLA to protect human health and the environment, to be cost effective, and to utilize treatment technologies to the maximum extent practical.

The preferred alternative provides complete protection, in the short-term, to groundwater users by treatment of the water at the individual wells. Long-term effectiveness will be obtained by implementing the pumping and treatment of the groundwater. The Responsible Parties identified at this Site will continue to maintain carbon filters and water via below grade tanks which provide both drinking and contact water and, which upon chemical analysis achieves the current guidelines of background.

EPA, in consultation with PADER, has made a preliminary determination that the preferred alternative provides the best overall compliance with respect to the nine criteria. The preferred alternative is anticipated to meet the following statutory requirements to:

- Protect human health and the environment
- Meet ARARs
- Be cost-effective
- Utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

In summary, at this time the preferred alternative is believed to provide the best overall compliance among the alternatives with respect to the criteria used to evaluate remedies. Based on the information available at this time, therefore, EPA and PADER believe the preferred alternative would be protective, would meet ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This alternative meets the goal of protecting human health and the environment and restoring the contaminated groundwater to a clean and uncontaminated condition.

Schedule

Remedial Design and Construction for the final remedy is anticipated to commence in Spring 1990.

C. Statement of Findings Regarding Wetlands and Floodplains

This decision provides a remedial alternative for treatment of contaminated groundwater, defined as the final remedial action for this site. However, the Design Report will consider the impact of contamination on wetlands floodplains and surface water.

XIII. The Statutory Determinations

A. Protection of Human Health and the Environment

The selected remedy will reduce and control the amount of groundwater contamination, which will ensure adequate protection of human health and the environment. No unacceptable short and long-term risks will be caused by implementation of the remedy.

Based on a review of volatile organic chemical analytical data from collected groundwater samples from affected off-site wells, and in view of the vinyl chloride concentrations in the untreated groundwater, the use of granular activated carbon filters has proven to be successful in reducing the concentrations of the contaminants of concern, (i.e. TCE, DCE, VC) to non-detectable levels.

B. Attainment of ARARs

The selected remedy will attain the applicable or relevant and appropriate requirements and are as follows:

Federal

Safe Drinking Water Act - MCLs

Clean Water Act - Ambient Water Quality Criteria

Clean Air Act, Part D

National Ambient Air Quality Standards

- State

Pennsylvania Clean Streams Law - Section 402	- Ambient Water Quality Standards
Pennsylvania Rules and Regulations Title 25 Chapter 93	
Pennsylvania Scenic Rivers Act	
French Creek State Park Scenic Rivers Act	
Pennsylvania Air Resource Regulations	
Pennsylvania Air Toxic Guidelines	

Additional Requirements for Protectiveness

The selected site remedy is consistent with the following:

Federal Executive Order 11988, Floodplain Management 40 C.F.R. Part 6, Appendix A.	- Action to avoid adverse effects, minimize potential harm, restore and preserve natural beneficial value.
Federal Executive Order 11990, Protection of Wetlands, 40 C.F.R. Part 6, Appendix A.	- Action to minimize destruction, loss, or degradation of wetlands.
Federal Clean Water Act	- Differential Groundwater Policy Class IIA aquifer.
Pennsylvania Scenic Rivers Act French Creek State Park Scenic River Act Pennsylvania Air Resource Regulations Pennsylvania Air Toxic Guidelines.	
New Jersey Coastal Plain Sole Source Aquifer	- Action to minimize aquifer impacts

C. Cost-effectiveness

The selected remedy is cost effective with respect. The PRPs are operating the current systems described in the selected remedial alternative in compliance with the PADER Consent Order and Agreement.

D. Utilization of permanent solutions employing alternative technologies to the maximum extent practicable

The selected remedy is the most appropriate solution for this operable unit and represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

E. Preference for treatment as a principal element

The preference is satisfied since treatment is the principal element of the chosen alternative.

10) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the results of GAC system sampling, 2/2/89. P. 301531-301532. The sampling results are attached.

11) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the Groundwater Technology Inc's. (GTI) report of sampling and analysis results for the third quarter of 1988, 2/2/89. P. 301533-301644. A memorandum regarding groundwater quality laboratory analytical data and a report entitled "Data Validation, CIBA-GEIGY, Kimberton, Pennsylvania" are attached.

12) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the results of GAC system sampling, 2/22/89. P. 301645-301648. The sampling results are attached.

13) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Kimberton RI/FS quarterly sampling well no. 33, 2/28/89. P. 301649-301649.

14) Report: Feasibility Study Report, prepared by Environmental Resources Management, Inc., 3/89. P. 301650-302077.

15) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the quarterly sampling event conducted in Kimberton dated February 21 and 22, 1989, and the results of GAC system sampling, 3/24/89. P. 302078-302109. The quarterly sampling event and the results of GAC system sampling are attached.

16) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the Groundwater Technology Inc.'s report of sampling and analysis results for the first quarter of 1989, 4/10/89. P. 302110-302116. A memorandum regarding groundwater quality laboratory analytical data is attached.

17) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the results of GAC system sampling of the Kimberton Country House collected on March 22 and 23. 1989, 4/17/89. P. 302117-302120. The sampling results are attached.

18) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the February 1989 quarterly sampling QA/QC data review package, 4/28/89. P. 302121-302152.

KIMBERTON II SITE
ADMINISTRATIVE RECORD FILE * **
INDEX OF DOCUMENTS

REMEDIAL RESPONSE PLANNING

1) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of December 1988 quarterly sampling QA/QC data review package, 3/2/88. P. 300001-300034. A report entitled "Analytical Quality Assurance Review, CIBA-GEIGY - Kimberton, Pennsylvania, December 1988 Quarterly Residential and Carbon System ACO Monitoring and Rebedding Samples" is attached.

2) Record of Decision, 9/30/88. P. 300035-300116.

3) Report: <u>Remedial Investigation Report, Kimberton, Pennsylvania, Volumes I-II</u>, prepared by Environmental Resources Management, Inc. and Groundwater Technology, Inc., 10/14/88. P. 300117-301484. References are listed on P. 300283.

4) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the GAC system sampling, 10/31/88. P. 301485-301488. The sampling results are attached.

5) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the GAC system sampling, 11/16/88. P. 301489-301490. The sampling results are attached.

6) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the analytical results obtained from the December 1988 quarterly sampling of the GAC systems, 1/5/89. P. 301491-301519. The analytical results are attached.

7) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the GAC system sampling, 1/9/89. P. 301520-301522. The sampling results are attached.

8) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the analytical results obtained from the December 1988 quarterly sampling of the GAC systems at the Weaver Residence, 1/12/89. P. 301523-301525. The analytical results are attached.

9) Letter to Mr. Eugene W. Pine, Pennsylvania Department of Environmental Resources, from Mr. J. Stewart Johnson, CIBA-GEIGY Corporation, re: Transmittal of the analytical results obtained after rebedding of carbon treatment systems at the Effgen, Pifer and Ludwick locations, 1/23/89. P. 301526-301530. The analytical results are attached.

* Administrative Record File available 5/15/89.

** For further documentation on this site, please refer to the Kimberton Site Administrative Record.

Note: Company or organizational affiliation is identified in the index only when it appears in the file.

APPENDIX C

ADMINISTRATIVE RECORD INDEX

GLOSSARY OF TERMS

Administrative Record (AR) - A legal document that contains information on Superfund site. The AR serves as the basis for the selection of a Superfund response action, and this record is available to the public.

ARARs - Applicable or relevant and appropriate Federal, State or other promulgated public health and environmental requirement.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act established a Trust Fund for the purposes of cleanup at hazardous waste sites identified on the National Priority List.

Feasibility Study (FS) - The purpose of this study is to identify and screen cleanup alternatives for remedial action, and to analyze in detail the technology and costs involved with the various alternatives.

National Contingency Plan (NCP) - Contains the regulations that govern the Superfund program.

National Priorities List (NPL) - EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response under superfund.

Remedial Design - An engineering phase that follows the Record of Decision when technical drawings and specifications are developed for the subsequent remedial action at a site on the National Priorities List (NPL).

Remedial Investigation (RI) - The purpose of this study is to gather the data necessary to determine the type and extent of contamination at a Superfund site.

Superfund - The common name used for the Comprehensive Environmental Response, Compensation, and Liability Act, also referred as the Trust fund. The Superfund program was established to help pay for cleanup of hazardous waste sites and to take legal action to force those responsible for the sites to clean them up.

4. The GAC point-of-use treatment systems and potable water supply storage tanks should be maintained until a public water supply is installed.

5. Administrative controls to prevent the installation of new groundwater extraction wells for potable use within the area affected by groundwater contamination should be implemented.

6. Long-term groundwater monitoring in conjunction with remedial activities should be instituted to further assess contaminant plume configuration and dynamics.

Implementation of these recommended remedial activities will meet the objectives of CERCLA to protect human health and the environment, to be cost effective, and to utilize treatment technologies to the maximum extent possible.

PADER, in consultation with EPA, has made a preliminary determination that the preferred alternative provides the best balance with respect to the nine criteria. In addition, both surface and groundwater remediation is consistent with the policy of the Pennsylvania Clean Streams Law which provides for the remediation and restoration of polluted streams and groundwater to a clean and unpolluted condition.

SUMMARIZING THE STATUTORY FINDINGS

In summary, at this time the preferred alternative is believed to provide the best balance of trade-offs among alternatives with respect to the criteria used to evaluate remedies. Based on the information available at this time, therefore, PADER and EPA believe the preferred alternative would be protect human health and the environment, would attain ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The proposed remedial activities focus on the known Site contamination. These activities will eliminate the risk the Site currently presents to human health and the environment. If unknown conditions or information becomes available and actions are warranted to protect human health and the environment or to prevent abate, or minimize an actual or threatened release of hazardous substances on at or from the Site, previous activities performed at the Site shall not be deemed to limit the power and authority of EPA and the Commonwealth of Pennsylvania.

NEXT STEPS

Following the conclusion of the 30-day public comment period on this proposed remedy, a Responsiveness Summary will be prepared. Changes to the preferred alternative or a change from the preferred alternative to another alternative may be made if public comments or additional data indicate that modifications to the preferred alternative or a different remedy would better achieve the cleanup goals for the Site. The Responsiveness Summary will summarize citizen's comments on the proposed remedy and PADER and EPA's responses to these comments. Thereafter, PADER and EPA will prepare a formal decision document that summarizes the decision process and the selected remedy. This document will include the Responsiveness Summary. Copies will be made available, for public review, in the information repository listed previously.

with the Pennsylvania Department of Environmental Resources (PADER). Alternative 5, which includes groundwater pumping off site in the Stockton Formation, was eliminated from further consideration because:

1. It would not provide a significant increase in VOC removal from groundwater compared to Alternative 4.

2. It could adversely affect the water quality of uncontaminated off-site wells in the Town of Kimberton.

3. It would be technically difficult to construct due to the extensive piping and electrical networks required, which would extend under roads, over hilly terrain and through residential areas.

4. It would be disruptive to roads and private property during - construction and subsequent operation and maintenance requirements.

5. It could adversely affect the water level of off-site wells in the town of Kimberton.

Treatment technologies identified as potentially appropriate for the contaminants present in ground and surface water include: (a) air stripping, (b) chemical oxidation, (c) GAC adsorption, (d) on-site biological treatment, and (e) treatment by a Publicly Owned Treatment Works (POTW). GAC adsorption was eliminated by the screening process because it is relatively ineffective for removal of vinyl chloride. Biological treatment on site was eliminated by the screening process because it is not practical for treatment of low concentrations of contaminants in ground and surface water at the Kimberton Site. Chemical oxidation and treatment by a POTW were eliminated because neither process is cost effective.

PRELIMINARY DETERMINATION OF PREFERRED REMEDIAL ALTERNATIVE

Recommendations for Remedial Actions

Alternative 4 (collection and treatment of a local spring and extraction and treatment of groundwater on site), as more fully described below, is recommended as the most technically feasible, practical, and effective remedial action for the Kimberton Site. The alternative also includes the continued provision of Alternative Water Supplies.

1. Ten extraction wells pumping a total of 100 gpm, initially, with a capacity to pump a total of 200 gpm should be installed for on-site hydraulic control and groundwater remediation. The extracted groundwater should be treated in an air stripping system with appropriate emission controls and then discharged to an adjacent surface water system.

2. The principal local groundwater discharge point to Stream A (Spring A-1 should be collected and treated by air stripping to improve surface water quality.

3. A public water supply should be installed when feasible to provide a long term water supply system for the area to replace currently used point-of-use water treatment systems and water storage tanks.

Five alternatives were specifically developed to address the ground and surface water contamination at the Site. These alternatives were identified and evaluated according to the previous described criteria required by CERCLA.

Development and Screening of Remedial Action Alternatives

The following remedial action alternatives were developed, each providing a different degree of remediation:

1. No Action: No provision of alternate water supplies and monitoring a certain locations.

   Estimated Construction Cost: 0
   Estimated Operation and Maintenance Cost: 0
   Estimated Implementation Timeframe: Not Applicable.

2. Continued Provision of Alternate Water Supplies (point of use GAC systems and water storage tanks) currently in place including monitoring.

   Estimated Construction Cost: 0
   Estimated Operation and Maintenance Cost: $250,000/year
   Estimated Implementation Timeframe: Indefinite.

3. Continued provision of Alternate Water Supplies, Collection and Treatment of Spring A-10: Same as alternative No. 2 plus the collection of Spring A and the treatment of the water by air-stripping with appropriate emission controls.

   Estimated Construction Cost: $162,000
   Estimated Operation and Maintenance Cost: $93,000/year
   Estimated Implementation Timeframe: 30 years

4. Continued Provision of Alternate Water Supplies, Collection and Treatment of Spring A-10, and On-Site Source Control and Groundwater Remediation: Same as alternative No. 3 plus the collection and treatment on-site through groundwater pumping and air-stripping with appropriate emission controls.

   Estimated Construction Cost: $656,000
   Estimated Operation and Maintenance Cost: $175,000/year
   Estimated Implementation Timeframe: 30 years

5. Continued Provision of Alternate Water Supplies, Collection and Treatment of Spring A-10, and On-Site Source Control and Groundwater Remediation, and Off-Site Groundwater Remediation: Same as alternative No. 4 plus off-site collection and treatment of groundwater.

   Estimated Construction Cost: $944,000
   Estimated Operation and Maintenance Cost: $194,000/year
   Estimated Implementation Timeframe: 30 years

The alternatives were screened on the basis of effectiveness, implementability, and cost. Alternative 1, No Action, was eliminated from further consideration because it would not provide for continuation of point of use granular activated carbon systems provided in accordance with an Administrative Consent Order (ACO)

There is currently no public exposure to site contaminants through groundwa use, because the potentially exposed population has been provided with individual point-of-use carbon filtration treatment systems. If the current water treatment systems are maintained, there should be no future risk to the potentially exposed population.

If installation of point-of-use systems and alternate water supplies had not been implemented, there would be a risk to the potentially exposed population. This hypothetical exposure scenario (i.e., use of untreated groundwater) would introduce a carcinogenic risk of 1×10^{-2} due to the presence of vinyl chloride and trichloroethene. This risk exceeds USEPA's recommended guidlines in groundwa of 1×10^{-4} to 1×10^{-7} at CERCLA sites. Known contaminants in the groundwater at the Kimberton Site do not currently pose risk to public health, however the objectives of groundwater remediation are to contain the contaminants on-site and to remove these contaminants from the groundwater to be protective for future use.

Human contact with or inhalation of compounds in sediments, streams, seeps, a springs represents an actual exposure scenario. However, the carcinogenic risks and hazard indices for this exposure (i.e., dermal contact with and inhalation of contaminants in surface water and dermal contact with PAHs in stream sediments) are within US EPA's recommended guidelines for CERCLA sites.

Comparison of aquatic life criteria with the actual concentrations in th stream and stream sediments shows that the aquatic life criteria are exceeded for TCE and DCE in Stream A at Spring A-10. The objectives of surface water remediation is to treat the water discharge at Spring A-10 thereby improving the water quality of Stream A.

The soil and air evaluated under the current RI are not considered exposure media for this assessment because site access is limited, the site is well vegetate and surficial soils are not contaminated. The results of the soils investigation conducted as part of the RI show that there are no significant concentrations of contaminants present within the former lagoons. Therefore the former lagoons are no longer acting as significant continuing sources for groundwater contamination and no remedial action is required with respect to the former lagoons.

Based upon the information presented in the Remedial Investigation and Risk Assessment, the following remedial action objectives have been developed:

1. Hydraulic groundwater control should be established to contain the identified Site contaminants and to reduce the concentration and mass of these contaminants present in groundwater.

2. A local spring (Spring A-10) should be remediated to improve the water quality of a local stream designated as "A" (see Figure 1).

- Short-term effectiveness: the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- Implementability: the technical and administrative feasibility of a remedy including the availability of materials and services needed to implement a particular option.

- Cost: includes estimated capital, operation and maintenance, and net preser worth costs.

- State Acceptance: indicates whether, based on its review of RI/FS and Proposed Plan, the State concurs on, opposes, or has no comment on the preferred alternative at the present time.

- Community Acceptance: will be assessed in the Record of Decision following a review of the public comments received on the Administrative Record and the Proposed Plan.

REMEDIAL INVESTIGATION AND RISK ASSESSMENT FINDINGS

The Remedial Investigation (RI) Reports prepared for the Kimberton Site indicate that past manufacturing and waste management operations have affected local ground and surface waters in the area. Trichloroethene, 1,1-dichloroethene, and trans-1,2-dichloroethene are present in ground and surface waters. In addition vinyl chloride is present in groundwater in several isolated locations. All of these compounds are known as volatile organic compounds (VOCs).

Local groundwater is the primary drinking water source in the Kimberton community. Those locations impacted by the presence of Site-related organic compounds have been equipped with Granular Activated Carbon (GAC) treatment systems and/or potable water supply storage tanks. These operational systems have been demonstrated to be effective in providing potable water which meets current drinkin water standards. This remediation was the subject of a Record of Decision dated September 29, 1988 and constitutes Operable Unit 1 of the remedial action for the Si

The Administrative Record for this site demonstrates that there is no current risk to human health associated with groundwater treatment systems or alternate water supplies which have been provided to the affected locations. Environmental regulations provide that, where practical, contaminated water supply aquifers should be remediated.

The Administrative Record also documents that the current risk to human health associated with dermal contact with or inhalation of compounds detected in surface water are below EPA guidelines. However, remedial action is recommended to treat the discharge of Site-related volatile organic compounds from a local spring due to excedence of Ambient Water Quality Criteria which could impact stream aquatic life.

COMMUNITY ROLE IN THE SELECTION PROCESS

This proposed plan is being distributed to solicit public comment regarding the proposed plan and the other alternatives to clean up the contamination at this Site. Detailed information on all of the material discussed here may be found in the documents contained in the Administrative Record (AR) for the Site, including the RI/FS Report for the Site. Copies of these documents are available for review at the following information repository location:

East Pikeland Township Municipal Building
Rapps Dam Road
Kimberton, PA 19442

The public comment period will run from May 16, 1989, to June 14, 1989. Written comments, questions and requests for information can be sent to:

Gene Pine, Project Manager
Bureau of Waste Management
PA Dept. of Environmental Resources
Fulton Building, 7th Floor
3rd and Locust Streets
Harrisburg, PA 17120
717-783-7816

Frank Koller
Community Relations Coordinator
Bureau of Waste Management
PA Dept. of Environmental Resources
Fulton Building, 7th Floor
3rd and Locust Streets
Harrisburg, PA 17120
717-783-7816

EVALUATION CRITERIA

With PADER oversight, CIBA-GEIGY and Monsey commenced remedial activities at the Site in 1984. A Remedial Investigation/Feasibility Study (RI/FS) performed under a 1987 Consent Order and Agreement with PADER, was completed in April 1989. In addition, the Consent Order and Agreement provides for the provision of alternate water supplies and monitoring of certain locations. The RI/FS identified remedial action alternatives that would address the contamination of the Site. These alternatives were then evaluated against the following nine criteria:

- Overall protection of human health and the environment: whether the remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs: whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of other Federal and State environmental statutes and/or provides grounds for invoking a waiver. Whether or not the remedy complies with advisories, criteria and guidance that EPA and PADER have agreed to follow.

- Long-term effectiveness and permanence: the ability of the remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- Reduction of toxicity, mobility or volume: the anticipated performance of the treatment technologies the remedy may employ.

and Liability Act (CERCLA). CIBA-GEIGY and Monsey signed a Consent Order and Agreement with PADER to provide certain residential and commercial locations with an alternative source of drinking and contact water in December 1986. Ciba Geigy and Monsey continue to monitor these and other designated locations periodically monitored according to prescribed sampling and analytical procedures outlined under the terms of this Consent Order.

The Kimberton Site was evaluated through the Hazard Ranking System (HRS) and subsequently placed on the National Priorities List (NPL) in 1982. The NPL is a list of hazardous waste sites targeted for action under the Superfund program.

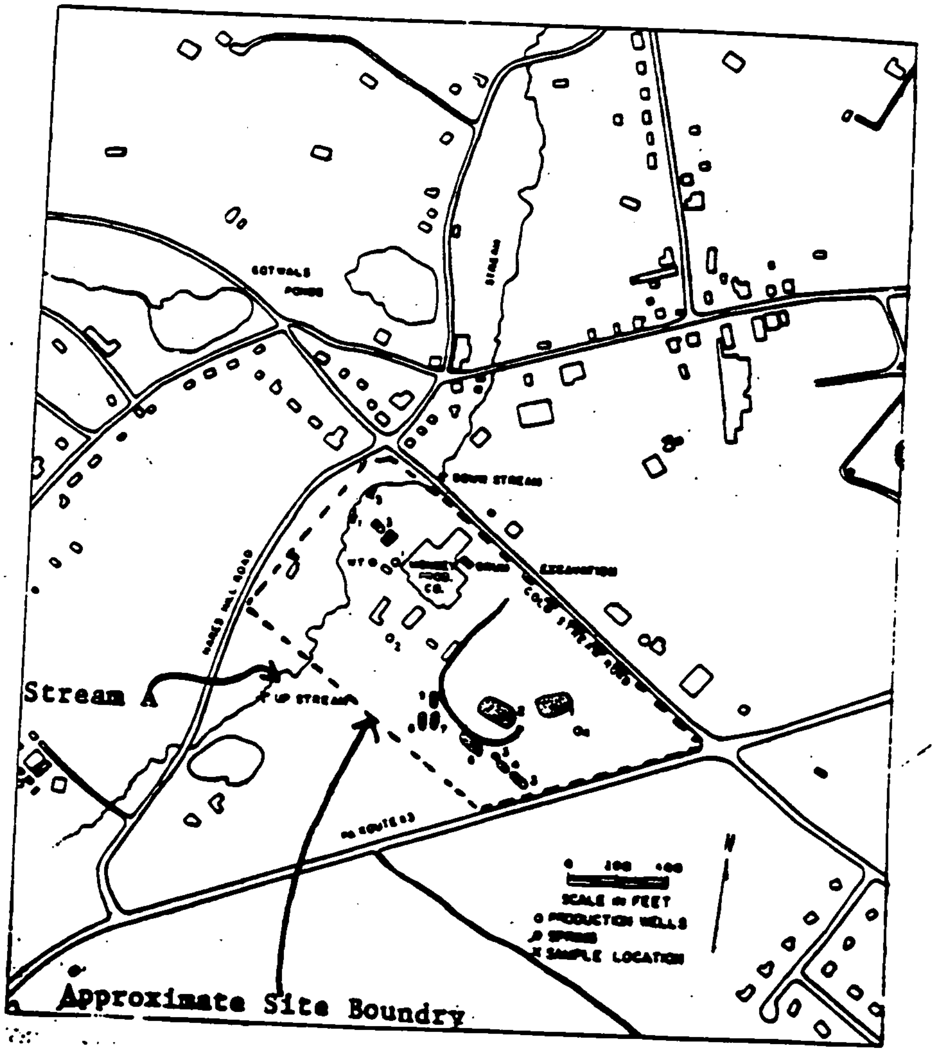


FIGURE 1

Kimberton Superfund Site Proposed Remedial Action Plan
Presented by Pennsylvania Department of Environmental Resources
and the United States Environmental Protection Agency

INTRODUCTION

- This proposed remedial action plan has been prepared by the Pennsylvania Department of Environmental Resources (PADER) and the United States Environmental Protection Agency (EPA). The proposed plan presents clean up alternatives that PADER and EPA have considered for the Kimberton Superfund Site (Site) in the Village of Kimberton, Chester County, Pennsylvania. These alternatives were identified and described in the Remedial Investigation reports and a Feasibility Study (RI/FS Report) which were prepared to evaluate: 1) the extent of the contamination problem at the site, 2) the potential risks to the public health and the environment and 3) the steps to be taken to correct the problem. The proposed plan discusses the second of two operable units for this site. The first operable unit provided for treatment of contaminated groundwater by filtration utilizing granular activated carbon adsorption and a monitoring program at certain locations. The second operable unit focuses on the elimination and control of the contamination source.

Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. Section 9617(a), requires publication of a notice and a brief analysis of a Proposed Plan for any remedial action at a Site. The proposed plan begins with a brief history of the Kimberton Site, followed by a summary of each of the remedial alternatives PADER and EPA have considered for dealing with the groundwater contamination at this site, and includes PADER and EPA's rationale for recommending and, in some cases eliminating, any one of these remedial alternatives. In addition, this proposed plan identifies the preliminary decision on a preferred alternative and explains the rationale for the preference. PADER and EPA are seeking public comment on all of the remedial alternatives currently under consideration. At the conclusion of this proposed plan, a glossary of terms that may be unfamiliar to the general public is provided.

SITE DESCRIPTION AND HISTORY

The Village of Kimberton is located in the northeastern portion of Chester County, Pennsylvania near the Philadelphia metropolitan area. Numerous domestic and commercial potable well water supplies have been sampled by the Chester County Health Department and analyzed by PADER since January 1982. High levels of chlorinated hydrocarbon chemical contamination have been detected in many of the sampled wells. The source of this contamination has been identified as the property currently owned by the Monsey Products Corporation (Monsey) which contains several buried lagoons that were operated by the CIBA-GEIGY Corporation (CIBA-GEIGY) during the 1950's (see Figure 1).

Three of the lagoons were excavated in 1984 and the contaminated soils were removed off-site. The lagoons are in close proximity to numerous private water supply wells and are less than one mile from French Creek, which is used for public recreation and fishing. CIBA-GEIGY sampled 67 residential and commercial establishments in August 1985 and found various concentrations of trichloroethene (TCE), trans-1,2-dichloroethene (1,2 DCE), 1,1-dichloroethene (1,1 DCE) and vinyl chloride (VC). These contaminants are all considered hazardous substances under the Comprehensive Environmental Response, Compensation

I. Introduction

The Kimberton site occupies approximately one acre and is located in the northeastern portion of Chester County in the Village of Kimberton. Domestic and commercial well water samples have detected high levels of chlorinated hydrocarbon chemical contamination. A source of this contamination has been identified as the property currently owned by the Monsey Corporation which contained several buried lagoons that were operated by CIBA-GEIGY Corporation during the 1950's. An investigation of the site and further sampling studies have revealed the presence of assorted volatile organic compounds. The Kimberton site was added to the Superfund National Priorities List (NPL) in 1982.

II. Summary of Community Relations Activities

A number of public meetings were conducted during 1981-82 by the Pennsylvania Department of Environmental Resources and EPA to discuss the results of preliminary water sampling and the possible cleanup actions that may be taken. In cooperation with PADER, CIBA-GEIGY and Monsey Products, Inc. conducted additional public meetings and provided briefings to local officials to inform them of the site investigation results. In 1985, both companies established interim water supplies for 23 families and also provided carbon adsorption systems. In August of 1988, PADER and EPA notified area residents that the Proposed Remedial Action Plan for Operable Unit I was available for review/comment by placing an advertisement in the August 26, 1988 edition of the Chester County Daily Local News. In addition, the proposed plan was mailed to all citizens in the area whose names were on the site mailing list. A public meeting to discuss the Proposed Remedial Action Plan was also offered to area residents. However, requests for such a meeting were never received.

Operable Unit II proposed remedial alternative focused on groundwater remediation at the Kimberton Site. In May of 1989, PADER and EPA notified area residents that the Proposed Remedial Action Plan was available for review/comment by placing an advertisement in the May 21, 1989 edition of the Reading Eagle times. A public meeting to discuss the Proposed Remedial Action Plan was also offered to area residents. However, requests for such a meeting were never received.

III. Written Comments

Neither PADER nor EPA received written nor verbal comments on either Proposed Remedial Action Plan for the Kimberton Superfund Site.

RESPONSIVENESS SUMMARY FOR THE
PROPOSED REMEDIAL ACTION PLAN
AT THE KIMBERTON SUPERFUND SITE
EAST PIKELAND TOWNSHIP, CHESTER COUNTY
PENNSYLVANIA

Table of Contents

APPENDIX A

ANNALYTICAL DATA

TABLE A2
Analytical Summary
Kimberton, PA
Supplemental Lagoon Sampling
(All results are reported in units of ug/Kg on a dry weight basis)
Date Sampled 1/11-1/19/88

SAMPLE LOCATION	LAGOON 1	LAGOON 1 VOLUME/ MASS EQUIVALENT (POUNDS)	LAGOON 2	LAGOON 2 VOLUME/ MASS EQUIVALENT (POUNDS)	LAGOON 3	LAGOON 3 VOLUME/ MASS EQUIVALENT (POUNDS)	LAGOON 3 Anomalous Layer	LAGOON 4	LAGOON 4 VOLUME/ MASS EQUIVALENT (POUNDS)	LAGOON 4 Anomalous Layer
volatile compounds							NA			NA
methylene chloride			2 B		1 B			2 B		
acetone	63 B		25 B		34 B			30 B		
1,2-dichloroethene (total)								1 J		
chloroform	09 B									
trichloroethene	70	0.123	410	1.751	11	0.014		3 J		
4-methyl-2-pentanone	1 B									
cis 1-3-dichloropropene			3 J							
benzene					0.4 B			.2 B		
tetrachloroethene			5 J					.1 B		
toluene	1 B		32 B		1 B			03 B		
chlorobenzene	8	0.0238	98	0.41	3 J			.8 B		
ethylbenzene			11	0.047						
xylenes			25	0.102						
semivolatile compounds										
phenol										
2-methylphenol										
4-methylphenol										
isophorone										
2,4-dimethylphenol										
1,4-dichlorobenzene	51 B		49 B							
benzoic acid					44 J					
naphthalene			12 J							
2-methylnapthalene										
diethylphthalate	47 B				76 B		130 B	300 B		70 B
di-n-butylphthalate	550	1.31	2100	8.97	1100	1.44	130 J	180 B		67 B
fluoranthene								140 J		34 J
pyrene								170 J		40 J
butylbenzylphthalate										
chrysene								98 J		
bis (2-ethylhexyl)phthalate					300 B		350 B	220 B		250 B
pesticides/PCBs	ND		ND		ND		ND	ND		ND

Qualifiers:
B - This result is qualitatively invalid because the compound was detected in a laboratory method and/or travel blank at a similar concentration.
J - This result is a quantitative estimate.
NA - Not analyzed for in this sample.
Note: Blank spaces indicate that the compound was not detected.
ND - None detected.

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David R Blye 10-7-8

RESPONSIVENESS SUMMARY FOR THE PROPOSED REMEDIAL ACTION PLAN AT THE KIMBERTON SUPERFUND SITE CHESTER COUNTY, PENNSYLVANIA

JUNE 20, 1989

APPENDIX B

RESPONSIVENESS SUMMARY

TABLE [illegible]
Kimberton, PA
Sediment Analytical Results
Lancaster Laboratories
Sampled 3/28-3/29/88
(All results dry weight corrected except rinsate sample)

Traffic Report #	7191	7192	7193	7194	7197	7203
ple Identification	travel blank	A-4	A-6	A-8	A-17	Equipment Rinse
s	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/L
- volatile compounds						
one	10 B	3 B	6 B	16 B	8 B	21 B
xanone	1 B					
loroethene		12	3 J	29		
dichloroethene (total)		6 J	3 J	35		
ene						2 J
atile TICs	ND	ND	ND	ND	ND	
known						19 J
- semivolatiles		NA	NA			ND
ylphthalate	40 B			51 B		
chlorobenzene				59 J		
zoic acid				49 J		
nanthrene				250	240 J.	
hracene				71 J		
oranthene				680	280 J	
rene				530	240 J	
nzo(a)anthracene				360		
rysene				460	140 J	
nzo(b)fluoranthene				400		
nzo(k)fluoranthene				400		
nzo(a)pyrene				400		
eno(1,2,3-cd)pyrene				190 J		
zo(g,h,i)perylene				190 J		
nivolatile TICs	ND	NA	NA			ND
owns				2840 J	290 J	
own hydrocarbon				2490 J	340 J	
own polyaromatic				140 J		
oxybisbenzene				500 J		
own carboxylate				150 J		
zo(e)pyrene				325 J		
ticides/PCBs	ND.	NA	NA	ND	ND	ND

ifiers:
This result is qualitatively invalid because the compound was detected in a laboratory method and/or travel blank at a similar concentration.
his result is a quantitative estimate.
Blank spaces indicate the compound was not detected.
Not analyzed for in this sample.
one detected.

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TABLE 5a
KIMBERTON, PA
SURFACE WATER ANALYTICAL RESULTS
LANCASTER LABORATORY
SAMPLED 3/28-3/29 1988

MPLE	1.1-Dichloroethene (ug/L)	trans-1.2-Dichloroethene (ug/L)	Trichloroethene (ug/L)
-1			
2		9	8
3		11	9
-5		22	20
-7		31	25
A-9		71	59
A-10	9	280	270
A-11		790	800
A-12		27	
-14		180	14
A-15		120	8
A-16			
B-3			
B-4			
C-1			
-2			7
-3			9
-4			17
C-5			

Blank spaces indicate the compound was not detected.

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David R. Blye 10-7-88
QA/QC MANAGER DATE

TABLE 5[illegible]

CIBA GEIGY
KIMBERTON, PA
SURFACE WATER ANALYTICAL RESULTS
LANCASTER LABORATORY

6/4/86			
SAMPLE	trans-1,2-Dichloroethene (ug/l)	Trichloroethene (ug/l)	1,1-Dichloroethene (ug/l)
S1 = A-11	20	BMDL	ND
S2= no equivalent sample point	180	150	ND
S3 = A-7	ND	ND	ND
S4 = A-3	20	10	ND
S6 = A-2	BMDL	BMDL	ND
S7 = A-1	BMDL	BMDL	ND
P1 = C-2	BMDL	30	ND
S5 = A-9	360	320	BMDL

12/6/85			
SAMPLE	trans-1,2-Dichloroethene (ug/l)	Trichloroethene (ug/l)	1,1-Dichloroethene (ug/l)
S1 = A-11	16	3	ND
S2 = no equivalent sample point	110	110	1
S-3 = A-7	25	25	ND
S-4 = A-3	21	25	ND

ND=NOT DETECTED
BMDL=BELOW MEAN DETECTION LIMIT

TABLE [illegible]-2
SAMPLES SPLIT WITH NUS
SUPPLEMENTAL LAGOON SAMPLING
KIMBERTON, PA

SOIL BORING	SAMPLE INTERVAL DEPTH (FEET)					
	LAGOON 1	LAGOON 2	LAGOON 3	LAGOON 4	LAGOON 8	AREA 5
A	2-6 6-8	2-6 6-10	6-10 12-16 16-20		0-4 4-8	
B	6-10 10-14	6-10 10-12	6-12 12-16		0-4 4-10	
C	2-6 6-10	4-8 8-12	4-6	4-8 8-12	0-4 4-8	
D	2-6	4-8 8-10	4-8 12-16		0-4 4-10	
E	0-4 4-8	0-4 4-8 8-10	0-4 6-10 12-16		0-4 4-12	

TABLE 6-1 (CONT.)
Analytical Summary
Kimberton, PA
Supplemental Lagoon Sampling
Tentatively Identified Compounds
(All concentrations are estimated values)
All results are in units of ug/Kg on a dry weight basis.
Date Sampled 1/11-1/19/88

ample Location	Lagoon #1	Lagoon #2	Lagoon #3	Lagoon #3 Anomalous Layer	Lagoon #4	Lagoon #4 Anomalous Layer	Lagoon #8	Lagoon #8 Anomalous Layer	Area #5	Rinse #1	Rinse #2	Equipment Rinse
volatile TICs												
hloropropane isomer	11	81.4	ND	NA	ND	NA	ND	NA	ND	ND	ND	ND
semivolatile TICs												
unknowns	1230	33800	2900	3445	3297	3380	10600	7650	17600	80	113	87
unknown hydrocarbons			10400	4880	421	6500	9850	18920		40	160	7
oxybisbenzene	1100											
1-(4-hydroxyphenyl)phenol]	170											
(1-methylethylidene)bisphenol		2800										
2-methoxy-1-methylethoxy)-2-propanol										6		
cosyne										7		
adecanoic acid										14	82	
2-octadecadien-1-ol										11	26	
tadecen-1-ol											15	
anoic acid											6	
tetradecadiene												
thylcyclohexane isomer					120							
omethane								7800				80
adecane								4600				
trimethylbenzene									370			
ybenzaldehyde isomer									390			
yl naphthalene isomer									270			
omethane												6
ydrofuran												6
e												7
en ether												5

er

Blank spaces indicated that the compound was not detected.
analyzed for in this sample.
e detected

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QUALITY ASSURANCE

David R. Bye 10-7-88

QA/QC MANAGER DATE

TABLE 6-1 (CONT.)
Analytical Summary
Kimberton, PA
Supplemental Lagoon Sampling
(All results are reported in units of ug/Kg on a dry weight basis)
Date Sampled 1/11-1/19/88

SAMPLE LOCATION	LAGOON 8	LAGOON 8 VOLUME/ MASS EQUIVALENT (POUNDS)	LAGOON 8 Anomalous Layer	AREA 6	AREA 5 VOLUME/ MASS EQUIVALENT (POUNDS)	RINSE 1	RINSE 2	Equipment Rinse
volatile compounds			NA					
methylene chloride						0.3 B		
acetone	33 B			6 B			3 B	
1,2-dichloroethene (total)								
chloroform								
trichloroethene	7	0.0028		2 J			1 J	
4-methyl-2-pentanone								
cis 1-3-dichloropropene								
benzene						0.1 J	0.1 J	
tetrachloroethene								
toluene	6 B			6 B		0.4 J	0.6 J	2 J
chlorobenzene							0.08 J	
ethylbenzene								
xylenes							0.1 J	
semivolatile compounds								
phenol				5700				
2-methylphenol				290 J				
4-methylphenol				720 J				
isophorone				870 J				
2,4-dimethylphenol				310 J				
1,4-dichlorobenzene								
benzoic acid	220 J							
naphthalene								
2-methylnapthalene				400 J				
diethylphthalate	61 B						0.6 J	
di-n-butylphthalate	180 B		18000 J					
fluoranthene								
pyrene				640 J				
butylbenzylphthalate	41 B			1000 B				
chrysene				320 J				
bis (2-ethylhexyl)phthalate	700 B			2300 B		1 B	2 B	
pesticides/PCBs	ND		ND			ND	ND	ND
archlor 1254				205	0.049			

Qualifiers:

"B"- This result is qualitatively invalid because the compound was detected in a laboratory method and/or travel blank at a similar concentration.
"J"-This result is a quantitative estimate.
NA- Not analyzed for in this sample.
Note: Blank spaces indicate that the compound was not detected.
ND-None detected.

APPROVED FOR
RELEASE BY
QUALITY ASSURANCE
David R. 10-7-88

APPENDIX D

STATE LETTER OF CONCURRENCE

GENERAL GUIDANCE DOCUMENTS *

1) "Promulgation of Sites from Updates 1-4," Federal Register, dated 6/10/86.

2) "Proposal of Update 4," Federal Register, dated 9/18/85.

3) Memorandum to U. S. EPA from Mr. Gene Lucero regarding community relations at Superfund Enforcement sites, dated 8/28/85.

4) Groundwater Contamination and Protection, undated by Mr. Donald V. Feliciano on 8/28/85.

5) Memorandum to Toxic Waste Management Division Directors Regions I-X from Mr. William Hedeman and Mr. Gene Lucero re: Policy on Floodplains and Wetlands Assessments for CERCLA Actions, 8/6/85.

6) Guidance on Remedial Investigations under CERCLA, dated 6/85.

7) Guidance on Feasibility Studies under CERCLA, dated 6/85.

8) "Proposal of Update 3," Federal Register, dated 4/10/85.

9) Memorandum to Mr. Jack McGraw entitled "Community Relations Activites at Superfund Sites - Interim Guidance," dated 3/22/85.

10) "Proposal of Update 2," Federal Register, dated 10/15/84

11) EPA Groundwater Protection Strategy, dated 9/84.

12) Memorandum to U.S. EPA from Mr. William Heckman, Jr. entitled "Transmittal at Superfund Removal Procedures - Revision 2," dated 8/20/84.

13) "Proposal of Update 1," Federal Register, dated 9/8/83.

14) Community Relations in Superfund: A Handbook (interim version), dated 9/83.

15) "Proposal of First National Priority List," Federal Register, dated 12/30/82.

16) "Expanded Eligibility List," Federal Register, dated 7/23/82.

17) "Interim Priorities List," Federal Register, dated 10/23/81.

18) Uncontrolled Hazardous Waste Site Ranking System: A User's Manual (undated).

19) Field Standard Operating Procedures - Air Surveillance (undated).

20) Field Standard Operating Procedures - Site Safety Plan (undated).

* Located in EPA Region III office.

PENNSYLVANIA
DER

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

Deputy Secretary for
Environmental Protection

June 29, 1989

717-787-5028

Mr. Edwin B. Erickson
Regional Administrator
USEPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
Kimberton Superfund Site, draft Record Of Decision (ROD)

Dear Mr. Erickson:

The draft Record of Decision (as received June 23, 1989) for the Kimberton Superfund site, groundwater operable unit, has been reviewed by the Department. It is my understanding that this Record of Decision will be submitted to you for your approval.

The proposed remedy for the groundwater operable unit would consist of pumping the contaminated groundwater, treating by air stripping, and discharging the water to a small stream. An on-going assessment of the pump and treat remedy would allow for modifications to the pump and treat project.

I hereby concur with the EPA's proposed remedy, with the following conditions:

- EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.
- The Department will be given the opportunity to concur with decisions related to the design of the remedial action, to assure compliance with DER design specific ARARs.
- The Department's position is that its design standards are ARARs pursuant to SARA Section 121, and we will reserve our right to enforce those design standards.
- The Department will reserve our right and responsibility to take independent enforcement actions pursuant to state and federal law.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

Thank you for the opportunity to concur with this EPA draft Record Of Decision. If you have any questions regarding this matter please do not hesitate to contact me.

Sincerely,

Mark M. McClellan
Deputy Secretary