Public Health Assessment for

EMMELL'S SEPTIC LANDFILL
GALLOWAY TOWNSHIP, ATLANTIC COUNTY, NEW JERSEY
EPA FACILITY ID: NJD980772727
MARCH 1, 2002

PUBLIC HEALTH ASSESSMENT

EMMELL'S SEPTIC LANDFILL

GALLOWAY TOWNSHIP, ATLANTIC COUNTY, NEW JERSEY

EPA FACILITY ID: NJD980772727

Prepared by:

New Jersey Department of Health and Senior Services
Hazardous Site Health Evaluation Program
Consumer and Environmental Health Services
Division of Epidemiology, Environmental, and Occupational 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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FOREWORD

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

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

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

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

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

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

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

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E56), Atlanta, GA 30333.

Contents

Summary

The Emmell's Septic Landfill (ESL) site occupies approximately 38 acres, and is located in a rural residential area of Galloway Township, Atlantic County, New Jersey. The ESL is the site of a former solid waste facility, permitted by the New Jersey Department of Environmental Protection (NJDEP) to accept sewage and septic wastes. In addition to permitted wastes, the ESL also accepted non-permitted refuse, tires, paint sludges, gas cylinders, and industrial wastes.

The ESL is located above the Kirkwood/Cohansey sand aquifer. Chemical wastes on-site have infiltrated the groundwater of the Cohansey element. Beginning in 1984, private potable wells in nearby residential areas were sampled by the Atlantic County Health Department (ACHD). These, and subsequent samples by the ACHD in 1988, indicated contamination by volatile organic compounds. The affected wells were closed, and deeper wells were provided for residents.

Groundwater investigations conducted by the NJDEP in 1996 confirmed release of on-site contaminants to groundwater, and confirmed that potable well contamination was the result of contaminant migration from the site. In 1997, the United States Environmental Protection Agency (USEPA) initiated a site investigation which again confirmed site-related contaminants in private potable wells.

Data and information available to the New Jersey Department of Health and Senior Services (NJDHSS) and the Agency for Toxic Substances and Disease Registry (ATSDR) indicate that a completed human exposure pathway to volatile organic compounds (VOCs) associated with the potable and domestic use of contaminated private wells existed from 1984 through 1988. Current sampling data indicate continued impact to private wells, however all potentially affected residences are reported to be utilizing point of entry treatment systems. The current public health implications of this pathway are dependent upon the degree to which residents have sought alternative potable water sources or elected to enhance and maintain filtration for their wells. Lead contamination documented by the USEPA was the basis of a Health Consultation by the NJDHSS and the ATSDR in 1999. Subsequently, lead contamination was determined to be not site related (through isotope ratio analysis), but was still significant from a public health perspective.

Community concerns regarding the site pertain to groundwater quality and the availability of alternative potable sources (bottled water and/or public water supplies). The NJDHSS and the ATSDR performed site visits and participated in public meetings for the ESL site in 1999.

The ESL site has been determined by the NJDHSS and the ATSDR to have represented a public health hazard in the past. This evaluation is based upon a completed exposure pathway associated with site-related contaminants (vinyl chloride, 1,1- dichloroethylene) in off-site potable wells at levels which may result in a low increased risk of cancer. It is further evaluated to currently represent no apparent public health hazard. This is because the impact to private wells threatened by the site has been successfully mitigated, interrupting or minimizing exposure.

The remedial investigation delineating of the nature and extent of groundwater contamination is ongoing and incomplete. Additional information regarding the public health significance of groundwater contamination is needed to further evaluate the potential public health implications of the site.

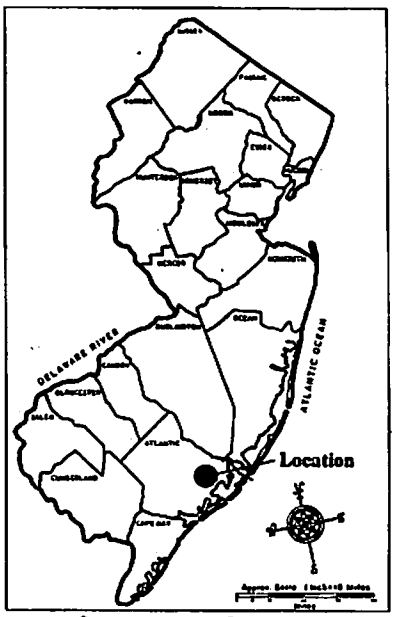
Purpose and Health Issues

This Public Health Assessment will document and evaluate the public health significance of human exposure pathways associated with the Emmell's Septic Landfill site. The health issues associated with this site pertain primarily to offsite groundwater contamination and the impact of this contamination upon private potable wells downgradient from the site.

Background

Demography and Land Use

The Emmell's Septic Landfill (ESL) site is located in Galloway Township, Atlantic County, New Jersey (see inset). The ESL occupies an area of approximately 38 acres and is surrounded by woodlands and rural residential areas. It is estimated that approximately 100 persons live within ½ mile of the site, with the closest residences to the northwest, across Zurich Avenue, approximately 200 feet from the site's boundary (see Appendix; Figures 2 and 3).



39° 30' 08" N; 74° 32' 30" W

Population demographics based upon the 1990 census have been prepared by the ATSDR using area-proportion spatial analysis and are presented in Figure 1. Within a 1-mile radius of the Emmell's Septic Landfill site, there is a population of 2,108 persons.

Groundwater is the primary source of potable water in the area of the site. The nearest private potable wells are located cross gradient to the ESL, on Zurich Avenue. The Kirkwood-Cohansey aquifer is impacted by the ESL site. Subsurface soils associated with the Cohansey element are fine to coarse grained sand, with lenses of silt and clay occurring sporadically. Depth to groundwater varies between 5 and 10 feet. Groundwater flows generally eastward at a rate of approximately 1 foot/day. Clay layers occur at approximately 80 feet below grade (fbg) and 120 fbg; it is not known if these layers are continuous and if they constitute an effective aquatard. Private wells impacted by the site were screened at an approximate depth of 100-120 feet. Replacement and new wells in the area are required to be drilled to a greater depth (> 200 fbg), and require a volatile organic scan prior to being granted a permit by the Atlantic County Health Department (ACHD).

Site History

The ESL is the location of a former septic waste disposal facility. The disposal operations were active from 1967–1979. In April 1974, a solid waste facility permit was issued allowing the site to be used for the disposal of sewage and septic sludge wastes into ponds, trenches, and lagoons. In addition, solid and chemical wastes were also disposed of at the ESL, including drums containing paint sludges, gas cylinders, tires, and construction/industrial debris (USEPA, 1999c).

The ESL was the subject of several enforcement activities by the New Jersey Department of Environmental Protection (NJDEP) during the period from 1976 - 1980; these actions/citations were based upon failure of the ESL to submit proper designs for the disposal of septic waste. In 1984, the NJDEP conducted a site investigation at the ESL. Data indicated the presence of polychlorinated biphenyls (PCBs), hydrocarbons, and metals in soils, as well as metals and volatile organic compounds (VOCs) in groundwater collected from exploratory trenches.

Groundwater contamination was first documented in off-site potable wells on Lisa Drive in 1984. Analysis of a domestic well showed elevated levels of VOCs as determined by USEPA method 601/602. Additional sampling by the NJDEP and the ACHD determined contamination to be present in 5 of 6 wells on Lisa Drive (see "Remedial History and Environmental Contamination"). The hazardous substances detected were either the same as or degraded products of the compounds found on the ESL site (USEPA, 1999b).

Previous Health Assessment Activity Summary

In August of 1999, the USEPA requested the ATSDR to review the public health significance of groundwater (private well data) collected in May 1999. Specifically, the ATSDR and the NJDHSS were asked to evaluate, in the format of a Health Consultation, the potential health risk associated with lead concentrations detected in private potable wells during the May 1999 sampling event (ATSDR, 2000). The NJDHSS and the ATSDR supported the provision of alternate water supplies for two households where lead levels exceeded 15 µg/l, and recommended all households take measures to minimize lead exposure to the extent possible. The public health implications of this exposure pathway are discussed below.

Site Visit

As part of the activities conducted in support of the Health Consultation and this Public Health Assessment, staff of the NJDHSS and the ATSDR performed visits to the ESL site and other associated locations within Galloway Township in March and August 1999.

Community Concerns

The ATSDR and the NJDHSS attended a community meeting (August 17, 1999) at the request of the USEPA where the information from the May 1999 sampling event was presented to the community. Also participating were the ACHD and representatives of Galloway Township.

The community expressed concern regarding several issues including the suitability of potable well water for consumption and the potential for adverse health effects, the possibility of providing bottled or public water supplies to the area, and the perception of an unacceptably long time frame for eventual remediation of the site under the Superfund process.

Discussion

Remedial History and Environmental Contamination

From 1984 through 1988, groundwater samples were collected from private potable wells in the vicinity of the ESL site.

In May and June 1984, the ACHD collected samples from five residential wells located on Lisa Drive (less than 2,000 feet east of the site). Data showed elevated levels of VOCs in groundwater, with concentrations exceeding the Maximum Contaminant Level (MCL) and Removal Action Level (RAL) for vinyl chloride (150 µg/L maximum) and the MCL for tetrachloroethylene (2 µg/L maximum) and trichloroethylene (4 µg/L maximum) in four wells (USEPA, 1998a). All the residential wells utilized the Kirkwood-Cohansey aquifer system and were screened at a depth of 100–120 feet. The NJDEP closed the affected wells and provided new, deeper wells (170–240 feet; below a locally continuous clay aquatard) for residents.

Further sampling by the ACHD in February and August 1988 confirmed continued contamination of wells at residences on Lisa Drive, even among the deeper wells (NJDEP, 1989 a,b). Table 1 presents a summary of VOCs detected in private potable wells on Lisa Drive in 1984 and 1988.

In early 1996, the NJDEP conducted groundwater sampling at the ESL site and in surrounding areas. Monitoring wells were installed in March 1996; in April 1997, NJDEP completed an expanded site inspection which indicated that groundwater contamination on Lisa Drive was site related (NJDEP, 1996). The expanded site investigation also indicated VOC contamination of potable wells on Zurich Avenue, and Liebig Street (see Figure 2).

An initial site scoping was conducted by the United States Environmental Protection Agency (USEPA) in July 1997 (USEPA, 1997). In late 1997 and early 1998, the USEPA (Remedial Action Branch and the Environmental Response Team) conducted soil and groundwater investigations to

determine the source of VOC contamination in downgradient residential wells. Site activities included the installation of monitoring wells, soil borings, test pits, and groundwater sampling. Hazardous organic substances were determined to be present in subsurface soils significantly above background levels. On-site soil gas surveys indicated the presence of vinyl chloride, 1,1-dichloroethylene, cis-1,2-dichloroethylene, benzene, trichloroethylene, toluene, and tetrachloroethylene. Soil investigations also indicated the presence of PCBs (960 mg/kg maximum in soils) and lead (3,870 mg/kg in a test pit) together with arsenic (3 mg/kg maximum in soils), chromium (838 mg/kg in a test pit), cadmium (11.6 mg/kg in a test pit), and zinc (1,270 mg/kg in a test pit). In addition, waste materials including paints and sludges were detected in subsurface soils, and found to contain elevated levels of organic and inorganic substances. Analysis of monitoring well samples documented release of these contaminants to groundwater. USEPA's investigation of the ESL has yielded preliminary data regarding contamination of on-site soils, and on-site/off-site groundwater. Table 2 presents a summary of the maximum detected concentrations of contaminants found in these media (USEPA, 1998 a,b,c,d).

The USEPA has performed removal and stabilization actions at the ESL site. As previously stated, these activities included assessment of the groundwater pathway with respect to potable wells. The USEPA sampled 31 private wells on Leibig Street, Lisa Drive, and Zurich Avenue (see Figure 2). Table 3 summarizes VOC contamination of private potable wells sampled by the USEPA in 1999.

In addition, potable wells were analyzed for lead. Lead levels ranged from non-detect to 120 µg/L. Although most wells were below action level concentrations, six wells exhibited lead levels exceeding the USEPA action level of 15µg/L. Lead data for the 31 private potable wells are presented in Table 4. Subsequent to the referenced round of sampling, the USEPA conducted an isotope ratio analysis which indicated the lead detected in residential wells was not site related.

Groundwater remediation at the site will be addressed through the Remedial Investigation/Feasibility Study process. The site was included on the National Priorities List (NPL) in July, 1999 (USEPA, 1999a).

Pathways Analysis

Assessment Methodology

To determine whether nearby residents are exposed to contaminants from the site, ATSDR evaluates the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: (1) a **source** of contamination; (2) transport through an **environmental medium**; (3) a **point** of human exposure; (4) **route** of human exposure; and, (5) a **receptor population**. ATSDR classifies exposure pathways into three groups: (1) "**completed pathways**," that is, those in which exposure is reasonably likely to have occurred, to occur, or to occur in the future; (2) "**potential pathways**,", that is, those in which exposure might have occurred, may be occurring, or may yet occur; and, (3) "**eliminated pathways**," that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified.

After the pathways are designated as completed, potential, or eliminated, ATSDR usually follows a two-step methodology to comment on public health issues related to exposure pathways at hazardous waste sites. First, ATSDR obtains representative environmental monitoring data for the site of concern and compiles a list of site-related contaminants. ATSDR compares this list of contaminants to health-based values (health comparison values or HCVs) to identify those contaminants that do not have a realistic possibility of causing adverse health effects. These comparison values are conservative, because they include ample safety factors that account for most sensitive populations. ATSDR typically uses HCVs as follows: if a contaminant is never found at levels greater than its comparison value, ATSDR concludes the levels of corresponding contamination are not at levels of public health concern. If, however, a contaminant is found at levels greater than its HCV, ATSDR designates the pollutant as a contaminant of concern and examines it further in the assessment. Because HCVs are based on conservative assumptions, the presence of concentrations greater than a HCV does not necessarily suggest that adverse health effects will occur among the exposed population. More information on the comparison values can be found in the Glossary, located in the Appendix.

Second, for the remaining contaminants, ATSDR evaluates site-specific conditions to determine what exposure scenario is realistic for a given exposure pathway. Given this exposure scenario, ATSDR determines a dose and compares this dose to scientific studies to determine whether the extent of exposure indicates a public health hazard.

Exposure Pathways

Completed exposure pathways at the ESL site were associated with the potable and domestic use of contaminated groundwater. During the period 1984 through 1988, sampling conducted by the ACHD indicated VOC contamination of private potable wells at levels of public health concern. New and replacement wells drilled subsequent to the 1984 sampling were not installed with double

casings and showed low level contamination most likely originating from the upper (shallow) aquifer (see Table 1).

Recent sampling conducted by the USEPA in 1999 shows continued impact by site-related VOCs to private potable wells in the Lisa Drive, Liebig Avenue, and Zurich Avenue areas (see Table 3). Data and information available to the NJDHSS and the ATSDR indicate that residents with actually or potentially affected wells have employed point of entry treatment (POET) systems, or an alternative potable water source, minimizing or eliminating the potential for exposure to volatile organic groundwater contaminants.

In addition, water samples from some homes in these same areas are also exhibiting significant lead contamination, although the USEPA has determined through isotope analysis that the lead is not site-related. As an interim emergency measure, the USEPA provided an alternative water source to those residences on Liebig Ave., Lisa Dr., and Zurich Ave., whose potable wells exhibited lead levels exceeding the 15 µg/L action level (see Table 4). This action served to temporarily interrupt the completed exposure pathway to lead for those residents. This has been discontinued subsequent to USEPA's determination that off-site lead contamination is not site related. Data and information available to the NJDHSS and the ATSDR indicate that residents with actually or potentially affected wells have employed point of entry treatment (POET) systems, or an alternative potable water source, minimizing or eliminating the potential for exposure to lead in groundwater.

Data and information available to the NJDHSS and the ATSDR suggest that private potable wells have been impacted by site-related VOCs. This contamination was most significant during the four year period from 1984 -1988. Based upon this information, the NJDHSS and the ATSDR have determined that a completed human exposure pathway to VOCs and lead existed in the past. Because the public health significance of current groundwater contamination is dependent upon the continued use of POET systems or the utilization of alternative water sources, this potential pathway will also be evaluated.

The total number of persons associated with this exposure pathway, based upon the number of households, is estimated to be approximately 100 (about 40 residences in the Lisa Drive, Liebig Avenue, and Zurich Avenue areas, at 2.5 persons per residence). (A summary of the completed human exposure pathways associated with private potable wells at the ESL site is presented in Table 5.)

Other Pathways

Although a potential exposure pathway to on-site soils likely existed in the past at the ESL site through routine access or trespassing on the site, the possibility of contact and/or ingestion of on-site soils has been interrupted through USEPA's removal actions. Contaminated surface soils, hazardous debris, and most physical hazards have been removed or stabilized.

Contaminated groundwater is the only environmental medium that has been associated with documented or suspected human exposure pathways (ingestion, inhalation, and dermal exposures) at the ESL site. There are no data or information describing air contamination, and there are no permanent surface water features at the site.

Contaminants of Concern (COC)

Tables 1 and 3 list VOC levels detected in private potable wells impacted by the site. These levels are shown with the associated health comparison levels (HCVs). Compounds detected above these HCVs are referred to as contaminants of concern and are shown in bold type in the tables. Lead, although not considered to be site related, will also be evaluated.

Public Health Implications

Toxicological Evaluation

The toxicological evaluation in a Public Health Assessment is a comparison of the estimated exposure dose (i.e., the amount of a substance individuals affected by an exposure pathway are exposed to daily) to an appropriate health guideline.

The exposure doses for ingestion of drinking water were calculated in the following manner. The maximum concentration for a contaminant was multiplied by the average water ingestion rate for adults, 2 liters per day, or children, 1 liter per day. This product was divided by a standard assumption of the weight for an adult, 70 kilograms (154 pounds), and for a child, 16 kilograms (35.2 pounds).

To evaluate non-carcinogenic health effects, the Agency for Toxic Substances and Disease Registry (ATSDR) has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. This health guideline is an estimate of a level of daily human exposure to a contaminant below which non-cancerous adverse health effects are unlikely. MRLs are developed for each route of exposure (e.g., ingestion and inhalation) and for the length of exposure (e.g., acute, less than 14 days; intermediate, 15–364 days; and chronic, 365 days or more). Because ATSDR has no methodology to determine amounts of chemicals absorbed through the skin, the Agency does not have MRLs for skin exposure. ATSDR presents information on MRLs in its series of Toxicological Profiles on hazardous substances. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. If ATSDR has not developed an MRL for a contaminant, the U.S. Environmental Protection Agency (EPA) Reference Dose (RfD) is used (if available). The RfD is an estimate of the daily exposure of the human population to a potential hazard that is likely to be without risk of a non-carcinogenic adverse health effects during a person's lifetime.

Carcinogenic risk from the ingestion of contaminated drinking water was calculated by multiplying the estimated exposure dose by the EPA Cancer Slope Factor (a health guideline). The result of this calculation was then adjusted to reflect 20 years of exposure for adults (ATSDR's worse case estimate of exposure at this site) and at 4 years for adults and children (representing the period 1984 to 1988, as discussed earlier). The actual risk of cancer is probably lower than the calculated number. The method used to calculate EPA's Cancer Slope Factor assumes that high dose animal data can be used to estimate the risk for low dose exposures in humans. The method also assumes that there is no safe level for exposure.

Public Health Implications of Exposure Pathways

For the contaminants of concern listed in Tables 1 and 3, specific doses were calculated for a chronic (greater than 365 days) exposure scenario given the exposure assumptions (see Assessment Methodology, Pathway Analysis section, above). A comparison of the calculated dose for children to the Lowest Observed Adverse Effect Level (LOAEL) for a given contaminant, found in the most recent ATSDR Toxicological Profile for that contaminant, was performed for chronic exposure scenarios. The ratio obtained from this comparison is a measure of how far the calculated dose is above (or below) the LOAEL for each specific contaminant. The results of this comparison are presented in Table 6.

As can be seen from the data in Table 6, all but one (vinyl chloride) of the calculated dose ratios were much lower (by 3 to 6 orders of magnitude) than the lowest level in the literature that has produced an adverse non-cancer health effect in either human or animal studies. Therefore, chronic exposures to all these contaminants were not at levels that are likely to result in adverse non-cancer health effects at the site. For vinyl chloride, however, the calculated dose was estimated to be only 15.8 times below the LOAEL for this contaminant cited in the ATSDR Toxicological Profile for this element. Vinyl chloride will be discussed below.

In addition to showing comparison ratios, Table 6 also lists calculated lifetime excess cancer rates (LECR) for contaminants that have a USEPA cancer slope factor. All but two, shown in bold type, have calculated LECR's in the range of "no apparent increased risk" (10^{-5}) to "no increased risk" (10^{-6}). Exposures associated with vinyl chloride and 1,1-dichloroethylene are discussed in depth to determine the public health implications of these contaminants. As can be seen in Table 6, the calculated LECR's for these contaminants are in the 10^{-4} range, which represents a "low increased risk" of cancer.

1,1-Dichloroethylene

The average estimated daily dose of 1,1-dichloroethylene in residential drinking water is less than the MRL for adults and children. Therefore, adverse non-carcinogenic health effects are unlikely to occur in non-hypersensitive individuals.

1,1-Dichloroethylene is a possible human carcinogen based on studies in animals. The evidence for the carcinogenicity of 1,1-dichloroethylene in animals is minimal. Slight increases in some types of liver cancer have been observed in rats. Other types of cancers have also been observed. However, their relevance to human cancer risk is questionable. No studies were located regarding cancer in humans after oral exposure to 1,1-dichloroethylene. Therefore, although a low increased risk of liver cancer is possible from exposure to 1,1-dichloroethylene in the residential drinking water at the site, there is no clear evidence that there would be an actual increase in risk of liver or other cancers in exposed persons (ATSDR, 1994).

Vinyl Chloride

Exposure to vinyl chloride has occurred to some residents through use of their private well water. The residents are exposed to vinyl chloride through ingestion of, inhalation of, and dermal contact with contaminated water. The average level detected in private wells is 18.7 μg/L. The concentration of vinyl chloride detected exceeds the New Jersey MCL of 2 μg/L and would result in calculated exposure doses exceeding ATSDR's chronic ingestion MRL (2×10^{-5} mg/kg/day), for both adults and children.

Long-term exposure to vinyl chloride at the average concentration identified in the private wells could result in mild health effects to the liver, but not to other organ systems. This conclusion is based on a study of rats exposed to vinyl chloride in feed for 149 weeks . There was an increase in the incidence of basophilic nuclei in liver tissue at a dose of 0.018 mg/kg/day. This dose is approximately 16 times greater than the exposure dose calculated for children at the site. Although the estimated amount of vinyl chloride ingested by people from drinking water exceeded the chronic oral MRL, no adverse health effects at that amount have been reported in the literature. It is important to remember that the chronic oral MRL has a 1,000-fold safety factor built into it (i.e., the observed liver damage occurred in the rats at a level 1,000 times above the MRL level). Animal studies do not report adverse health effects after ingestion of vinyl chloride at the amount estimated to have occurred at the ESL site. Therefore, it is not anticipated that any non-carcinogenic health effects would occur because of exposure to vinyl chloride.

The USEPA has classified vinyl chloride as a human carcinogen. A human carcinogen is a chemical for which there is sufficient evidence from human epidemiological studies that it causes cancer. Most of what is known about how vinyl chloride affects human health is from studies of people exposed in the workplace. In particular, vinyl chloride is identified as a known human carcinogen because people who inhaled very high concentrations in the workplace, over many years, were shown to have a significantly increased risk of developing liver cancer. Such occupational exposures to vinyl chloride are well above that seen in these private wells. Oral exposure of laboratory animals to vinyl chloride has caused liver toxicity and cancer of the liver (ATSDR, 1997b).

Based upon the average concentration found in residential well water, the calculated lifetime excess cancer risk (LECR) associated with oral exposure to vinyl chloride represents a low increased risk (10^{-4}) of cancer.

Lead

Although the USEPA does not consider the lead found in private wells to be associated with the ESL site, lead was detected at levels of public health concern (> 15 µg/l) on Liebig Ave., Lisa Drive, and Zurich Avenue (Table 4). To evaluate the public health significance of completed human exposure pathways associated with oral exposure to lead, chronic exposure doses were calculated. Toxicological estimates were calculated for adults assuming a 70 kg body weight and ingestion rate of 2 liters of water per day. Similarly, estimates for children assumed a 16 kg body weight, and an ingestion rate of 1 liter of water per day. Exposure durations were assumed to occur for a period greater than1 year.

To determine the public health significance of exposure to lead in potable wells, the maximum detected concentration (120 µg/L; wells on Liebig Ave and Lisa Drive, see Table 4) were utilized for calculation of exposure doses. Calculated exposure doses for adults were estimated at approximately 0.0032 mg/kg/day. This dose exceeds the lowest No Observed Adverse Effect Level (NOAEL), but is less than the Lowest Observed Adverse Effect Level (LOAEL) cited in the ATSDR Toxicological Profile for Lead (ATSDR, 1997a, reviewing Krasovskii, et. al.; 1979) with respect to oral exposures of intermediate or chronic duration. At such levels, non-carcinogenic adverse health effects would not be expected in non-hypersensitive individuals. Calculated exposure doses for children were estimated at approximately 0.007 mg/kg/day. Exposure doses for children exceeded the LOAEL (ATSDR, 1997a) for hematological, hepatic, reproductive, and neurological effects in animals (rats) for oral exposures (lead acetate in water) of intermediate duration as cited in the ATSDR Toxicological Profile for Lead. Similarly, estimated exposure doses for children which utilized the second highest concentration of lead detected (44 µg/L; well on Zurich Ave., see Table 4) roughly achieved the LOAEL cited above. Exposure doses based upon lead concentrations of less than 15 µg/L would not be expected to be associated with adverse health outcomes in non-hypersensitive individuals (ATSDR, 1997a).

Some animal studies have linked exposure to lead with cancer. However, there is inconclusive evidence relating oral lead exposure with cancer.

ATSDR Child Health Initiative

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances emitted from a waste site. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are shorter than adults, which means they breathe

dust, soil, and heavy vapors closer to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

In addition to the organic contaminants discussed above, the NJDHSS and the ATSDR evaluated the likelihood for children ingesting lead contaminated well water to be exposed to lead at levels of public health concern. Children who ingest well water containing lead at the maximum documented concentration are likely to be exposed at levels where adverse health effects are possible. Children ingesting well water at levels less than the maximum detected concentration would be at a comparatively lesser risk. However, it is prudent from the public health perspective to minimize children's exposure to lead to the greatest extent as is practical.

Health Outcome Data

Health outcome data were not reviewed for the ESL site. Because of the small population size, statistical analysis of existing databases would be of limited usefulness in the determination of adverse health outcomes.

Public Comment

This Public Health Assessment was released for public comment during the period October 24 through November 24, 2001. No comments were received.

Conclusions

Hazard Category

The Emmell's Septic Landfill site is evaluated by the ATSDR and the NJDHSS to have represented a public health hazard in the past. This evaluation is based upon a completed exposure pathway associated with site-related contaminants (vinyl chloride, 1,1- dichloroethylene) in off-site potable wells at levels which may result in a low increased risk of cancer. Although site-related contaminants continue to impact off-site potable wells as denoted in Table 3, the ATSDR and the NJDHSS categorize the site as currently constituting no apparent public health hazard. The determination of the public health implications of this exposure is dependent upon: the location of potentially affected wells relative to the contamination plume, the degree to which individual homeowners use their wells for potable purposes, and the effectiveness of individual homeowners mitigative actions taken to reduce or eliminate exposure. Information available to the NJDHSS and

the ATSDR indicates that all potentially affected residences are utilizing POET systems and/or alternative water supplies effectively minimizing or interrupting the potential for exposure.

In addition, the nature and extent of groundwater contamination at the ESL site is not fully delineated. The USEPA is currently engaged in the implementation of the Remedial Investigation (RI) for the ESL site which will document the site's potential impact across environmental media. Data from the groundwater operable unit of this RI, together with ongoing monitoring of private wells in the environs of the site, and threatened areas downgradient, will determine the potential public health implications of groundwater contamination. The public health hazard currently posed by the ESL site will be reevaluated subsequent to review of new data and information when available, and revised if warranted.

While most private wells (as denoted in Table 4) are not now exhibiting lead contamination at levels where intervention is indicated (> 15 µg/L), the presence of any lead in potable water supplies is undesirable.

While current interim measures conducted by the USEPA are justified in the context of present site data and information, future groundwater data regarding the contaminant plume migration may necessitate additional actions.

Recommendations

Cease/Reduce Exposure Recommendations

Residents with contaminated wells should continue to use an alternative source for potable water, and/or implement individual mitigative measures to reduce VOC and lead exposure. Appropriate maintenance by homeowners of existing POET systems and other filtration systems is necessary to reduce VOC and lead exposure to insignificant levels.

The ACHD offers a lead screening program for children. Those residents concerned about exposure to lead should take advantage of this program to accurately assess any potential lead exposure to their children.

Site Characterization Recommendations

The Remedial Investigation presently being implemented by the USEPA should address the issue of plume migration beyond the present study area. Of particular importance is evaluation of where additional areas of private potable wells threatened by the plume from the ESL site may be located.

Public Health Action Plan

The Public Health Action Plan (PHAP) for the Emmell's Septic Landfill Site contains a description of the actions to be taken at or in the vicinity of the site. The purpose of the PHAP is to ensure that this Public Health Assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR and NJDHSS to follow up on this plan to ensure its implementation. This Public Health Assessment will be placed in repositories that also contain copies of the previous Health Consultation, and will be provided to persons who request it. The public health actions taken or to be implemented are as follows:

Public Health Actions Undertaken by ATSDR/NJDHSS:

Available data and information have been evaluated by ATSDR/NJDHSS to determine public health implications of human exposure pathways in the past and present associated with VOCs and lead detected in private wells.

Public Health Actions Planned By ATSDR/NJDHSS:

The ATSDR and the NJDHSS will work with the USEPA to provide a public health review of future groundwater and private well data generated during ongoing site investigation and remedial activities to further evaluate the public health significance of the ESL site.

An assessment of the need for additional community education will be conducted in conjunction with, and as a supplement to, those which have been implemented by the USEPA and the ACHD.

The ATSDR and the NJDHSS will reevaluate and revise the Public Health Action Plan (PHAP) as warranted. New environmental, toxicological, and health outcome data, changes in conditions at the ESL site, or the results of implementing the above proposed actions may determine the need for additional actions at the ESL site by the NJDHSS and/or the ATSDR.

Certification

This Public Health Assessment was prepared by the New Jersey Department of Health and Senior Services (NJDHSS) 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 begun.

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

for Richard Gillig
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Toxicological Profiles Utilized:

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ATSDR Toxicological Profile for 1,2-Dichloroethene, August 1996.

ATSDR Toxicological Profile for 1,2-Dichloroethane, August 1999.

ATSDR Toxicological Profile for 1,1,1-Trichloroethane, August 1995.

ATSDR Toxicological Profile for Trichloroethene, September 1997.

ATSDR Toxicological Profile for Tetrachloroethene, September 1997.

ATSDR Toxicological Profile for Chloroform, September 1997.

ATSDR Toxicological Profile for Benzene, September 1997.

ATSDR Toxicological Profile for Methylene Chloride, September 1998.

ATSDR Toxicological Profile for 1,1,2,2-Tetrachloroethane, August 1996

ATSDR Toxicological Profile for 1,1,2-Trichloroethane, December 1989.

Appendices

Tables

Table 1. Emmell's Septic Landfill. Summary of maximum levels of volatile organic compounds detected in private potable wells on Lisa Drive in 1984 and 1988. Concentrations in µg/L.

Compound	ACHD 1984[1]	NJDEP 1984[2]	ACHD 1988[3]	Comparison Value
1,1-Dichloroethane	34	16	34	50 NJMCL
1,2-Dichloroethane	21	ND	4	2 NJMCL
1,1-Dichloroethylene	20	7	120	2 NJMCL
Cis-1,2-Dichloroethylene	37	37	ND	70 NJMCL
1,1,1-Trichloroethane	180	46	14	30 NJMCL
Vinyl Chloride	6	ND	38	0.02 CREG
Chlorobenzene	10	2.5	10	100 NJMCL
Tetrachloroethylene	5	5	2	1 NJMCL
Trichloroethylene	25	11	21	1 NJMCL
Chloroform	63	ND	ND	6 CREG
1,2-Dichlorobenzene	4	ND	ND	600 NJMCL
Benzene	ND	ND	5	1 NJMCL
Methylene Chloride	ND	ND	3	2 NJMCL

Contaminant of Concern, **in Bold**, are compounds detected equal to or above Health Comparison Values (HCV).
1 - Sampling conducted by the Atlantic County Health Department, June 1984, 5 wells. (USEPA, 1997)
2 - Sampling conducted by the New Jersey Department of Environmental Protection, September 1984, 1 well. (USEPA, 1997)
3 - Sampling conducted by the Atlantic County Health Department, February 1988, 9 wells. (USEPA, 1997)
NJMCL = New Jersey Maximum Contaminant Level
CREG = ATSDR Cancer Risk Evaluation Guide

Table 2. Emmell's Septic Landfill. Current Soil and Groundwater analytical data; compiled by the USEPA 1996 - 1998, maximum detected concentrations.

Compound	Soils (mg/kg)	On-Site Groundwater (ug/l)	Off-Site groundwater (ug/l)	Test Pits (ug/kg)
Vinyl Chloride	ND	1,200 *	150	ND
Chloroform	ND	25	ND	ND
1,1-Dichloroethane	ND	200	23	ND
1,1-Dichloroethylene	ND	96 *	ND	ND
Cis-1,2-Dichloroethylene	1.9	6,100 *	140	ND
Trans-1,2-Dichloroethylene	.003	42 *	ND	ND
1,1,1-Trichloroethane	.014	1,400 *	4	ND
1,1,2-Trichloroethane	ND	50	37	ND
Trichloroethene	.22	40 *	4	ND
Tetrachloroethene	ND	2	2	ND
Chlorobenzene	0.89	204	16	2.8
1,2-Dichlorobenzene	0.53	14	ND	32
1,4-Dichlorobenzene	1.4	48	ND	60
Carbon Tetrachloride	ND	89 *	ND	ND
Xylene	2.51	400 *	210	151
Benzene	ND	73 *	4	ND
Ethyl Benzene	0.47	78 *	4	34
Toluene	5.3	8,300 *	78	0.44
MTBE	0.067	31 *	ND	0.015
Naphthalene	0.032	64	18	105
PCB's	960	ND	ND	ND
Arsenic	3	65	9 ***	ND
Chromium	33	180	3.8 **	838
Lead	140	160	19 ***	3,870
Cadmium	9.6	4	15 ***	11.6
Zinc	350	1,200	18.2 **	1,270

* = NJDEP MW 1 or Microwell cluster GW11. Off-site Groundwater sampled at MW 2
** = Sampled By USEPA; May 4, 1999. *** = Sampled by USEPA; October 1, 1999

Table 3. Emmell's Septic Landfill. Volatile Organic Compounds detected in private potable wells on Liebig Avenue, Lisa Drive, and Zurich Avenue. Frequency of detection and concentration range in µg/L. Sampling conducted by the USEPA; May 3-4, August 26-27, December 2-3 1999 (Standard method 524.2).

Compound	Liebig Avenue (N=11)	Lisa Drive (N=10)	Zurich Avenue (N=7)	Comparison Value
1,1,2,2-Tetrachloroethane	1/11 0.87	1/10 1.8	ND	0.2 CREG
Cis-1,2-Dichloroethylene	3/11 0.5 - 6.0	ND	ND	70 NJMCL
Naphthalene	1/11 0.42	2/10 1.1 - 2.4	ND	200 EMEG
1,1,1-Trichloroethane	1/11 0.54	ND	ND	30 NJMCL
Benzene	1/11 0.9	ND	ND	1 NJMCL
1,1-Dichloroethane	1/11 5.0	ND	ND	50 NJMCL
1,1,2-Trichloroethane	1/11 4.0	ND	ND	0.6 CREG
Trichloroethylene	1/11 1.0	ND	ND	1 NJMCL
Vinyl Chloride	1/11 12.0	ND	ND	0.2 CREG
Methylene Chloride	ND	2/10 2.9 - 3.2	3/7 0.8 - 2.8	2 NJMCL
1,2-Dichloropropane	ND	ND	1/7 2.6	5 NJMCL

Contaminant of Concern, **in Bold**, are compounds detected at or above Health Comparison Values (HCV).
CREG = ATSDRCancer Risk Evaluation Guide
NJMCL= New Jersey Maximum Contaminant Level
EMEG = ATSDR Environmental Media Evaluation Guide
ND = Not Detected
NA = Not Available

Table 4. Emmell's Septic Landfill. Lead levels detected in private potable wells on Liebig Avenue, Lisa Drive, and Zurich Avenue. Frequency of detection and concentration range in µg/L.

Location	Frequency of Detection	Number of Wells with Maximum level >15 µg/l	Range (µg/l)
Liebig Avenue	9 / 12	3 / 12	ND - 120
Lisa Drive	10 / 10	2 / 10	ND - 120
Zurich Avenue	7 / 9	1 / 9	ND - 44.7

Sampling conducted by the USEPA; May 3-4, August 26-27, December 2-3 1999.

Table 5. Summary of Completed Human Exposure Pathways Associated with Potable Wells at ESL Site.

Completed Human Exposure Pathways							
Name	**Source**	**Media**	**Point of Exposure**	**Route of Exposure**	**Exposed Population**	**Time Period**	**Number Exposed**
Private Wells VOCs	Emmell's Septic Landfill	Groundwater	Household	Ingestion (Other Domestic Use) Inhalation Dermal	Household Residents	1984 1988	~100
Private Wells Lead	Unknown	Groundwater	Household	Ingestion	Household Residents	1984 1988	~ 100

Table 6. Comparison of Calculated Doses (Child) with Lowest Observed Adverse Effect Levels (LOAEL)[1,2] and Lifetime Excess Cancer Risk (LECR) estimates.

Contaminant of Concern	Comparison Ratio Chronic Exposure(3)	LECR		
		Child 4 Year	Adult 4 Year	Adult 20 Year
1,2-Dichloroethane	6.03×10^{4}	4.0×10^{-6}	1.9×10^{-6}	9.4×10^{-6}
1,1,1-Trichloroethane	1.33×10^{5}	NSF (4)	NSF	NSF
Tetrachloroethylene	1.5×10^{6}	NSF	NSF	NSF
Trichloroethylene	2.76×10^{5}	NSF	NSF	NSF
Chloroform	3.81×10^{3}	1.4×10^{-6}	6.0×10^{-7}	3.1×10^{-6}
Benzene	1.36×10^{5}	3.04×10^{-7}	1.39×10^{-7}	6.99×10^{-7}
Methylene Chloride	6.97×10^{5}	8.04×10^{-8}	3.66×10^{-8}	1.84×10^{-7}
1,1-Dichloroethylene	2.9×10^{5}	1.06×10^{-4}	4.79×10^{-5}	2.4×10^{-4}
Vinyl Chloride	15.8	1.53×10^{-4}	7.0×10^{-5}	3.5×10^{-4}
1,1,2,2-Tetrachloroethane	5.29×10^{5}	9.27×10^{-7}	4.23×10^{-7}	2.12×10^{-6}
1,1,2-Trichloroethane	7.8×10^{5}	8.12×10^{-7}	3.7×10^{-7}	1.9×10^{-6}

Notes:

1 - Values in table represent the number obtained by dividing the LOAEL by the calculated dose. This is a measure of how far above or below the calculated dose is from the LOAEL (i.e., how many times above or below the LOAEL). See Appendix C for a more detailed definition of a LOAEL.

2 - LOAEL's were obtained from ATSDR Tox Profiles for each contaminant of concern (see references).

3. All levels below the LOAEL

4. NSF - No Slope Factor

Figures

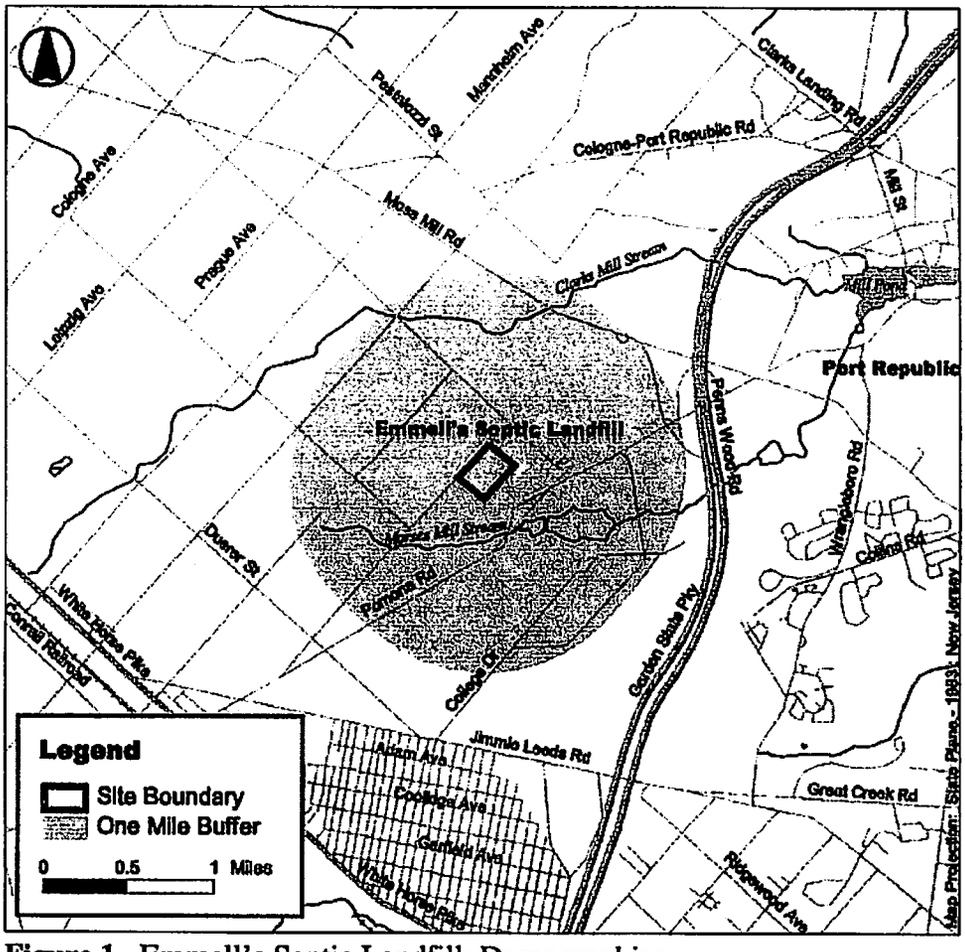

Figure 1. Emmell's Septic Landfill; Demographics.

Total Population	2,108		
White	1,784	Children aged 6 and Younger	29
Black	288	Adults aged 65 and older	25
American Indian	2	Females Aged 15–44	1
Asian	18		
Other	16		
Hispanic	57		

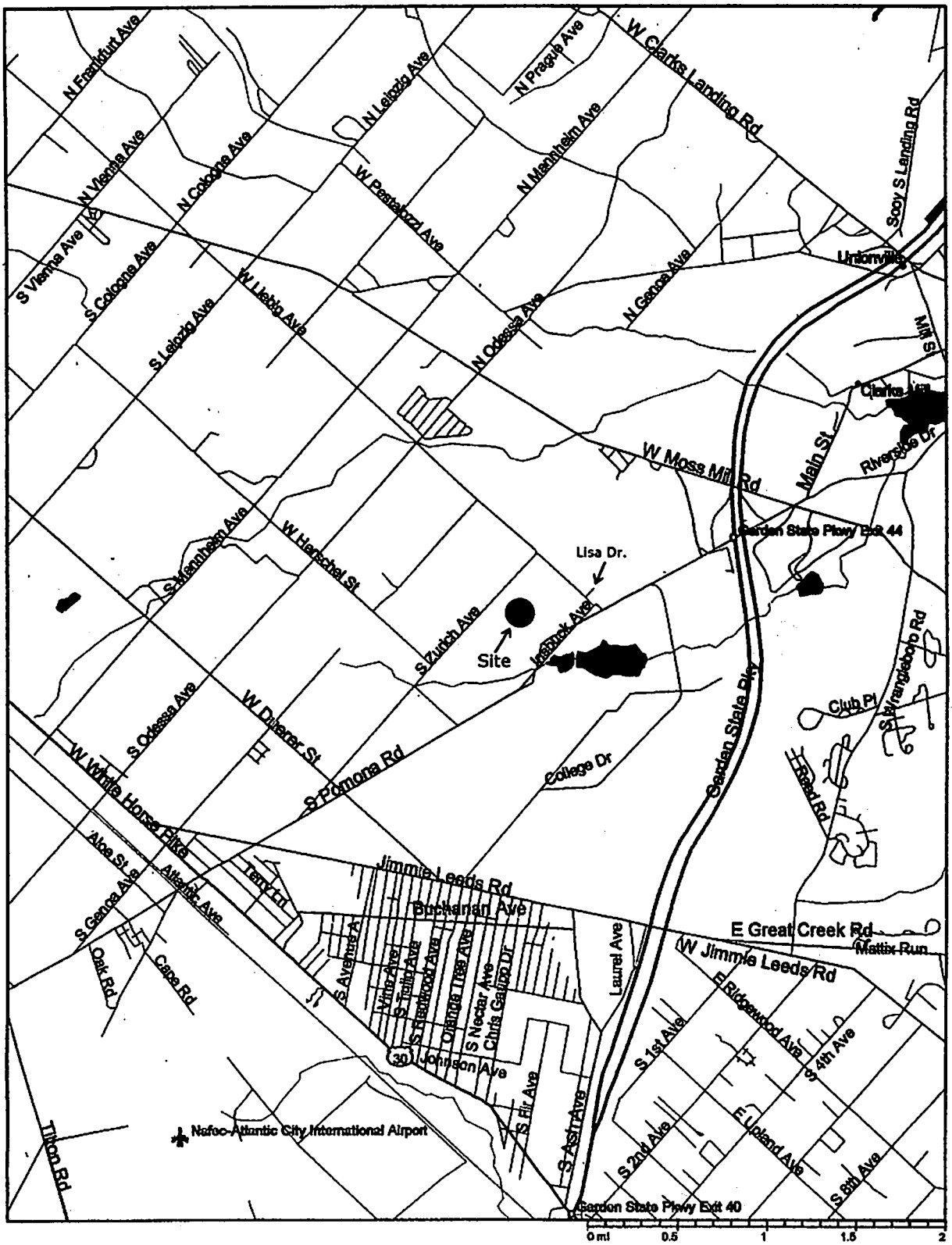

Figure 2. General Site Location

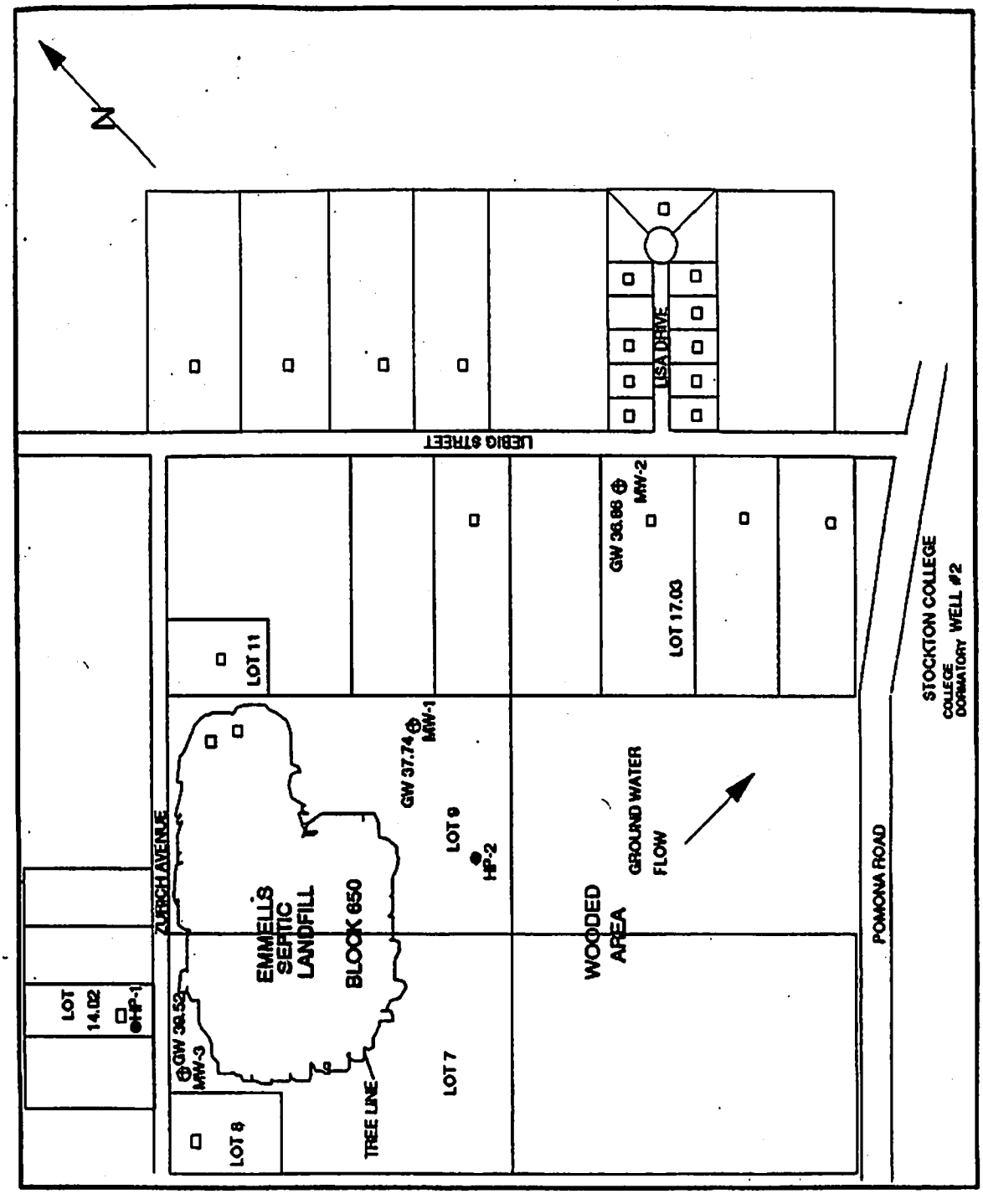

Figure 3. ESL site map.

Glossary

ATSDR Plain Language Glossary of Environmental Health Terms

Absorption: How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Acute Exposure: Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.

Additive Effect: A response to a chemical mixture, or combination of substances, that might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

Antagonistic Effect: A response to a mixture of chemicals or combination of substances that is less than might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

ATSDR: The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Background Level: An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.

Biota: Used in public health, things that humans would eat – including animals, fish and plants.

CAP: See Community Assistance Panel.

Cancer: A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.

CERCLA: See Comprehensive Environmental Response, Compensation, and Liability Act.

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be *chronic.*

Completed Exposure Pathway: See **Exposure Pathway.**

Community Assistance Panel (CAP): A group of people from the community and health and environmental agencies who work together on issues and problems at hazardous waste sites.

Comparison Value: (CVs) Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): **CERCLA** was put into place in 1980. It is also known as **Superfund.** This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant.**

Delayed Health Effect: A disease or injury that happens as a result of exposures that may have occurred far in the past.

Dermal Contact: A chemical getting onto your skin. (see **Route of Exposure**).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemcials of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway**.

U.S. Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance.(For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:

1. Source of Contamination,
2. Environmental Media and Transport Mechanism,
3. Point of Exposure,
4. Route of Exposure, and
5. Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: Lowest Observed Adverse Effect Level. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Malignancy: See **Cancer**.

MRL: Minimal Risk Level. An estimate of daily human exposure – by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: The National Priorities List. (Which is part of **Superfund.**) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: No Observed Adverse Effect Level. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA: Public Health Assessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Plume: A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.

PRP: **P**otentially **R**esponsible **P**arty. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP's are expected to help pay for the clean up of a site.

Public Health Assessment(s): See **PHA**.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

Public Health Hazard Criteria: PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

- Urgent Public Health Hazard
- Public Health Hazard
- Indeterminate Public Health Hazard
- No Apparent Public Health Hazard
- No Public Health Hazard

Receptor Population: People who live or work in the path of one or more chemicals, and who could come into contact with them (See **Exposure Pathway**).

Reference Dose (RfD): An estimate, with safety factors (see **safety factor**) built in, of the daily, life-time exposure of human populations to a possible hazard that is <u>not</u> likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:
- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use

"safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The Superfund Amendments and Reauthorization Act in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See **Population**).

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics: A branch of the math process of collecting, looking at, and summarizing data or information.

Superfund Site: See **NPL**.

Survey: A way to collect information or data from a group of people (**population**). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.

Synergistic effect: A health effect from an exposure to more than one chemical, where one of the chemicals worsens the effect of another chemical. The combined effect of the chemicals acting together are greater than the effects of the chemicals acting by themselves.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Tumor: Abnormal growth of tissue or cells that have formed a lump or mass.

Uncertainty Factor: See **Safety Factor**.

Urgent Public Health Hazard: This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.