

Site Review And Update

FAIR LAWN WELL FIELD

FAIR LAWN, BERGEN COUNTY, NEW JERSEY

CERCLIS NO. NJD980654107

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REVISED

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia

Site Review and Update: A Note of Explanation

The purpose of the Site Review and Update is to discuss the current status of a hazardous waste site and to identify future ATSDR activities planned for the site. The SRU is generally reserved to update activities for those sites for which public health assessments have been previously prepared (it is not intended to be an addendum to a public health assessment). The SRU, in conjunction with the ATSDR Site Ranking Scheme, will be used to determine relative priorities for future ATSDR public health actions.

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SITE REVIEW AND UPDATE
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Prepared by:

**New Jersey Department of Health
Environmental Health Service**

**Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**

SUMMARY OF BACKGROUND AND HISTORY

The Fair Lawn Wellfields (FLW) site is located in Fair Lawn Borough, Bergen County, New Jersey (Figure 1). A statewide groundwater study was conducted by New Jersey Department of Environmental Protection (NJDEP) during late 1978. An industrial supply well in Fair Lawn, New Jersey was found to be contaminated with volatile organic compounds totaling 461 ppb. As a result, all 14 of Fair Lawn's municipal supply wells and other nearby industrial wells were sampled. By early 1979, groundwater contamination was confirmed in five of Fair Lawn's municipal wells and several local industrial wells. The total volatile organic concentration of water tested in these bedrock wells ranged from 50 to 19,141 ppb. The compounds with the highest concentrations were 1,1,1-trichloroethane (TCA), tetrachloroethylene (PCE), trichloroethylene (TCE), carbon tetrachloride, and chloroform.

In an attempt to locate the source(s) of the ground-water contamination, the NJDEP initiated an industrial survey of the area. Many commercial businesses and light industries are located within this area. This survey identified Fisher Scientific Company (FSC) and Sandvik, Inc., whose handling, storage, and/or disposal of volatile organic chemicals may have contributed to the Fair Lawn groundwater contamination problem. NJDEP began site-specific investigations at the two companies suspected of being the contaminant sources. The two companies are located adjacent to each other, and are in a location upgradient of the area of ground-water contamination. In addition, those municipal wells whose water contained the highest concentrations of volatile organic compounds are located very near these companies. The source of the groundwater contamination was believed to be Sandvik, Inc., and Fisher Scientific Company (FSC). The Pollitt Drive Wellfield is approximately 1500 feet from the FSC.

FSC is located on Block 4902 Lot 1 in Fair Lawn Industrial Park in Fair Lawn Borough (Figure 2). FSC has owned the 10-acre site since 1955 and has been formulating, distilling, repackaging, and distributing high purity laboratory grade reagents and solvents since that time. FSC has been involved in the distillation and repackaging of various laboratory reagents and clinical solutions, including many volatile organic compounds such as chloroform and carbon tetrachloride. The plant site has drum storage, tank farm and transfer areas, and reportedly used a dry well containing limestone chips for storm-water runoff. Sandvik is a manufacturer of cutting tools and has used various volatile organic compounds, including 1,1,1-trichloroethane, in its manufacturing process.

Prior to 1955, the land was open and undeveloped, probably farmland. The area surrounding the Park is urbanized and heavily populated with approximately 300,000 people living within 4 miles of the site. The Fair Lawn Wellfields are located in a developed area, and several companies have been documented to have spilled organic chemicals on nearby properties. These potential groundwater contamination sources were identified at the initiation of the Remediation Investigation (RI).

Private Wells:

There are many private wells in the Borough of Fair Lawn. Although the majority of private wells are used for irrigation purposes, some are used for domestic purposes. USEPA, in conjunction with the Fair Lawn Department of Health, has extensively researched the possibility of usage of private wells in the town of Fair Lawn. USEPA, gathered information from several sources including the Fair Lawn Water Department, the Fair Lawn Health Department, the Fair Lawn tax assessor's office and a well survey report prepared by Environ Corporation.

USEPA distributed 151 well usage surveys to residents of Fair Lawn to verify the possible use of a private well on their property. USEPA has received a total of 97 responses. Sixty (60) responses stated the well is no longer operational and the household is connected to the municipal water supply. The remaining residents responded that their private well was used for drinking and/or irrigation, therefore USEPA collected samples at these residences.

On May 9, 1995, USEPA conducted the first sampling event which included the collection of samples from ten private wells. The results indicated that the water from nine wells to be of acceptable drinking water quality. One sample indicated the presence of tetrachloroethylene at 55 parts per billion (ppb). USEPA and Fair Lawn Department of Health immediately contacted this homeowner and explained the situation. The homeowner stated that he is aware of the presence of contamination in his well and therefore does not use the well water for potable purposes.

On June 27, 1995, USEPA conducted the second sampling event which included the collection of samples from seventeen private wells (including a re-sample of the well which indicated contamination with tetrachloroethylene in the May sampling event). Seven of the residences where private well water samples were collected are also connected to the municipal water supply. USEPA has not yet received the analytical results from the second sampling event. USEPA is planning on distributing additional well usage surveys to those residents who did not respond to the previous letter and conduct well water sampling if necessary.

Municipal Wells:

In 1981, samples were collected and analyzed for volatile organic compounds from Fairlawn Borough wellfields (wells #2, #4, #6, #7, #8, #9, #10, #11, #14, #16, #17, #19, #23, and #24). No contaminants were detected in wells #4 and #6. Municipal wells #2, #7, #8, #16, #17, and #19 showed low level contamination with tetrachloroethylene (PCE) ranging from 10 ppb to 16 ppb. Municipal wells #10, #11, #23, and #24 were most contaminated wells with various volatile organic compounds including trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, 1,1,1-tetrachloroethane, 1,1-dichloroethene, 1,2-dichloroethane, and trans 1,2-dichloroethylene. The maximum reported concentrations of contaminants in municipal wells were: trichloroethylene - 304 ppb, tetrachloroethylene - 685 ppb, carbon tetrachloride - 292 ppb, chloroform - 433 ppb, 1,1,1-tetrachloroethane - 350 ppb, 1,1-dichloroethene - 35 ppb, 1,2-dichloroethane - 32 ppb, and trans 1,2-dichloroethylene - 400 ppb.

In 1983, Fair Lawn Wellfields was placed on the National Priority List (NPL). Following a comprehensive investigation by the NJDEP (Division of Water Resources), FSC and Sandvik, Inc. were named as responsible parties to the Fair Lawn Wellfields contamination. In 1984 the NJDEP entered into an Administrative Consent Order (ACO) with both FSC and Sandvik, Inc. The ACO's called for on-site investigations of soil and groundwater, removal and disposal of contaminated soils, long-term monitoring of on-site groundwater quality and payment to the Borough Fair Lawn for installation and operation of air stripper units to treat the groundwater.

Extensive soil sampling was conducted at FSC. Contaminants detected include toluene, benzene, ethylbenzene, chlorobenzene, trichloroethene, 1,2-dichloroethane, 1,1,-trichloroethane, tetrachloroethane, carbon tetrachloride and chloroform. The maximum reported concentrations of contaminants in soils were: benzene - 250 ppm, ethylbenzene - 230 ppm, trichloroethylene (TCE) - 1,000 ppm, and toluene - 670 ppm. As of September 1988, all contaminated soils have been excavated and removed from the site.

Groundwater analyses from the shallow monitoring wells also confirmed significant contamination by volatile organic compounds, with one of the wells totaling over 600,000 ppb. Sampling from the on-site production wells, pumping from the Brunswick Aquifer, revealed total volatile organic concentrations as high as 2,900 ppb. Groundwater is continuously monitored and results submitted to the Bureau of Environmental Evaluation Cleanup Responsibility Assessment (BEECRA). There are 18 groundwater monitoring wells on the Fisher Scientific property ranging from 19 to 100 feet deep. Extensive sampling of these wells has shown them to be contaminated with volatile organics such as 1,1,1-trichloroethane, tetrachloroethylene, chloroform, carbon tetrachloride, trichloroethylene, and benzene. The maximum reported concentrations of contaminants in monitoring wells were: methylene chloride - 3000 ppb, benzene - 25,000 ppb, PCE - 2000 ppb, TCE - 50,000 ppb, and 1,1,1-trichloroethane - 2000 ppb. Clean-up activities at FSC have included the excavation of contaminated soils and installation of a groundwater recovery system.

Sandvik took soil samples, installed shallow monitoring wells, and collected water samples from the wells. Monitoring results of water taken from these wells confirmed the presence of more than 200 ppb total volatile organics. However, according to the regional water quality patterns defined later, these wells were not located in appropriate downgradient locations and were too shallow to reveal the full impact of the buried waste.

In December 1986, Borough of Fair Lawn installed an air-stripper system to treat the contaminated municipal water wells located at Westmoreland Wellfield (wells #10, #11, and #14). Approximately 32,000 people are served by this and other wellfields which are part of an interconnected system that serves Fair Lawn Borough.

The Pollitt Drive (Kodak) Wellfield, consisting of two municipal wells (wells # 23 and # 24), located within the Fair Lawn Industrial Park, were sealed after detection of contaminants.

Well numbers 20, 21, 22, 25 and 27 are sealed. Well numbers 25, 26 and 28 are operational and do not require treatment. The Westmoreland Wellfield, located adjacent to Fair Lawn Industrial Park consists of five municipal wells (wells #10, #11, #12, #13 and #14). Well numbers 10, 11 and 14 are operational and water from these wells is treated by an air stripper. Well number 13 has been sealed. The town of Fair Lawn plans to rehabilitate well number 12.

Currently, many other municipal wells are operational in the Borough of Fair Lawn. The Cadmus Wellfield consists of nine groundwater supply wells located in an area south of the Fair Lawn Industrial Park. Well numbers 7, 8 and 9 are operational and water from these wells are treated by an air stripper. Well numbers 1 through 6 have been sealed. The Memorial Park Wellfield consists of five groundwater supply wells (wells #15, #16, #17, #18 and #19) which is located southwest of the Fair Lawn Industrial Park. Well numbers 15, 16, 17, and 19 are operational and water from these wells is treated by the air stripper unit located in the Cadmus Wellfield. Well number 18 is used as a monitoring well.

The Environ Corporation conducted a Preliminary Assessment of the potential sources of contamination to the Fair Lawn WellFields site for FSC, and published their findings in October 1993. In addition, in March 1994, Environ Corporation conducted a Well Survey (Private wells) of the Borough of Fair Lawn and a section of the Borough of Glen Rock within one-half mile of the Fair Lawn Industrial Park.

Groundwater monitoring is conducted at FSC and Sandvik, Inc. every three months and remedial activities are on-going at FSC to treat the contaminated groundwater. Total detected VOC concentrations in samples from shallow and deep bedrock wells near Sandvik, Inc. during 1994 sampling were generally lower than 1993. Highest total VOC level in a single well occurred in a deep aquifer well at 924 ppb, located southwest of the plant, the shallow aquifer system continues to exhibit higher overall VOC levels than the deep aquifer system. Total VOCs in the shallow bedrock well sampled summed 2,570 ppb, whereas total VOCs in the deep bedrock well samples summed 1,464 ppb.

ATSDR:

In January 1989, the NJDOH/ATSDR completed a preliminary health assessment for the FLW site. Potential human exposure pathways cited in the preliminary health assessment included ingestion and dermal contact with contaminated soil, sediments, and surface water. Other pathways cited in the preliminary health assessment included ingestion, dermal contact, and inhalation (volatile components) of contaminated groundwater.

Current site data and information does not support the potential pathways associated with the use of contaminated groundwater since municipal well water supplies are being treated with air stripping systems. However, current information does support the potential pathways associated with the domestic use of contaminated private potable wells (private well usage for potable purposes needs to be determined).

The primary completed exposure pathway identified involves the past exposure of residents to volatile organic compounds (VOCs) in municipal well water through ingestion, inhalation, and direct contact. Other pathways associated with soil, sediment, and surface water are not valid under current site conditions since the contaminated soils have been removed.

The 1989 preliminary health assessment did not identify any community health concerns. The ATSDR/NJDOH identified the following public health concerns in the 1989 preliminary health assessment:

- 1) The Fair Lawn Borough residents using municipal well water have probably been exposed to VOC's in the past at concentrations that may result in adverse health effects;
- 2) Whether any other public wells potentially impacted by the contaminated groundwater may be in use;

In summary, the ATSDR/NJDOH categorized the site in 1989 as a potential public health concern because of the risk to human health caused by the possibility of exposure to hazardous substances via groundwater, surface water, and soil. In addition, ATSDR/NJDOH concluded that further information is needed to adequately assess the impact of the site on public health. Recommendations were made to conduct the following activities:

- 1) Continued and frequent monitoring of levels of contamination in the municipal wells, particularly if consideration is being given to reintroduce the contaminated municipal wells back into public water supply system;
- 2) On-going remediation activities at the site should include capping the contaminated soils and groundwater extraction and treatment;

PUBLIC HEALTH IMPLICATIONS

For an undetermined period of time, residents using the water supplied from Fair Lawn municipal wells were exposed to various volatile organic compounds (VOC's). Residents may have been exposed to trichloroethene (TCE), tetrachloroethylene (PCE), chloroform, carbon tetrachloride, 1,1-dichloroethene, 1,2-dichloroethane, trans 1,2-dichloroethene, and 1,1,1-trichloroethane (TCA) in their drinking water for an unknown period of time until 1979, when contamination was detected. In 1979, volatile organic compounds (VOC's) were detected in five municipal supply wells located within and adjacent to the Fair Lawn Industrial Park. These wells were removed from the municipal system after contamination was detected. The source of the groundwater contamination was believed to be Sandvik, Inc., and Fisher Scientific Company (FSC). Fisher Scientific Company has been in operation on this 10-acre site since 1955. Since exposure to most residents near the FLW site would likely have occurred during the period from 1955 to 1979. An exposure duration of 24 years was used to estimate exposure doses and resultant lifetime excess cancer risk estimates. The levels of contamination prior to 1979 are not

known. Since sampling results for 1979 are not available, 1981 data for various volatile organic contaminants detected in drinking water were used in the following toxicological evaluation. Toxicological evaluation was completed for most frequently detected chemicals in municipal wells and exposure dose calculations were based upon the maximum concentrations detected, thus representing a worse case exposure scenario.

In this section, NJDOH will discuss the health effects in persons exposed to specific contaminants. To evaluate health effects, ATSDR has developed a Minimal Risk Level (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. MRLs are developed for each route of exposure, such as ingestion and inhalation, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR presents these MRLs in the Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. In the following discussion, NJDOH used ATSDR Toxicological Profiles for the contaminants of concern at the site. The NJDOH will use a USEPA Reference Dose (RfD) as a health guideline, when a MRL is not available. The RfD is an estimate of daily human exposure of a contaminant for a lifetime below which (non-cancer) health effects are unlikely to occur.

Municipal Well Pathways

The toxicological evaluation of the completed human exposure pathway at the FLW site is based upon chronic oral ingestion of contaminants in municipal well water. The completed exposure pathway at the Fair Lawn Wellfield site (FLW) is based upon a duration of twenty-four (24) years for the ingestion pathway. The use of a 24 year exposure duration represents the time from the beginning of operations at the FSC (1955) to the detection of contaminants in FLW site (1979). The maximum reported concentrations of contaminants in municipal wells during 1981 sampling were: trichloroethylene - 304 ppb, tetrachloroethylene - 685 ppb, carbon tetrachloride - 292 ppb, chloroform - 433 ppb, 1,1,1-tetrachloroethane - 350 ppb, 1,1-dichloroethene - 35 ppb, 1,2-dichloroethane - 32 ppb, and trans 1,2-dichloroethylene.

The toxicological effects of the contaminants detected in FLW have been considered singly. The cumulative or synergistic effects of possible mixture of contaminants may serve to enhance their public health significance. Additionally, individual or mixtures of contaminants may have the ability to produce greater adverse health effects in children as compared to adult. Non-potable domestic usage of contaminated water (showers) may be associated with significant exposure through the inhalation and dermal contact routes. Current literature suggests exposure doses from these routes may approach or exceed those associated with direct ingestion. There is no data available to estimate the exposure doses to these secondary routes of exposure at the FLW site. This toxicological discussion recognizes their potential contribution to exposure dose estimates (EED) and consequent public health implications. Cancer estimates are based on an intake of 2 liters of water per day for a 70 kilogram adult for a lifetime (70) years.

Since exposure to most residents near the FLW site would likely have occurred during the period from 1955 to 1979. An exposure duration of 24 years was used to estimate exposure doses and resultant lifetime excess cancer risk estimates. Toxicological evaluation was completed for volatile organic compounds (VOC's) detected in municipal supply wells and exposure dose calculations were based upon the maximum concentrations detected, thus representing a worse case exposure scenario. Table 1 presents the maximum concentrations of contaminants detected in the municipal wells of the Fair Lawn Borough wellfields during 1981 sampling.

Carbon tetrachloride

Based upon maximum concentrations of carbon tetrachloride (292 ppb) detected in municipal wells in 1981, calculated exposure dose was below the chronic oral RfD of 0.0007 mg/kg/day. No chronic oral Minimum Risk Level (MRL) is available. At such concentrations, it is not likely that non-carcinogenic adverse health effects would occur.

Carbon tetrachloride is considered by the USEPA to be a probable human carcinogen. Chronic oral exposure to chloroform at maximum concentrations found in municipal wells for a duration of 24 years would result in low increased cancer risk as calculated by Lifetime Excess Cancer Risk (LECR).

Table 1. Chemicals of Public Health Concern in Municipal Well Water Samples (1981).

CHEMICAL	MAX. CONC.. (ppb)	COMPARISON VALUE (ppb)	BASIS	ESTIMATED EXPOSURE DOSE (mg/kg/d)
carbon tetrachloride	292	0.3	CREG	0.0083
trichloroethylene (TCE)	304	3.0	CREG	0.0086
tetrachloroethylene (PCE)	685	0.7	CREG	0.0195
chloroform	433	6.0	CREG	0.0123
trans-1,2-dichloroethylene	400	10.0	NJMCL	0.0114
1,1,1 trichloroethane (TCA)	350	26.0	NJMCL	0.01
1,1 dichloroethene (DCE)	35	0.06	CREG	0.001
1,2-dichloroethane (DCA)	32	0.4	CREG	0.0009

ppb - parts per billion.

CREG - ATSDR cancer risk evaluation guide.

NJMCL - New Jersey Maximum Contaminant Level.

Trichloroethene (TCE)

A 24 year exposure duration was assumed for this compound. No chronic oral MRL or RfD is available for trichloroethene to evaluate the potential for non-carcinogenic health effects. However, Estimated Exposure Doses (EED) calculated from the maximum reported concentration of trichloroethene (304 ppb) in 1981 was below the No Observed Adverse Effects Level (NOAEL) for animal studies presented in the ATSDR Toxicological Profile for TCE. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur. Currently there is scientific debate regarding the carcinogenicity of TCE in humans. However, animal studies have shown that tumors can result from oral exposure to TCE. TCE is under consideration for placement into either probable human carcinogen or possible human carcinogen by the USEPA. NJDOH concur with USEPA regarding TCE's potential carcinogenicity in humans. Chronic oral exposure to TCE at maximum concentrations found in municipal wells for a duration of 24 years would result in no apparent increased cancer risk.

Tetrachloroethylene (PCE)

A 24 year exposure duration was assumed for this compound. Based upon maximum reported levels of tetrachloroethylene (685 ppb) detected in municipal wells in 1981, estimated exposure dose was above the USEPA chronic oral RfD of 0.01 mg/kg/day. No chronic oral MRL is available. However, Estimated Exposure Dose (EED) calculated from the maximum reported concentration of tetrachloroethylene was below the No Observed adverse Effects Level (NOAEL) for animal studies presented in the ATSDR Toxicological Profile for this chemical. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur. Currently there is scientific debate regarding the carcinogenicity of PCE in humans. However, animal studies have shown that tumors can result from oral exposure to PCE. PCE is under consideration for placement into either probable human carcinogen or possible human carcinogen by the USEPA. NJDOH concur with USEPA regarding TCE's potential carcinogenicity in humans. Chronic oral exposure to tetrachloroethylene at maximum concentrations found in municipal wells for a duration of 24 years would result in low increased cancer risk.

Chloroform

Based upon maximum concentrations of chloroform (433 ppb) detected in municipal wells in 1981, Estimated Exposure Dose (EED) was approximately equal to the ATSDR Minimum Risk Level (MRL) of 0.01 mg/kg/day for chronic oral exposure. However, EED was below the No Observed adverse Effects Level (NOAEL) for animal studies presented in the ATSDR Toxicological Profile for this chemical. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur. Chloroform is considered by the USEPA to be a probable human carcinogen. Chronic oral exposure to chloroform at maximum concentrations found in municipal wells for a duration of 24 years would result in no apparent increased cancer risk as calculated by Lifetime Excess Cancer Risk (LECR).

Trans-1,2-dichloroethylene

No chronic studies are available from which to derive oral MRLs for chronic exposure for trans-1,2-dichloroethylene to evaluate the potential for non-cancer health effects. Estimated Exposure Dose (EED) calculated from the maximum reported concentration (400 ppb) of trans-1,2-dichloroethylene was above the chronic oral RfD of 0.02 mg/kg/day. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur. No information is available to indicate that trans-1,2-dichloroethylene causes cancer. The USEPA has determined that trans-1,2-dichloroethylene is not classifiable as to its human carcinogenicity.

1,1,1-trichloroethane (TCA)

Estimated Exposure Dose (EED) calculated from the maximum reported concentration (350 ppb) of 1,1,1-trichloroethane was below the No Observed adverse Effects Level (NOAEL) for animal studies presented in the ATSDR Toxicological Profile for this chemical. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur from exposure to 1,1,1-trichloroethane. No information is available to indicate that 1,1,1-trichloroethane causes cancer. The USEPA has determined that 1,1,1-trichloroethane is not classifiable as to its human carcinogenicity.

1,1-dichloroethene (DCE)

Based upon maximum reported concentration (35 ppb) of 1,1-dichloroethene detected in municipal wells at the site, estimated exposure dose was below the Minimum Risk Level (MRL) for chronic oral exposure represented in the ATSDR Toxicological Profile for 1,1-dichloroethene. At such concentrations, it is not likely that non-carcinogenic adverse health effects would occur. 1,1-dichloroethene is considered by the USEPA to be a possible human carcinogen. The calculated Lifetime Excess Cancer Risk (LECR) associated with the chronic oral exposure to 1,1-dichloroethene at maximum concentrations found in municipal wells for a duration of 24 years would result in low increased cancer risk.

1,2-dichloroethane (DCA)

No chronic oral MRL or RfD is available for 1,2-dichloroethane to evaluate the potential for non-cancer health effects. However, Estimated Exposure Dose (EED) calculated from the maximum reported concentration (32 ppb) of 1,2-dichloroethane was well below the No Observed adverse Effects Level (NOAEL) for animal studies presented in the ATSDR Toxicological Profile for this chemical. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur.

USEPA considers 1,2-dichloroethane as a probable human carcinogen. The calculated Lifetime Excess Cancer Risk (LECR) associated with chronic oral exposure to 1,2-dichloroethane at maximum concentrations found in municipal wells for a duration of 24 years would result in no apparent increased cancer risk.

CURRENT CONDITIONS OF SITE

On September 13, 1994 Narendra P. Singh, and Jim Pasqualo of the NJDOH conducted a site visit of the Fair Lawn Borough wellfields accompanied by the Representative of Fair Lawn Health Department (FLHD).

The Fair Lawn Borough have many municipal wells for public water supply. Currently, many other municipal wells are operational in Borough of Fair Lawn including Memorial Park Wellfield (wells #15, #16, #17, and #19), Willow Street Well (well #8), George Street Well (well #9), and Cadmus Wellfield (wells #2, #5, and #7). The water from these wells are being treated by an air stripping system, which was installed in December 1987 at Cadmus Wellfield. During the site visit air stripper systems at Westmoreland and Cadmus Wellfields were operational.

There are other municipal wells (#25, #26 and #28) in Fair Lawn Borough which do not require any water treatment systems. The municipal wells appeared to be secure and there was no evidence of any trespassing on the site.

According to the FLHD's Environmental Specialist, water samples are analyzed every six months for VOC's. In December 1994, sampling and analysis of raw water prior to treatment with air stripper system for VOC's at the Westmoreland Municipal Wellfields (blend from Borough wells # 10, #11, and #14) showed the presence of various VOC's including 1,1-dichloroethylene (9.4 ppb), 1,1-dichloroethane (3 ppb), cis 1,2-dichloroethylene (28.9 ppb), chloroform (12.4 ppb), 1,1,1-TCA (38.1 ppb), carbon tetrachloride (3.6 ppb), trichloroethylene (30.3 ppb), and tetrachloroethylene (301 ppb).

In December 1994, sampling and analysis of raw water prior to treatment with air stripper system for VOC's at the Cadmus Wellfields (blend from Borough wells # 2, #7, #8, #9, #15, #16, #17, and #19) showed the presence of various VOC's including 1,1-dichloroethane (0.6 ppb), cis 1,2-dichloroethylene (17.5 ppb), chloroform (2.5 ppb), 1,1,1-TCA (1.2 ppb), trichloroethylene (2.8 ppb), and tetrachloroethylene (8.5 ppb).

The analysis of results from municipal wells for VOCs after treatment of water with the air stripper system for VOC's indicated that all compounds tested were within the Maximum Contaminant Level (MCL) as set forth in the New Jersey Safe Drinking Water Act.

The air-stripping systems have been demonstrated to be effective in treating municipal wells. In a conversation with the FLHD's Environmental Specialist, she expressed concerns regarding use of private wells for potable purposes, so that identified users can be informed of the potential contamination.

CURRENT ISSUES

Based on the current site conditions, site-related contamination is present in groundwater and it remains as the primary media of concern. The primary public health issue associated with the Fair Lawn Borough wellfields site pertains to the potential impact of the groundwater plume on existing private potable wells.

The groundwater plume flow is in a south-southwest direction along the fractures and down the hydraulic gradient toward the Passaic River. The primary source of drinking water in the site vicinity consists of aquifers developed within the Brunswick Formation, which provides water for municipal, private, and industrial use. The hydrogeology of the Brunswick Formation is highly complex, due primarily to its occurrence as a fractured shale formation. Other complicating factors include influences exerted by local high capacity water well production. The direction of groundwater flow in the deep aquifer (bedrock aquifer) is estimated to be southwesterly. Groundwater flow in the shallow region of the bedrock aquifer (defined at the site by a series of wells with open boreholes in bedrock between 15 and 55 feet below grade) is in a west-northwest direction. The groundwater flow direction in the deep bedrock aquifer (between 70 and 125 feet below grade) system fluctuates, significant changes in the direction of groundwater flow is attributed to the pumping of production wells in the area.

The Remedial Investigation (RI) conducted at the site has confirmed the presence of site related contaminants in both shallow and deep aquifers underlying the site. The deep aquifer is the major source of potable water in the vicinity of the Fairlawn Borough wellfields site.

Both Sandvik, Inc. and FSC were sources of the contamination found in aquifers developed within the Brunswick Formation, which provides water for municipal, private, and industrial use. Sandvik, Inc. was the principal source of the 1,1,1-trichloroethane and tetrachloroethylene found within the aquifer (Figure 5). The monitoring wells near FSC were mainly contaminated by chloroform and carbon tetrachloride with much lower concentrations of 1,1,1-trichloroethane and tetrachloroethylene. FSC was the principal source of the chloroform and carbon tetrachloride found within the aquifer.

The extent and degree of regional ground-water contamination had been defined, but the volatile organic compounds in the affected wells of Fair Lawn Borough appeared to be a complex mixture, probably resulting from multiple sources. The contaminants found in municipal wells were volatile organic compounds (VOC's) including trichloroethene (TCE), tetrachloroethylene (PCE), chloroform, carbon tetrachloride, 1,1-dichloroethene, 1,2-dichloroethane, trans 1,2-dichloroethene, and 1,1,1-trichloroethane (TCA). In addition, several other volatile organic compounds with relatively low specific gravities, such as benzene and toluene, were found in soil and shallow groundwater at the two sites. However, these compounds were not found in the municipal wells, and experience has shown that these compounds do not migrate downward through aquifers as readily as the volatile organic compounds with higher specific gravities. A water quality map showing only 1,1,1-trichloroethane and tetrachloroethylene, representing the contaminant plume from Sandvik, Inc. is shown on (Figure 3). A water quality map showing

chloroform and carbon tetrachloride, representing the contaminant plume from FSC, is shown on (Figure 4).

The bedrock aquifer showed a high level of contamination with VOC's. Private potable wells farther downgradient of the site are at risk due to the continued off-site migration of the contaminated groundwater.

At the time the original ATSDR preliminary health assessment was written, there was a great deal of concern regarding off-site groundwater contamination. Currently, there are no known completed exposure pathways associated with the site. Private potable wells have not been sampled in the month of May and June for the presence of site related contaminants. The ATSDR/NJDOH have public health concerns regarding resident's past exposures to the contaminated municipal well water and potential exposures to the private well users in the area. NJDOH has not identified any additional community health concerns.

CONCLUSIONS

1. Based on the current site data, site-related contamination is present in groundwater. Remedial efforts have mitigated exposure pathways associated with municipal water supplies. The contaminated municipal wells are being treated with air stripper systems. However, human exposures may still be occurring through the ingestion of contaminated groundwater drawn from private wells.
2. Conclusions that were made, in the 1989 preliminary health assessment, regarding the site being of potential public health concern is valid. This conclusion was made because residents may have been exposed to contaminants in the past at levels that may cause adverse health effects.
3. The ATSDR and the NJDOH have concluded that the FLW site to have constituted a public health hazard in the past as a result of exposure to contaminated municipal water supplies. Potential exposure doses associated with maximum levels of TCE, PCE, 1,1-dichloroethene, 1,2-dichloroethane, chloroform and carbon tetrachloride present a no apparent to low increased risk of cancer. Furthermore, the hazard presented by past exposures may have been enhanced by cumulative effects of the total VOC concentrations to which people were exposed.
4. The ATSDR and the NJDOH have concluded that the FLW site currently constitutes an indeterminate health hazard because of a lack of private well data. However, USEPA is conducting private well water sampling and analysis in the Borough of Fair Lawn.
5. The recommendation from the 1989 preliminary health assessment for periodic monitoring of contaminant levels of the municipal drinking water supply source is satisfied by the specific testing requirements of the New Jersey Safe Drinking Water Act.

RECOMMENDATIONS

1. Currently USEPA is conducting sampling and analysis of private wells in the Borough of Fair Lawn. NJDOH/ATSDR will perform a public health consultation on private well water data when available to ascertain potential public health implications.
2. Any residence not currently connected to the municipal water supply should be strongly encouraged to do so by the municipality/local Health department and/or the USEPA. If necessary, health education/risk communication should be provided to residents to ensure comprehension of the potential health risk with continued use of contaminated groundwater.
3. The data and information developed in the Site Review and Update have been evaluated to determine if follow-up actions may be indicated. Further site evaluation is needed to determine appropriate public health actions. Future environmental, toxicological, health outcome data or changes in the conditions as a result of implementing the proposed plan, may determine the need for additional actions at this site.

RECOMMENDATIONS OF THE HEALTH ACTIVITIES RECOMMENDATIONS PANEL (HARP)

The data and information developed in the Site Review and Update for the Fair Lawn Wells, Fair Lawn Borough, New Jersey, has been evaluated by ATSDR's Health Activities Recommendation Panel (HARP) for appropriate follow-up with respect to health activities. The panel determined that community health education is indicated for those persons on previously contaminated water sources and those currently using private wells. In addition, the panel concurs with the recommendation by NJDOH for a well survey and continued private well sampling.

PUBLIC HEALTH ACTION PLAN

The purpose of the public health action plan (PHAP) is to ensure that this Site Review and update not only identifies public health hazards but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment.

Actions Undertaken by ATSDR/NJDOH:

1. Environmental data and proposed remedial activities have been evaluated within the context of human exposure pathways and relevant public health issues.

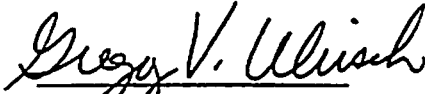
Actions Planned by ATSDR/NJDOH:

1. The NJDOH will provide community health education to persons exposed in the past to contaminated groundwater and those persons in the area currently using private wells for their source of drinking water.
2. ATSDR and the NJDOH will evaluate all future private wells data related to the FLW site for public health implications.
3. ATSDR will provide an annual follow up to this PHAP, outlining the actions completed and those in progress.

ATSDR will reevaluate and expand the Public Health Action Plan (PHAP) when needed. New environmental , toxicological, health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at this site.

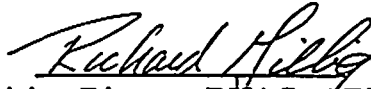
CERTIFICATION

The Site Review and Update for the Fair Lawn Wellfields site was prepared by the New Jersey Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the site review and update was initiated.



Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Site Review and Update and concurs with its findings.



for

Division Director, DHAC, ATSDR

DOCUMENTS REVIEWED

1. Garden State Laboratories, Inc.- Report of Analysis - Volatile Organic Compounds (Westmoreland municipal wellfields raw water prior to treatment with air stripper system water sampling - blend from Borough wells # 10, #11, and #14), Fair Lawn Wellfield Site, Bergen County, New Jersey. December 1994
2. Garden State Laboratories, Inc.- Report of Analysis - Volatile Organic Compounds (municipal wellfields raw water prior to treatment with cadmus wellfield air stripper system water sampling - blend from Borough wells # 2, #7, #8, #9, #15, #16, #17, and #19), Fair Lawn Wellfield Site, Bergen County, New Jersey. December 1994
3. Environ Corporation, Well Survey Results, Fair Lawn Wellfield Site, Bergen County, New Jersey. March 1994
4. Environ Corporation, Groundwater Monitoring And Remedial Action Progress Report, FSC, Fair Lawn Wellfield Site, Bergen County, New Jersey. Second Quarter 1994
5. IT Corporation, Groundwater Monitoring Report, Sandvik, Inc., Fair Lawn Wellfield Site, Bergen County, New Jersey. First Quarter 1994
6. Environ Corporation, Preliminary Assessment Of The Potential Sources And Circumstances Of Release To The Fair Lawn Well Fields Site, Borough Of Fair Lawn, Bergen County, New Jersey. October, 1993
7. ATSDR, preliminary health assessment document for Fair Lawn Borough wells, Fair Lawn Borough, Bergen County, New Jersey. January 1989
8. Movement of Volatile Organics through a Fractured Rock Aquifer by Steven E. Spayd, New Jersey Geological Survey, Division of Water Resources, NJDEP. 1985
9. Garden State Laboratories, Inc.- Report of Analysis - Volatile Organic Compounds (Municipal well # 24 water sampling), Fair Lawn Wellfield Site, Bergen County, New Jersey. May 1985
10. Ram, N.M., Christman, R.F., and Cantor, K.P., Eds., "Significance and Treatment of VOC's in Water Supplies", Chelsea, Maine, Lewis Publishers, pp.485-504.
11. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,2-dichloroethane. Atlanta, ATSDR, 1992.
12. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Tetrachloroethylene, Atlanta, ATSDR, 1993.

13. Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Trichloroethylene, Atlanta, ATSDR, 1993.
14. Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Chloroform, Atlanta, ATSDR, 1991.
15. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,1,1-Trichloroethane, Atlanta, ATSDR, 1993.
16. Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Carbon tetrachloride, Atlanta, ATSDR, 1994.
17. Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for 1,1-dichloroethene, Atlanta, ATSDR, 1994.
18. Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for 1,2-dichloroethylene, Atlanta, ATSDR, 1994.

INTERVIEWS / PERSONAL COMMUNICATIONS

1. USEPA:
- Site Manager
2. Site Remediation Program/NJDEPE:
- Site Manager
3. Fair Lawn Department of Health Services:
- Environmental Health Specialist

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Trenton, NJ 08625-0360

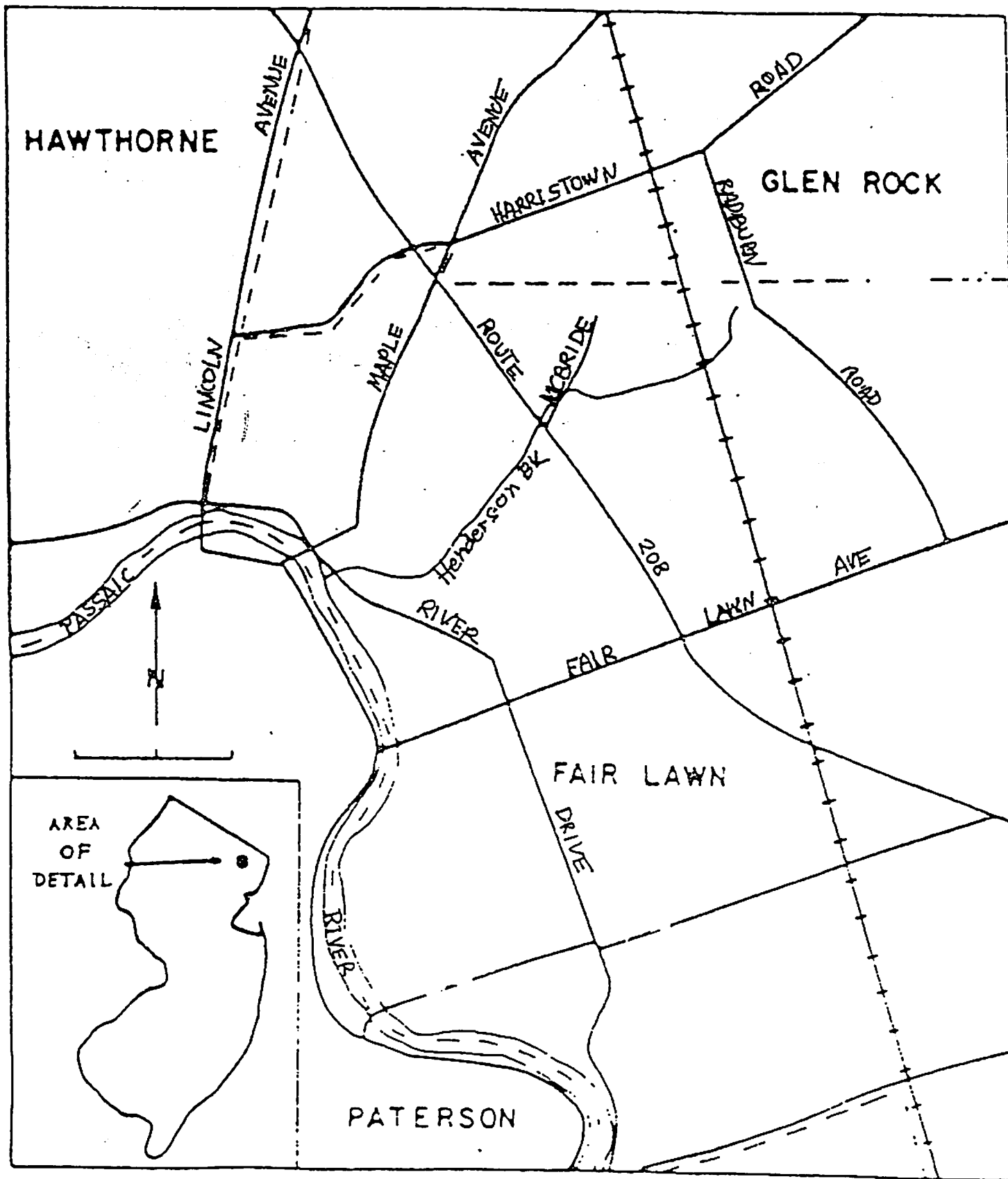
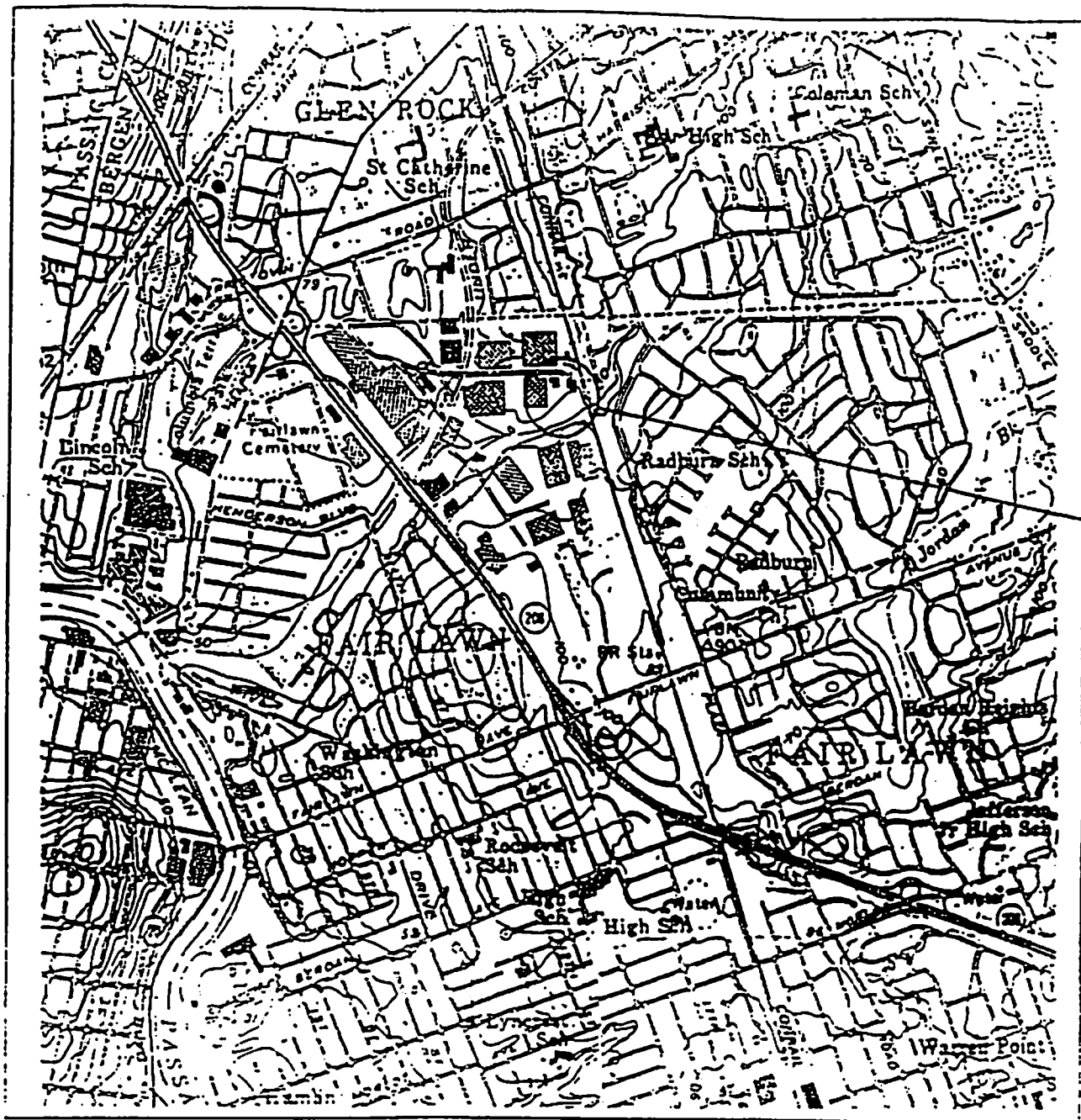
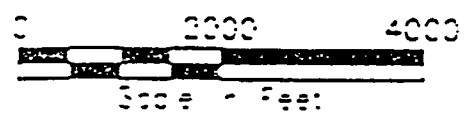


FIGURE 1 Location of study area 19



SITE



Source: USGS Topographic Series: Paterson & Hackensack, N.J. Quad, Photorevised 1951

ENVIRON

SITE LOCATION MAP
 FISHER SCIENTIFIC CO. INC.
 FAIR LAWN NEW JERSEY

Figure
 2

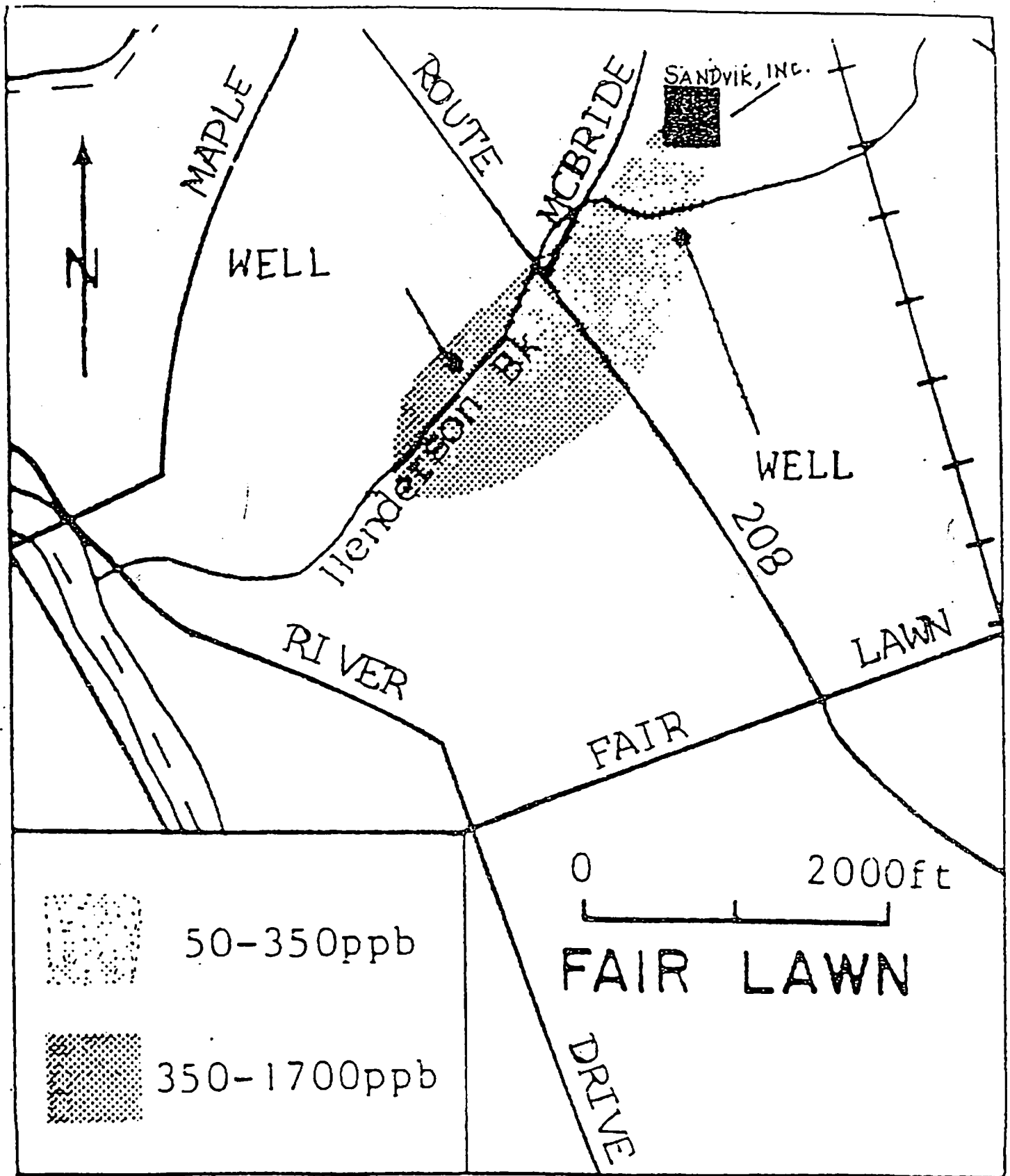


Fig. 3. contaminant plume. 1,1,1-trichloroethane, and tetrachloroethylene concentrations (1982-1992)

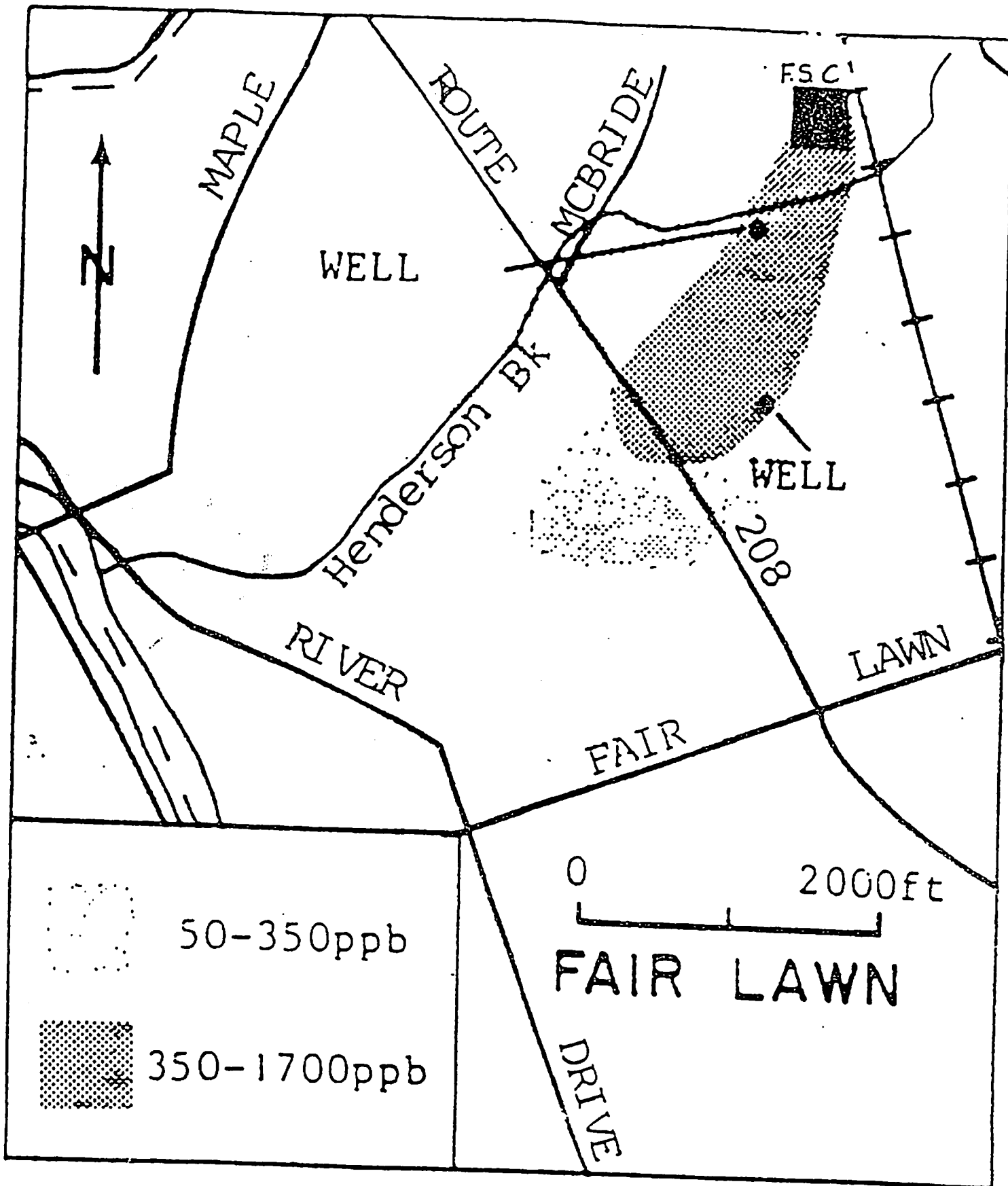
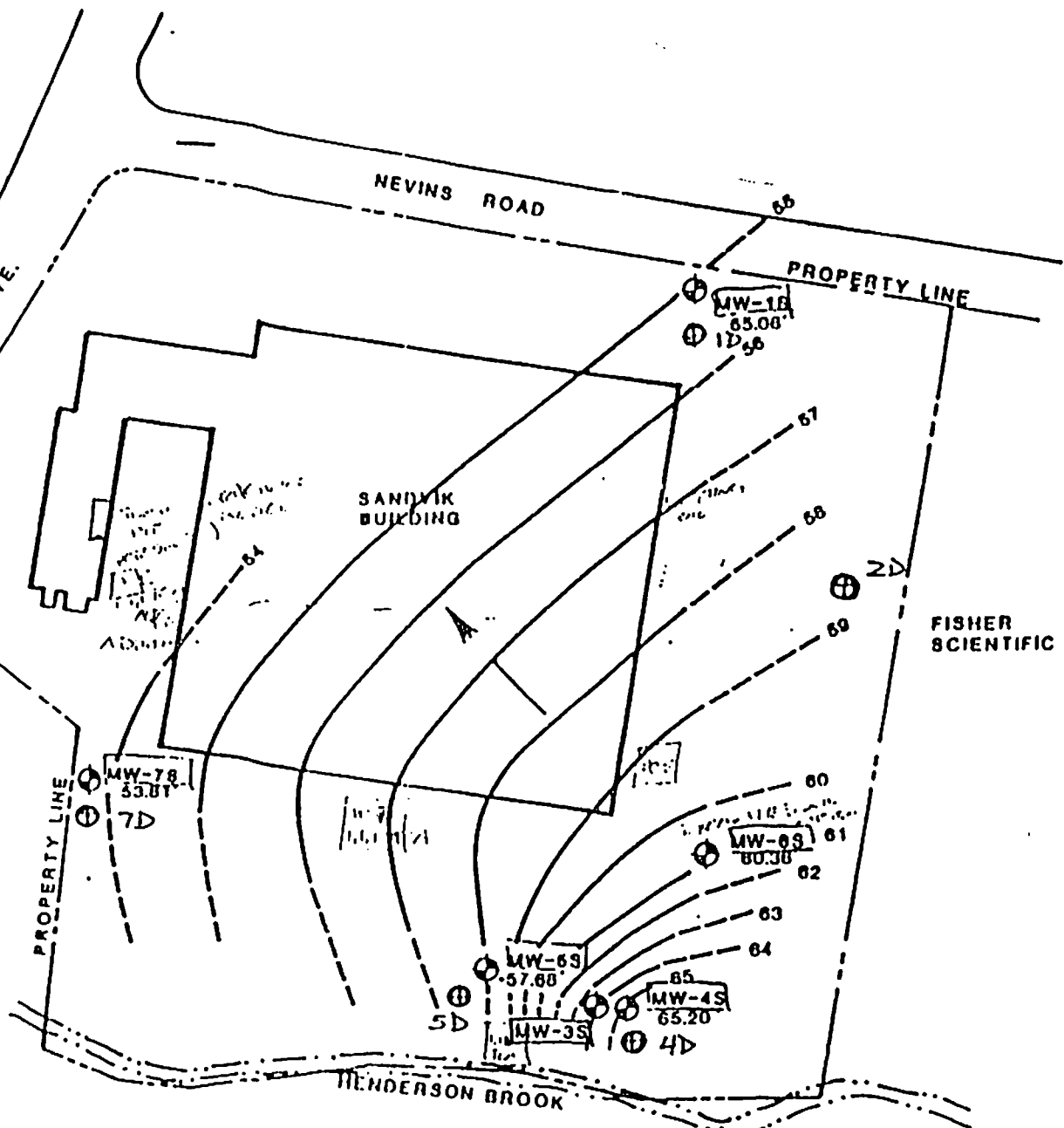





Fig. 4. contaminant plume. Carbon tetrachloride and chloroform concentrations (1982-1983).



- LEGEND**
-  MONITOR WELL LOCATION
 - MW-
 - 62.00' WATER LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL
 -  LINE OF EQUAL WATER ELEVATION, IN FEET ABOVE MEAN SEA LEVEL (DASHED WHERE INFERRED)
 -  GROUND WATER FLOW DIRECTION

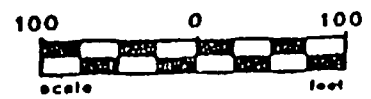


FIGURE 5
GROUND WATER CONTOUR
MAP SHALLOW BEDROCK
MONITOR WELLS
FEBRUARY 2/3, 1988

SANDVIK, INC.
 FAIR LAWN, N.J.
 JOB No. 424224