

# Public Health Assessment for

**UPPER DEERFIELD TOWNSHIP SANITARY LANDFILL**

**UPPER DEERFIELD TOWNSHIP, CUMBERLAND COUNTY, NEW JERSEY**

**CERCLIS NO. NJD980761399**

**AUGUST 3, 1992**

**\*ADDENDUM\***

**FEBRUARY 14, 1995**

**U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES**  
**Public Health Service**  
**Agency for Toxic Substances and Disease Registry**



## THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT ADDENDUM

UPPER DEERFIELD TOWNSHIP SANITARY LANDFILL

UPPER DEERFIELD TOWNSHIP, CUMBERLAND COUNTY, NEW JERSEY

CERCLIS NO. NJD980761399

Prepared By:

The New Jersey Department of Health  
Under a Cooperative Agreement with  
The Agency for Toxic Substances and Disease Registry

## FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

**Exposure:** As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

**Health Effects:** If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

**Conclusions:** The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its public health action plan. ATSDR is primarily an advisory agency, so usually these reports

identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

**Interactive Process:** The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

**Community:** ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

**Comments:** If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

## SUMMARY

The Upper Deerfield Township Landfill (UDTL) consists of 14 acres in a 23 acre site belonging to Upper Deerfield Township, Cumberland County, New Jersey, located amidst a rural farming district. It was originally a gravel pit owned by Seabrook Farms, Inc. and dumping may have started in the 1940's. The Township purchased the land in 1960 and operated it as a municipal sanitary landfill, until its closure the end of 1983. In the late 1970's, local residents began to complain about well-water discoloration and odors. Contaminated groundwater is the environmental media of concern. Three landfill monitoring wells and 26 residential wells were sampled for metals and volatile organics in February 1980. Monitoring well samples were contaminated with benzene, lead, mercury, vinyl chloride, trans-1,2-dichloroethylene, 1,1,1-trichloroethane and trichloroethylene at concentrations above ATSDR comparison values. Residential well samples contained benzene, mercury and vinyl chloride above ATSDR comparison values. Additional groundwater characterization was conducted in January of 1984 by the New Jersey Department of Environmental Protection and Energy (NJDEPE), finding similar results. Completed exposure pathways at the site are associated with past domestic use of contaminated groundwater. The Township supplied residents with bottled drinking water from December 1983 through June 1986 and then provided an alternative water supply to the Township residents in June 1986. Approximately nine households south of the site (downgradient) may have been exposed. Mercury and vinyl chloride were the only compounds found in sufficient concentration to possibly cause adverse health effects. Soil gas (methane) was found less than two meters from a residence next to the site at levels not of public health concern. In November 1981, NJDEPE issued the Township a Notice of Prosecution for operational deficiencies. In March 1982, a second Notice of Prosecution was issued by the NJDEPE for the landfill's acceptance of unauthorized bulk waste. An Administrative Consent Order (ACO) was issued by the NJDEPE in June 1985, requiring a Remedial Investigation and Feasibility Study (RI/FS), but Upper Deerfield Township has refused to sign the ACO agreement. The New Jersey Department of Health (NJDOH) and the Agency for Toxic Substances and Disease Registry (ATSDR) prepared a Health Assessment of this site on June 20, 1990 in which the Upper Deerfield Landfill was considered to be a potential public health hazard. This public health assessment Addendum considers the site to have constituted a public health hazard in the past due to exposure to contaminated residential well water. A groundwater monitoring program is to be implemented by Upper Deerfield Township. Currently, the site poses an indeterminant hazard because of the possible migration off-site of soil gas toward homes adjacent to the site. It was recommended that the landfill should be closed according to New Jersey State regulations, and the site should be restricted to prevent access to physical hazards. The Health Activities Recommendation Panel (HARP) determined that those persons exposed to benzene, through the consumption of contaminated drinking water, should be considered for the ATSDR benzene subregistry. The Public Health Action Plan (PHAP) calls for evaluation of any future soil gas data.

## BACKGROUND

In cooperation with the New Jersey Department of Health (NJDOH), the Agency for Toxic Substances and Disease Registry (ATSDR) will evaluate the public health significance of this site. More specifically, ATSDR will determine whether health effects are possible and will recommend actions to reduce or prevent possible health effects. ATSDR, located in Atlanta, Georgia, is a Federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, to conduct public health assessments at hazardous waste sites. This evaluation is intended to addend the Upper Deerfield Township Landfill Health Assessment of June 20, 1990 (Appendix A).

### A. Site Description And History

The Upper Deerfield Township Landfill (UDTL) consists of 14 acres in a 23 acre site belonging to Upper Deerfield Township, Cumberland County, New Jersey. The site is located amidst a rural farming district. The landfill is located at Block 63, Lot 5A on the local tax map. An area map is shown in Appendix B. The site lies between Woodruff-Husted Station road (County Route 687) to the east and Centerton Road (County Route 553) to the West (Appendix C). A private residence is located across the street from the site on Centerton Road. The northern boundary abuts a cornfield and the southern side is adjacent to a residence. The Township of Seabrook is approximately 2.5 miles east southeast of the landfill. (9)

The Landfill was originally a gravel pit owned by Seabrook Farms, Inc. Dumping at the site may have started as early as the 1940's. The Township purchased the land in 1960, and operated it as a municipal sanitary landfill until its closure at the end of 1983. The site is a relatively small flat landfill next to a borrow pit, as seen in Appendix D.

In the late 1970's, local residents began to complain about well-water discoloration and odors. In response to these complaints, the Cumberland County Health Department installed three monitoring wells at the landfill in January of 1980. In February, the three monitoring wells and 26 residential wells were sampled for metals and volatile organic compounds (VOCs). Residential wells were found to be contaminated with mercury, vinyl chloride, trans-1,2-dichloroethylene, 1,1,1-trichloroethane and/or 1,1-dichloroethane. The groundwater was sampled in January of 1984 by the New Jersey Department of Environmental Protection and Energy (NJDEPE) with similar results. (7)

Potable wells in the area draw upon the Cohansey-Kirkwood Aquifer. The depth of residential wells range from 60 to 150 feet below the surface. The well closest to the site lies approximately 100 feet south. The groundwater has a southerly flow. In 1982, a geophysical survey, using conductivity measurements around the landfill, indicated a possible plume of contamination in the southeast corner of the landfill.

Upper Deerfield Township supplied residents with bottled drinking water between December of 1983 through June of 1986. The Township drilled two public supply wells and constructed a distribution system in order to provide an alternative water supply to the affected Township residents. The residents were hooked up to the alternative water supply in June of 1986.

The NJDEPE issued, in November of 1981, a Notice of Prosecution to the Upper Deerfield Township Landfill for operational deficiencies (e.g., lack of proper cover, extended working face size and windblown litter). In March 1982, NJDEPE issued a second Notice of Prosecution for the landfill's acceptance of unauthorized bulk waste. An Administrative Consent Order (ACO) was issued by the NJDEPE in June of 1985, requiring a Remedial Investigation and Feasibility Study (RI/FS), but Upper Deerfield Township refused to sign the ACO agreement (9).

The United States Environmental Protection Agency (USEPA) is the lead agency for remediation efforts at the Upper Deerfield Township Landfill (8). The USEPA conducted a Remedial Investigation (RI) at the Upper Deerfield site from April 1987 through April 1990, to delineate the nature and extent of site-related contamination. The RI field work included a soil gas survey, an air sampling program, a site grid survey, a geophysical survey, subsurface soil sampling, sediment sampling, monitoring well and piezometer installation, and groundwater sampling from monitoring wells and residential wells. In addition, an environmental assessment was conducted to address the potential risk posed by site-related contaminants.

The results of the RI showed only low levels of contaminants in landfill soil. While volatile organic contaminants (VOC's) and mercury are present in on-site soil gas, little migration of the soil gas is presently occurring. Additionally, VOCs and inorganics were found at relatively low levels in the ground water, and results indicate that these levels have decreased.

USEPA has determined that no further remedial action is necessary at the Upper Deerfield site. However, since groundwater contamination did exist in the vicinity of the Upper Deerfield Landfill, and because low levels of hazardous substances remain on site, continued air and groundwater sampling to monitor the overall was recommended in a Record of Decision (9/30/91). The Township of Upper Deerfield is responsible for the implementation of the groundwater monitoring program. Although residential well samples collected during the RI showed low levels of contaminants, USEPA has determined there is an ongoing need to monitor groundwater quality in the vicinity of the landfill.

The NJDOH and the ATSDR prepared a Health Assessment for the Upper Deerfield Landfill site on June 20, 1990 (Appendix A) in which the Upper Deerfield Landfill was considered to be a Potential Public Health Hazard. This Public Health Assessment Addendum has been prepared because there now is additional site information (11, 12).

## **B. Site Visit**

On April 1, 1990, a site visit was conducted at the Upper Deerfield Township Landfill by Jonathan Savrin of the New Jersey Department of Health (NJDOH) and the USEPA's consultant Site Manager. A second site visit was made by Howard Rubin of the NJDOH and a representative of the County Health Department on June 12, 1992.

The UDTL is covered with soil which has remained intact. However, the site does not have a final cap. The landfill had a fence that was intact on the eastern and southern side of the landfill. However, the western and northern sides of the site are not fenced.

A borrow pit was observed which was approximately 12 to 15 feet deep with steep slopes and evidence of a lack of maintenance. Deep depressions resembling sinkholes were observed. These holes pose a physical hazard to trespassers.

Evidence of trespassing was observed. Old tires have been placed in the borrow pit to create a racetrack for dirt bikes. It appeared that the borrow pit was heavily used for recreational purposes. There were several paths offering access to the site. The USEPA had erected three signs at the site which identified the area as a "USEPA Site Inspection Area". However, two of the three signs had been knocked down and the other sign was difficult to find. The USEPA's consultant had a trailer on-site which had been broken into several times.

There was no surface water near the site; however, there was some standing water at the landfill. Heavy rains may apparently result in run-off into the borrow pit and/or rapid percolation through the soil.

## **C. Demographics, Land Use, and Natural Resource Use**

In order to evaluate potential health effects associated with exposure to hazardous substances in the environment, NJDOH obtains information on the population in the vicinity of the site, the types of land near the site, and natural resources use in the area.

Population information is needed because some types of illness and disease are more common in certain age groups such as the elderly or children, in certain ethnic groups, or in groups of people with low income. In addition, some groups may be more sensitive to the presence of hazardous substances in the environment. Information on educational levels provides NJDOH some guidance on what types of health communication programs may be useful near the site in the future. Land use information is important because sensitive groups of people such as school children or residents of health care facilities may be located near the site. Use of some of the natural resources, such as groundwater, may have an effect on the potential for human exposure to hazardous substances.

The Upper Deerfield Township Landfill is located in a sparsely populated rural area. Approximately 215 people (86 residences X 2.5 people/residence) live within one mile of the site, with the nearest residence being approximately 100 feet south of the site. There are a total of about 31 residences within 0.5 miles of the site consisting of about 78 residents (2.5 residents/home). The 1980 Census placed the population of Deerfield Township at 6,810 people. The nearest population centers to the site are Seabrook and Carls Corner, both about 2.5 miles west and south west, respectively, from the site. Bridgeton is the nearest sizeable community and lies five miles southwest of the site.

The main use for the land surrounding the landfill is farming. There are few homes adjacent to the site, and no industries nearby. Lebanon Branch is the closest stream down-gradient to the landfill and is approximately three miles away. There are no recreational areas impacted by the site.

All private potable wells within the immediate area of the site have been closed. The Township granted waivers to twelve residential lots for non-potable groundwater uses. The nearest downgradient potable wells still in use are on Richards Road, more than one mile downgradient from the site. Potable water is currently supplied by two public supply wells, located approximately one-half mile upgradient of the site.

#### **D. Health Outcome Data**

There are multiple sources of health outcome data in New Jersey. State and local data for health outcome information include the New Jersey State Cancer Registry, Birth Defects Registry, Vital Statistics Records, Renal Dialysis Network, and Hospital Discharge Reports. Federal databases such as those maintained by the agencies within the US Department of Health and Human Services (i.e., National Cancer Institute and National Institute for Occupational Safety and Health) are not site-specific, but may be used for comparison or evaluation purposes.

Cancer might be possible from long-term exposure to one of several of the site contaminants. Please refer to the Toxicological Evaluation subsection of the Public Health Implications section for more information on cancer.

### **COMMUNITY HEALTH CONCERNS**

The concerns of the community with respect to the Upper Deerfield Township Sanitary Landfill have focused upon those issues associated with the potential for contamination of potable water supplies and domestic well contamination, the potential for residents to have a higher incidence of cancer, the health hazard associated with children using the borrow pit and the landfill for recreational purposes and the impact on property values.

## ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables in this section list the contaminants of concern. NJDOH evaluates these contaminants in the subsequent sections of the Health Assessment to determine whether exposure to them has public health significance. NJDOH selects and discusses these contaminants based upon the following factors:

1. Concentrations of contaminants on and off the site.
2. Field data quality, laboratory data quality, and sample design.
3. Comparison of on-site and off-site concentrations with health assessment comparison values for noncarcinogenic endpoints and carcinogenic endpoints.
4. Community health concerns.

In the data tables that follow under the On-Site Contamination subsection and the Off-Site Contamination subsection, the listed contaminant does not mean that it will cause adverse health effects from exposures. When selected as a contaminant of concern in one medium, that contaminant will be reported in all media.

The Data tables include the following acronyms:

- **CREG** = ATSDR Cancer Risk Evaluation Guide
- **EMEG** = ATSDR Environmental Media Evaluation Guide
- **RMEG** = Reference Dose Media Evaluation Guide, calculated from EPA's reference dose (RfD).
- **LTHA** = USEPA's Lifetime Health Advisory
- **MCL** = Maximum Contaminant Level
- **NJ MCL** = NJ Maximum Contaminant Level
- **PPB** = Parts Per Billion
- **ND** = Not Detected

Comparison values for public health assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation. These values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), and other relevant guidelines. CREGs are estimated contaminant concentrations based on a one excess cancer in a million persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors. Maximum contaminant levels (MCLs) represent contaminant concentrations that New Jersey or a Federal regulatory agency deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day. MCLs are regulatory concentrations. EPA's Reference Dose (RfD) is an estimate of the daily exposure to a contaminant that is unlikely to cause health effects.

The environmental contamination section includes sampling data from a variety of media sources including: groundwater (Monitoring wells and residential wells); surface water; surface soil; subsurface soil; and sediments.

Although, the final RI/FS (12,13) contains concentrations of contaminants that are somewhat different from previous studies (8, 10), the earlier studies would more likely represent the amount of contamination to which the residents have been exposed.

#### **A. On-Site Contamination**

Refer to pages 2 and 3 in the original Health Assessment document for Upper Deerfield Township Landfill (Appendix A), for additional information regarding on-site contamination. No further sampling was done subsequent to the original Health Assessment.

##### **Groundwater**

The contaminants of concern found in the three on-site monitoring wells sampled at various times are presented in Table I (7,9,11,12). It is likely that the contamination is due to leaching of the debris in the Landfill.

**Table I. Contaminants Found In On-Site Groundwater Samples**

Contaminant	Year Sampled	Maximum Conc. (ppm)	Comparison Values	
			ppm	Source
Benzene	1984	0.007	0.001	NJMCL
Lead	1981	0.130	0.050	MCL
Mercury	1984	0.400	0.002	MCL
Trans-1,2-Dichloroethylene	1981	0.720	0.010	MCL
1,1,1-Trichloroethane	1981	0.027	0.026	NJMCL
Trichloroethylene	1981	0.007	0.002	NJMCL
Vinyl Chloride	1984	0.354	0.002	MCL

NJMCL - Maximum Contaminant Value established under the New Jersey Safe Drinking Water Act.

MCL - Federal Maximum Contaminant Level

**Soils and Sediments**

Beryllium was found in deep subsurface soil (up to eight feet below the surface) and sediment samples at concentrations above ATSDR comparison values (Table II) (7,9,11,12). Organic sediment analyses were rejected due to faulty quality assurance/quality control procedures. However, inorganic analyses were adequate for review. Results from surface soil samples, if they were taken, were not reported.

**Table II. Contaminants Found in On-Site Subsurface Soil and Sediments**

Contaminant	Year Sampled	Maximum Conc. (ppm)	Comparison Values	
			ppm	Source
Beryllium	1988	4.30	0.16	CREG

CREG - ATSDR's Cancer Risk Evaluation Guide

## **Air**

In March of 1987 the air was sampled with an Organic Vapor Analysis (OVA) meter. The results indicated the presence of volatile organic chemicals at concentrations greater than background levels. The air was not sampled to determine which chemicals were responsible for the elevated readings. However, methane was probably responsible for the greatest percentage of organic chemicals being released from the Landfill. Air samples were taken on April 27 and 29, 1988, and analyzed for benzene, vinyl chloride and 1,1-dichloroethylene. Benzene was at 0.046 ppm while vinyl chloride and 1,1-dichloroethylene were not significantly above their detection limits of 0.001 ppm. Mercury was found to be at a concentration of 0.35 ppm at the southern boundary of the Landfill. (7,9)

## **Soil Gas**

Soil gas released from perturbed soil was sampled between June 8 and 12, 1988. The main concentration of chemicals detected was benzene at 8.0 ppm, trans-1,2-dichloroethylene at 13.0 ppm, tetrachloroethylene at 4.0 ppm, 1,1,1-trichloroethane at 3.0 ppm, trichloroethylene at 7.0 ppm, toluene at 9 ppm and vinyl chloride at 20 ppm. (7,9) Soil gas (Methane) was found less than two meters from a residence that is approximately 100 feet from the edge of the landfill, indicating that the soil gas was migrating off-site. A second soil gas survey was conducted in 1990, which confirmed low levels (concentration not at levels of public health concern) of contaminants. USEPA plans to conduct additional soil gas monitoring at the Upper Deerfield site.

## **B. Off-Site Contamination**

### **Residential Wells**

The NJDEPE found several chemicals above comparison values in residential wells (Table III) (7,9,11,12). In 1982, a geophysical survey revealed a possible plume of groundwater contamination moving toward the southeast. For additional information, refer to the Health Assessment document for Upper Deerfield Township Landfill, June 20, 1990 (Appendix A).

**Table III. Contaminants found in Off-Site Residential Wells**

Contaminant	Year Sampled	Maximum Conc. (ppm)	Comparison Values	
			ppm	Source
Benzene	1984	0.003	0.001	NJMCL
Mercury	1984	0.130	0.002	MCL
Vinyl Chloride	1984	0.038	0.002	MCL

NJMCL - Maximum Contaminant Value established under the New Jersey Safe Drinking Water Act.

MCL - Federal Maximum Contaminant Level

**C. Quality Assurance/Quality Control**

In preparing this public health assessment, the ATSDR and the NJDOH relied on the information provided in the referenced documents and assumed that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures and data reporting. The validity of analyses and conclusions drawn for this public health assessment is determined by the completeness and reliability of the referenced information.

**D. Physical and Other Hazards**

The borrow pit is accessible and used for recreational purposes. For additional information regarding physical hazards associated with the landfill, refer to the Health Assessment document for Upper Deerfield Township Landfill, June 20, 1990 (Appendix A). There are no known or suspected radiological or biological hazards associated with the site.

**E. Toxic Chemical Release Inventory**

The NJDOH conducted a search of the Toxic Chemical Release Inventory (TRI) in an attempt to identify any possible facilities that could be contributing to the environmental contamination near the Site. The TRI is compiled by USEPA and is based on estimated annual releases of toxic chemicals to the environment (air, water, soil, or underground injection) provided by certain industries.

The TRI search for the years from 1987 to 1990 did not list any reported emissions of chemicals that were pertinent to the Upper Deerfield Landfill site.

## PATHWAYS ANALYSES

To determine whether nearby residents are exposed to contaminants migrating from the site, NJDOH evaluates the environmental and human components that lead to human exposure. This pathway analysis consists of five elements: 1) a source of contamination; 2) Transport through an environmental medium; 3) A point of exposure; 4) A route of exposure; and 5) An exposed population.

NJDOH classifies exposure pathways into three groups: 1) Completed pathways, that is, those in which exposure has occurred, is occurring, or will occur; 2) Potential pathways, that is, those in which exposure might have occurred, may be occurring, or may yet occur; and 3) Eliminated pathways, that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified. A summary of the pathways for the Upper Deerfield site are discussed below. Table IV identifies the completed exposure pathways at the Upper Deerfield site. Table V identifies the site's potential exposure pathways. The discussion following the two tables address only pathways important and relevant to the site.

### A. Completed Exposure Pathways

#### Groundwater Pathways

Completed exposure pathways at the UDTL are limited to those pathways associated with the domestic use of contaminated groundwater for a period of approximately 50 years prior to the availability of a public water supply.

Dumping may have started in the 1940's when the site was owned by Seabrook Farms and continued until 1983 when the landfill was closed. Private well water in the southeast portion of the township was found to be contaminated with 130  $\mu\text{g}/\text{l}$  of mercury, 3  $\mu\text{g}/\text{l}$  of benzene and 38  $\mu\text{g}/\text{l}$  of vinyl chloride. The township supplied the 215 residents with bottled water until the alternate distribution system was completed in 1986. Three homes north of the site refused to be hooked up to the public water supply. They are not expected to be at risk, however, since the plume was flowing toward the southeast. The residents living to the south of the landfill were exposed via ingestion (drinking the contaminated water), skin contact (bathing, dish washing) and inhalation (breathing volatilized groundwater contaminants). Exposure occurred in the past for the residents south of the site (Table IV).

### B. Potential Exposure Pathways

#### Surface Soil Pathway

No on-site surface soil samples were taken for analysis so the potential hazard caused by direct contact or ingesting the Landfill soil by trespassers cannot be determined. Potential exposure occurred in the past and shall continue into the future until the site is either remediated or

completely fenced. The landfill cover consists of clean fill. Therefore, it is unlikely that the surface of the Landfill should become sufficiently contaminated to be of concern to trespassers at the site, the potentially exposed population.

### Soil Gas Pathway

Soil gas was detected at levels not of public health concern less than two meters from a residence approximately 30 meters from the edge of the landfill. No measures have been taken at the landfill to collect or prevent the potential migration of soil gas. In as much as there are several other homes that are adjacent to the landfill, monitoring for soil gases and methane is indicated to ensure concentrations remain at levels not of public health concern.

### Air Pathway

Complaints of odors emanating from the landfill began in the 1970's. Positive readings on field air monitoring equipment indicate that contaminants are being released from the site. However, the air on and off-site has not been adequately qualitatively or quantitatively analyzed. This information is needed to determine the possibility that exposures occurred either directly from the site or from the volatilization of chemicals in contaminated well water used by residents. The population exposed to potential airborne contamination consists of the approximately 215 residents that are near the landfill and/or were using contaminated well water. Exposure may have occurred in the past, the present and may occur in the future via inhalation and/or skin contact. It is not possible to determine the number of people who use the Landfill and/or the borrow pit for recreational purposes or to determine those exposed to the volatilization of the chemicals from contaminated tap water.

Although the borrow pit and the Landfill are used for recreational purposes it is unlikely that anyone would spend sufficient time at the site to elicit an adverse health effect through inhalation of the vent gases. Air contaminated by Landfill venting is not considered further because of the relatively low concentrations of hazardous contaminants being released, atmospheric dilution and the distance that people live from the edge of the site.

**Table IV. Completed Exposure Pathway**

EXPOSURE PATHWAY ELEMENTS					TIME
SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
*UDTL	Groundwater	Homes With Well Water	Ingestion, Inhalation, Skin Contact	Residents on Well Water	Past

\* = Upper Deerfield Township Landfill

**Table V. Potential Exposure Pathways**

EXPOSURE PATHWAY ELEMENTS					TIME
SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
*UDTL	Soil	On-Site	Ingestion, Skin Contact	Trespassers	Past, Present, Future
*UDTL	Soil-Gas	Off-Site	Inhalation	Residents Adjacent to Landfill	Future
*UDTL	Air	On-Site, Off-Site	Inhalation, Skin Contact	Upper Deerfield Residents	Past, Present, Future

\* = Upper Deerfield Township Landfill

## PUBLIC HEALTH IMPLICATIONS

### Introduction

In this section we will discuss the health effects in persons exposed to specific contaminants, evaluate state and local databases, and address specific community health concerns. Health effects evaluations are accomplished by estimating the amount (or dose) of those contaminants that a person might come in contact with on a daily basis. This estimated exposure dose is then compared to established health guidelines. People who are exposed for some crucial length of time to contaminants of concern at levels above established guidelines are more likely to have associated illnesses or disease.

Health guidelines are developed for contaminants commonly found at hazardous waste sites. Examples of health guidelines are the ATSDRs Minimum Risk Level (MRL) and the USEPAs Reference Dose (RfD). When exposure (or dose) is below the MRL or RfD than non-cancer, adverse health effects are unlikely to occur.

MRLs are developed for each route of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (365 days and greater). ATSDR presents these MRLs in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status.

### A. Toxicological Evaluation

The toxicological effects of the contaminants detected in the groundwater have been considered singly. The cumulative or synergistic effects of mixtures 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 adults. This situation depends upon the specific chemical being ingested or inhaled, its pharmacokinetics in children and adults, and its toxicity in children and adults.

### Groundwater Exposure

In the past, residents and workers who used well water were exposed to groundwater contaminated with a various toxicants for up to 50 years. It is unlikely that prolonged exposure to most of these contaminants at the concentrations that were detected in the groundwater samples would result in adverse health effects. The residents were supplied with bottled water in 1983 and were subsequently hooked up to an alternative water supply.

It is known that dumping took place at the site in the 1940's, when it was still a gravel pit. The exposure dose assessment is based on adults and assumes that they drank 2 liters of tap water per day for 50 years. Dumping took place in the 1940's, however, it is not known when dumping, and exposure, actually began.

The population at risk via groundwater exposure consists of approximately 9 households south of the site that used contaminated well water.

Several contaminants of concern were found in groundwater samples on or off-site but not found in samples taken from the residential wells. Thus, exposure to these chemicals is undocumented and should be considered as a worst possible case. The possibility exists that the wells might have been contaminated for a period of time with these chemicals in the past. Of these compounds, only trans-1,2-dichloroethylene was found in on-site groundwater samples at concentrations above its comparison values. Trichloroethylene was found below the comparison value in groundwater. Thus, these chemicals were at levels that would probably be unlikely to cause adverse health effects. Of the other chemicals that were equal to or above their comparison values, lead and 1,1,1-trichloroethane had exposure doses sufficiently elevated to be of concern if exposure would occur. Benzene, mercury and vinyl chloride were found at levels that might result in adverse health effects.

### **Benzene**

Benzene is a colorless liquid with a sweet odor and is highly volatile and soluble in water. It is used to make other chemicals, in the production of rubber, lubricants, dyes, detergents, drugs, and pesticides. It is produced naturally via volcanic activity and through forest fires. Benzene is a normal constituent of crude oil. The ingestion of high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, and rapid heart rate. The effects from ingesting low levels of benzene in humans are unknown. However, animal studies indicate that the oral route of benzene exposure can damage the blood and the immune system and can cause cancer.

Based upon maximum levels of benzene detected in the groundwater samples, exposure dosages were below the "No Observed Adverse Effect Level" (NOAEL) for chronic ingestion exposure as cited in the ATSDR Toxicological Profile for Benzene (1). Hence, non-carcinogenic health effects are not likely to occur. It is impossible to estimate the exposure dosages and resultant health effects that might have occurred due to the inhalation route or via dermal contact resulting from domestic activities which would liberate VOCs.

Benzene is classified by the USEPA as a known human carcinogen. The Lifetime Excess Cancer Risk (LECR) associated with the oral exposure route for benzene at the site would present an insignificant cancer risk for adults. For every 1,000,000 persons who were exposed through ingestion for 50 years to the maximum concentration of benzene detected in potable wells, at most an additional four cases of cancer may occur in 70 years. Therefore, it is unlikely that the population exposed to benzene via the ingestion route will develop cancer from their exposure. Therefore, past exposure to benzene from the underground water supply is probably unlikely to cause adverse health effects.

## Mercury

Mercury is a naturally occurring ubiquitous element that is found either in the inorganic form as a mineral or in the organic form, usually as methylmercury (5,6). Chronic exposure to inorganic mercury may cause behavioral changes, weight loss, anorexia and immune deficiency. Long term exposure to organic mercury may result in permanent damage to the brain, kidneys and to fetal development. There is insufficient human or animal evidence to link mercury with cancer. (3)

Mercury was found in on-site groundwater samples at a concentration of 0.4 ppm (Table I) and in private well samples at 0.13 ppm (Table III). The estimated chronic exposure dose is above the MRL/RfD value for both the on-site and residential well samples. Thus, the data indicate that the exposed population of residents and workers south of the site who drank well water were probably exposed to mercury at sufficient levels to cause adverse non-carcinogenic health effects via ingestion. It is impossible to estimate the exposure dosages and resultant health effects that might have occurred due to the inhalation route or via dermal contact resulting from domestic activities which would liberate mercury into the air.

## Vinyl Chloride

Vinyl chloride is an anthropogenic colorless vapor having a mild, sweet odor that is used as the backbone for the polymer, polyvinyl chloride (PVC). It is also used to make furniture, automobile upholstery, wall coverings, housewares and automotive parts. Breathing vinyl chloride can cause sensitivity reactions, dizziness and/or sleepiness and can damage the liver, lungs, kidneys, heart, nerves, and prevent blood from clotting. Dermal contact can numb the skin and cause redness and blisters. As reported in the ATSDR's Toxicological Profile for Vinyl Chloride (4), there are very few studies on the ingestion of vinyl chloride but there are indications that chronic exposure can cause hepatic damage.

Vinyl chloride was found in groundwater samples both from the monitoring wells at the Landfill and from the residential wells at 0.3354 ppm and 0.038 ppm, respectively. The exposed population of residents south of the landfill had estimated exposure doses significantly above the ATSDR's comparison values, indicating that there is the possibility of adverse health effects. It is impossible to estimate the exposure dosages and resultant health effects that might have occurred due to the inhalation route or via dermal contact resulting from domestic activities which would liberate VOCs.

Although vinyl chloride is a known human carcinogen (5, 6) via inhalation, there are no human studies relating the ingestion of vinyl chloride to cancer. The few existing animal studies, however, did demonstrate a causal relationship. The target organ appears to be the liver with angiosarcomas being formed. This is similar to human studies on the inhalation of vinyl chloride.

The vinyl chloride ingestion exposure route has not been associated with cancer. In order to be conservative, the Lifetime Excess Cancer Risk (LECR) associated with the ingestion exposure route for vinyl chloride from the site was calculated and was found that it would present an insignificant or no increased cancer risk for adults. For every 1,000,000 persons who were exposed through ingestion for 50 years to the maximum concentration of vinyl chloride detected in potable wells, at most an additional four cases of cancer may occur in 70 years. For the population exposed to vinyl chloride via the oral route, it is unlikely that they will develop cancer from their exposure.

### **Air and Soil Pathways**

The air and soil exposure pathways are not complete. Since the landfill cover is clean fill, it is considered unlikely that trespassers at the Landfill could be exposed, via the soil route of exposure, for adverse health effects to occur. It is also considered unlikely that sufficient quantities of toxicants will be vented, as landfill gases, to have an elevated potential for adverse health effects.

Only beryllium was found at concentrations above its comparison values for subsurface samples. However, even using the most conservative estimates, the exposure dose of this chemical was below the NOAEL in its ATSDR Toxicological Profiles (2,3). The quantitative cancer risk for beryllium is classified as no apparent increased risk for adults. Therefore, none of these chemicals are in sufficient amounts to be expected to cause any adverse health effects to people who might frequent the site.

### **B. Health Outcome Data Evaluation**

Health outcome data was not reviewed for this site. Approximately 215 people were potentially exposed to the contamination. Of this number, about 78 people lived 0.5 mile from the landfill. The groundwater plume may not have reached all of the residences. Thus, the exposed population is so small that any increased rates of disease due to the contaminated groundwater would probably not be observable by a review of the data bases.

### **C. Community Health Concerns Evaluation**

Community health concerns are addressed as follows:

**Question 1) Can the groundwater plume affect the quality of the water in the new public supply wells?**

**Answer 1) The public supply wells are upgradient to the groundwater plume and are monitored. Therefore, the public supply wells should not be affected.**

**Question 2) People in the local neighborhood seem to have a higher incidence of cancer. Is this due to the Landfill?**

**Answer 2)** The chance of an increase in cancer incidence is unlikely based on the concentrations of contaminants and on the length of exposure to those contaminants.

**Question 3) People, particularly children use the borrow pit and Landfill for recreational purposes. Is there a health hazard associated with these activities?**

**Answer 3)** The borrow pit and the landfill may be a physical hazard to the unsupervised children who are there and, therefore, access to the area should be restricted. However, they are not considered to be a health hazard to trespassers to the site because the landfill cover is composed of clean fill and the borrow pit is not contaminated. Landfill venting is not of consequence because of the low volume of gases discharged into the atmosphere per unit time.

### **Public Comment Period**

The New Jersey Department of health conducted a public comment period for the Public Health Assessment Addendum of the Upper Deerfield Landfill site from March 28, through April 29, 1994. The Public Health Assessment Addendum was placed in local repositories to facilitate written commentary and reaction from the public at large. In addition, the document was circulated to the Cumberland County Health Department (CCHD) for the purpose of soliciting commentary by local Health Officials.

The NJDOH did not receive commentary from the public or the CCHD with regard to the Upper Deerfield Landfill site

## CONCLUSIONS

1. Based on the information reviewed, ATSDR and NJDOH have concluded that the Upper Deerfield Township Landfill constituted a public health hazard in the past because people were exposed to levels of groundwater contaminants which may result in carcinogenic and noncarcinogenic health effects. Currently, the site poses an indeterminant public health hazard because of the possibility of off-site migration of soil gas toward homes adjacent to the property.
2. About 9 households (approximately 32 persons) living south of the landfill were exposed in the past to mercury and vinyl chloride through ingestion of contaminated groundwater. Calculated exposure doses were at a level where adverse health effects may be possible.
3. There are no indoor air sampling data available for review which describe potential past exposures as a result of volatilization from non-potable domestic use of contaminated groundwater.
4. A potential physical hazard exists because of free access to the borrow pit.
5. The groundwater monitoring program to be conducted by Upper Deerfield Township, when implemented, is consistent with protection of the public health.
6. Based on 1990 data, soil gases are migrating off-site at levels presently not of public health concern. Additional soil gas sampling planned by the USEPA will address this issue and is consistent with protection of the public health.

## RECOMMENDATIONS

1. The landfill should be closed according to New Jersey State regulations, and access to the site should be restricted to lessen the potential for physical hazards as soon as is practically possible.
2. Upper Deerfield Township should implement the groundwater monitoring program proposed in the Record of Decision to ensure the continued quality of groundwater resources in the environs of the site.
3. The ATSDR and the NJDOH will review additional soil gas data when available for public health significance.

## **HEALTH ACTIVITIES RECOMMENDATION PANEL STATEMENT**

The data and information developed in the public health assessment addendum for the Upper Deerfield Township Landfill site, Cumberland County, New Jersey, have been evaluated by ATSDR's Health Activities Recommendation Panel (HARP) for follow-up with respect to health activities. Because of past completed exposure to site-contaminants, at levels of public health concern, the HARP determined that those persons exposed to benzene, through consumption of contaminated drinking water, should be considered for the ATSDR benzene subregistry. In addition, HARP determined that if public comments indicate a need for community health education, then it should be conducted.

### **PUBLIC HEALTH ACTIONS**

The Public Health Action Plan (PHAP) for the Upper Deerfield site contains a description of actions to be taken by NJDOH and/or ATSDR at or around the site subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included, is a commitment on the part of ATSDR/NJDOH to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by ATSDR/NJDOH are as follows:

#### **Public Health Actions Taken:**

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

#### **Public Health Actions Planned:**

1. The ATSDR and the NJDOH will review any additional soil gas data regarding the Upper Deerfield Twp. landfill for public health significance.
2. ATSDR and the NJDOH will coordinate with the appropriate Township, County, and environmental agencies to monitor plans to implement the cease/reduce exposure and site characterization recommendations contained in this health assessment.
3. ATSDR will provide an annual follow up to this PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this health assessment, and will be provided to persons who request it.

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.

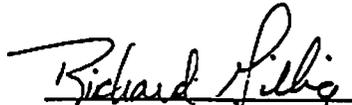
## CERTIFICATION

The Public Health Assessment for the Upper Deerfield Township Landfill 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 public health assessment was initiated.



Technical Project Officer, SPS, SSAB, DHAC

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



for Division Director, DHAC, ATSDR

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**APPENDICES**

APPENDIX A

Upper Deerfield Township Landfill Health Assessment, June 20, 1990

# Health Assessment for

UPPER DEERFIELD TOWNSHIP SANITARY LANDFILL

CERCLIS NO. NJD980761399

UPPER DEERFIELD TOWNSHIP, CUMBERLAND COUNTY, NEW JERSEY

JUN 20 1990

Agency for Toxic Substances and  
U.S. Public Health Service

HEALTH ASSESSMENT  
UPPER DEERFIELD TOWNSHIP LANDFILL  
CUMBERLAND COUNTY  
UPPER DEERFIELD TOWNSHIP , NEW JERSEY

Prepared by:  
Division of Science and Research  
New Jersey Department of Environmental Protection (NJDEP)  
and  
Environmental Health Service  
New Jersey Department of Health (NJDOH)

Prepared for:  
Agency for Toxic Substances and Disease Registry (ATSDR)

BACKGROUND

The Upper Deerfield Township Landfill (UDTL) is listed by the U.S. Environmental Protection Agency (EPA) on the National Priorities List (NPL). In the late 1970s, local groundwater users began to complain about water discoloration and odor. Subsequent investigation by the Cumberland County Health Department revealed contamination by mercury and volatile organic compounds (VOCs) in samples taken from test wells at the UDTL, as well as samples taken from residential wells. After repeated recommendations and citations by the NJDEP, the site was closed in December 1983. All but three local area residents now use an alternative public water supply system.

The UDTL is located on 22.72 acres of sparsely populated farmland in Upper Deerfield Township, Cumberland County, New Jersey (Appendix 1). The site lies between Woodruff-Husted Station road (County Route 687) to the east and Centerton Road (County Route 553) to the west. The UDTL was originally a gravel pit owned by Seabrook Farms, Inc. Upper Deerfield Township purchased the land in 1960 and operated it as a municipal sanitary landfill. EPA is the lead agency for remediation efforts at the UDTL site.

COMMUNITY CONCERNS

In the late 1970's, residents near the site experienced a severe degradation of ground water quality. Initially, local officials discounted any connection with this phenomenon to the

municipal landfill. Water quality became a local election issue, and as a result in 1982 the Township obtained financing for a new municipal water system, and in 1983 began to supply bottled water to affected residents (USEPA 1987). In 1986, the municipal water system began operation.

Present community concerns may be summarized as follows:

- \* The nature and extent of groundwater contamination. Also of concern is the proximity of the new supply wells to the landfill.
- \* Health and safety. Issues include a perceived high cancer incidence in local neighborhoods and the use of the landfill for recreational purposes by local children.

Other community concerns include a lack of a clear and viable system of information exchange between residents and government agencies, a perceived decrease in property values, a negative community image, and the financial responsibility of the township. Designation of the Township as a responsible party could mean a large financial liability and subsequent tax increase for local residents.

## SITE VISIT

The UDTL was visited by the NJDEP, Division of Science and Research, on August 30, 1988. The site was well posted, but the north side of the site was unfenced. This side of the site is partially protected by soil piles and heavy vegetation, but there were several paths offering relatively easy access (especially for children) to the site.

## ENVIRONMENTAL CONTAMINATION

### A. On-site Contamination

Contamination of groundwater with mercury and VOCs was confirmed in January 1984, by NJDEP. Samples were taken from the three on-site monitoring wells and elevated concentrations of mercury, benzene, and vinyl chloride were observed (Table 1). On-site samples taken in 1981 and 1982 by NJDEP revealed levels of trichloroethylene, 1,1,1-trichloroethane, trans-1,2-dichloroethylene, and lead above New Jersey State standards (Table 1). Soil samples have not yet been taken. However, the source of the groundwater contamination is likely to be the soil and debris in the Landfill.

During the initial site investigation in March 1987, Organic Vapor Analysis (OVA) readings were taken and were higher than background. It is likely that most of the OVA readings were due to escaping methane gas, but the presence of other organic vapors, including vinyl chloride, cannot be ruled out.

The initial site characterization noted isolated puddles of water and several drainage ditches on the UDTL. These areas, as well as the old gravel burrow pit (located just north of the landfill) receive run-off water from the landfill.

Table 1. Contaminants Exceeding New Jersey Standards or Guidelines in UDTL Groundwater.

	Maximum Contaminant Concentration(ug/L) (1)	Standards or Guidelines(ug/L) (2)
Benzene	7.0	1.0
Trans-1,2-dichloroethylene	720.0	10.0
1,1,1-trichloroethane	27.0	26.0
Trichloroethylene	7.0	1.0
Vinyl Chloride	354.0	2.0
Lead	130.0	50.0
Mercury	400.0	2.0

(1) All maximum concentrations are taken from 1981 or 1982 data, except mercury, benzene, and vinyl chloride, which are from 1984 data.

(2) All heavy metal standards are from New Jersey Safe Drinking Water Act (N.J.A.C. 7:10-5.1 et seq.). All VOC standards are New Jersey Maximum Contaminant Levels (MCLs) (N.J.A.C. 7:10-16.7).

#### B. Off-site Contamination

In January 1984, the NJDEP detected VOCs and mercury in samples taken from residential wells in the area (Table 2). The site lies atop the shallow Cohansey-Kirkwood Aquifer and there is the possibility of contamination of the Aquifer. A 1982 geophysical survey indicated a possible plume of groundwater contamination traveling southeast from the landfill. However, the UDTL may be on a groundwater divide and further testing is needed to confirm the exact direction of contamination spread. Further testing is planned in future RI/FS studies.

Local residents currently use water from two wells located approximately 1/2 mile north of the landfill. The NJDEP agreed to the design and location of this alternative system in March 1985. Samples taken from these two wells by the township in December 1987, revealed levels of trichloroethylene and tetrachloroethylene slightly above New Jersey MCLs. Trichloroethylene was also found in the groundwater beneath the UDTL. VOCs were not detected when NJDEP/Division of Water Resources resampled these wells in September 1988. It is unlikely that the contamination detected in 1987 is from the site, since the wells are topographically upgradient from the site. Delineation of the plume and a determination of the exact flow of the groundwater is included in future RI/FS studies.

The closest stream down-gradient of the UDTL is the Lebanon Branch which is almost three miles from the site. Significant contamination of the Lebanon Branch is unlikely, due to the distance of the Branch from the site, the dilution of the contaminants by the surface water, and the unlikelihood of run-off reaching the Branch.

Table 2. Contaminants Exceeding New Jersey Standards and Guidelines in Groundwater from Residential Wells Near UDTL (January 1984).

Contaminant	Maximum Concentration(ug/L)	Standards or Guidelines(ug/L)
Mercury	130.0	2.0 (1)
Benzene	3.0	1.0 (2)
Vinyl Chloride	38.0	2.0 (2)

(1) New Jersey Safe Drinking Water Act (N.J.A.C. 7:10-5.1 et seq.).

(2) New Jersey MCLs (N.J.A.C. 7:10-16.7).

### C. Physical Hazards

The surface of the landfill is very irregular with numerous hills and much vegetation. The burrow pit is very deep and steep-sided. These characteristics create the potential for "slip and fall" type injuries. During a recent site visit by the NJDEP, Division of Science and Research, various pieces of debris and equipment (drums, chemicals, pipes and machinery) were seen at the site. This material is supposedly locked in the maintenance shed at night, but the shed is dilapidated and easily entered. The presence of this

material increases the possibility of injury, especially to curious children who might venture onto the site.

#### QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) information that may have been generated by both NJDEP/DHSM and the consultants could not be located. Since the health assessment relies heavily on the environmental data from the site, this information is essential to know how much confidence one has in the quality of the data. Future data on the site must be accompanied by QA/QC information and/or verification. The review of the QA/QC data on this site (during the RI/FS) will be conducted by the USEPA.

#### POTENTIAL ENVIRONMENTAL AND HUMAN EXPOSURE PATHWAYS

##### A. Environmental Pathways

Groundwater is the primary medium in which contamination has been detected. Although groundwater flow is probably in a southerly direction (based on the 1982 geophysical survey data), the site may be on a groundwater divide and groundwater may flow in more than one direction.

##### B. Human Exposure Pathways

Dumping at the site may have started as early as the 1940s (when it was owned by Seabrook Farms, Inc.) and continued until the Landfill was closed in late 1983. In December 1983, the township provided bottled water to residents until they could be hooked up to the alternate distribution system (2 wells located up-gradient) in June 1986. If the supply wells are being contaminated by chemicals from the UDTL, exposure pathways associated with that water supply are a concern. As of September 1987, three residents had refused hook-up. Further investigation is needed to determine if these three residents are still being exposed to the contaminated groundwater.

Little exposure from contaminated groundwater should have occurred after June 1986. Prior to this date, considerable human exposure could have occurred from ingesting contaminated groundwater, crops irrigated with contaminated water, or livestock fed contaminated feed or water. Exposure is likely to have been greatest for those residences located southeast of

the UDTL. Dermal exposure may have occurred from cleaning or bathing activities. Inhalation exposure may have occurred from showering or other activities where water is vaporized or misted.

Exposure may have also occurred from ingestion of contaminated soils or surface water by children playing at the site or by laborers on-site. Inhalation of contaminants, both volatile organic compounds and contaminants adsorbed to dust, is also a potential exposure pathway.

#### DEMOGRAPHICS

The UDTL is located in a sparsely populated rural area. The 1980 census placed the population of Deerfield Township at 6,810 persons. The nearest population centers to the site are Seabrook and Carlls Corner, both about 2 1/2 miles from the site. Only about 100 people live within one mile of the site with the nearest residence about 100 feet to the south. The nearest large population center topographically downgradient from the UDTL is Bridgeton (pop. approximately 20,000) which is located over five miles away. Sensitive populations near the site (e.g., children, elderly) have not been identified or characterized.

#### PUBLIC HEALTH IMPLICATIONS

The UDTL was registered to accept only normal household refuse. However, the high levels of VOCs and mercury in the groundwater indicate that unauthorized waste may have been dumped there. The 1980 to 1984 groundwater analyses found levels of mercury, lead, vinyl chloride, trichloroethylene, trans-1,2-dichloroethylene, 1,1,1-trichloroethane, and benzene that exceeded New Jersey drinking water standards or guidelines. (New Jersey's drinking water standards and guidelines are more stringent than federal standards.) Only chronic exposure is of concern since contaminant concentrations are too low to cause acute toxicity.

Mercury used extensively in the chloralkali industry, can be found in fossil fuels (may contain up to one ppm mercury), and can also be found in household waste. Chronic exposure to mercury results primarily in central nervous system effects such as paresthesia, ataxia, tremor, and excitability. Mercury can also cause kidney damage (either directly or indirectly through immunologic mechanisms) and all forms of mercury readily cross the placenta.

Lead is a common contaminant of some paints and petroleum products. Chronic lead exposure leads to central nervous system damage similar to mercury, as well as more subtle behavior and learning disorders (especially in children). Exposure to lead can also result in renal and hematopoietic effects.

Volatile organic compounds are common products and solvents of the petrochemical industry. Benzene and vinyl chloride have been classified as human carcinogens (EPA Group A). Trichloroethylene has been classified as a probable human carcinogen (EPA Group B2). Chronic exposure to vinyl chloride, 1,1,1-trichloroethane, and trichloroethylene can result in liver damage and exposure to benzene has been associated with bone marrow depression. Little data are available on chronic exposure to trans-1,2-dichloroethylene, but 1,1-dichloroethylene has been classified as a possible human carcinogen (EPA Group C) and is associated with liver toxicity after chronic exposure. Exposure to several VOCs (at higher concentrations than those found at the site) has resulted in CNS depression.

No data exists prior to 1980 to confirm the duration of the contamination. It is likely that human exposure has occurred since at least the late 1970s, when drinking water degradation was noted.

## CONCLUSIONS AND RECOMMENDATIONS

On the basis of the information reviewed, the Upper Deerfield Township Landfill Site is a potential public health concern because humans have probably been exposed to hazardous substances at concentrations that may result in adverse health effects. As noted in environmental pathways and exposure pathways section, human exposure to high levels of VOCs and mercury in the ground water has probably occurred in the past via drinking water.

Samples taken from 1980-1984, confirmed groundwater contamination with VOCs and heavy metals both at the site and in the local area. The health threat from this site has lessened considerably since it was closed in 1983 and since residents began using the alternative supply system in 1986. However, there are further measures that need to be taken while the site is awaiting clean up.

Phase II of the RI/FS was designed to further delineate the spread, direction, and level of contamination from the UDTL. Phase II includes soil, sediment, surface water, as well

as air samples, and a determination of the direction and extent of the groundwater contamination. Radar and conductivity studies will determine the depth and amount of the deposited waste and to aid in the placement of the drill holes. Data that is used in the assessments of the site need to have passed a QA/QC review. QA/QC information will be included with all future data and will be reviewed by USEPA.

It is recommended that the site be completely fenced (including the burrow pit) to eliminate it as an attractive nuisance to children.

The groundwater from the alternate supply wells needs to be monitored routinely. This monitoring is currently occurring under New Jersey's A-280 program. It needs to be determined if the contamination in the monitoring wells is from UDTL or from another source. In addition, if the three potable wells that were not closed in 1986 are still in use, they need to be resampled to determine if the contamination in those wells has increased or is still present.

In accordance with CERCLA as amended, the Upper Deerfield Township Landfill site has been evaluated for appropriate follow-up with respect to health effects studies. Since human exposure to on-site and off-site contaminants may currently be occurring and may have occurred in the past, this site is being considered for follow-up health studies. After consultation with Regional EPA staff and State and local health and environmental officials, the Division of Health Studies, ATSDR and NJDOH, will determine if follow-up public health actions or studies are appropriate for this site.

This Health Assessment was prepared by the State of New Jersey Departments of Health and Environmental Protection, under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry. The Division of Health Assessment and Consultation and the Division of Health Studies of ATSDR have reviewed this Health Assessment and concur with its findings.

## REFERENCES

A-280 Report, 1988. NJDEP, Division of Water Resources.

New Jersey Safe Drinking Water Act (N.J.A.C. 7:10-1.1 through 7.3)

Final RI/FS Work Plan for the Upper Deerfield Township Landfill Site, Cumberland County, New Jersey. Volume 1, September, 1987. EPA WA# 363-2LG2

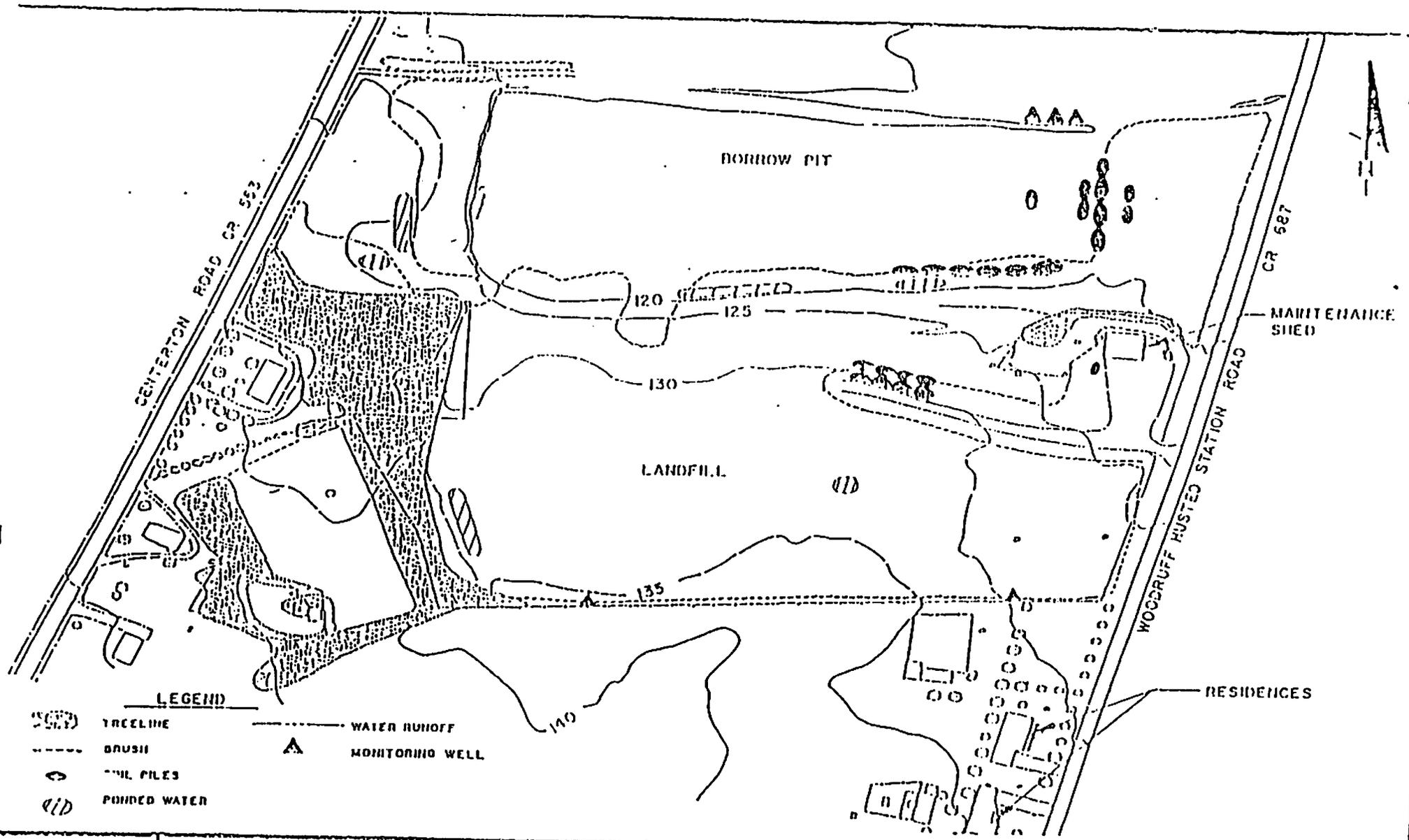
New Jersey Drinking Water Quality Institute, 1987. Maximum contaminant level recommendations for hazardous contaminants in drinking water. Appendix B Health-based maximum contaminant level support documents. Submitted to NJDEP, Trenton, New Jersey.

Klaassen, C., Amdur, M. and Doull, J., 1986. Cassarett and Doull's Toxicology: The Basic Science of Poisons, pp.598-609. New York:Macmillan.

Site Manager, NJDEP, Division of Waste Management. Personal Communication, 1988.

Upper Deerfield Township Landfill - Update  
April 23, 1990

Additional Superfund documents on the Upper Deerfield Township Landfill have been finalized, since this health assessment was drafted. Reportedly, the documents have verified groundwater as the primary environmental pathway (Personal communication, NJDEP). Information from these documents will be included in the health assessment, in the form of an addendum, when the Upper Deerfield Township Landfill Health Assessment is updated.



**LEGEND**

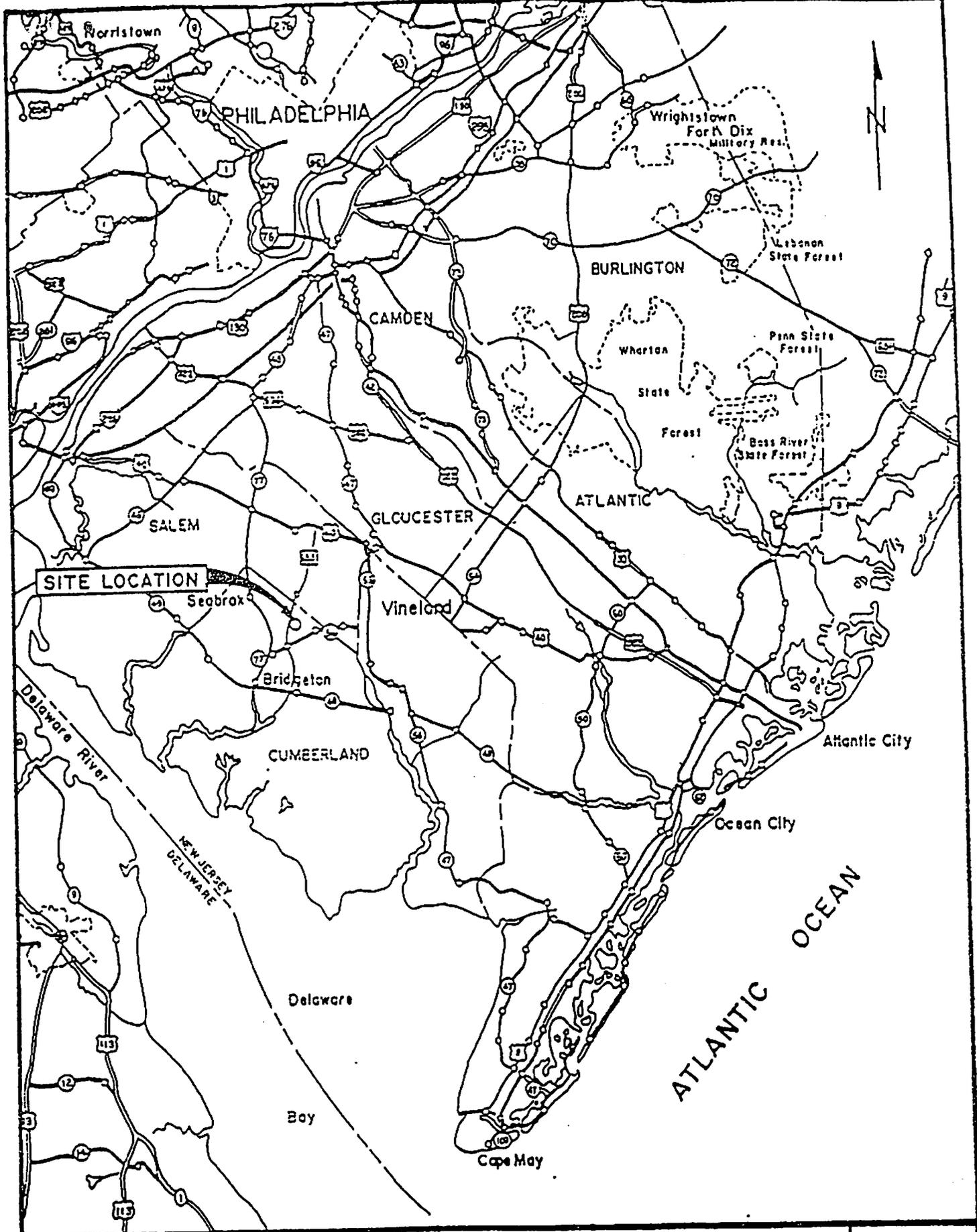
- (---) TREELINE
- (---) BRUSH
- (⊗) FUEL PILES
- (11) POOLED WATER
- (---) WATER RUNOFF
- (▲) MONITORING WELL

<p>SCALE 1" = 200'</p>	<p>UPPER DEERFIELD SITE</p>	
<p>DATE AUGUST, 1987</p>	<p>UPPER DEERFIELD TOWNSHIP LANDFILL SITE</p>	
	<p>SOURCE: INITIAL SITE CHARACTERIZATION, MARCH 6, 1987</p>	

J.C. JOHNSON & MALHOTRA, P.C.

**APPENDIX B**

**Area Map**

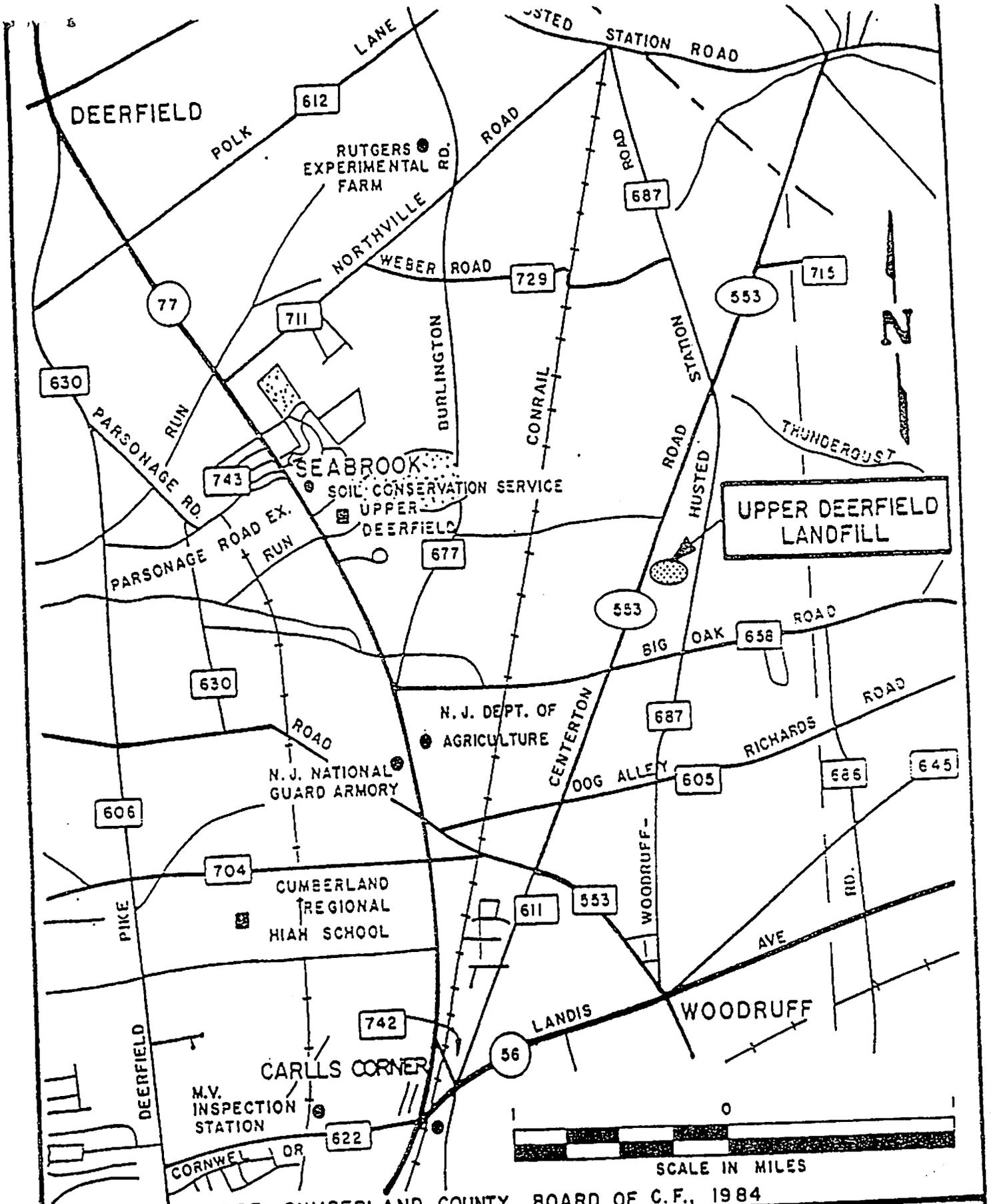


<p>SCALE 1" = 10.1 Miles</p>	<p>REM V UPPER DEERFIELD LANDFILL SITE VICINITY MAP</p>	<p>FIGURE 1</p>
<p>DATE NOV. 1990</p>		

TCA 301-565-3340

APPENDIX C

Site Location Map



SOURCE: CUMBERLAND COUNTY, BOARD OF C.F., 1984

SCALE  
AS SHOWN  
DATE  
AUGUST 1990

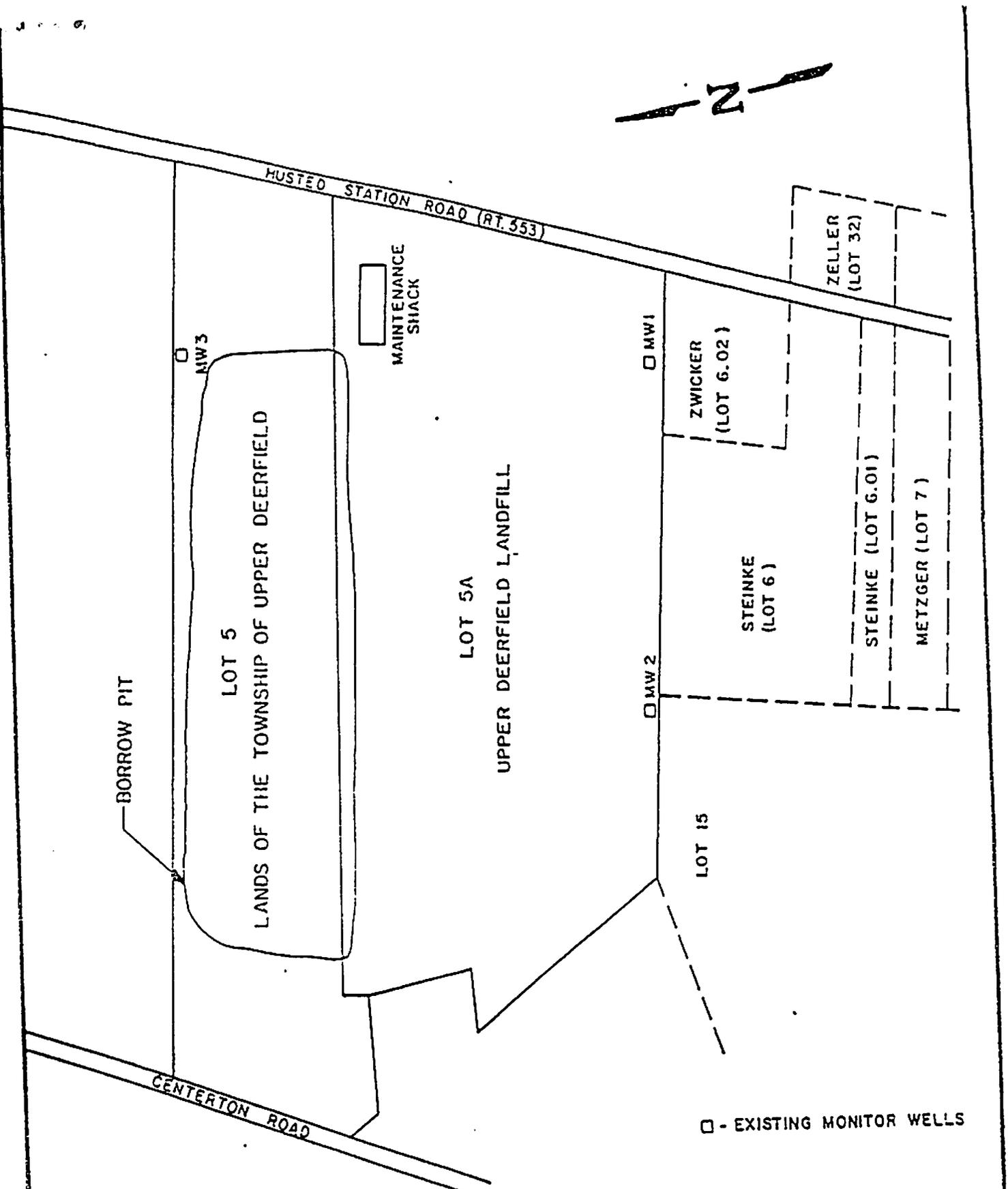
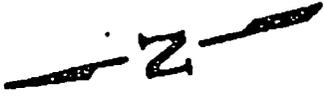
REM V  
UPPER DEERFIELD LANDFILL SITE  
SITE LOCATION MAP

FIGURE  
2

TCA 301-565-3340

APPENDIX D

Site Map



□ - EXISTING MONITOR WELLS

SOURCE: DRAFT ADMINISTRATIVE CONSENT ORDER, 1984

SCALE  
1" = 200'

DATE  
NOV. 1990

REM V  
UPPER DEERFIELD LANDFILL SITE  
LOT MAP

FIGURE  
3

TCA 301-565-3340