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Public Health Assessment

RAMAPO LANDFILL

Rockland County

Ramapo, NY

January 1994

New York State Department of Health

Agency for Toxic Substances and Disease Registry

PUBLIC HEALTH ASSESSMENT

RAMAPO LANDFILL

RAMAPO, ROCKLAND COUNTY, NEW YORK

CERCLIS NO. NYD000511493

Prepared By

New York State Department of Health
Under A Cooperative Agreement With The
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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ATSDR and its Public Health Assessment

ATSDR is the Agency for Toxic Substances and Disease Registry, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency. Created by Superfund legislation in 1980, ATSDR's mission is to **prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.**

The Superfund legislation directs ATSDR to undertake actions related to public health. One of these actions is to prepare public health assessments for all sites on or proposed for the Environmental Protection Agency's National Priorities List, including sites owned or operated by the federal government.

During ATSDR assessment process the author reviews available information on

- the levels (or concentrations) of the contaminants,
- how people are or might be exposed to the contaminants, and
- how exposure to the contaminants might affect people's health

to decide whether working or living nearby might affect peoples' health, and whether there are physical dangers to people, such as abandoned mine shafts, unsafe buildings, or other hazards.

Four types of information are used in an ATSDR assessment.

1) **environmental data**; information on the contaminants and how people could come in contact with them

2) **demographic data**; information on the ethnicity, socioeconomic status, age, and gender of people living around the site,

3) **community health concerns**; reports from the public about how the site affects their health or quality of life

4) **health data**; information on community-wide rates of illness, disease, and death compared with national and state rates

The sources of this information include the Environmental Protection Agency (EPA) and other federal agencies, state, and local environmental and health agencies, other institutions, organizations, or individuals, and people living around and working at the site and their representatives.

ATSDR health assessors visit the site to see what it is like, how it is used, whether people can walk onto the site, and who lives around the site. Throughout the assessment process, ATSDR health assessors meet with people working at and living around the site to discuss with them their health concerns or symptoms.

A team of ATSDR staff recommend actions based on the information available that will protect the health of the people living around the site. When actions are recommended, ATSDR works with other federal and state agencies to carry out those actions.

A public health action plan is part of the assessment. This plan describes the actions ATSDR and others will take at and around the site to prevent or stop exposure to site contaminants that could harm peoples' health. ATSDR may recommend public health actions that include these:

- restricting access to the site,
- monitoring,
- surveillance, registries, or health studies,
- environmental health education, and
- applied substance-specific research.

ATSDR shares its initial release of the assessment with EPA, other federal departments and agencies, and the state health department to ensure that it is clear, complete, and accurate. After addressing the comments on that release, **ATSDR releases the assessment to the general public.** ATSDR notifies the public through the media that the assessment is available at nearby libraries, the city hall, or another convenient place. Based on comments from the public, ATSDR may revise the assessment. ATSDR then releases the final assessment. That release includes in an appendix ATSDR's written response to the public's comments.

If conditions change at the site, or if new information or data become available after the assessment is completed, ATSDR will review the new information and determine what, if any, other public health action is needed.

For more information about ATSDR's assessment process and related programs please write to:

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SUMMARY

The Ramapo Landfill site is an inactive landfill in the Town of Ramapo, Rockland County, New York. On-site groundwater, leachate seeps and landfill gas are contaminated at levels of public health concern as are off-site groundwater monitoring wells and surface water. Exposure to several metals in on-site leachate seeps could present an increased public health risk. Persons on the landfill may be at increased risk of noncarcinogenic effects from exposures to xylene and ethylbenzene in ambient air. A public health threat may exist due to the generation of methane which could migrate off the landfill and accumulate in closed buildings, such as the baler building, weigh station and adjacent homes. Off-site groundwater monitoring wells are contaminated at levels of public health concern with volatile and semi-volatile compounds and metals. There exists the potential for exposure to site-related groundwater contaminants which may reach residential wells and the baler building well. This pathway is incomplete since migration to residential wells has not been identified and therefore no known exposure is occurring.

Citizens raised several health-related questions about contamination of their drinking water, protection of health of persons living near the site, and landfill odors.

The site is an indeterminate public health hazard. The limited data do not indicate exposures likely to cause adverse health effects have occurred, however, not all media to which persons are exposed to have been sampled. Additional investigation is needed to determine if ambient air is contaminated on-site and is migrating to off-site residential areas.

The New York State Department of Health (NYS DOH) has made recommendations to (1) reduce and prevent exposure to contaminants and (2) better characterize the site.

The data and information developed in the public health assessment for the Ramapo Landfill, Ramapo, New York, has been reviewed by ATSDR's Health Activities Recommendations Panel for appropriate follow-up with respect to health actions. The panel agrees that the community health education performed by the NYS DOH was appropriate. No other follow-up health actions were determined appropriate for the site.

Public health actions taken and/or planned include the following: (1) The NYS DOH, Rockland County Department of Health and US EPA have been involved with the site and continue to provide education and information pertaining to resident's health concerns, (2) Landfill closure measures will be taken which will prevent on-site contact with contaminated media and reduce human exposure due to the migration of contaminants from the site, (3) Security measures are being planned which should reduce the frequency of trespassers on the landfill, (4) Public and private drinking water supply wells have been and continue to be tested for site-related contaminants.

BACKGROUND

In cooperation with the New York State Department of Health (NYS DOH), the Agency for Toxic Substances and Disease Registry (ATSDR) will evaluate the public health significance of this site. More specifically, the ATSDR and NYS DOH will determine whether health effects are possible and will recommend actions to reduce or prevent possible health effects. The 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) to conduct public health assessments at hazardous waste sites.

A. Site Description and History

All figures and tables in this public health assessment are in Appendices A and B, respectively. The use of the words on-site and off-site throughout the document are to depict the area within the property lines shown on Figure 2, and are not intended to convey the meanings defined under Superfund. The Ramapo Landfill is an inactive landfill site located on a 96-acre tract in the Town of Ramapo, Rockland County, New York. It lies at the base of the Ramapo Mountains, about 35 miles northwest of New York City, and 1 mile northeast of the Village of Hillburn, New York. Figure 1 shows the site location. Important features located on and near the site are included in Figure 2. The site is situated off Torne Valley Road east of the New York State Thruway, NYS Route 17, and NYS Route 59. The site is currently being used as a trash compaction and transfer facility by the Town of Ramapo, owner of the site. Trash and debris are weighed at a weigh station/guard house located along Torne Valley Road and compacted at a baler facility in the eastern corner of the site. Following compaction, all trash is transferred for disposal at the Al Turi Landfill in Goshen, New York. Since 1986, a portion of the eastern corner of the site has occasionally been used as a pistol range by the Ramapo Police Department. A leachate collection system installed in 1984 diverts groundwater and surface runoff from the landfill to a fenced pond in the southwestern corner of the site. Prior to November 1, 1990, this pond was used for leachate treatment via aeration followed by discharge to the adjacent Ramapo River. Since this date, however, collected leachate has been discharged to the Suffern Wastewater Treatment facility located about 1 and one half miles south of the site. As a result of this measure, on-site leachate treatment has ceased and the leachate outfall to the Ramapo River has been sealed.

About 50 acres of the site are covered with fill materials. The landfilled portion of the site is mounded into two major lobes (northern and southern) comprised of fill ranging in depth between 70-90 feet and slopes steeply toward the west with grades ranging from less than one percent to greater than 30 percent. Both landfill lobes consist of mixed refuse. Vegetative cover, although generally thick, varies from young trees to a mix of grasses and underbrush. Areas along the site boundaries consist of mature hardwood forest. The dominant surface water features near the site are the Ramapo River, Torne Brook, and

Candle Brook. The Ramapo River, located about 300 feet from the southwest corner of the site, is designated by the New York State Department of Environmental Conservation (NYS DEC) for use as a source of water supply for drinking, culinary, and food processing purposes. The river originates near Harriman, New York, and drains an area of about 95 square miles in New York State before it enters New Jersey. The river passes within 400 feet of the landfill property. Two sewage disposal facilities discharge treated sewage into the Ramapo River within one and fifteen miles from the site, respectively. Torne Brook originates in the Ramapo Mountains about 2.5 miles upstream of the site. Candle Brook traverses the northern end of the site and flows into Torne Brook. Torne Brook, which flows as close as 50 feet from the landfill, feeds into the Ramapo River at the former leachate outfall. Torne Brook is designated for primary contact recreation use and other use except as a source of potable water.

On May 28, 1971, the Rockland County Department of Health (RC DOH) granted a permit to the Town of Ramapo for the operation of a sanitary landfill. At that time, the site was owned by the Ramapo Land Company and the contract-operator was the Torne Mountain Sand and Gravel Co., Inc. Early operations at the landfill occurred in the northern half of the site. Prior to landfill operations in the 1950s and 1960s, portions of the site were excavated as a source of gravel. In June 1976, a contract was awarded to Sorgine Construction Services of New York, Inc., for operation and maintenance of the landfill until June 1981. However, the contract was terminated by the Town of Ramapo on August 23, 1979, when the Town began to operate the landfill directly. Landfilling was completed by 1984, however, construction and demolition debris was accepted until 1989. Substances alleged to have been disposed of on-site include: industrial sludges and wastes, sewage sludges, municipal solid waste, asbestos, construction and demolition debris, yard debris, and paint sludge. The landfill is alleged to have received wastes from illegal dumping.

As early as 1974, the Spring Valley Water Supply Company, operator of the nearby Ramapo Valley well field, discovered a black sludge coming from the landfill. Following this discovery, numerous investigations of the various media on and near the site commenced which continue to this date. In 1979, the initial subsurface investigation of the landfill was carried out. In 1982, the site was placed on the U.S. Environmental Protection Agency's (US EPA) National Priorities List (NPL), the nation's official register of inactive hazardous waste sites. In February 1988, the Town of Ramapo entered into an Order on Consent with NYS DEC to develop and implement a Remedial Investigation/Feasibility Study (RI/FS) for the site. Remedial Investigations (RI) follow preliminary site investigations conducted by Town, County, state and/or federal agencies that verify hazardous wastes are present and that the wastes pose a significant threat to public health and the environment. The RI is carried out to determine the nature and extent of contamination. The Feasibility Study (FS) uses RI information to develop alternative remedial actions that will eliminate the threat to public health or the environment posed by the site. The Town is funding its remedial effort under New York State's Title 3 1986 Environmental Quality Bond Act (EQBA). Under the EQBA any municipality which owns or has owned an inactive hazardous waste site may be reimbursed by the State for up to 75 percent of its costs in remediating such a site. Due to

the Town's participation in the EQBA Title 3 grant program, the NYS DEC maintains the role of technical and enforcement lead for the site.

In June 1989, a Preliminary Health Assessment was issued for the site; it was prepared by the NYS DOH under a cooperative agreement with the ATSDR. A Remedial Investigation (RI) was conducted at the site by URS Consultants, Inc. of Buffalo, New York, under contract with the town of Ramapo. Field work was carried out in two phases, the first from April 1989 through May 1990, the second in August-September 1990. A final RI report and a draft final Feasibility Study (FS) were completed in September 1991 and August 1991, respectively.

B. Actions Implemented During the Public Health Assessment Process

The NYS DOH and the RC DOH have been involved with the site and continue to provide information and respond to questions from the surrounding community. The US EPA provides on-going education and information through various community relations activities.

C. Site Visit

Mr. John Olm from the NYS DOH visited the site area on March 17, 1992. The site visit included private well water sampling at the on-site baler building and at a 2-family apartment identified as PW-2 on Figure 2. During the site visit, Mr. Olm met with two residents of the nearby "Torne Brook Farm" apartments. He obtained information about the area from these individuals, which has been incorporated into appropriate sections of the public health assessment. During the site visit, the following observations were made:

- Vehicular traffic, primarily garbage haulers, was observed on a frequent basis enroute to and leaving the active baler facility. Prior to arrival and after leaving the baler building all vehicles stopped at the weigh station situated on Torne Valley Road. A Town of Ramapo employee was on-duty at the weigh station. He informed Mr. Olm that the operating hours of the weigh station are Monday through Friday from 7:30AM to 2:45PM. Additional information concerning the operation of the on-site baler facility was obtained during an interview with the facility's supervisor. About eight men were performing work at and near the baler facility. Hours of operation at the baler facility are 7AM to 4PM, Monday through Friday. Materials accepted at the facility consist of residential and light commercial refuse and recyclable containers.

- While visiting the baler facility, winds were moderate and from the west. No odors were detected.

- According to an employee at the baler facility, the adjacent outdoor pistol range has not been used (by the Ramapo Police Department) since the Fall of 1991. Two buildings were present at the pistol range consisting of a mobile trailer and truck box type storage trailer. Spent shotgun shells were present on the ground at the pistol range.

- o No persons were seen on the landfill proper, although mention was made by a resident of Torne Brook Farm as to the sighting of all-terrain vehicle (ATV) users and hikers on the landfill.

- o The on-site leachate collection pond was found to contain standing water in which two ducks were swimming. Water was seen emptying into the pond from a pipe at the east bank of the pond.

- o Water was observed flowing along sections of the paved swale at the toe of the landfill and entering a concrete catch basin about 450 feet north of the leachate collection pond. Overflow in the catch basin was observed entering an outfall which empties into Torne Brook.

For areas off the site, a fenced, power substation was observed just to the north of the site at the end of Torne Valley Road. The nearby Torne Brook Farm apartment complex was visited and found to consist of about five dwellings and several out buildings. Single-family residences are also present along Torne Brook Road, one of which is about 1200 feet west of the site with an active well. About 14 private homes are situated at the western end of Torne Brook Road and all are reportedly supplied with public water from the Pothat Water Company.

A visit was made to "Flat Rock", located on the east bank of the Ramapo River, about one-half mile south of the site along Torne Valley Road. Although no persons were seen at Flat Rock, evidence of past usage was indicated by the presence of graffiti and litter.

Accompanied by a local resident, Mr. Olm was guided to several off-site areas near the landfill, between the east side of Torne Brook and Torne Valley Road. Exposed waste material resembling paint sludge, which appeared solid and grey in color, was noted at several locations.

D. Demographics, Land Use, and Natural Resource Use

The land surrounding the site is mountainous, heavily wooded and sparsely populated; about 200 residents live within one mile of the site. The nearest residential property referred to as Torne Brook Farm, an apartment complex, is located within 500 feet west of the landfill along the west bank of Torne Brook. About 50 persons reside at the Torne Brook Farm. In addition, about 6 persons reside at a 2-family apartment also located a short distance from the west bank of Torne Brook. The intervening land between the landfill and the nearby dwellings is wooded. Residents must cross Torne Brook to access the site (Torne Brook Road leads from Torne Valley Road from these residences). About 14 single family homes are located at the western end of Torne Brook Road, about one-half mile west of the site. Commercial properties are located within 2,000 feet west of the site along the west bank of the Ramapo River. There is no residential development close to the site along the north,

south or east boundaries. The nearest suburban development is the Village of Hillburn. A total of about fifteen men are employed full-time at the on-site baler facility and weigh station.

Available 1990 Census Tract Data indicate that the Village of Hillburn lies within census tract 118.00, an area covering 2.25 square miles within the Town of Ramapo. The total population for census tract 118.00 was reported as 892, of which 6% is under 5 years of age, 22% is 5-19 years old, 60% of the population is 20-64 years old and 12% of persons living in this census tract are 65 years or older. The racial makeup of the population is 50% white, 23% are black and about 27% of the population is comprised of other races. The median income in 1979 was $18,264, with about 3.0% of the families with income below the poverty level.

Land Use

The landfill and surrounding area are zoned for industrial use. The Town of Ramapo expects to operate the compaction facilities into the near future. Planned development of the site into the distant future, whether industrial, recreational and/or residential, is unknown. However, the Town of Ramapo has stated that is has no plans to modify industrial zoning in the areas adjacent to the landfill. Utility corridors lie on three sides of the site, high voltage power transmission lines to the east and west and a high pressure gas line to the south. An active electrical sub-station constructed in 1972-73 is located just to the north of the site. The nearest agricultural land may be found along the east side of the Ramapo Mountains about 1.5 miles east of the landfill.

Natural Resource Use

Ten production (drinking water supply) wells operated by the Spring Valley Water Supply Co. and serving a population of over 200,000 (referred to as the Ramapo Valley wellfield) are located along the Ramapo River both upstream and downstream of the site. The wells, which range in depth from 71 to 127 feet, are completed in the Ramapo Valley Aquifer. The average supply capacity of the Ramapo Valley well field is considered to be 8 to 10 million gallons per day (mgd) with a maximum capacity of 14 mgd. Four of the production wells are located within 1500 feet of the landfill (SV-93, SV-94, SV-95 and SV-96 on Figure 2). These wells were drilled in 1978 and pumps were set in 1980. Torne Brook Farm has a potable water well 450 feet from the landfill. The nearby 2-family apartment maintains a potable water well about 1,200 feet from the landfill. These wells are designated as PW-1 and PW-2, respectively, on Figure 2, and are located between the landfill and the Ramapo River on the western side of the Torne Brook. The on-site baler facility has a drilled well located adjacent to the northwest side of the building. This well supplies water to the restrooms (toilets and handwash sinks). According to the supervisor at the facility, employees have in the past drank this water, however a portable water cooler with bottled water is provided for this purpose.

Drainage at the site follows the topography, which steeply slopes toward Torne Brook and the Ramapo River. Upgradient diversion trenches have been constructed along portions of the southern property lines of the landfill. These trenches help to transport surface water runoff from upslope areas away from the landfill and into a surface water collector installed along the base of the landfill. Surface water which enters the collector system is directed to a holding pond prior to being discharged to the Suffern Wastewater Treatment Plant. According to a resident of Torne Brook Farm, the Ramapo River is used for recreation, including the area at "Flat Rock" off Torne Valley Road, about one-half mile downstream of the site. Flat Rock is a popular area for swimming and fishing, especially by families who commute from New Jersey.

The Township of Mahwah, New Jersey, which is downgradient of the site, draws its water supply from a sole-source aquifer as designated by the US EPA. This aquifer is recharged primarily by the Ramapo River.

E. Health Outcome Data

The 1978-82 cancer incidence and mortality in Census tract 117 (Sloatsburg) and Census tract 116 (Ramapo Town) were reviewed (Figure 3). In addition, the Rockland County Department of Health in collaboration with the Bureau of Cancer Epidemiology conducted a study of the 1983-1986 cancer incidence in Rockland County. An evaluation of these studies is included in the Public Health Implications section.

COMMUNITY HEALTH CONCERNS

The New York State Department of Health determined community health concerns during their March 1992 site visit. Prior to this visit, the New York State Department of Health, New York State Department of Environmental Conservation, and United States Environmental Protection Agency met with the public to present the conclusions of the RI/FS, to identify the preferred clean-up remedy, and to receive public comments. Of the 50 persons who attended the public meeting, several voiced concern. During the site visit and the public meeting, residents raised the following health-related concerns:

1. Will residents living near the landfill be provided with public water, and if so, when?

2. Will measures be taken to ensure the overall protection of health of persons living near the site?

3. Will an appropriate monitoring program be provided to determine the presence of contaminants encroaching on or in nearby drinking water supply wells?

During the site visit, we found that several residents along Torne Brook Road complained about landfill odor in outdoor air. Odors occurred mostly during the summer, particularly on

very humid days. These concerns and other raised in this section will be addressed in the Public Health Implications section.

On February 26, 1993, the NYS DOH sent copies of the public health assessment for the Ramapo Landfill site to all known interested parties, requesting concerns and comments on the report by March 16, 1993. The responses to the public comments received by the NYS DOH are included in Appendix C.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The environmental contamination data from the RI for the Ramapo Landfill site are summarized in Appendix B, Tables 1-6. The listing of a contaminant does not necessarily mean that its presence is a public health concern. Contaminants selected for further evaluation are identified and evaluated in subsequent sections of the public health assessment to determine whether exposure to them has public health significance. When selected as a contaminant of concern in one medium, that contaminant will be reported in all media where it is detected. These contaminants are selected and discussed 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 background concentrations.

4. Comparison of contaminant concentrations in environmental media both on- and off-site with public health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints. Contaminant concentrations above a comparison value do not necessarily represent a health threat but are evaluated further to determine if exposure is of public health significance. Comparison values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), drinking water standards, and other relevant guidelines.

5. Community health concerns.

A. On-Site Contamination

The most recent environmental data for the Ramapo Landfill were collected as part of the RI by the environmental engineering firm URS Consultants, Inc., under contract with the Town of Ramapo. These data are used to describe the nature and extent of contamination at the site on a media-specific basis. The media sampled during the RI were air, surface water, sediments, soil, and groundwater. An attempt was made to conduct two rounds of sampling about six months apart so as to be representative of more than one season.

Ambient Air and Soil Gas

An air monitoring study was conducted during the second phase of field activities and focused upon "hot spots" identified during a pre-RI soil gas survey. The pre-RI soil gas survey consisted of 240 air and soil gas monitoring locations spaced about 100 feet apart. At each soil gas survey station three 1/4-inch diameter holes were made, two to depths of 24 inches and one to a depth of 8 inches. Organic vapor concentrations were recorded in the 8-inch and in one 24-inch hole using a photoionization detection unit (PID). The remaining 24-inch hole was monitored for explosive gases and hydrogen sulfide using an Explosive Gas Indicator (EGI). Ambient air readings which exceeded the background level were also noted.

The primary objectives of the air monitoring study were to determine the type and concentration of airborne contaminants coming from the landfill, the production and quality of landfill gases (specifically methane) and the dispersion of the existing contaminants at known on-site receptor areas (downwind from the prevailing westerly winds at the baler building and outdoor pistol range). Three air monitoring activities were conducted which consisted of point source monitoring for volatile organic compounds and methane, "hot spot" monitoring for volatile organic compounds (VOCs), and monitoring for methane quality within piezometers. No air monitoring for hydrogen sulfide was conducted.

As shown in Figure 4, the point source sampling was conducted along the line of prevailing winds towards the occupied baler building and the pistol range. The point Source Monitoring locations are identified with the prefix PS and PSR. Samples were collected above the landfill surface and/or from within piezometers using a Tedlar bag (for collection of samples for methane analysis) and Tenax tubes (volatile organic compound analysis). In addition to sampling the on-site receptor areas, point source monitoring consisted of an on-site point source (existing piezometer) sample and a background sample from an off-site location. The results of the point source sampling show the highest concentration of methane (596,900 parts per million) at the point source location (PS-2) decreasing to 700 parts per million and non-detect at sampling locations selected near the pistol range (PS-3) and baler building (PS-4), respectively. The explosive range for methane is between 53,000 ppm (5.3%) and 150,000 ppm (15%). The concentration of methane (1,100 parts per million) detected at the single upwind background sampling location (PS-1) actually exceeds the levels detected at both downwind receptor locations. Volatile organic compounds were detected at the same point source location (PS-2), and included xylene at 1.77 parts per million (ppm), ethylbenzene (0.28 ppm) and lesser amounts of several other VOCs.

Low and non-detectable levels of several VOCs were detected at the upwind background sampling location and at the two downwind receptor areas. Hotspot monitoring was conducted at three locations (VOC-1; VOC-2; VOC-3) on the landfill which had registered high PID readings during the soil gas survey. A sample was collected at each of these locations on the surface of the landfill by Tenax adsorbent tube and analyzed for VOCs. A total of twelve VOCs were detected. Acetone had the highest concentration in each sample with levels ranging from 0.005 to 0.007 ppm, which are below the comparison value.

A total of four samples, identified in Figure 4 as GS-1 through GS-4, were obtained within three piezometers and one pre-existing vent. Samples were collected in Tedlar bags and analyzed for landfill gas quality, specifically methane. Sample results showed high concentrations of methane at locations GS-3 and GS-4 (593,800 ppm and 570,600 ppm, respectively) and low concentrations at locations GS-1 and GS-2 (non-detect and 100 ppm, respectively).

During the RI, a portable combustible gas indicator (CGI) was used to monitor for flammable/explosive atmospheres in the on-site structures (baler building and weigh station). Poorly ventilated spaces such as buildings are strong candidates for flammable/explosive atmospheres. The CGI is calibrated to read percent (%) of the lower explosive limit (LEL) of a combustible gas present in the atmosphere. Most CGI's are calibrated to read accurately for methane or pentane. The lower explosive limit is the minimum amount of a gas or vapor in air needed to produce a flash of fire when an ignition source is present. If the concentration is greater than the LEL and lower than the Upper Explosive Limit (UEL), it indicates that the ambient atmosphere is readily combustible. As previously mentioned, the explosive range for methane exists when it is present between 5.3% and 15%. No positive LEL readings were detected in the baler building or weigh station.

In addition to the above activities, independent eight-hour air samples were collected upwind (LPUP-1) and downwind (LPDW-1) of the on-site leachate pond and analyzed for VOCs. VOCs were detected at the upwind and downwind locations at concentrations below comparison values, with no significant differences between upwind and downwind sample results. Once again, acetone was the compound detected at the highest concentration (0.004 ppm) in both samples. Because the air monitoring activities occurred over a one or two day period, the results do not represent the possible range of landfill gas concentrations that might occur over time. Therefore a data gap exists on how on-site air concentrations of landfill gases range over different times of the year and under various climatological conditions.

Surface Water and Sediments

Surface water and stream sediment samples were collected and tested to determine if disposal activities at the site have contaminated sediments and/or surface water through surface water runoff and/or groundwater discharge. Sampling locations are shown in Figure 5. Two rounds of surface water and stream sediment sampling were conducted during the RI, data for which is presented in the off-site contamination section. However, two on-site leachate seep samples (SW-LS-1; SW-LS-2) were collected during the first sampling round. On-site samples collected during the second round of sampling included two additional leachate samples (LIN; LEF), and a sediment sample (LPSS-1) collected from the leachate holding pond. Samples collected in both sampling rounds were analyzed for VOCs, semi-volatile compounds, pesticides/PCBs, metals, cyanide, total phenols, and indicator parameters.

Leachate seep samples SW-LS-1 and SW-LS-2 contained several metals at concentrations higher than in the upstream surface water samples. In the absence of specific public health assessment comparison values for contaminants in leachate, the sampling results for leachate are compared to comparison values for drinking water, and to standards or guidelines for groundwater, surface water and drinking water (Table 7). Comparison values (Table 7) were exceeded for the following metals: barium (5,780 micrograms per liter; mcg/L), beryllium (10 mcg/L), cadmium (149 mcg/L), chromium (564 mcg/L), cobalt (10 and 508 mcg/L), copper (705 mcg/L), iron (2,240 and 2,739,000 mcg/L), lead (918 mcg/L), manganese (674 and 78,300 mcg/L), and zinc (4,010 mcg/L). Although ingestion of significant amounts of leachate is unlikely, these contaminants will be evaluated further to determine if exposure to them could pose a public health threat. Chlorobenzene is the only detected organic compound at 1 mcg/L which is below the comparison value for this compound. A data gap exists for these two leachate seep samples because the pesticides and PCBs data were rejected.

Leachate from the on-site leachate collection system (LIN), contained nineteen VOCs and one semi-volatile compound at concentrations below comparison values. Iron (7,820 mcg/L) and manganese (1,930 mcg/L) were at concentrations which exceed comparison values. Three semi-volatile compounds were in the leachate effluent from the leachate holding pond (LEF) all at concentrations below comparison values. Metals were at similar or lower concentrations than those in the leachate influent sample (LIN). Iron (2,840 mcg/L) and manganese (923 mcg/L) concentrations exceed comparison values.

The sediment sample from the on-site leachate holding pond (LPSS-1) contained only one VOC (2-butanone) and one semi-volatile compound (bis-2-ethylhexyl-phthalate), both at concentrations below comparison values. The pesticide, dieldrin, was detected at 0.0018 mg/kg, which slightly exceeds the public health assessment comparison value for soil contaminants. The metal concentrations are generally higher than those in the off-site stream sediments. The cadmium concentration exceeds its public health assessment comparison value in soil. Further discussion of on-site surface water will be limited to leachate seeps as contact with leachate in the subsurface leachate collection system and in the leachate holding pond is not expected to occur.

Soil/Waste Material (0-8 inches)

During the RI, nine on-site shallow soil samples were collected with a bucket auger or hand trowel, some being strictly soil (SPS-6 through SPS-10) and others containing waste materials (SPS-1 through SPS-4). Sampling depths generally ranged from 0 to 8 inches. Sample locations are shown on Figure 5. Table 1 is a summary of the sampling data for on-site shallow soil.

The results of analysis for sample SPS-9 are considered by URS to be representative of natural conditions near the site. No organic compounds were detected in this sample. A total of 18 metals were detected in SPS-9, all at concentrations below typical background

ranges and available comparison values for metals in soil. Although only one background shallow soil sample was collected (during the RI), additional samples (from either on-site or off-site locations) taken from undisturbed areas would likely provide data indicative of background conditions. Of the metals in the remaining eight on-site shallow soil samples, all are within the typical background range for metals in soil. Volatile organic compounds were below public health assessment comparison values.

A total of 22 semi-volatile organic compounds were detected in the eight on-site samples and consisted primarily of polycyclic aromatic hydrocarbons (PAHs), at concentrations below the typical background range and available comparison values.

Pesticides were not widespread across the site. A low concentration of heptachlor epoxide was detected in SPS-3 and similarly low concentrations of dieldrin, alpha- and gamma-chlordane in SPS-6.

Subsurface Soil (4-6 feet)

Subsurface soil by ATSDR's definition is more than 3 inches deep. Only the subsurface soil sample identified as MW-5-SB is within the property boundary. MW-5 was taken above the water table at a depth between 4 and 6 feet below the surface. URS considers this sample to be representative of background conditions. Parameters analyzed for include VOCs, semi-volatile compounds, pesticides/PCBs, metals, and several miscellaneous indicator parameters. Excluding acetone at 0.016 mg/kg, no other VOCs were detected in MW-5-SB. No semi-volatile compounds were detected. A data gap exists for pesticides/PCBs as the sampling results for these parameters were rejected for QA/QC reasons. Sixteen metals were detected, all at concentrations below typical background ranges and public health assessment comparison values.

Groundwater - Monitoring Wells

A total of 28 groundwater monitoring wells were installed at the Ramapo Landfill site to investigate the hydrogeology of the site and to collect groundwater samples. The wells were installed in the shallow overburden aquifer, eight in the intermediate aquifer, and ten in the bedrock aquifer. The locations of the monitoring wells are shown in Figure 5. For purposes of distinguishing between on-site and off-site locations, only well clusters MW-5 and MW-6 are considered as on-site based on their placement within the property boundary. Two rounds of groundwater sampling were conducted. The first sampling round was conducted in January 1990 and round two was conducted in September 1990. Both rounds included samples obtained from the 28 wells installed during the RI and, in addition, during the second round, water from an off-site private well (GDT-1) was sampled. Samples were analyzed for VOCs, semi-volatile compounds, pesticides/PCBs, metals and other miscellaneous parameters (due to QA/QC violations, no data exists for semivolatiles in the shallow well MW-5-OS).

The on-site monitoring well cluster identified as MW-5 is located on the upgradient edge of the landfill. As such, URS considers these wells to be background and representative of natural conditions in the area. However, between both sampling rounds, six VOCs, one semi-volatile compound and one pesticide were detected in this well cluster. Of these contaminants, bis(2-ethylhexyl)phthalate is the only organic compound which exceeds a comparison value (the US EPA drinking water standard) and therefore, will be further evaluated in the Public Health Implications section of this report. Metals (unfiltered) detected at concentrations which exceed NYS DOH drinking water standards (Table 7) are chromium (up to 143 mcg/L), iron (up to 27,000 mcg/L) and manganese (up to 981 mcg/L). Aluminum was detected above US EPA's secondary maximum contaminant level (MCL) in drinking water. Secondary levels are nonenforceable taste, odor, or appearance guidelines. These metals will be further evaluated in the Public Health Implications section of this public health assessment. The presence of these contaminants in MW-5 creates uncertainty as to the designation of this well cluster as background. The absence of additional background data for this medium also creates doubts as to whether or not these data are indicative of natural groundwater conditions. The on-site monitoring well cluster MW-6 was installed to provide data for the second round of sampling. Low concentrations of about fourteen VOCs, all of which were at concentrations below NYS DOH drinking water standards, were detected in groundwater samples obtained from this cluster. No semi-volatile compounds were detected in well cluster MW-6. Metals (unfiltered) detected at concentrations which exceed NYS DOH drinking water standards are iron (up to 10,6000 mcg/L), manganese (6,770 mcg/L), mercury (2.3 mcg/L), and sodium (23,900 mcg/L). Aluminum was detected above US EPA's secondary MCL for this compound in drinking water. This report includes a discussion of these metals in the Public Health Implications section.

Groundwater - Private Wells

On March 17, 1992, tap water from the on-site baler building was sampled by the NYS DOH. Samples were analyzed for VOCs, semi-volatile compounds, and metals. Sampling did not detect any contamination.

B. Off-Site Contamination

Toxic Release Inventory (TRI)

To identify possible facilities that could contribute to environmental contamination at or near the Ramapo Landfill and/or create health threats unrelated to the site, the NYS DOH searched the 1989 Toxic Chemical Release Inventory (TRI). TRI is developed by the US EPA from the chemical release (air, water, and soil) information provided by certain industries. A search of the TRI facilities list was conducted to identify those industries located near the Ramapo Landfill (within 2.5 miles) which citizens (living near the site) may also be exposed to. Using a screening method developed by the NYS DOH, two TRI facilities were identified as reporting 1989 air emissions. These facilities are "Decorative Industries, Inc.", and "Ciba-Geigy Corporation", which are located west and southeast of the

site, respectively (Figure 6). Decorative Industries reported the following releases to the environment via stack or point air emissions: Isopropyl alcohol-250 pounds per year; toluene-250 pounds per year. The Ciba-Geigy Corporation reported annual air emissions (fugitive nonpoint and stack or point) of dichloromethane at 21,775 pounds per year and methanol at 11,474 pounds per year. Based on TRI data and air emissions modeling, results of the screening evaluation indicate that the contribution of these two industrial facilities to health risks in the community around the Ramapo Landfill site is minimal.

Ambient Air and Soil Gas

Off-site ambient air and soil gas samples have not been collected.

Surface Water and Sediments

Two rounds of off-site surface water/sediment sampling were conducted during the RI. During the first phase of sampling, a total of two surface water samples were collected at two locations in Torne Brook (SW-2; SW-3), one location in the Ramapo River (SW-1), and one in a small swale draining the southern portion of the site (SW-4). Surface water samples collected during the second round of sampling consisted of three new locations along Torne Brook (SW-6, SW-7, SW-8) and resamples from the same locations identified as SW-1, SW-3, and SW-4. Sample SW-5 was taken at the same location previously sampled and identified as SW-2. Figure 5 shows the locations of the 8 surface water sampling points and Table 2 reports the contaminants and concentration range.

Sample SW-5 collected from Torne Brook upstream of the landfill and considered to be representative of background conditions, demonstrated the presence of vinyl chloride and oil and grease (1.1 mg/L). The concentration of vinyl chloride detected exceeds the comparison value recognized for this contaminant. However, based on the location of SW-5, the landfill is not considered a likely source for this contamination. No semi-volatile compounds were detected in any of the off-site surface water samples. Of the metals detected in the background samples (SW-2 and SW-5), only thallium slightly exceeds the respective comparison value in SW-2. Metals detected in downstream samples (in either the Torne Brook or Ramapo River) which exceed the same comparison value or NYS DEC standard include antimony (SW-1), iron (SW-1 and SW-8), manganese (SW-1), and thallium (SW-4). These metals will be further evaluated in the Public Health Implications section.

On July 12, 1991, the NYS DEC conducted supplemental surface water sampling of the Ramapo River. Samples were collected upstream of the former outfall, at the confluence with the former outfall, and downstream of the outfall. Results of sampling for the parameters analyzed for indicate that the contamination noted previously at SW-1 is no longer occurring due to the diversion of leachate to the Suffern sewage treatment facility.

Composite sediment samples were collected at surface water sample locations SW-1 through SW-8 and labeled SS-1 through SS-8. Samples were analyzed for VOCs, semivolatile

compounds, pesticides/PCBs, and metals. Figure 5 shows the locations of the 8 sediment sampling points, and Table 3 reports the contaminants and concentration range. Samples collected from Torne Brook upstream of the landfill (SS-2, SS-5) and considered to be background showed no organic compounds and a total of 17 metals, all at concentrations below comparison values. Similar concentrations of these metals were generally found in the downstream samples. The presence of organic compounds in any of the downstream samples is limited to SS-3 whereas three semi-volatile compounds were detected at concentrations below available comparison values. Results of analysis of the sediment sample collected from a drainage swale at an adjacent property along the southern portion of the landfill (SS-4) indicate the presence of semi-volatile contaminants, primarily PAH compounds below available comparison values. In addition, the pesticide, gamma-chlordane, was detected in SS-4 below the comparison value for this chemical.

Soil/Waste Material (0-8 inches)

A shallow soil sample identified as LSMW-10 was taken off-site at a location where a leachate seep was observed near monitoring well cluster MW-10. This soil sample was collected instead of a leachate sample because at the time of sampling there was insufficient leachate to allow the collection of a liquid sample. No organic compounds were detected at levels of concern in the single off-site shallow soil sample.Of the metals detected, only cadmium at 3.7 milligrams per kilogram (mg/kg) and copper (30 mg/kg) were found at concentrations slightly exceeding the typical background range. However, these concentrations were below the respective comparison values.

A sample of paint sludge identified as SPS-5 was obtained from an off-site location between Torne Valley Road and Torne Brook. Comparison values (see Table 1) were exceeded for the semi-volatile compound naphthalene at 16 mg/kg; and the metals antimony (97.9 mg/kg), barium (11,300 mg/kg) and chromium (1,510 mg/kg). Removal of the paint sludge and surrounding soil was undertaken in the Fall of 1990 by the NYS DEC. A site visit made by the NYS DOH in March 1992 encountered paint sludge material at off-site areas between Torne Valley Road and Torne Brook.

Subsurface Soil (1-13 feet)

A summary of off-site subsurface soil data is provided in Table 4. A total of six subsurface soil samples were taken from off-site monitoring well borings installed at locations downgradient from the two landfill lobes. Off-site subsurface soil samples are identified as MW-1-SB, MW-2-SB, MW-3-SB, MW-4-SB, MW-7-SB, and MW-8-SB and are located coincident with the same numbered monitoring wells (Figure 5). All samples were taken above the water table and all but MW-4-SB (collected at a depth of 1 to 4 feet) were taken at a depth between 4 feet to 13 feet. Samples were analyzed for VOCs, semi-volatile compounds, pesticides/PCBs, metals, and several miscellaneous indicator parameters. Acetone and toluene were the only VOCs detected. Semi-volatile compounds (six) were detected only in MW-3-SB, and mainly consisted of PAH compounds. Detected organic

compounds were present at concentrations below available public health assessment comparison values. Neither pesticides nor PCBs were detected, although it must be noted that three of the six sample results for pesticides and PCBs were rejected due to QA/QC violations. Metals were detected at concentrations below or near the typical background range.

Groundwater - Monitoring Wells

As previously mentioned in the "On-Site Contamination" subsection, with the exception of monitoring well clusters MW-5 and MW-6, the remaining 22 monitoring wells sampled during the RI are located outside of the property boundary and are therefore considered to be off-site wells. A summary of off-site monitoring well data is presented in Tables 5 (Round 1) and 6 (Round 2).

In sampling round one, no VOC compounds were detected at concentrations exceeding comparison values (Table 7). However, the semi-volatile compound, bis(2-ethylhexyl)phthalate was detected at low concentrations but may be due to laboratory contamination. Six metals (unfiltered) were detected at concentrations exceeding comparison values and therefore will be further evaluated.

In the second sampling round, the only VOC which exceeds a comparison value is chlorobenzene. This VOC will be further evaluated. Di-n-octylphthalate is the only semi-volatile organic compound detected at a concentration which exceeds a comparison value. This compound will also be further evaluated. In addition, bis(2-ethylhexyl)phthalate was detected at a concentration in exceedance of the comparison value for this compound. In sampling round two, seven metals (unfiltered) were detected at concentrations in exceedance of comparison values.

Groundwater - Private Wells

During the second round of groundwater sampling, water from the pump house of an adjacent property owner was sampled and labelled GDT-1 (Figure 5). The pump house draws groundwater from the residential well (PW-1) and supplies it to the residents of Torne Brook Farm. GDT-1 was analyzed for VOCs, semi-volatile compounds, pesticides/PCBs, and metals. Sampling results indicate the presence of tetrachloroethane at 0.6 mcg/L and twelve metals. The concentration of tetrachloroethane and all metals detected are below comparison values. On December 16, 1991, this supply was sampled by the RC DOH and analyzed for volatile organic compounds and metals. Results of analysis indicate no organic contamination and all metals detected are below comparison values. According to RC DOH records, tetrachloroethane has also been detected in this supply in May 1981 and in October 1988 below comparison values on both occasions.

On March 17, 1992, water from a nearby residence on Torne Brook Road (PW-2) was sampled by the NYS DOH and analyzed for VOCs, semi-volatile compounds, and metals. Results of testing indicate no contamination.

Groundwater - Public Supplies

The Spring Valley Water Company provided URS with water quality information regarding Spring Valley Water Company wells 94, 95 and 96. Figure 5 shows the locations of these public supply wells. Samples were analyzed for VOCs, pesticides, metals, and several miscellaneous indicator parameters. Sampling did not detect any contamination.

C. Quality Assurance and Quality Control (QA/QC)

In preparing this public health assessment, the NYS DOH relied on the information provided in the referenced document and assumed that adequate quality control measures were followed with regard to chain of custody, laboratory procedures, and data reporting. The analyses and conclusions in this public health assessment are valid only if the referenced information is correct.

Due to QA/QC violations, pesticides and PCB data are unavailable for the on-site leachate seep samples, for the on-site subsurface soil sample MW5-SB, and for three of six off-site subsurface soil samples collected during the RI.

The semivolatile compound, bis(2-ethylhexyl)phthalate, was detected at low concentrations in various media sampled during the RI. The presence of this chemical at the concentrations detected is suspect and may be attributed to laboratory contamination.

D. Physical and Other Hazards

Portions of the landfill are steep and/or eroded, conditions which may create insecure footing. Therefore, persons accessing the landfill are faced with an increased risk of injury resulting from slips and falls.

PATHWAYS ANALYSES

To determine whether nearby residents and persons on-site are exposed to contaminants migrating from the site, an evaluation was made of the environmental and human components that lead to human exposure. The pathways analysis consists of five elements: A source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population.

An exposure pathway is categorized as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. A completed exposure pathway occurs when the

five elements of an exposure pathway link the contaminated source to a receptor population. Should a completed exposure pathway exist in the past, present, or future, the population is considered exposed. A potential exposure pathway exists when one or more of the five elements is missing, or if modeling is performed to replace real sampling data. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. The discussion that follows incorporates only those pathways that are important and relevant to the site.

A. Completed Exposure Pathways

No completed exposure pathways have been identified for this site.

B. Potential Exposure Pathways

Ambient Air/Soil Gas Pathways

Past, current, and future exposure pathways are possible from contamination of the ambient air on-site and at the adjacent residential area. Populations at risk of exposure to contaminated ambient air via inhalation include the following: persons trespassing on the site for recreational purposes; persons using the on-site pistol range; employees at the on-site baler facility and weigh station; and residents of nearby dwellings.

Landfill gases produced from the degradation of buried wastes have migrated upward through the cover material on the landfill. Landfill gas contains about 60% methane and 40% carbon dioxide. Under certain conditions, landfill gas may also contain volatile organic compounds which can volatilize through surface soils into the atmosphere. Persons on-site could be exposed to contaminants volatilizing from the landfill at any point on the site. The primary route of exposure is inhalation of airborne chemicals. Contaminants released to ambient air (breathing zone) will likely be dispersed and diluted at unconfined on-site and off-site areas. Testing of landfill gas within on-site piezometers indicates the presence of xylene and ethylbenzene. However these chemicals were not detected at levels exceeding comparison values in ambient air at on-site receptor areas.

Site contaminants could also migrate through porous media as soil gas and enter confined building spaces (basements) through crawl spaces, plumbing holes, other floor holes (e.g., sumps) and foundation cracks, and contaminate indoor air in on-site (baler building/weigh station) and off-site buildings. Limited data on landfill gas generation indicate that the on-site methane levels could pose a public health threat. One public health threat from methane generation is the potential for explosive levels of methane that accumulate in closed buildings and hence be a safety problem. Another public health threat is that toxic gases tend to be carried with methane. Also, oxygen depletion may result if a significant quantity of landfill gas is present.

Testing of ambient air for toxic chemicals has been limited to the on-site baler building and pistol range and one off-site location. VOCs tested for are present at levels typical of normal atmospheric conditions. A data gap exists for hydrogen sulfide which has not been tested for at the site. At this time, the soil gas/ambient air exposure pathway is categorized as a potential human exposure pathway since limited quantitative data exist to fully evaluate this pathway.

As mentioned previously in the Off-Site Contamination section, ambient air monitoring has not been conducted at the residential area near Torne Brook Road. Due to the lack of data, it is not possible to determine the extent of soil gas contamination from the site and whether the site is responsible for the odors detected at Torne Brook Farm.

Waste Material/Leachate Seep Pathway

The potential exists for exposure to site related contaminants, specifically metals, present in on-site leachate seeps. Populations at risk of exposure to contaminated leachate include persons trespassing on the site and persons using the on-site pistol range who could be exposed by skin contact or incidental ingestion. Trespassers observed on-site have been primarily hikers or adults operating all-terrain vehicles and the potential for any significant exposures to leachate appears to be very low.

The leachate could also be contributing metals to on-site and off-site soil, however the limited sampling of soil to date does not indicate the presence of metals at levels of concern.

The off-site disposal of paint sludge presents a potential for exposure to persons via direct contact and/or incidental ingestion of the waste material.

Surface Water/Sediment Exposure Pathway

As previously mentioned in the Background section of this public health assessment, the surface water features near the site are the Ramapo River, Torne Brook, and Candle Brook. Public concern has been expressed regarding potential exposure to surface water contaminated by the

landfill. Of particular concern is an area on the Ramapo River referred to "Flat Rock", which is reportedly used for recreation, including swimming and fishing.

Site related contaminants could be transported to adjacent surface water bodies via precipitation runoff flowing down the landfill and/or groundwater discharge from the shallow aquifer underlying the site. In addition, a significant portion of contamination detected in the Ramapo River could be related to the discharge of treated leachate from the on-site leachate collection system directly into the river. Contaminants which have entered the nearby Torne Brook and Ramapo River are available for direct contact or incidental ingestion for persons, particularly children, who might be swimming in these off-site areas. The presence of vinyl

chloride in surface water samples from Torne Brook is likely due to upstream contamination, the source of which has not been determined. Notwithstanding, there is some evidence of a landfill effect upon Torne Brook which now appears relatively minor. Since only limited surface water sampling was performed during the RI, there is some uncertainty regarding potential exposure to surface water at "Flat Rock". However, based on current data, the likelihood for exposure to site related contaminants at "Flat Rock" is expected to be low. This conclusion is further supported by the fact that discharge of treated leachate to the Ramapo River has ceased, thus removing a likely source of contamination.

Groundwater Exposure Pathway

Three groundwater producing units have been identified as underlying the site: a shallow aquifer consisting of loose and dense sands with abundant boulders and cobbles; an intermediate layer within a thin zone of weathered rock; and a bedrock aquifer. Depth to bedrock ranges from zero (outcrops near the site) to greater than 65 feet.

The water table surface closely parallels the surface topography and shallow groundwater generally flows towards Torne Brook which is a topographic low between the landfill and lands between the brook and the Ramapo River. Much of the flow in the shallow aquifer is intercepted by the leachate collection system along Torne Valley Road. The flow direction in the intermediate and bedrock aquifer is likely very similar to that of the water table aquifer but in all probability flows beneath Torne Brook to the Ramapo River. Groundwater contamination has been detected in all three aquifers in both on-site and off-site monitoring wells. To date, testing of the private drinking water supply well at Torne Brook Farm, at the residence identified as PW-2 and at the on-site baler building, has not detected any site-related contaminants at levels of concern. Future contamination of these wells is possible should contaminated groundwater migrate to these well locations. The possibility also exists for future contamination of the nearby Spring Valley Water Company supply wells, which to date have not been affected by site-related contaminants.

Exposures to contaminants in drinking water supplies occur via ingestion; dermal contact and absorption during showering, bathing, or other household uses ;and inhalation of aerosols and vapors from water used in the household.

Populations at risk of exposure to contaminated groundwater include the following: tenants at Torne Brook Farm; tenants at the nearby residence identified as PW-2; employees at the baler building, and individuals connected to the Spring Valley Water Company distribution system.

C. Eliminated Exposure Pathways

Soil Pathways

Chemicals in shallow and subsurface soil at the site are at concentrations below typical background levels and/or public health assessment comparison values. Therefore, we will eliminate the soil exposure pathway from further evaluation in the public health assessment.

Fish Pathways

No data are available for fish samples from the streams in the area. Fishing occurs in the Ramapo River; however, the extent is not known. Contaminants of concern attributable to the landfill and discharging to Torne Brook will be greatly reduced in the Ramapo River. Furthermore, the contaminants of concern in Torne Brook and the Ramapo River have not been found at elevated levels in the sediment of these streams. Therefore, fish bioaccumulation is not expected to result in a human exposure pathway and will not be discussed further in this public health assessment.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluation

On-site groundwater, leachate seeps and landfill gas at the Ramapo Landfill and off-site groundwater monitoring wells and surface water are contaminated at levels of concern for potential human exposure pathways (Tables 2, 5 and 6). There have been no documented past or current exposures to contaminants at the Ramapo site. However, residents are concerned about potential contamination of nearby drinking water supply wells. An analysis of the toxicological implications of the potential human exposure pathways of concern is presented below:

1. Potential ingestion, dermal and inhalation exposure to contaminants in private wells as a result of contaminant plume migration.

   As indicated in Tables 5 and 6, off-site groundwater monitoring wells are contaminated with volatile and semi-volatile organic compounds and metals at concentrations that exceed comparison values (Table 7). On-site groundwater is also contaminated with these chemicals. There is a potential for oral (ingestion), dermal and inhalation exposure to contaminants in residential well water from contaminated groundwater. This pathway is incomplete since migration to residential wells has not been identified and therefore no known exposure is occurring. There is also a potential for oral exposure to contaminants in on-site groundwater by workers in the baler facility, however, to date, site related contaminants have not been detected in this supply.

Volatile and Semi-Volatile Organic Compound Contaminants

The semi-volatile compound, bis(2-ethylhexyl)phthalate, was detected at low concentrations in fourteen of 28 groundwater samples (Tables 5 and 6). The presence of this chemical at the concentrations detected is suspect and may be the result of laboratory contamination.

Bis(2-ethylhexyl)phthalate causes cancer in laboratory animals exposed to high levels over their lifetime (ATSDR, 1991a). Chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans exposed to lower levels over long periods of time. Based on the results of animal studies, chronic (lifetime) exposure to bis(2-ethylhexyl)phthalate at the highest concentrations found in groundwater monitoring wells would pose a low increased cancer risk.

Bis(2-ethylhexyl)phthalate and di-n-octylphthalate can cause kidney, liver, and male reproductive system damage (ATSDR, 1991a) and chlorobenzene can cause nervous system, liver and kidney damage (ATSDR, 1989a) at exposures several orders of magnitude greater than potential exposures to groundwater. Chemicals that cause effects in humans and/or animals after high levels of exposure may also pose a risk to humans who are exposed to lower levels over long periods of time. Although the risk of noncarcinogenic effects from these potential exposures isn't completely understood, the existing data suggest it would be minimal.

Metal Contaminants

Exposure to chromium can increase the risk of kidney damage, birth defects and reproductive effects (ATSDR, 1991b). Chronic exposure to elevated lead levels is predominantly associated with neurological and hematological effects (ATSDR, 1991c). The developing fetus and young children are particularly sensitive to lead-induced neurological effects. Exposure to high manganese concentrations can cause nervous system effects (ATSDR, 1990b). Exposure to high levels of nickel can cause reproductive effects and allergic reactions (ATSDR, 1988). Little is known about the chronic toxicity of aluminum in humans. Some animal toxicity studies indicate that a relatively high dose of aluminum may cause nerve and skeletal damage and may adversely affect the reproductive system (NYS DOH, 1990). Although iron is an essential nutrient, ingestion of large amounts can lead to accumulation in the body and tissue damage (WHO, 1984). The levels of aluminum, iron and manganese in groundwater monitoring wells are over 95, 750 and 620 times the levels, respectively, at which the aesthetic quality of drinking water begins to be affected (WHO, 1984). Water containing more than 20,000 mcg/L of sodium should not be used for drinking by people on severely restricted diets and water containing more than 270,000 mcg/L of sodium should not be used for drinking by people on moderately restrictive diets. Exposure to drinking water contaminated with these metals, in particular chromium,

manganese and lead, at the highest concentrations found in groundwater monitoring wells could pose a moderate increased risk of adverse health effects.

2. Potential ingestion, inhalation and dermal exposure of persons coming into contact with contaminated on-site leachate seeps, landfill gas, and off-site soil/paint sludge material.

The potential for on-site exposure to contaminated surface water and landfill gas can occur since site access is possible.

On-site leachate seeps and off-site paint sludge are contaminated with metals including antimony, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese and zinc. Incidental ingestion exposure to these metals could present an increased public health risk, especially to children who could play in these areas on a frequent basis.

Limited landfill gas sampling on-site indicates a potential for exposure to methane gas. One public health threat from methane generation is the potential for explosive levels of methane to migrate off-site and accumulate in closed buildings, such as the baler facility, weigh station, and adjacent homes, and hence be a safety problem. These risks are in addition to the effects that can be caused by large amounts of methane displacing oxygen in air. Individuals who continue to breathe high levels of methane may become dizzy, experience difficulty in breathing or loose consciousness (Sax, 1979). In addition, toxic gases may be carried with methane, which if inhaled can result in adverse health effects.

3. Potential ingestion, dermal and inhalation exposure of persons engaged in recreational activities in adjacent streams.

Potential runoff of contaminants in on-site leachate seeps and surface runoff could impact surface water and sediments in Torne Brook stream and the Ramapo River. These waters are used for recreational purposes including swimming and fishing. As indicated in Table 2, initial sampling of off-site surface waters found several metals at concentrations which exceed comparison values. Subsequent sampling of the Ramapo River indicates that the contamination is no longer occurring due to the diversion of on-site leachate to the Suffern sewage treatment plant. Past exposure to contaminants at the highest levels previously detected in off-site surface water and sediments (Tables 2 and 3) is unlikely to result in any adverse health effects.

B. Health Outcome Data Evaluation

Cancer Incidence and Mortality Data

A review of the 1978-82 cancer incidence and mortality data in Census tract 117 (Sloatsburg) and Census tract 116 (Ramapo Town) found no significant excess in total cancer or cancer of any of 17 common sites of cancer when compared to the mortality and incidence rates of New York State excluding New York City.

C. Community Health Concerns Evaluation

We have addressed each of the community concerns about health as follows:

1. Will residents living near the landfill be provided with public water, and if so, when?

   To date, results obtained from sampling of nearby private wells indicate that the wells are not being contaminated by the landfill. Therefore, no provision for an alternate water supply is warranted at this time. However, should future groundwater monitoring data indicate that drinking water standards are being exceeded in nearby wells, then an alternate water supply may be deemed necessary. If drinking water standards are exceeded for site-related contaminants in residential wells, and/or significant concentrations are detected in the same aquifer in the closest monitoring wells to the residential wells, and detected concentrations are confirmed by subsequent sampling, residents would immediately be provided with bottled water and/or an acceptable treatment system. This interim measure would remain in effect until a permanent alternate water supply could be constructed.

2. Will measures be taken to ensure the overall protection of health of persons living near the site?

   The selected clean-up remedy for the site is expected to achieve protection of human health. The planned capping of the landfill protects human health by reducing the mobility of contaminated materials. In addition, capping the landfill will eliminate threats to persons who come in contact with the landfill. Long-term monitoring of the site will be performed to ensure that residential drinking water wells are protected from contamination coming from the site. Air monitoring will be performed prior to, during, and following clean-up construction at the site to ensure that air emissions resulting from the cap construction meet air quality requirements. Landfill gas emissions will be controlled, if necessary.

3. Will an appropriate monitoring program be provided to determine the presence of contaminants encroaching on or in nearby drinking water supply wells?

As part of the selected remedy for the site, groundwater samples will be collected on a quarterly basis from nearby residential wells and from new and existing monitoring wells. Samples will be tested for site-related contaminants. Early warning monitoring wells will be installed where needed between the site and private residential drinking water wells and also between the site and the nearby Spring Valley Water Company production wells. These production wells will be sampled quarterly for contaminants associated with the site, for the first year of long-term monitoring, or longer if contamination is noted.

4. Complaints by Residents about Landfill Odors.

It is not known if the landfill odors are from garbage handled at the active baler building or is caused by the migration of hydrogen sulfide emitted at the site. Limited ambient air sampling has only been performed on-site and did not include measurements for hydrogen sulfide, which is known to have a rotten-egg odor. While chronic exposure to hydrogen sulfide may cause adverse health effects, additional air data are needed both on-site and off-site to determine the health significance of these odors.

CONCLUSIONS

1. Based on the information reviewed, the Ramapo Landfill site near the Village of Hillburn, Rockland County, poses an indeterminate public health hazard. The available data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects. However, insufficient and/or incomplete data for certain environmental media creates uncertainty as to the presence of contaminants which may cause adverse health effects. Data inadequacies include the following:

   a. The number of shallow soil samples collected may not be sufficient to provide data indicative of overall site conditions.

   b. No ambient air data exist on hydrogen sulfide concentrations at on-site and off-site receptor locations. Also, no air data exist to determine the specific source of the landfill odors off-site, and its public health implications.

   c. Due to QA/QC violations, pesticides and PCB data are unavailable for the on-site leachate seep samples, for the on-site subsurface soil sample MW5-SB, and for three of six off-site subsurface soil samples collected during the RI.

   d. Insufficient data exist to confirm vinyl chloride contamination found in an upstream surface water sample from Torne Brook.

e. Air monitoring activities were performed over a one or two day period and do not represent the quality of ambient air over time.

f. No data exist to determine the extent of contamination, if any, in surface water and sediments in the Ramapo River at the recreation area referred to as "Flat Rock".

2. On-site and off-site groundwater monitoring wells are contaminated with volatile and semi-volatile organic compounds and selected metals at concentrations that exceed comparison values and under certain exposure scenarios could pose an increased risk of adverse health effects. To date, migration of these contaminants to two nearby residential wells and public drinking water supply wells has not been identified and therefore no known exposure is occurring. Testing of the on-site baler building well has not indicated any contamination.

3. The potential for on-site exposure to contaminated surface water and related media is limited to leachate seeps. Exposure to leachate at the on-site leachate holding pond and in the subsurface leachate collection system is not expected to occur since access is controlled. Leachate seeps are contaminated with metals which could present a public health risk, especially to children who could play in these areas on a frequent basis.

4. Limited ambient air sampling on-site indicates a potential for exposure to methane gas. A public health threat exists with methane due to the potential for explosive levels of methane to migrate and accumulate inside the baler building and weigh station. Off-site ambient air has not been sampled to determine if site related contaminants are migrating to the residential area near Torne Brook Road.

5. Past recreational use of Torne Brook stream and the Ramapo River is unlikely to result in any adverse health effects due to contamination with metals from landfill leachate. Current and future use of these waters is not expected to cause any adverse health effects since on-site leachate is no longer discharged to the Ramapo River.

6. Cancer incidence and mortality data reviewed for the years 1978-1982 found no significant excess in cancer or cancer of any of 17 common sites of cancer when compared to the mortality and cancer incidence rates of New York State excluding New York City.

7. Various health concerns have been raised by the local community. These concerns have been addressed in the Public Health Implications section of this document.

RECOMMENDATIONS

1. Private and public groundwater wells downgradient of the site and the on-site baler building well should be routinely monitored, whether they have exhibited contamination in the past or not. Groundwater quality needs to be monitored downgradient from the site and in the general path of groundwater flow. New and selected existing monitoring wells should be used to identify any encroaching contamination that may affect downgradient private and public wells. Residents with wells in which contamination has consistently been found should be provided with a permanent, alternate water supply.

2. Measures should be taken to restrict public access onto the landfill sections and within the surface water collector installed at the base of the landfill.

3. The safety of on-site remedial workers and the surrounding community should be addressed during activities which may disturb the existing soils. Optimal dust control measures should be used and perimeter monitoring (for presence and transport of soil vapor) should be implemented during remedial activities to ensure the safety of nearby residents. Appropriate protective clothing and respiratory protection should be worn by workers during activities involving removal or disturbance of soils. On-site remedial workers should follow relevant Occupational Safety and Health Administration and National Institute for Occupational Safety and Health guidelines.

4. The potential for contaminants to affect indoor air quality at nearby residences and at the on-site baler building and weigh station warrants the need to conduct additional ambient air monitoring. Measurement locations should be focused particularly at locations at the edge of the landfill to evaluate potential human exposures to volatile organic compounds or explosive hazards from methane. Measures should be taken to control and monitor gas emissions from the landfill.

5. Remediation should address the landfill's role as an on-going source of contamination to surface water and surface water sediments.

6. Implement institutional controls to prevent the installation of drinking water wells at the site.

7. Additional investigations should be conducted to confirm the vinyl chloride contamination found in an upstream surface water sample from Torne Brook.

8. Additional surface water/sediment sampling should be conducted in the Ramapo River at the area referred to as "Flat Rock."

Health Activities Recommendation Panel (HARP) Recommendations

The data and information developed in the public health assessment for the Ramapo Landfill, Ramapo, New York, has been reviewed by ATSDR's Health Activities Recommendations Panel for appropriate follow-up with respect to health actions. The panel agrees that the community health education performed by the NYS DOH was appropriate. No other follow-up health actions were determined appropriate for the site.

PUBLIC HEALTH ACTIONS

The Public Health Action Plan (PHAP) for the Ramapo Landfill site contains a description of actions to be taken by the US EPA, ATSDR and/or the New York State Department of Health (NYS DOH) at and near 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 the ATSDR/NYS DOH to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented are as follows:

1. The US EPA Record of Decision includes the construction of a permanent landfill cap on the site and improvements to the existing leachate collection system. Capping will prevent direct contact exposure to any contaminated soils and leachate seeps. This action will also reduce human exposure due to migration of contaminants from the site into soil gas and groundwater where these media may be contacted by nearby workers and residents. Exposure to groundwater contamination will be further reduced through groundwater pumping and off-site treatment.

2. US EPA's selected remedy calls for posting and fencing of the landfill. This action will reduce the frequency of trespassers on the landfill property thereby preventing on-site exposure to contaminated media, including leachate seeps and landfill gas.

   Air monitoring for VOCs and landfill gases will be included under this remedy, and landfill gases will be vented to the atmosphere or controlled, as needed to ensure the safety of nearby residents and workers. The selected remedy also includes deed restrictions with respect to the future use of the site, and the prohibition of on-site groundwater extraction for potable use.

3. The US EPA Record of Decision includes the collection of groundwater samples from nearby private and public drinking water supply wells and from new and selected existing monitoring wells. If increases are noted through this monitoring program at or immediately upgradient of the residences, New York State and the US EPA will make a

determination as to the need for appropriate action (i.e., extension of a public water line) to remedy the situation.

4. All site activity will be conducted under a prepared health and safety plan. These plans will include provisions for air monitoring to assure that nearby residents are not exposed to significant concentrations of site-related contaminants.

5. The ATSDR and NYS DOH will coordinate with the appropriate agencies regarding actions to be taken in response to those recommendations provided in this public health assessment for which no plan of action has yet been developed.

6. The ATSDR will provide an annual follow-up to the PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this Public Health Assessment, and will be provided to persons who request it.

CERTIFICATION

The Public Health Assessment for the Ramapo Landfill site was prepared by the New York State 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.

Gregory V. Ulirsch

Technical Project Officer, SPS, RPB, DHAC

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

Division Director, DHAC, ATSDR

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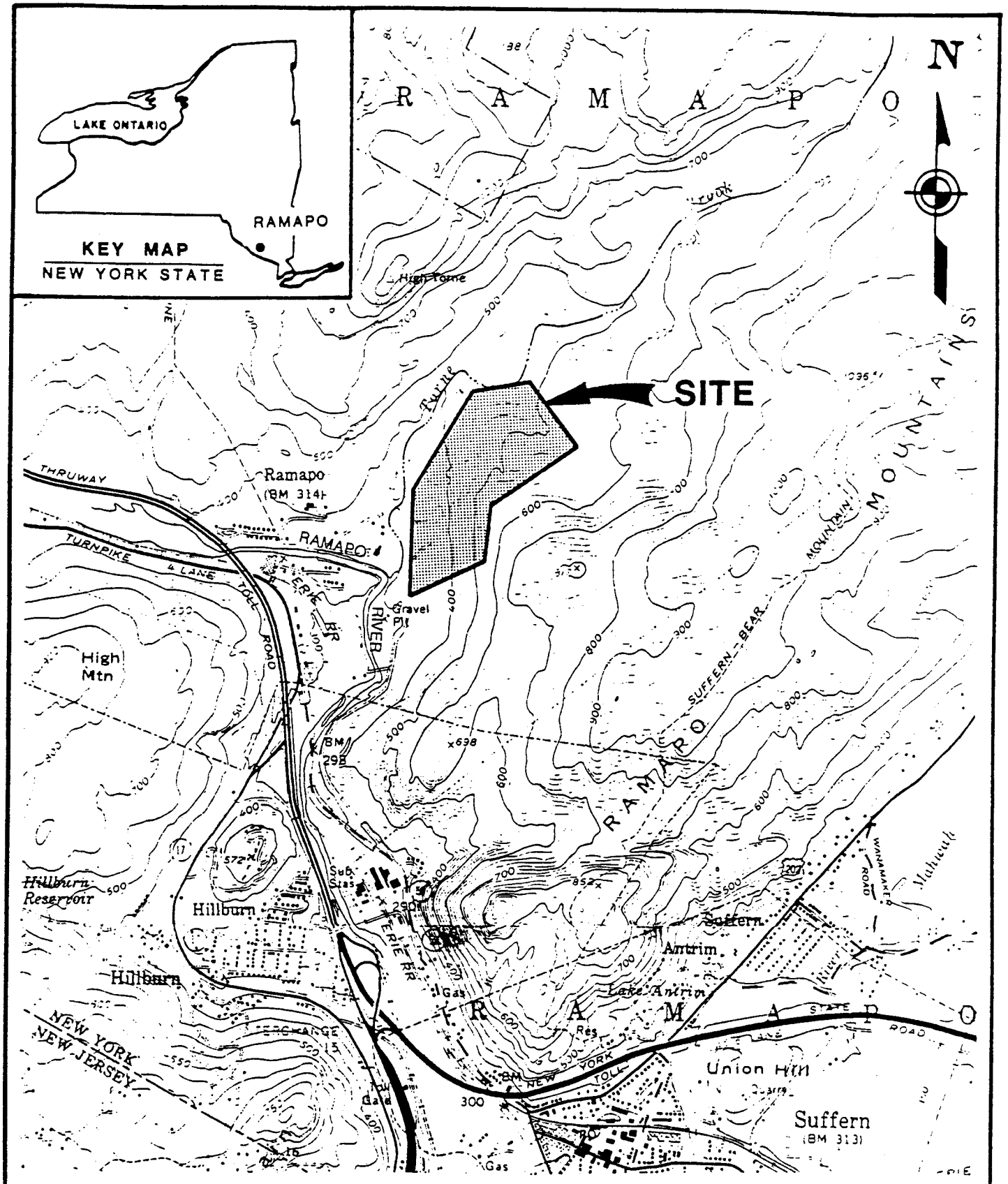
APPENDIXES

APPENDIX A

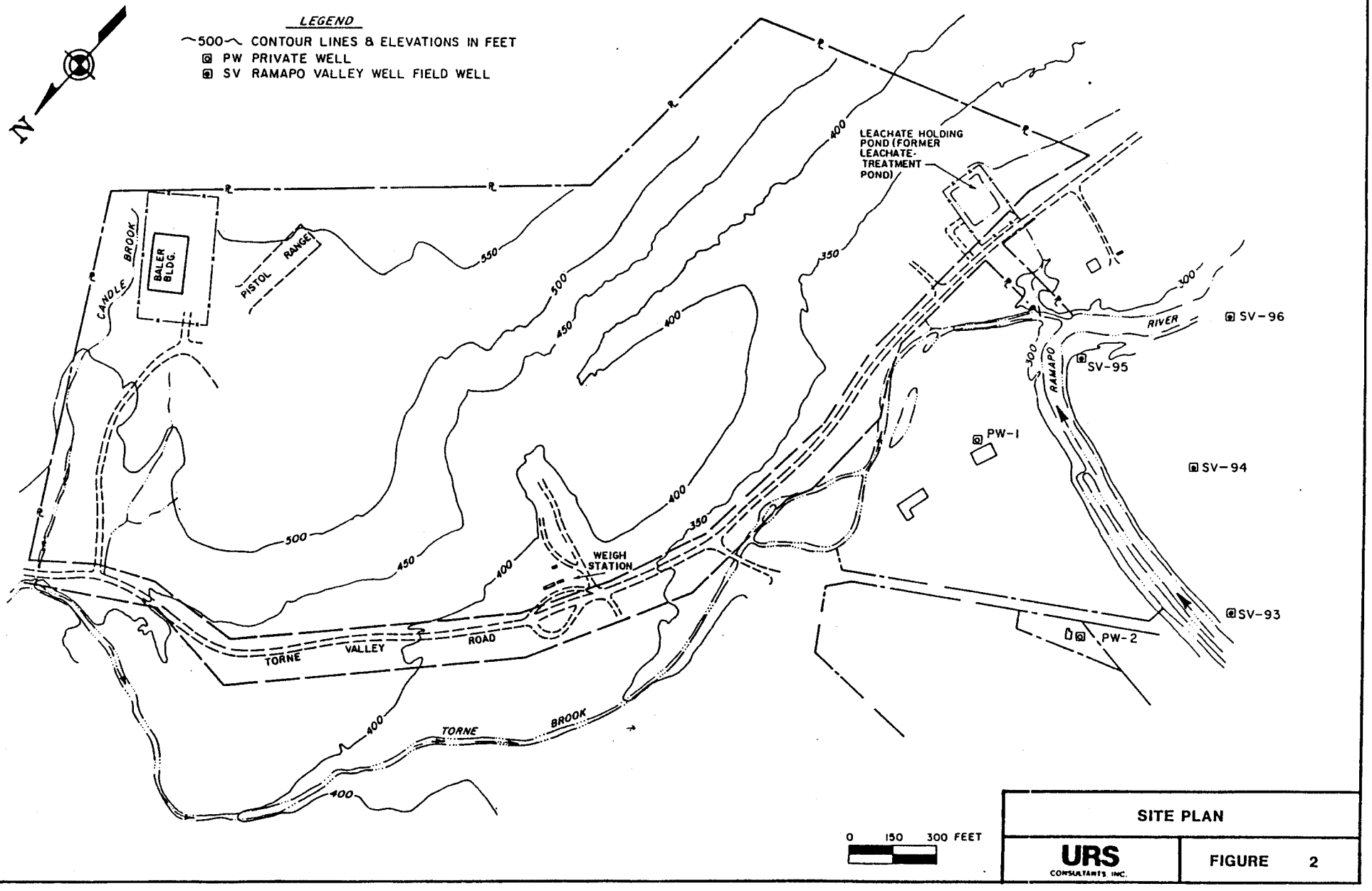
Figures



USGS 7.5 MINUTE SERIES
RAMSEY AND SLOATSBURG
QUADRANGLES (1955)

SCALE 0 1000 2000FT

URS CONSULTANTS, INC.	SITE LOCATION	FIGURE 1



SITE PLAN

URS CONSULTANTS, INC.

FIGURE 2

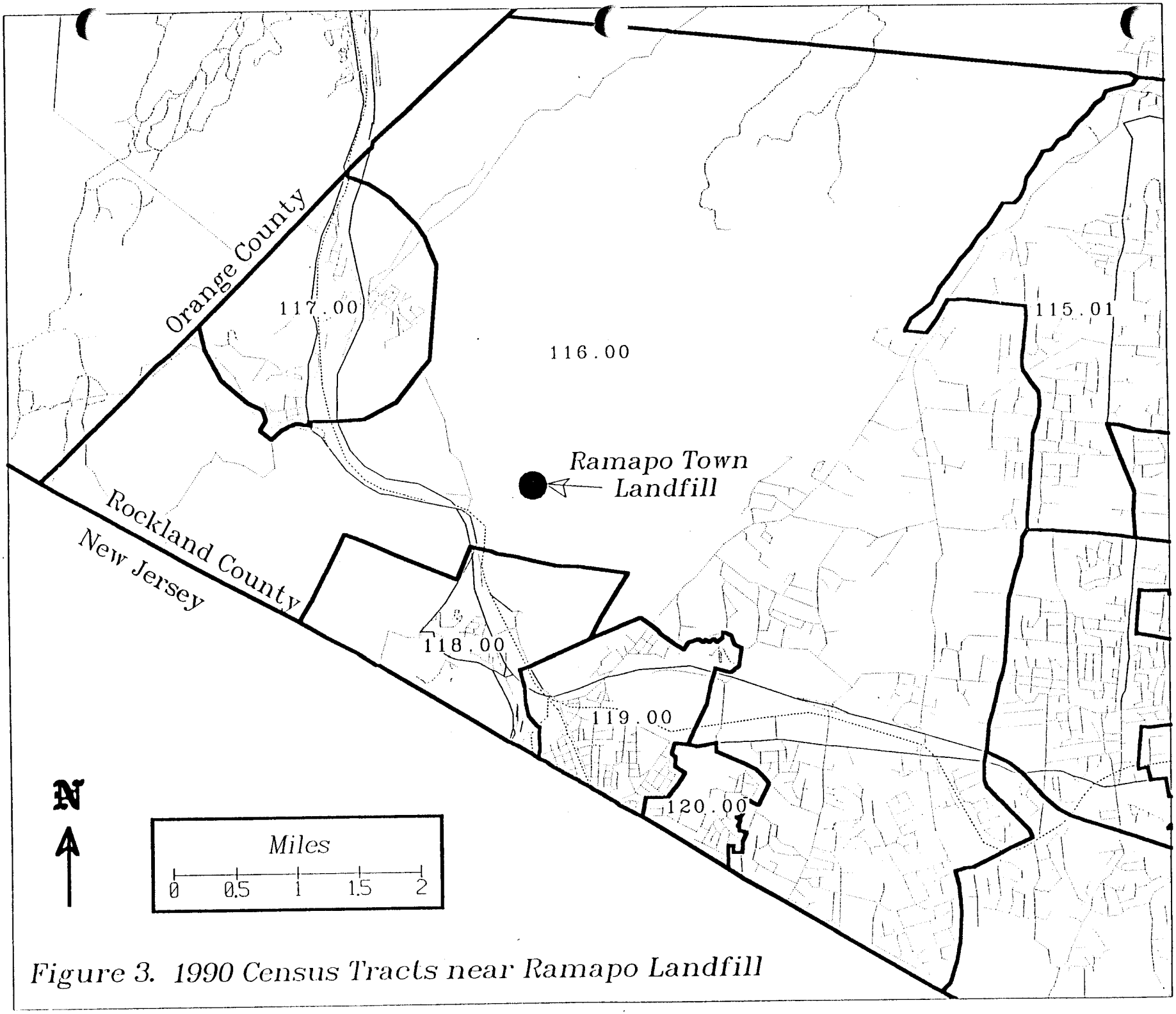
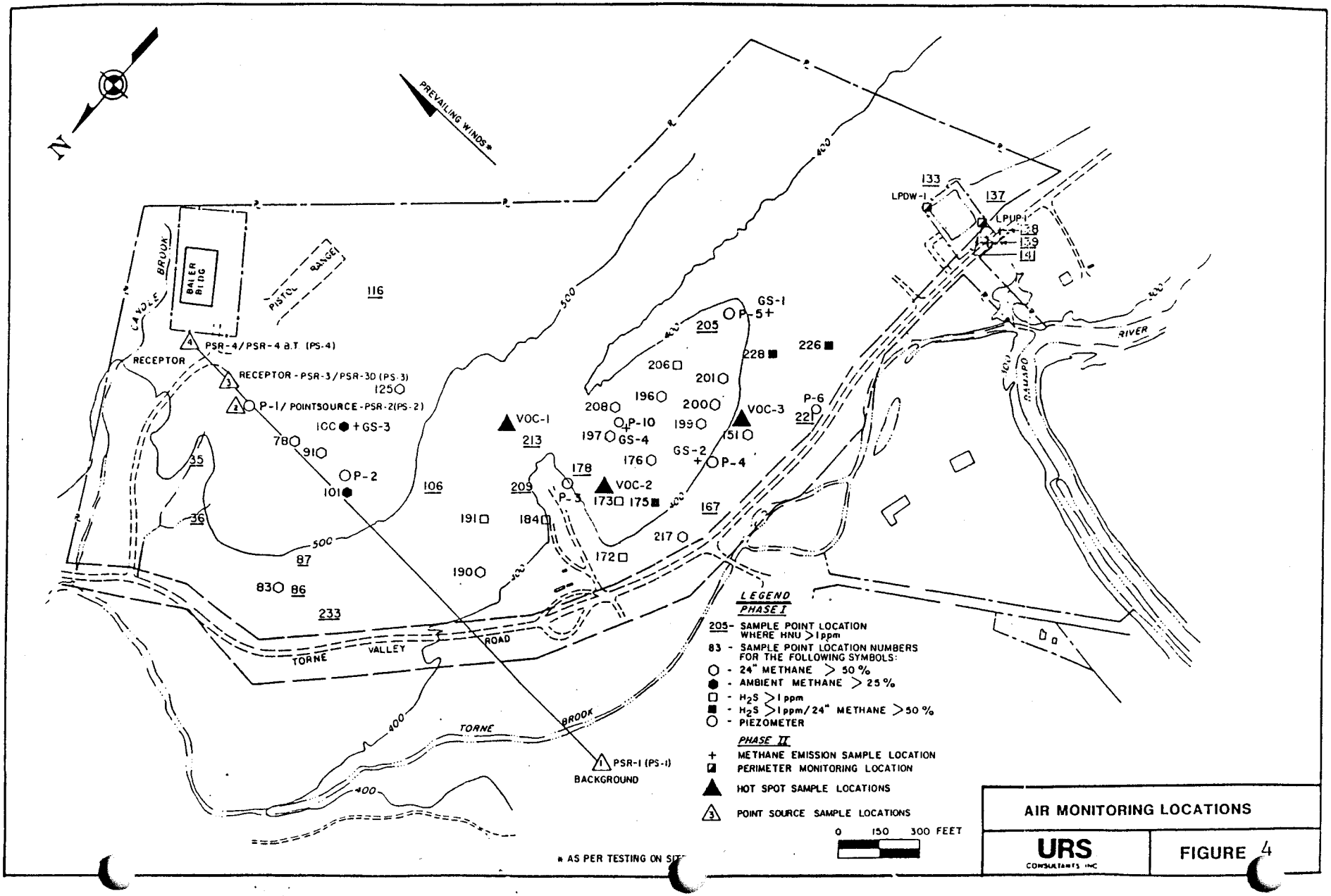


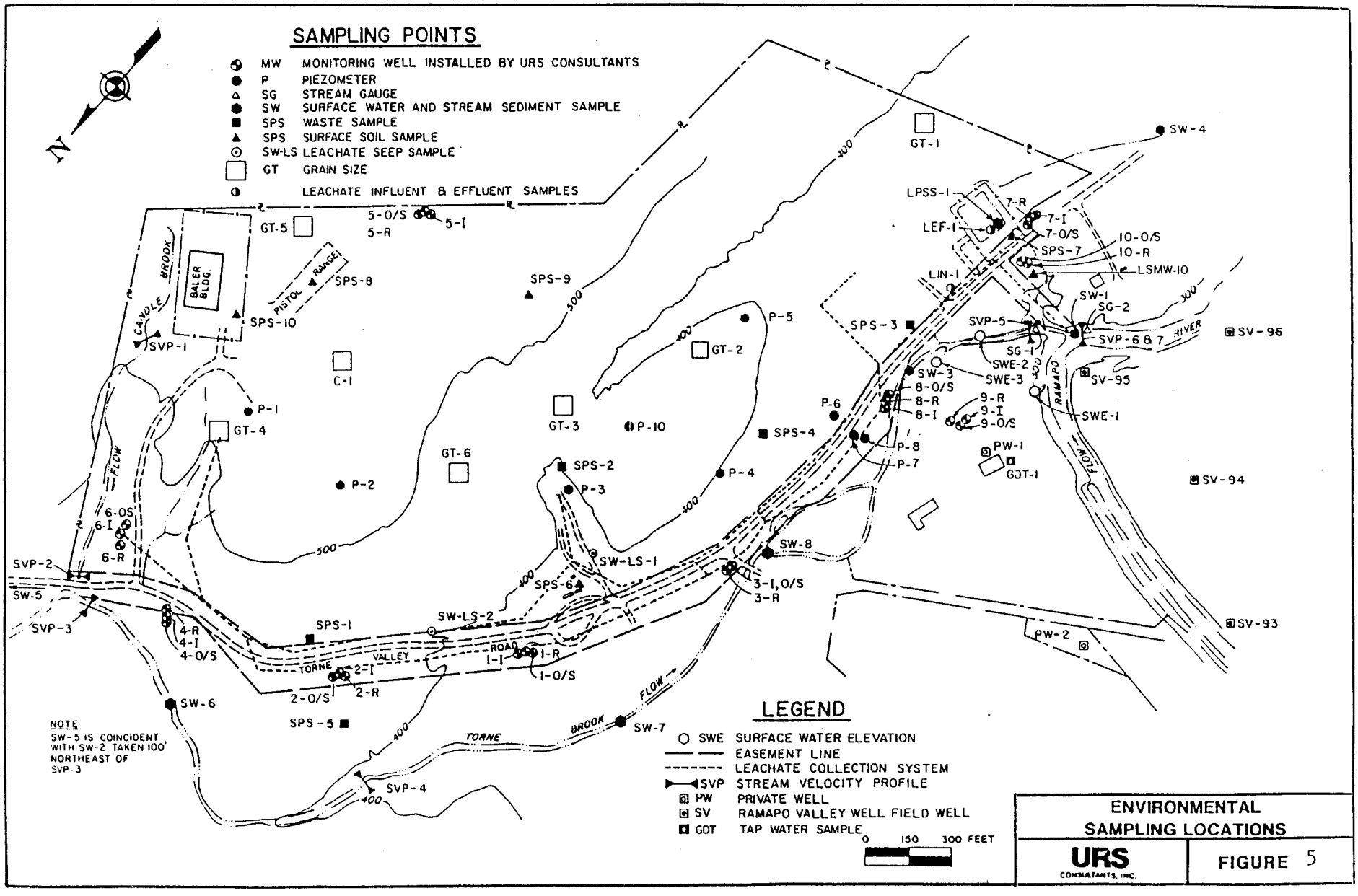
Figure 3. 1990 Census Tracts near Ramapo Landfill



AIR MONITORING LOCATIONS

URS CONSULTANTS, INC

FIGURE 4


SAMPLING POINTS
MW MONITORING WELL INSTALLED BY URS CONSULTANTS
P PIEZOMETER
SG STREAM GAUGE
SW SURFACE WATER AND STREAM SEDIMENT SAMPLE
SPS WASTE SAMPLE
SPS SURFACE SOIL SAMPLE
SW-LS LEACHATE SEEP SAMPLE
GT GRAIN SIZE
LEACHATE INFLUENT & EFFLUENT SAMPLES
N
BALER BLDG.
BROOK
CANOE
PISTOL RANGE
FLOW
VALLEY
TORNE
ROAD
RAMAPO
RIVER
NOTE
SW-5 IS COINCIDENT WITH SW-2 TAKEN 100' NORTHEAST OF SVP-3
LEGEND
SWE SURFACE WATER ELEVATION
EASEMENT LINE
LEACHATE COLLECTION SYSTEM
SVP STREAM VELOCITY PROFILE
PW PRIVATE WELL
SV RAMAPO VALLEY WELL FIELD WELL
GDT TAP WATER SAMPLE
0 150 300 FEET
ENVIRONMENTAL SAMPLING LOCATIONS
URS CONSULTANTS, INC.
FIGURE 5

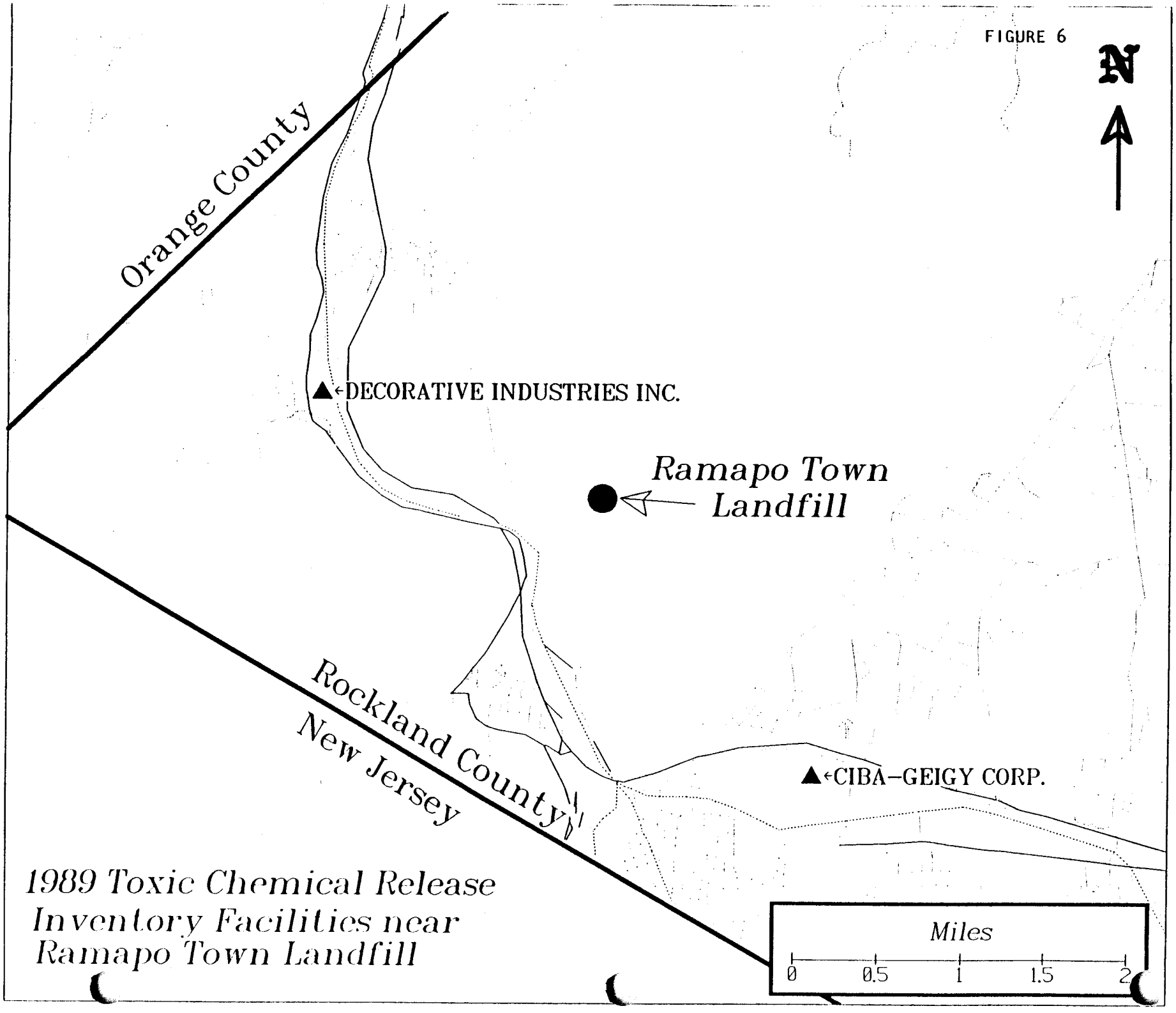


FIGURE 6
N
Orange County
DECORATIVE INDUSTRIES INC.
Ramapo Town
Landfill
Rockland County
New Jersey
CIBA-GEIGY CORP.
1989 Toxic Chemical Release
Inventory Facilities near
Ramapo Town Landfill
Miles
0
0.5
1
1.5
2

APPENDIX B

Tables

Table 1.

Ramapo Landfill.
Summary of On-Site Shallow Soil Data (0-8 inches).
Remedial Investigation.
[All values in milligrams per kilogram (mg/kg)]

Compound Name	Frequency of Detection	Range of Detection (excluding non-detects)	Typical Background Range*	Comparison Values for Soil**	Source****
Semivolatile Organics					
1,4-Dichlorobenzene	1/9	.370	ND	0.4	NYS CREG
1,2-Dichlorobenzene	1/9	.094	ND	324	NYS RfG
Benzo(a)anthracene	4/9	.042-.200	***	NA	
Benzo(a)pyrene	4/9	0.062-.160	<1-1.3	0.005	NYS CREG
Benzo(b)fluoranthene	5/9	0.073-0.170	***	NA	
Benzo(ghi)perylene	4/9	0.048-0.130	***	NA	
Benzo(k)fluoranthene	5/9	0.061-0.180	***	NA	
Bis(2-ethylhexyl) phthalate	4/9	0.048-.480	ND	2.3	NYS CREG
Chrysene	4/9	0.064-0.230	***	NA	
Acenaphthene	1/9	.190	***	235	NYS RfG
Fluoranthene	5/9	0.064-0.442	***	746	NYS RfG
Fluorene	1/9	0.170	***	328	NYS RfG
Indeno(123cd)pyrene	3/9	0.061-.140	***	NA	
Naphthalene	1/9	1.10	ND	1.4	NYS RfG
Phenanthrene	4/9	0.081-.390	***	NA	
Pyrene	5/9	0.073-0.310	***	67	NYS RfG
2-Methylnaphthalene	1/9	.200	ND	NA	
Dibenzofuran	1/9	.150	ND	NA	
N-nitrosodiphenylamine	1/9	0.110	ND	0.4	NYS CREG
Anthracene	1/9	0.043	***	7,470	NYS RfG
Butylbenzylphthalate	3/9	0.100-0.160	ND	3,220	NYS RfG
Di-n-octylphthalate	1/9	0.043	ND	489	NYS RfG
Inorganics					
Aluminum	9/9	4610-16,900	7,000-100,000	NA	
Arsenic	9/9	0.93-2.3	10-20	50	ATSDR EMEG
Barium	9/9	27.4-122	300-500	3,500	USEPA RfD
Cadmium	3/9	0.84-1.7	<0.5-1	10	ATSDR EMEG
Calcium	9/9	805-10,000	100-400,000	NA	
Chromium	9/9	12.6-22.7	10-40	250	USEPA RfD
Cobalt	9/9	4.0-9.6	<0.3-70	NA	
Copper	9/9	8.6-48.3	<1-25	6,500	USEPA RfD
Iron	9/9	17,200-47,000	10,000-40,000	NA	
Lead	9/9	5.3-15.9	10-300	NA	
Magnesium	9/9	1,500-4,710	50-6,000	NA	
Manganese	9/9	88.1-335	500-3,000	5,000	USEPA RfD
Antimony	3/9	4.7-7.3	0.6-10	20	USEPA RfD
Beryllium	1/9	0.24	<1-7	0.16	ATSDR CREG
Selenium	3/9	0.22-0.65	0.1-4	150	ATSDR EMEG
Nickel	9/9	10.9-19.8	<5-20	1,000	ATSDR EMEG
Potassium	9/9	511-1,430	50-30,000	NA	
Sodium	9/9	113-857	3,000-50,000	NA	
Vanadium	9/9	14.6-40.8	3-500	350	USEPA RfD
Zinc	9/9	26.2-76.6	50-100	10,000	USEPA RfD

Table 1.

Ramapo Landfill.
Summary of On-Site Shallow Soil Data (0-8 inches) (page 2).
Remedial Investigation.
[All values in milligrams per kilogram (mg/kg)]

Compound Name	Frequency of Detection	Range of Detection (excluding non-detects)	Typical Background Range*	Comparison Values for Soil**	Source****
Pesticides/PCBs					
Heptachlor Epoxide	1/9	.026	ND	0.02	NYS CREG
Dieldrin	1/9	.0034	0.001-0.049	0.001	NYS CREG
alpha-chlordane	1/9	.016	ND	0.1 (total)	NYS CREG
gamma-chlordane	1/9	.020	0.34	0.1 (total)	NYS CREG
Volatile Organics					
2-Butanone	1/9	.190	ND	2	NYS RfG
Benzene	1/9	.042	ND	0.05	NYS CREG
1,1,2,2-Tetrachloroethane	1/9	.002	ND	0.01	NYS CREG
Chlorobenzene	1/9	.730	ND	26.5	NYS RfG
Ethylbenzene	2/9	.260	ND	200	NYS RfG
Total xylenes	1/9	.570	ND	4,620	NYS RfG

NA = not available
ND = not determined

Note: Only detected results are reported

*References: Adriano (1986); Clarke et al. (1985a,b); Connor et al. (1957); Davis and Bennett (1983); Dragun (1988); Frank et al. (1976); Klein (1972); McGovern (1988); Schacklette and Boerngen (1984)

**Comparison values for volatile and semi-volatile organics based on ingestion of soil and homegrown vegetables; comparison values for metals (inorganics) based on ingestion of soil.

***Based on reported background levels for total polycyclic aromatic hydrocarbons of <1 to 13 milligrams per kilogram in soil (ATSDR, 1990e; Edwards, 1983).

****NYS CREG = New York State Cancer Risk Evaluation Guidelines
NYS RfG = New York State Risk Reference Guideline
NYS EMEG = New York State Environmental Media Evaluation Guide
ATSDR CREG = ATSDR Cancer Risk Evaluation Guidelines
ATSDR EMEG = ATSDR Environmental Media Evaluation Guide
USEPA RfD = USEPA Risk Reference Dose

Table 2.

Ramapo Landfill.
Summary of Off-site Surface Water Data.
Remedial Investigation.
[All values in micrograms per liter (mcg/L)]
(see Table 7 for Comparison Values)

Compound Name	Frequency of Detection	Range of Detection (excluding non-detects)	Concentration Detected in Upstream Samples
Volatiles			
Benzene	1/8	0.08	ND;ND
Toluene	2/8	0.08;0.2	ND;ND
Vinyl chloride	2/8	0.7;2	ND;2
Inorganics			
Aluminum	4/8	120-995	ND;120
*Antimony	1/8	38	ND;ND
Arsenic	1/8	2	ND;ND
Barium	8/8	9-83	12;14
Calcium	8/8	3,190-110,000	3,190;4,570
Copper	3/8	3-6	ND;ND
*Iron	7/8	74-2,630	93;163
Lead	6/8	1-3	ND;2
Magnesium	8/8	853-33,100	853;1,100
*Manganese	8/8	7-1,120	20;45
Mercury	5/8	0.3-1	ND;4
Nickel	1/8	25	ND;ND
Potassium	8/8	260-42,100	259;432
Sodium	8/8	2,700-109,000	2,700;2,740
Vanadium	1/8	5	ND;ND
Zinc	6/8	4-55	ND;36
*Thallium	2/8	5	ND;5

ND - Not detected
Note: Only detected results are reported

*Contaminant selected for further evaluation.

Table 3.

Ramapo Landfill.
Summary of Off-site Sediment Data.
Remedial Investigation.
[All values in milligrams per kilogram (mg/kg)]

Compound Name	Frequency of Detection	Range of Detection (excluding non-detects)	Concentration Detected in Upstream Samples	Comparison Value* (Soil Contaminants)	Source**
Semivolatile Organics					
Benzo(k)fluoranthene	1/7	0.071	ND	NA	
4-Methylphenol	1/7	0.19	ND	NA	
Benzo(a)anthracene	1/7	0.065	ND	NA	
Benzo(b)fluoranthene	1/7	0.150	ND	NA	
Bis(2-ethylhexyl)-phthalate	2/7	0.045-0.120	ND	2.3	NYS CREG
Chrysene	1/7	0.083	ND	NA	
Fluoranthene	2/7	0.040-0.140	ND	746	NYS RfG
Phenanthrene	1/7	0.075	ND	NA	
Pyrene	2/7	0.046-0.160	ND	67	NYS RfG
Benzoic Acid	1/7	0.42	ND	1,470	NYS RfG
Benzo(a)pyrene	1/7	0.070	ND	0.005	NYS CREG
Inorganics					
Aluminum	8/8	4050-6470	4660;4270	NA	
Arsenic	8/8	0.70-1.5	0.79;1.2	50	ATSDR EMEG
Barium	8/8	19.9-72.3	19.9;30.1	3,500	USEPA RfD
Beryllium	6/8	0.27-0.99	0.99;0.38	0.16	ATSDR CREG
Cadmium	5/8	1.3-4.3	ND;3.4	10	ATSDR EMEG
Calcium	8/8	773-13,300	1660;773	NA	
Chromium	8/8	5.9-13.0	7.0;5.9	200	ATSDR EMEG
Cobalt	8/8	2.1-11.2	2.1;3.9	NA	
Copper	8/8	3.8-24.6	3.8;4.5	6,500	USEPA RfD
Iron	8/8	9510-25,400	14,800;9510	NA	
Lead	8/8	3.7-22.2	6.0;4.5	NA	
Magnesium	8/8	1260-8590	1260;1680	NA	
Manganese	8/8	86.7-2970	86.7;203	5,000	USEPA RfD
Nickel	7/8	6.8-32.4	9.0;ND	1,000	ATSDR EMEG
Potassium	8/8	421-958	515;448	NA	
Sodium	8/8	39.3-214	114;65.1	NA	
Thallium	1/8	0.65	ND;ND	4	USEPA RfD
Vanadium	8/8	9.9-23.9	10.4;9.9	350	USEPA RfD
Zinc	8/8	26.0-82.9	53.6;33.5	10,000	USEPA RfD
Pesticides/PCBs					
gamma-Chlordane	1/7	0.012	ND	0.1	NYS CREG

NA - Not available
ND - Not detected
Note: Only detected results are reported.

*Comparison values for volatile and semi-volatile organics based on ingestion of soil and homegrown vegetables; comparison values for metals (inorganics) based on ingestion of soil.

**NYS CREG = New York State Cancer Risk Evaluation Guidelines
NYS RfG = New York State Risk Reference Guideline
NYS EMEG = New York State Environmental Media Evaluation Guide
ATSDR CREG = ATSDR Cancer Risk Evaluation Guidelines
ATSDR EMEG = ATSDR Environmental Media Evaluation Guide
USEPA RfD = USEPA Risk Reference Dose

Table 4.

Ramapo Landfill.
Summary of Off-Site Subsurface Soil Data.
Remedial Investigation.
[All values in milligrams per kilogram (mg/kg)]

Compound Name	Frequency of Detection (off-site samples)	Range of Detection (excluding non-detects)	Typical Background Range*	Comparison Values for Soil**	Source****
Semivolatile Organics					
Benzo(a)anthracene	1/5	0.042	***	NA	
Bis(2-ethylhexyl)-phthalate	1/5	0.043	ND	2.3	NYS CREG
Chrysene	1/5	0.043	***	NA	
Fluoranthene	1/5	0.075	***	746	NYS RfG
Phenanthrene	1/5	0.040	***	NA	
Pyrene	1/5	0.072	***	67	NYS RfG
Volatile Organics					
Acetone	4/6	0.013-0.028	ND	2	NYS RfG
Toluene	1/6	0.002	ND	230	NYS RfG
Inorganics					
Aluminum	6/6	6100-11,600	7,000-100,000	NA	
Antimony	1/6	5.2	0.6-10	20	USEPA RfD
Arsenic	6/6	1.2-2.9	10-20	50	ATSDR EMEG
Barium	6/6	26.9-50.7	300-500	3,500	USEPA RfD
Beryllium	1/6	0.23	<1-7	0.16	ATSDR CREG
Cadmium	1/6	0.93	<0.5-1	10	ATSDR EMEG
Calcium	6/6	1150-15,100	100-400,000	NA	
Chromium	6/6	11.1-31.8	10-40	250	USEPA RfD
Cobalt	6/6	4.7-9.4	<0.3-70	NA	
Copper	6/6	10.3-25.9	<1-25	6,500	USEPA RfD
Iron	6/6	16,000-32,000	10,000-40,000	NA	
Lead	6/6	1.5-11.2	10-300	NA	
Magnesium	6/6	2620-5170	50-6,000	NA	
Manganese	6/6	155-382	500-3,000	5,000	USEPA RfD
Nickel	6/6	10.3-14.2	<5-20	1,000	ATSDR EMEG
Potassium	6/6	866-1410	50-30,000	NA	
Sodium	6/6	70.4-240	3,000-50,000	NA	
Vanadium	6/6	15.1-34.5	3-500	350	USEPA RfD
Zinc	6/6	17.7-35.3	50-100	10,000	USEPA RfD
Selenium	1/6	0.51	0.1-4	150	ATSDR EMEG
Thallium	1/6	1.5	NA	4	USEPA RfD

NA - not available
ND - not detected
Note: Only detected results are reported

*References: Adriano (1986); Clarke et al. (1985a,b); Connor et al. (1957); Davis and Bennett (1983); Dragun (1988); Frank et al. (1976); Klein (1972); McGovern (1988); Schacklette and Boerngen (1984)

**Comparison values for volatile and semi-volatile organics based on ingestion of soil and homegrown vegetables; comparison values for metals based on ingestion of soil.

***Based on reported background levels for total polycyclic aromatic hydrocarbons of <1 to 13 milligrams per kilogram in soil (ATSDR, 1990e; Edwards, 1983).

****NYS CREG = New York State Cancer Risk Evaluation Guidelines
NYS RfG = New York State Risk Reference Guideline
NYS EMEG = New York State Environmental Media Evaluation Guide
ATSDR CREG = ATSDR Cancer Risk Evaluation Guidelines
ATSDR EMEG = ATSDR Environmental Media Evaluation Guide
USEPA RfD = USEPA Risk Reference Dose

Table 5.
Ramapo Landfill.
Summary of Groundwater Data (Off-Site Monitoring Wells) - Round 1.
Remedial Investigation.
[All values in micrograms per liter (mcg/L)]
(see Table 7 for Comparison Values)

Compound Name	Frequency of Detection	Range of Detection
Semi-volatile Organics		
*Bis(2-ethylhexyl)-phthalate	10/16	2-30
Diethylphthalate	2/16	3-5
Volatile Organics		
1,1-Dichloroethane	2/17	3-5
Benzene	5/17	1-3
Chlorobenzene	2/17	1-3
Chloromethane	2/17	3
Toluene	1/17	1
Carbon disulfide	1/17	2
4-Methyl-2-pentanone	2/17	3-4
2-Hexanone	1/17	2
1,1,2,2-Tetrachloroethane	1/17	2
Inorganics		
*Aluminum	16/17	138-18,900
Arsenic	2/17	2.8-26
Barium	17/17	9-441
Calcium	17/17	22,100-187,000
*Chromium	17/17	16.1-587
Cobalt	1/17	17.8
Copper	14/17	3.1-78
*Iron	16/17	406-229,000
Lead	16/17	1.2-11.8
Magnesium	17/17	5,690-42,700
*Manganese	17/17	51.9-8,700
*Nickel	15/17	15-331
Potassium	17/17	1,050-34,200
*Sodium	17/17	11,400-166,000
Vanadium	4/17	5.3-51.6
Zinc	17/17	7.1-79.33
Pesticides/PCBs		
delta-BHC	1/17	1.9
gamma-BHC	1/17	0.06

*Contaminant selected for further evaluation
Note - Only detected results are reported.

Table 6.

Ramapo Landfill.
Summary of Groundwater Data (Off-Site Monitoring Wells) - Round 2.
Remedial Investigation.
[All values in micrograms per liter (mcg/L)]
(see Table 7 for Comparison Values)

Compound Name	Frequency of Detection	Range of Detection
Semivolatile Organics		
*Di-n-octylphthalate	1/22	130
*Bis(2-ethylhexyl)-phthalate	4/22	2-9
Diethylphthalate	3/22	2-5
Naphthalene	1/22	3
Butylbenzylphthalate	1/22	2
Volatile Organics		
Chloromethane	1/22	2
Benzene	10/22	2-2.9
*Chlorobenzene	4/22	1.2-16
Toluene	2/22	0.3-0.6
Acetone	3/22	23-35
1,1-Dichloroethane	5/22	0.5-2.8
1,2-Dichloroethane	2/22	0.1-0.2
Dichlorodifluoromethane	1/22	0.2
cis-1,2-dichloroethene	4/22	0.1-0.9
ortho-Xylene	1/22	0.7
Isopropylbenzene	5/22	0.5-3.7
Propylbenzene	2/22	0.5-0.8
1,3,5-Trimethylbenzene	3/22	1.8-1.9
tert-Butylbenzene	1/22	1.5
1,2,4-Trimethylbenzene	2/22	0.8-1.4
p-Isopropyltoluene	2/22	1.2-1.7
1,2-Dichlorobenzene	2/22	0.9-1.2
Naphthalene	3/22	0.3-4.2
1,4-Dichlorobenzene	1/22	1.1
Inorganics		
*Aluminum	19/22	165-19,000
Arsenic	6/22	2.4-20.5
Barium	21/22	3-559
Cadmium	1/22	4.9

Table 6.

Ramapo Landfill.
Summary of Groundwater Data
(Off-Site Monitoring Wells) - Round 2 (page 2).
Remedial Investigation.
[All values in micrograms per liter (mcg/L)]
(see Table 7 for Comparison Values)

Compound Name	Frequency of Detection	Range of Detection
Inorganics (cont.)		
Calcium	22/22	7,300-219,000
*Chromium	22/22	5.5-1,290
Cobalt	12/22	9.8-42.3
*Iron	22/22	145-43,800
*Lead	20/22	1.7-34.1
Magnesium	22/22	1,920-51,100
*Manganese	22/22	14.6-31,200
*Nickel	17/22	17.6-153
Potassium	22/22	717-196,000
*Sodium	22/22	2,250-147,000
Vanadium	9/22	5.9-40
Zinc	22/22	3.7-107
Copper	18/22	3.2-62.3
Mercury	4/22	0.2-2

*Contaminant selected for further evaluation.
Note: Only detected results are reported.

Table 7.

Ramapo Landfill
Public Health Assessment Comparison Values for Contaminants
Found in Sources of Drinking Water.
[all values in micrograms per liter (mcg/L)]

Chemical	Standards/Guidelines NEW YORK STATE Ground Water	Surface Water	Drinking Water	U.S. EPA Drinking Water	Comparison Values	Source***
Volatile Organics						
1,1-Dichloroethane	5	5g	5	–	700	EPA RfD
Benzene	0.7	0.7	5	5	0.7	NYS CREG
Chlorobenzene	5	20	5	100	140	EPA RfD
Chloromethane	5	–	5	–	3	EPA LTHA
Toluene	5	5g	5	1,000;40ps	1,000	EPA LTHA
Carbon disulfide	–	–	50	–	700	EPA RfD
4-Methyl-2-pentanone	50	50g	50	–	350	EPA RfD
2-Hexanone	50g	50g	50	–	–	
1,1,2,2-Tetrachloroethane	5	–	5	–	1.3	ATSDR CREG
Vinyl chloride	2	0.3g	2	2	0.02	EPA CPF
Acetone	50	–	50	–	700	EPA RfD
1,2-Dichloroethane	5	0.8	5	5	0.38	ATSDR CREG
Dichlorodifluoromethane	5	–	5	–	1,000	EPA LTHA
cis-1,2-Dichloroethene	5	–	5	70	70	EPA LTHA
ortho-Xylene	5	5g	5	1,000;20ps	10,000	EPA LTHA
Isopropylbenzene	5	–	5	–	–	
Propylbenzene	5	–	5	–	–	
1,3,5-Trimethylbenzene	5	5g	5	–	–	
para-Isopropyltoluene	5	–	5	–	–	
1,2-Dichlorobenzene	4.7*	–	5	600;10ps	600	EPA LTHA
1,4-Dichlorobenzene	4.7	30	5	75;5ps	1.5	EPA CPF
tert-Butylbenzene	–	–	5	–	–	
1,2,4-Trimethylbenzene	5	5g	5	–	–	
Semi-Volatile Organics						
Di-n-octylphthalate	50g	50g	50	–	140	EPA RfD
Bis(2-ethylhexyl)-phthalate	50	4g	50	6	2.5	EPA CPF
Diethylphthalate	50g	50g	50	4	5,000	EPA LTHA
Naphthalene	10g	10	50	–	20	EPA LTHA
Butylbenzylphthalate	50g	50g	50	100p	1,400	EPA RfD
Pesticides						
delat-BHC	ND	0.01	5	–	–	
gamma-BHC	ND	0.01	0.2	0.2	0.03	EPA CPF
Inorganics						
Aluminum	–	–	–	50-200s	–	
Antimony	3g	3g	–	6	3	EPA LTHA
Arsenic	25	50	50	50	11	EPA RfD
Barium	1,000	1,000	2,000	2,000	2,000	EPA LTHA
Cadmium	10	10	5	5	5	EPA LTHA
Calcium	–	–	–	–	–	
Chromium	50	50	100	100	100	EPA LTHA
Cobalt	–	–	–	–	–	
Copper	200	200	1,000	1,300	–	

Table 7.

Ramapo Landfill
Public Health Assessment Comparison Values for Contaminants
Found in Sources of Drinking Water (page 2).
[all values in micrograms per liter (mcg/L)]

Chemical	Standards/Guidelines NEW YORK STATE Ground Water	Surface Water	Drinking Water	U.S. EPA Drinking Water	Comparison Values	Source***
Inorganics (continued)						
Iron	300	300	300	300s	–	
Lead	25	50	50	15*	–	
Magnesium	35,000g	35,000	–	–	–	
Manganese	300	300	300	50s	3,500	EPA RfD
Mercury	2	2	2	2	2	EPA LTHA
Nickel	–	–	–	100	100	EPA LTHA
Potassium	–	–	–	–	–	
Sodium	20,000	–	**	–	–	
Thallium	4g	4g	–	2	0.4	EPA LTHA
Vanadium	–	–	–	–	20	EPA LTHA
Vinyl chloride	2	0.3g	2	2	–	
Zinc	300	300	5,000	5,000s	2,100	EPA LTHA

e = applies to total of 1,2- and 1,4-isomers
g = guidance value
p = proposed maximum contaminant level (MCL)
s = secondary MCL

*Maximum contaminant level goal (MCLG) of zero for lead and an action level of 15 mcg/L at the tap.

**No designated limit; water containing more than 20,000 mcg/L should not be used for drinking by people on severely restricted sodium diets; water containing more than 270,000 mcg/L should not be used for drinking by people on moderately restricted sodium diets.

***ATSDR CREG = ATSDR Cancer Risk Evaluation Guide
EPA LTHA = EPA Drinking Water Lifetime Health Advisory
EPA CPF = EPA Cancer Potency Factor
EPA RfD = EPA Reference Dose
NYS CREG = NYS Cancer Risk Evaluation Guideline

APPENDIX C

Responses

RAMAPO LANDFILL
RESPONSES TO PUBLIC COMMENTS

Comment #1

One local resident asked how the data gap involving on-site air monitoring would be solved.

Response #1

Additional on-site monitoring will be performed prior to, during and following remedial construction activities at the site. The proposed landfill cap design includes the installation of a gas venting system. Landfill gas emissions from this system will be monitored for methane, as well as other contaminants. If necessary, appropriate measures will be taken to treat emissions to ensure protection of human health and the environment.

Comment #2

A question was raised concerning the Quality Assurance and Quality Control (QA/QC) section of the report. Specifically, how did the QA/QC violations occur involving pesticides and PCB analysis of several leachate and subsurface soil samples collected during the remedial investigation.

Response #2

According to the remedial investigation report, pesticides and PCBs data had to be rejected for a number of samples due to holding time violations by the laboratory and could not be re-sampled.

Comment #3

The summary discusses the increased risk to persons on the landfill resulting from xylene and ethylbenzene in ambient air; however, the Pathways Analyses section (page 23) indicates the VOCs tested for are present at levels typical of normal atmospheric conditions.

Response #3

As indicated on page 23 of the report, testing of ambient air for toxic chemicals has been limited to the on-site baler building and pistol range and one off-site location. These limited data indicate that VOCs tested for at these specific locations are present at levels typical of normal atmospheric conditions. The statement included in the summary involving a discussion of risk to persons on the landfill resulting from xylene and ethylbenzene in ambient air relates to a sample taken within an open piezometer which exists about 350 feet west of the baler building. A piezometer consists of a plastic pipe (1

1/2" - 2" diameter) installed within an open hole augered into the ground. Piezometers are primarily used to obtain groundwater level readings to determine groundwater flow patterns. Selected piezometers installed on-site were also used to obtain landfill gas data during the air monitoring program performed at the site in 1990. The actual risk to a person standing next to the piezometer cannot be assessed as a sample of the ambient air (outside of the piezometer) was not collected. Although persons are not known to frequent the piezometer areas, the landfill gas emissions escaping from the piezometer may contain elevated concentrations of toxic gases. These contaminants, once released to ambient air, will likely be dispersed and diluted to levels which would not be expected to cause adverse health effects.

Comment #4

Air sampling data have not been provided so that an evaluation of the conclusions cannot be made.

Response #4

The "Ambient Air and Soil Gas" subsection includes a discussion of the three air monitoring activities conducted during the remedial investigation and presents a range of concentrations or maximum concentrations for methane and volatile organic compounds. A complete list of the chemicals tested for and the testing results are included in the remedial investigation report. This report is available for public review at the Suffern Free Library at Washington and Maple Avenues, Suffern, New York and the Finkelstein Memorial Library at 24 Chestnut Street, Spring Valley, New York.

Comment #5

On page 14 "comparison values" need to be defined and the rationale for selection needs to be provided.

Response #5

Comparison values are one of the factors used to evaluate if the contaminants at a site are likely to pose a health threat. Each environmental medium (air, soil, water) has its own comparison value for a contaminant. If a contaminant concentration is above its comparison value, the contaminant is evaluated further to determine if exposure is of public health significance. A general discussion of comparison values and the selection of contaminants for further evaluation is provided on page 11. In the absence of specific comparison values for contaminants in leachate, the sampling results discussed on page 14 were compared to comparison values for drinking water, and to standards or guidelines for groundwater, surface water, and drinking water (Table 7). The potential for exposure is evaluated in the exposure pathways analysis (pp. 22-26) and the potential for health effects is discussed in the toxicological evaluation (pp. 26-29).

Comment #6

The results for LPSS-1 need to be provided.

Response #6

One purpose of the public health assessment is to determine what chemicals are present at concentrations which could result in adverse health effects if exposure was to occur. As such, the Environmental Contamination section is intended to inform the reader about the type of contamination and to determine which site-related contaminants need to be evaluated for cancer and noncancer health risks. A complete list of the chemicals tested for in the various media sampled and the testing results are included in the remedial investigation report.

Comment #7

The detection of bis(2-ethylhexyl)phthalate in the upgradient MW-5 monitoring well, along with the inconsistency of the concentrations detected in other wells between rounds suggests that the presence of bis(2-ethylhexyl)phthalate is questionable. Bis(2-ethylhexyl)-phthalate is a common laboratory contaminant and is commonly found in samples as a result of laboratory contamination. The discussion of bis(2-ethylhexyl)phthalate as a contaminant of concern may not be appropriate if bis(2-ethylhexyl)phthalate is a laboratory contaminant.

Response #7

The Quality Assurance and Quality Control section of the report has been revised and now includes a discussion of bis(2-ethylhexyl)-phthalate relative to this comment. As suggested, the presence of this chemical in various media is suspect given its frequent occurrence (at low concentrations) and that it is frequently due to laboratory contamination.

Comment #8

"Level of Concern" needs to be defined for air contaminants in ambient air. The presence of xylene and ethylbenzene at 1.77 and 0.28 ppm, respectively, in air samples would not appear to be "typical" atmospheric levels.

Response #8

The term "Levels of Concern" has been deleted from the ambient air/soil gas pathways analysis section. The intended meaning of this phrase in this section is to state that no chemical was detected at a level exceeding its comparison value. As noted in Response #3, xylene and ethylbenzene were detected inside a piezometer and not in open air. Therefore, these data are descriptive of soil gas quality and not ambient air quality.

Comment #9

The reference to vinyl chloride as a toxic gas possibly carried by methane should be eliminated. There is no evidence that vinyl chloride exists on-site; this statement implies it does.

Response #9

The reference to vinyl chloride as a toxic gas passible carried by methane has been removed from both the Pathways Analyses and Public Health Implications sections.

Comment #10

The response to question #1 of the community concerns indicates that drinking water standards would have to be significantly exceeded in residential wells before bottled water would be provided. This is inconsistent with recommendations on page 32, which indicate that bottled water will be provided to residents with wells contaminated above drinking water standards.

Response #10

Statements in the assessment relative to this comment have been revised to indicate that bottled water will be provided to residents with wells contaminated above drinking water standards. This provision is not considered an acceptable long-term measure and therefore would remain in effect until treatment and/or a permanent, alternate water supply is made available.

Comment #11

Provide further data about the landfill's construction. I assume by its origins that there's no liner.

Response #11

Detailed information concerning the landfill's construction is not included in any of the references reviewed by the NYS DOH during the preparation of the report. As with many landfills of similar origin, regulations in effect at the time did not require the placement of impermeable liners beneath the fill.

Comment #12

What about performing a statistical cancer evaluation regarding a ratio of cancer and mortality rates to the general population prior to the start-up of landfill operations, during

the operational period, and now.

Response #12

Available data do not indicate that residents have been exposed to levels of contaminants that would cause disease. An evaluation of cancer cases in the area would not be useful since there is no site specific exposure information which could be linked to cases of cancer.

Comment #13

When did the NYS DEC classify the Ramapo River as a source of drinking water supply? Has the classification changed based upon the landfill study and public health assessment findings?

Response #13

According to information obtained from the NYS DEC Division of Water, Bureau of Water Quality Management, the section of the Ramapo River near the site was classified as a Class "A" surface water in 1966. New York State water quality regulations indicate that the best use of Class "A" surface water is as a source of water supply for drinking, culinary or food processing purposes and any other usages. Treatment of Class "A" water so as to make it suitable for drinking water include full treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities. The water supply itself will be considered satisfactory for drinking water purposes only after all New York State Department of Health drinking water standards are met.

Comment #14

How do you address the physical and psychological aspects of living next to a landfill?

Response #14

The NYS DOH is aware of the psychological impacts of living in a community near a landfill and in June 1992 we co-sponsored a workshop with the ATSDR to discuss this issue. If anyone would like additional information, they may contact the Health Liaison Program at 1-800-458-1158 extension 402.