Public Health Assessment for

ICELAND COIN LAUNDRY SITE
(a/k/a ICELAND COIN LAUNDRY AREA
GROUNDWATER PLUME)
VINELAND, CUMBERLAND COUNTY, NEW JERSEY
EPA FACILITY ID: NJ0001360882
DECEMBER 20, 2001

EPARTMENT OF HEALTH AND HUMAN SERVICES
C HEALTH SERVICE
for Toxic Substances and Disease Registry

HEALTH CONSULTATION

ICELAND COIN LAUNDRY SITE
(a/k/a ICELAND COIN LAUNDRY AREA GROUNDWATER PLUME)

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EPA FACILITY ID: NJ0001360882

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.

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Summary

The Iceland Coin Laundry (ICL) site is an area of contaminated groundwater located in a commercial/residential area of the City of Vineland, Cumberland County, New Jersey.

In 1987 and 1990, groundwater samples were collected from a private potable well located on Garrison Road by the City of Vineland Department of Health (CVDH). Analytical results from these samples indicated the presence of volatile organic compounds (VOCs). Subsequently, between December 1990 and September 1991, the CVDH collected samples from fifty-five potable wells located in the area. The primary contaminants detected in potable well samples were trichloroethylene (TCE), tetrachloroethylene (PCE), 1,2-dichloroethylene (1,2-DCE; both cis- and trans- isomers), and mercury.

Based on a review of analytical data from groundwater samples collected in the area, the contaminated groundwater plume area encompasses all or a portion of South Delsea Drive, Dirk Drive, Garrison Road, Lois Lane, South Orchard Road, West Elmer Road, and West Korff Drive.

As a result of the private potable well contamination, the New Jersey Department of Environmental Protection (NJDEP) installed point of entry treatment units at the affected residences as a temporary remedial measure until public supply water mains could be extended to the area. Public supply water mains were extended to the affected residences in these areas in 1994, and to an additional 91 homes by early 1996. The majority of the private potable wells in the area have been reported to be sealed. Currently, all affected residences are connected to the public supply wells.

In 1995-1996, the NJDEP conducted an expanded site investigation in the area. This investigation included soil and groundwater sampling, and concluded that the former Iceland Coin Laundry and Dry Cleaning (ICLDC) facility contributed to the groundwater contamination in the area. In addition, contamination was also detected in samples collected from areas not expected to be impacted by the ICLDC, which suggests the possibility of other sources contaminating the groundwater.

To date, remedial actions at the site have been limited to extension of the public water supply to affected residences. Studies are currently underway by the NJDEP to consider various alternative remedial designs for the site. The ICL site was proposed for addition to the National Priorities List (NPL) in July 1999, and was placed on the NPL on October 22, 1999.

Based on a weight-of-evidence analysis of the health and environmental information compiled, the ICL site is considered by the ATSDR and the NJDHSS to have represented a public health hazard in the past because of exposures to VOCs documented in private wells on West Korff Drive and Garrison Road. This determination is based on the following considerations: 1) the presence of completed exposure pathways in the past (through use of private well water) to VOCs

including PCE, and TCE; 2) the presence of VOCs at levels of public health concern in private wells on West Korff Drive and Garrison Road, and, 3) epidemiologic studies from other communities suggesting that exposure to TCE and PCE may increase the risk of certain childhood cancers and adverse neurological effects.

Current site conditions and available data indicate that exposure to contaminants from the ICL site through the ingestion of groundwater is no longer occurring. The exposure pathway through use of private well water was interrupted by interim remedial measures and the provision of a public water system to those residences with contaminated wells. However, the groundwater contamination plume has not yet been fully delineated. For these reasons, the ATSDR and the NJDHSS categorize the ICL site as currently constituting no apparent public health hazard.

The ATSDR and the NJDHSS recommend continued monitoring of the ICL site at an appropriate interval to ensure the groundwater plume remains delineated, and does not impact currently unaffected private potable wells in the general area of the site.

Purpose and Health Issues

This Public Health Assessment evaluates the public health issues associated with the Iceland Coin Laundry (ICL) site, which was proposed for inclusion on the National Priorities List (NPL) in July 1999, and was placed on the NPL on October 22, 1999 (USEPA,1999a). NPL or "Superfund" sites represent those sites that are associated with significant public health concern in terms of the nature and magnitude of contamination present, and the potential to adversely impact the health of nearby populations.

This document will evaluate human exposure pathways associated with known contaminated environmental media within or associated with the ICL site and recommend actions consistent with protection of the public health.

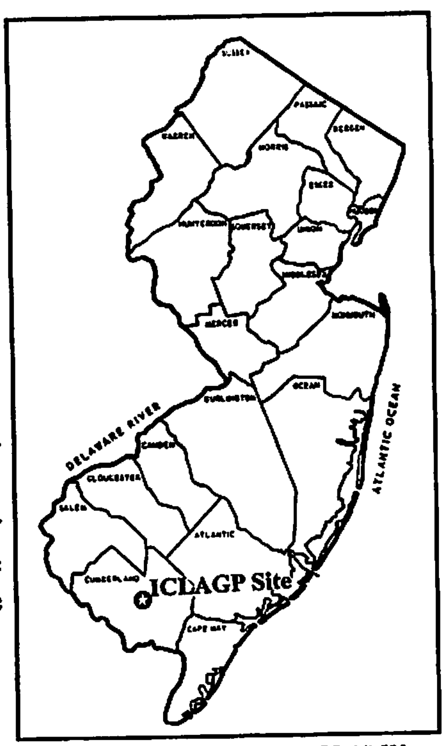
At the ICL site, the known contaminated medium is groundwater. The primary exposure pathway being considered is the ingestion of water from contaminated private potable wells in the past.

Background

Site Description and History

The ICL site is located within a generally residential/commercial area in the southern portion of Vineland City, Cumberland County (see inset and Figure 1; Appendix). The ICL site has also been known as the Garrison Road Well Contamination site and the Iceland Coin Laundry Area Groundwater Plume (ICLAGP) site.

From 1963 to 1971, the Iceland Coin Laundry and Dry Cleaning (ICLDC) facility operated from a building located at 1888 South Delsea Drive. The ICLDC operated four coin-operated dry cleaning units of an 8-pound capacity, with each unit using 4 gallons of tetrachloroethylene (perchloroethylene or PCE), however, it is not known how often the units were refilled. The effluent from these dry cleaning units, as well as 10 other washing machines, discharged to an on-site septic tank. Since 1972, the building has been solely utilized for retail and storage operations (NJDEP, 1998).



39° 27' 26.1"N 75° 02' 50.1" W

The discharge practices of the ICLDC resulted in contamination of underlying groundwater. On September 3, 1987, the City of Vineland Department of Health (CVDH) collected a sample from a residential potable well on Garrison Road. The sample result showed the presence of trichloroethylene (TCE) at 8 parts per billion (ppb). The NJ Maximum Contaminant Level (MCL) is 1 ppb.

Subsequently, additional samples of this and 55 other potable wells in the area were collected between August 3, 1990, and February 20, 1992 by the CVDH and the New Jersey Department of Environmental Protection (NJDEP). The primary contaminants detected in potable well samples above NJMCL and/or ATSDR comparison values were TCE, PCE, 1,2-dichloroethylene (1,2-DCE; both cis- and trans- isomers), and mercury. Other volatile organics detected below MCLs or the ATSDR comparison values included 1,1,1-trichloroethane, methylene chloride, 1,2-dichloroethane, dibromochloromethane, chloroethane and the three isomers of dichlorobenzene (NJDEP, 1998). In November 1991, point of entry treatment (POET) units were installed in 16 of the affected residences as a temporary remedial measure.

On April 13, 1993, the Vineland City Water and Sewer Utility was issued a permit by the NJDEP for the extension of a public water line to Dirk Drive, Garrison Road, Lois Lane, Orchard Road, Elmer Road, and West Korff Drive. Public supply water mains were extended to the affected residences in these areas in 1994, and to 91 additional homes by early 1996. The majority of the private potable wells in the area have been sealed. Currently, all affected residences are connected to the public water supply.

Demography and Land Use

Land use in the environs of the ICL site is predominantly residential and commercial. The wells screened in the Cohansey-Kirkwood aquifer supply most of the potable water in this area. Well records indicate that the water table in the area is encountered at depths ranging from about 8 to 40 feet below grade. Groundwater in the upper Cohansey-Kirkwood aquifer beneath the site generally flows to the southwest; groundwater in the deeper parts of the aquifer flows toward the east due to the influence of pumping in the Atlantic City area. Records of the private potable wells in the area indicate that they are screened at depths between 43 and 120 feet.

Population demographics based upon the 1990 census have been prepared by the ATSDR using area-proportion spatial analysis, and are presented in Figure 1 (see Appendix). Within a one-mile radius of the site, there are approximately 1,939 persons and 716 residences.

Previous ATSDR/NJDHSS Activity

There has been no prior activity by the ATSDR and/or the NJDHSS at the ICL site prior to initiation of this Public Health Assessment.

Site Visit

On May 3, 2000, Sharon Kubiak, Suzanne Hooper, Jim Pasqualo and Narendra P. Singh of the New Jersey Department of Health and Senior Services (NJDHSS) visited the ICL site. The NJDHSS was accompanied by representatives of the NJDEP and a regional representative of the Agency for Toxic Substances and Disease Registry (ATSDR). South Delsea Drive is a major thoroughfare in the city. The area surrounding the site includes a mixture of residential and commercial properties. The former ICL facility is presently occupied by a carpet retailer. Single family and mobile homes are adjacent to the property, as are several commercial operations.

Discussion

Based on the NJDEP's investigation and other site-related information (NJDEP, 1998), the primary public health issue associated with the ICL site pertains to groundwater contamination and its impact on the aquifer. Groundwater samples collected on site, and at locations downgradient from the septic tanks confirm a release of PCE and other volatile organic solvents which are attributable to the site.

Environmental Contamination

Private Potable Wells

As stated previously, the first private potable well exhibiting site-related contamination was documented in September 1987 on Garrison Road. On August 3, 1990, an additional sample was collected from the same well. Analytical results indicated the presence of trichloroethylene (TCE) and tetrachloroethylene (PCE) at 14 ppb and 37 ppb, respectively. On October 24, 1990, another confirmatory sample was collected by CVDH. Analytical results indicated the presence of TCE (6.8 ppb), PCE (25 ppb), and mercury (3 ppb) (NJDEP, 1998). Mercury is not likely to be associated with the ICL site.

Between 1990 to 1992, the NJDEP and the CVDH collected water samples from 55 private potable wells in the area and analyzed them for VOCs and/or mercury. The main contaminants detected were PCE, TCE, 1,2-DCE, and mercury. The maximum concentration of PCE (760 ppb) was detected in a sample from a residence located at West Korff Drive. Tetrachloroethene (PCE) was detected in nineteen out of sixty-six samples collected and analyzed. Trichloroethene (TCE) was detected in fourteen out of sixty-six samples collected, the reported maximum concentration (50.6 ppb) was from a sample collected at West Korff Drive. Dichloroethene (1,2-DCE) was detected in ten out of sixty-six samples collected, the reported maximum concentration (310 ppb) was from a sample collected at Garrison Road. Mercury was detected in fourteen out of sixty-six samples collected. Results of the analyses of the 55 wells are summarized in Table 1 (NJDEP, 1998). As stated previously, the presence of mercury is most likely not associated with the ICL site.

In November 1991, point of entry treatment (POET) units were installed in 16 of the affected residences as a temporary remedial measure. On December 29, 1992, the CVDH collected raw water samples from 13 of the 16 residences which were supplied with POET units. Volatile organic compounds were detected in five of the 13 well samples collected. Tetrachloroethene (PCE) was detected at concentrations ranging from 1.2 ppb to 38.9 ppb. Trichloroethene (TCE) was detected in 3 of the samples with concentrations ranging from 2.2 ppb to 41.7 ppb (NJDEP, 1998).

On-Site Contamination

Surface Soils

The NJDEP conducted a soil gas survey in the general area of the former ICLDC facility in November 1991 (Figure 3). Forty-one soil gas samples were collected at depths of 6 to 9 feet below ground surface and were analyzed for PCE, TCE, 1,1,1-trichloroethane (TCA) and 1,2- DCE. The maximum concentration of PCE (40,675 ppb) was detected in a sample behind the former ICLDC facility. Trichloroethene (TCE) was detected in only 2 soil gas samples at concentrations of 116.6 ppb (northwest corner of the facility) and 548.3 ppb (sample collected on South Delsea Drive in front of a used automobile lot) (USEPA, 1999b).

Soil samples were collected from the ICLDC facility by the NJDEP on August 31, 1993, from eight locations identified in the November 1991 soil gas survey as possible source areas. No evidence of contamination was found (USEPA, 2000).

Subsurface Soils

Three soil samples were collected from the area of the former cesspools located at the ICLDC facility by the NJDEP on November 15, 1995. Contaminants detected at levels below the NJDEP Non-residential Direct Contact Soil Cleanup Criteria included PCE, phthalates and other organic chemicals.

Groundwater Investigations

In 1992, the NJDEP initiated an investigation to identify potential sources for the groundwater contamination in the area of the ICL site. Seven potential sources were identified. The NJDEP investigation determined that the ICLDC used PCE in its operations and discharged Tetrachloroethene (PCE) contaminated wastewater into two on-site septic tanks. On-site groundwater samples collected by the NJDEP downgradient of the septic tanks exhibited PCE at concentrations up to 1,193 ppb. The NJDEP investigation and groundwater sampling confirmed the ICLDC facility as the primary source of the PCE, TCE and 1,2-DCE that impacted private potable wells off-site in residences adjacent to the facility.

No monitoring wells have been installed on the ICL site; however, numerous on-site groundwater samples have been collected via small diameter direct push points using a hydraulically powered soil probing unit, and by a "hydropunch" sampler using a hollow stem auger drilling rig. Groundwater samples were collected on three occasions between 1995 and 1996 (Figure 4). Tetrachloroethene (PCE), TCE, and 1,2-DCE were detected at maximum concentrations of 140 ppb, 14 ppb, and 51 ppb respectively. These data are summarized in Table 2.

The second and third groundwater sampling events occurred in May and November of 1996 respectively. Groundwater samples collected around the former ICLDC facility and down-gradient to the south/southwest contained PCE, TCE, and 1,2- DCE at levels exceeding the NJMCLs. In general, these compounds were detected in shallower levels of the aquifer close to the suspected source areas (USEPA, 2000).

Off-Site Contamination

Groundwater Investigations

There are no off-site monitoring well data for the ICL site. In 1995 and 1996, the NJDEP conducted an expanded investigation off-site, including South Delsea Drive, Dirk Drive, Garrison Road, Lois Lane, South Orchard Road, West Elmer Road, and West Korff Drive (Figure 2). This investigation included soil and groundwater sampling. It was determined that the former ICLDC facility contributed to the groundwater contamination in the area described above. In addition, contamination was also detected in groundwater samples collected from areas not expected to be impacted by the former ICLDC facility, which suggests the possibility of other sources contaminating the groundwater (NJDEP, 1998).

Contaminants detected were similar to on-site contaminants (1,2-DCE, TCE, and PCE). These data are summarized in Table 3 (USEPA,1999b). Analytical data from groundwater samples taken near the former ICLDC facility and from down-gradient private potable wells indicate the groundwater plume encompasses South Delsea Drive, Dirk Drive, Garrison Road, Lois Lane, South Orchard Road, West Elmer Road, and West Korff Drive (Figure 2), an area that extends approximately 0.6 miles from the facility. The full delineation of off-site contamination is still on-going.

Pathways Analysis

To determine whether residents in the vicinity of the ICL site were or are exposed to contaminants in the groundwater through the private potable wells, the ATSDR and the NJDHSS evaluate 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) a route of human exposure; and (5) an exposed receptor population.

The ATSDR and the NJDHSS classify exposure pathways into three groups: (1) "completed pathways," that is , those in which exposure has occurred, is occurring, or will occur; (2) "potential pathways," that is, those in which exposure might have occurred, may be occurring, or may yet occur; and (3) "eliminated pathways," that is, those which 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.

Based on the results of on and off-site groundwater sampling, the former ICLDC facility is a source of PCE, TCE, and 1,2-DCE contamination. Furthermore, groundwater sampling confirms the ICL site as the primary source of volatile organic contamination detected in private potable wells along Dirk Drive, Garrison Road, Lois Lane, South Orchard Road, West Elmer Road, and West Korff Drive, immediately downgradient from the facility. The presence of mercury is most likely not associated with the ICL site.

The ATSDR and the NJDHSS have determined that a completed human exposure pathway to VOCs and mercury existed in the past through use of contaminated private potable wells. This exposure pathway to VOCs and mercury is estimated to have occurred for as long as 33 years among residents living closest (adjacent) to the facility; from the onset of documented operation of the former ICLDC facility (1963) until 1996 when the residences in the area were connected to the public water supply.

Currently, the documented completed exposure pathway to contaminated groundwater associated with the site has been interrupted, as all of the affected, as well as non-affected but nearby residences with private potable wells, are connected to the public water supply. The NJDHSS and the ATSDR consider contaminated groundwater to constitute a potential exposure pathway at the ICL site; this determination is based upon the potential for plume migration. Based upon data and information currently available to the NJDHSS/ATSDR for review and evaluation, there are no other potential or completed exposure pathways associated with any other environmental media.

A summary of completed human exposure pathways associated with private potable wells at the ICL site is presented in Table 4.

Public Health Implications

This section contains a discussion of the potential for health effects in persons exposed to specific contaminants (for completed pathways), reviews health outcome data (as appropriate), and addresses community health concerns. Health effects evaluations are accomplished by estimating the amount (or dose) of those contaminants that a person might come in contact with on a daily basis. This estimated exposure dose is then compared to established health guidelines. People who are exposed for some crucial length of time to contaminants of concern at levels above established guidelines are more likely to have associated illnesses or disease.

Several contaminants were confirmed to be present in water from private potable wells at levels above health-based comparison values. The NJDHSS and the ATSDR have further evaluated the public health significance of past exposures to these contaminants through an examination of relevant toxicologic and epidemiologic information.

Analytical results of samples taken from private potable wells indicate that persons residing in 55 residences on Dirk Drive, Garrison Road, South Orchard Road, and West Korff Drive (homes located above the groundwater contaminant plume) were potentially exposed (through ingestion, inhalation, and dermal contact) to VOCs (TCE, PCE, and 1,2-DCE) and mercury. Most of the persons using the contaminated potable wells were not exposed to the highest levels of VOCs detected; the highest levels of exposure likely occurred among 16 residences on West Korff Drive and Garrison Road.

Toxicologic and Epidemiologic Evaluation

To assess the public health significance of completed human exposure pathways associated with oral exposure to these groundwater contaminants, exposure doses were estimated and compared to ATSDR's Minimal Risk Levels (MRLs) or USEPA Reference Doses (RfDs), when available. In addition, lifetime excess cancer risk estimates (LECRs) based on these exposure doses were calculated, when applicable.

Dose estimates were calculated for adults assuming a 70 kg body weight and ingestion rate of 2 liters of water per day for 33 years. Similarly, estimates for children assumed a 10 kg body weight, and an ingestion rate of 1 liter of water per day for ten years. Toxicological evaluation was completed for compounds detected in excess of ATSDR comparison values (TCE, PCE, 1,2-DCE, and mercury), and were based upon the maximum concentrations detected in the private potable wells (Garrison Road, and West Korff Drive).

To evaluate the possible cancer risk associated with the exposures to persons living near the ICL site the NJDHSS and the ATSDR calculated the theoretical cancer risk using the U.S. Environmental Protection Agency cancer slope factors. These calculations are based upon the assumption that there is no safe level of exposure to a chemical which may cause cancer. However, these calculated risks represent a worst case exposure scenario, and overestimate the risk associated with the exposures that occurred. This is because the theoretical cancer risk calculations do not take into account that the exposure did not occur continuously, that the human body can repair itself, and that humans may not react to these chemicals in the same way as test animals. These calculations are only used as a guide, and should be considered in combination with the evaluation of the mechanism of toxicity of the chemical(s) and the strength and weight of evidence of laboratory and epidemiological studies.

Effects of TCE and PCE

The available analyses of water from private potable well water samples indicates that VOCs (primarily TCE and PCE) were the most consistently detected contaminants. For this reason, a discussion of the current scientific knowledge regarding the public health implications of these contaminants is presented below.

The effects of exposure to TCE and PCE have been evaluated in scientific studies for their possible impact upon adult human health. Trichloroethene (TCE) and PCE are classified as probable human carcinogens by the International Agency for Research on Cancer (IARC, 1995) based on the weight of evidence from laboratory animal experiments and limited human epidemiologic studies.

Laboratory animals have been exposed to these chemicals via contaminated air, drinking water, and food. The results of these studies indicate that the nervous system and liver, and to a lesser degree the kidney and heart, are the primary organs of adult animals affected by these VOCs (ATSDR, 1997a; ATSDR, 1997b).

Following long-term, high level exposure, TCE has been shown to produce liver cancer in mice and kidney and testicular tumors in rats (ATSDR, 1997b; IARC, 1995). Chronic, high level PCE exposure produces liver cancer in mice and kidney tumors and mononuclear cell leukemia in rats (ATSDR, 1997a; IARC, 1995). The exposure levels that caused these adverse impacts in laboratory animals are many times higher than exposure levels that could have occurred through the use of contaminated drinking water (ATSDR, 1997a; ATSDR, 1997b) at this site.

Epidemiological studies of occupationally-exposed workers suggest an association between long-term inhalation exposure to high levels of TCE and increased risk of liver and biliary tract cancer and non-Hodgkin's lymphoma (IARC, 1995; ATSDR, 1997b). Increased risks of esophageal cancer, cervical cancer, and non-Hodgkin's lymphoma have been observed in workers exposed to high levels of PCE (IARC, 1995; ATSDR, 1997a). Participants in the ATSDR TCE Exposure Subregistry (approximately 4,300 individuals with exposure to TCE in drinking at levels ranging from 2 to 19,000 μg/l for as long as 18 years) have reported a variety of health problems at rates above national averages (ATSDR, 1999). However, only the rate for strokes was reported to increase with increasing concentration of TCE in drinking water. Results from the Subregistry have not documented any increased occurrence of cancer in the study population (ATSDR, 1999).

Some epidemiological studies of dry-cleaning workers suggest a possible association between long term inhalation exposure to high levels of PCE and an increased risk of cancer (ATSDR 1997a, Blair, 1979). However, the results of these studies are inconclusive because of the likelihood that the study population was exposed to petroleum solvents (known to cause cancer) at the same time. In addition, the effects of other confounding factors, such as smoking and other lifestyle variables, were not evaluated by these studies.

Effects of TCE and PCE in Children and the Fetus

Children may be particularly susceptible to the toxic effects of chemicals; fetuses may also be sensitive to toxic effects if the chemicals can cross the placental barrier. Recent epidemiologic studies suggest that fetal exposure to VOCs in drinking water could result in adverse health effects. The NJDHSS evaluated the effects of VOCs in drinking water on birth outcomes in an area of northern New Jersey (Bove et al., 1995). This exploratory study found that maternal residence during pregnancy in areas with TCE-contaminated drinking water was associated with an increased risk of birth defects of the neural tube and oral cleft. Exposure to PCE during pregnancy was associated with an increased risk of oral cleft defects. The authors concluded that their study by itself cannot determine whether the drinking water contaminants caused the reported adverse birth outcomes.

A recent ATSDR study of exposure to VOCs in drinking water and occurrence of adverse pregnancy outcomes was conducted for residents of the U.S. Marine Corps Base at Camp LeJeune, North Carolina (ATSDR, 1997c). The researchers reported a significantly decreased mean birth weight and increased small for gestational age babies for two potentially susceptible subgroups: infants of mothers older than 35 years of age and infants of mothers with histories of fetal death. However, length of exposures to VOCs was not known for the entire period during which pregnancy outcomes were evaluated. Therefore, this study provides limited evidence for a causal relationship between exposure to VOCs and the reproductive and developmental effects evaluated.

A study of childhood leukemia conducted in Woburn, Massachusetts, concluded that the incidence of childhood leukemia was associated with the mother's potential for exposure to water from specific wells contaminated with TCE and PCE, particularly for exposure during pregnancy (MDPH, 1997). The study did not find any association between the development of childhood leukemia and the child's exposure to contaminated water after birth. The Woburn study should be interpreted with caution, however, since small numbers of study subjects led to imprecise estimates of risk. A study by the NJDHSS found a statistically elevated rate of childhood leukemia in towns served by community water supplies contaminated with TCE and PCE in the years 1979 to 1987 (before current drinking water regulations had been implemented), compared to towns without a history of such contamination (Cohn et al., 1994). Overall, the associations drawn from these limited epidemiological data in humans are suggestive, yet inconclusive, that exposure to these VOCs through drinking water may cause birth defects or childhood leukemia in children exposed while a fetus. ATSDR and others are conducting or sponsoring research to clarify this possible relationship.

Comparison of Exposure Estimates with Toxicologic Information for TCE and PCE

No chronic oral MRL is available for TCE to evaluate the potential for non-carcinogenic health effects, although there is a provisional RfD (USEPA Region III) of 0.006 milligrams per kilogram per day (mg/kg/day). Estimated exposure doses for adults and children, calculated from a concentration of 50.6 ppb of TCE, were 0.0014 mg/kg/day, and 0.005 mg/kg/day, respectively. These levels are below the provisional RfD and were well below the No Observed Adverse Effects Level (NOAEL) of 50 mg/kg/day for animal studies (renal effects in rats) presented in the ATSDR Toxicological Profile for this chemical (ATSDR, 1997a). At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur. Lifetime excess cancer risk (LECR) calculations based upon the maximum detected concentration of TCE indicated no increased risk of cancer (~ 7×10^{-6}) for adults (33 years duration) or children (10 year duration).

Based upon maximum reported levels of PCE (760 ppb) detected in one private potable well (West Korff Dr.), estimated exposure doses were above the USEPA chronic oral RfD of 0.01 mg/kg/day for both children and adults. No chronic oral MRL is available. However, estimated exposure doses calculated from the maximum reported concentration of PCE were below the chronic No Observed Adverse Effects Level (NOAEL) of 941 mg/kg/day for animal studies (renal effects in mice) presented in the ATSDR Toxicological Profile for this chemical (ATSDR, 1997b). At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur among non-hypersensitive individuals. Lifetime excess cancer risk (LECR) calculations based upon the maximum concentration of PCE detected indicated a low increased risk of cancer (~ 5×10^{-4}) for adults (33 years exposure duration) or children (10 year exposure duration).

1,2-DCE

Based upon maximum levels of 1,2-DCE detected in wells, estimated exposure doses were below the USEPA chronic oral RfD of 0.02 mg/kg/day for both children and adults; at such levels, non-carcinogenic adverse health effects among non-hypersensitive individuals are not likely to occur.

No studies (human or animal) are available from which to derive MRLs for chronic exposure, although MRLs have been derived for acute and intermediate exposure to the cis- and trans- isomers of 1,2- DCE. The most significant and sensitive effects of 1,2-DCE exposure are hematological and hepatic. There are limited data available to indicate that 1,2-DCE causes cancer in humans (ATSDR, 1995).

Mercury

Mercury, a naturally occurring element found in the earth's crust, exists in several forms: metallic, inorganic and organic; the form of mercury being dependent upon the valence state and various environmental factors. The mercury discussed in this Public Health Assessment is not likely to be associated with the ICL site but is instead naturally occurring, or from other sources. Metallic mercury in soils and surface water undergoes chemical and biological transformation, usually forming inorganic complexes with chloride and hydroxide ions. These in turn may, under certain conditions (usually anaerobic microbial processes), be transformed into organic mercurial compounds. The soil chemistry and conditions at the ICL site would favor the conversion of metallic mercury into its inorganic compounds, but not organic (methylated) species. Thus, for the purposes of this Public Health Assessment, the total mercury data for groundwater will be assumed to represent inorganic mercury. In general, inorganic mercury is less bioavailable and less toxic than organic mercury. Inorganic mercury compounds are most readily absorbed by humans (up to 40% efficiency) through the gastrointestinal system. The target organ for inorganic mercury toxicity is the kidney. Other routes of exposure are inconsequential; inorganic mercury compounds are not generally volatile, and they are not readily absorbed through the skin.

Mercury was detected at a maximum concentration of 7 ppb. A 33 year exposure duration was assumed for mercury exposure. Based upon maximum reported levels of mercury detected in a private potable well, estimated exposure doses were well below the No Observed Adverse Effects Level (NOAEL) for animal studies (inorganic mercury) presented in the ATSDR Toxicological Profile for this chemical. At such concentrations, it is unlikely that non-carcinogenic adverse health effects would occur in non-hypersensitive individuals. There is no chronic MRL available for mercury, but the MRL for intermediate oral exposure to mercuric chloride is 0.002 mg/kg/day, which incorporates a safety factor of 100; the USEPA RfD is 0.0003 mg/kg/day. Adult exposure dose estimates for mercury are below the MRL and RfD, while the child's estimate falls between these comparison values. There are no data available to indicate that elemental mercury causes cancer, and it is classified as a Group D (not classifiable) carcinogen by the USEPA. Limited data indicates an increase of renal tumors in rats fed high levels of methylmercury and there is limited evidence that mercuric chloride (an *inorganic* form) is carcinogenic in animals (ATSDR, 1999).

Health Outcome Data

The exposed and potentially exposed populations are relatively small, rendering statistical analysis of incidence data of limited usefulness. As such, health outcome data for the area of the ICL site was not evaluated.

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 waste sites. They are more likely 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 importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

At the ICL site, it is likely that children were exposed in the past to contaminants from the site through use of private potable well water. Specifically, exposure to PCE by children in the past was estimated to be at levels of public health concern. The potential public health implications of this exposure are described above.

Community Health Concerns

In order to gather information on community health concerns, NJDHSS contacted the CVDH and the NJDEP's Community Relations Coordinator. The community health concerns associated with the site were primarily associated with the groundwater contamination issue, particularly by volatile organics and mercury, and their impact on private potable wells in the past. As discussed, the provision of public water supplies has addressed the issues and exposure pathway associated with contaminated potable wells. Currently, no additional community concerns have been identified by the NJDHSS.

Public Comment

This Public Health Assessment was released for public comment during the period September 10 to October 10, 2001. No comments were received.

Conclusions

Hazard Category

Based on a weight-of-evidence analysis of the health and environmental information compiled, each Public Health Assessment assigns a hazard category in response to the public health risk posed by the site being evaluated. Each category relates to a set of additional actions or interventions that may be considered by the ATSDR, the NJDHSS or other public health agencies, as well as recommendations for further action to the USEPA, NJDEP or other environmental agencies

Based on an analysis of the health and environmental information compiled, the ICL site is considered by the ATSDR and the NJDHSS to have represented a public health hazard because of past exposures. This determination is based on the following considerations, taken together: 1) the presence of a completed exposure pathway in the past (through private potable wells) to VOCs including PCE and TCE, 2) VOCs were documented at levels of public health concern in private wells on West Korff Drive and Garrison Road, and, 3) epidemiologic studies from other communities suggesting that exposure to TCE and PCE may increase the risk of certain childhood cancers and adverse neurological effects.

Current site conditions, and available data and information indicate that exposure to contaminants from the ICL site through the ingestion of groundwater is no longer occurring. The exposure pathway through use of private well water was interrupted by the sealing of most of the affected potable wells and the provision of a public water system. However, the groundwater contamination plume affecting the ICL site has not yet been fully delineated. For these reasons, the ATSDR and the NJDHSS have determined that the ICL site currently presents no apparent public health hazard.

At the ICL site, it is likely that children were exposed in the past to contaminants from the site through use of private potable well water. Specifically, exposure to PCE by children in the past was estimated to be at levels of public health concern. The potential public health implications of this exposure are described above.

Recommendations

Cease/Reduce Exposure Recommendations

The ATSDR and the NJDHSS recommend continued monitoring of the ICL site and surrounding areas at an appropriate interval to ensure the groundwater plume remains delineated, and does not impact currently unaffected private potable wells in the general area of the site.

Site Characterization Recommendations

With the exception of issues pertaining to plume delineation and migration noted above, the ICL site has been fully characterized within the context of exposure assessment.

Public Health Action Plan

The Public Health Action Plan (PHAP) for the ICL 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 that it is implemented. The public health actions taken or to be implemented are as follows:

Actions Undertaken by ATSDR/NJDHSS:

Available data and information have been evaluated by the ATSDR and the NJDHSS to determine public health concerns regarding potential human exposure pathways associated with the ICL site.

Actions Planned By ATSDR/NJDHSS:

The ATSDR/NJDHSS will review the remedial plan for the ICL site when available. Of particular public health significance is delineation of the groundwater plume and options for cleanup of the aquifer.

The ATSDR and the NJDHSS will re-evaluate and expand the Public Health Action Plan (PHAP) if warranted. New environmental, toxicological, health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at the ICL site.

The NJDHSS will prepare a Citizen's Guide for this Public Health Assessment for distribution to interested parties as warranted. Local health officials and other community leaders should be surveyed for additional public health concerns and the need for future community educational activity.

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.

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Appendices

Tables

Table # 1 - Volatile Organic Compounds and mercury detected in private potable wells on Dirk Drive, Garrison Road, Lois Lane, South Orchard Road, West Elmer Road, and West Korff Drive. Frequency of detection and concentration range in parts per billion (ppb). Sampling conducted by the NJDEP/CVHD; 1990-1992. Source: Garrison Road Well Contamination Report, NJDEP, 1998.

Contaminant	Dirk Drive (N=4)	Garrison Road (N=31)	Lois Lane (N=4)	South Orchard Road (N=9)	West Elmer Road (N=3)	West Korff Drive (N=15)	Comparison Value
PCE	**3/4 ND-44.91**	**8/31 ND-80.0**	0/4 ND	**2/9 ND-7.6**	0/3 ND	**6/15 ND-760.0**	1 NJMCL
TCE	**2/4 ND-2.59**	**8/31 ND-31.0**	0/4 ND	**1/9 ND-4.36**	0/3 ND	**3/15 ND-50.6**	1 NJMCL
1,2-DCE	1/4 ND-3.0	**4/31 ND-310.0**	0/4 ND	**2/9 ND-14.59**	0/3 ND	**3/15 ND-36.0**	10 NJMCL
Mercury	**4/4 <1.0-2.9**	**6/31 ND-7.0**	0/4 ND	1/9 ND-2.0	0/3 ND	**3/15 ND-2.83**	2 NJMCL

CREG = Cancer Risk Evaluation Guide

NJMCL= New Jersey Maximum Contaminant Level

RMEG = ATSDR Reference Media Evaluation Guide

ND = Not Detected

Bold = Exceeds NJMCL and/or ATSDR Comparison Value

N = Number of Samples

Table # 2 - Groundwater sampling (via a "hydropunch" sampler) results -concentration in parts per billion (ppb). Sampling conducted by the NJDEP; 1995. Source: Garrison Road Well Contamination Report, NJDEP, 1998.

Contaminants	Minimum Concentration Detected (ppb)	Maximum Concentration Detected (ppb)	Detected Concentrations Exceeding NJMCL	NJ Drinking Water Standard: NJMCL (ppb)	ATSDR Drinking Water Comparison Value (ppb)
PCE	0.02J	140	6/14	1	5
TCE	0.07	14	6/14	1	5
1,2-DCE	0.53J	51	4/14	10	70

N.D. - Not Detected
NJMCL - New Jersey Maximum Contaminant Level
J - Estimated Concentration

Table # 3 - Groundwater sampling (via a "hydropunch" sampler) results (off-site). Concentration in parts per billion (ppb). Sampling conducted by the NJDEP; 1995. Source: Garrison Road Well Contamination Report, NJDEP, 1998.

Contaminants	Minimum Concentration Detected (ppb)	Maximum Concentration Detected (ppb)	Detected Concentrations Exceeding NJMCL	NJ Drinking Water Standard: NJMCL (ppb)	ATSDR Drinking Water Comparison
PCE	0.01J	489	15/37	1	5
TCE	0.02J	294	11/37	1	5
1,2-DCE	0.40J	282	8/37	10	70

N.D. - Not Detected
NJMCL - New Jersey Maximum Contaminant Level
J - Estimated Concentration

Table # 4

Completed Human Exposure Pathways						
Pathway Name	**Source**	**Environmental Media**	**Point of Exposure**	**Route of Exposure**	**Exposed Population**	**Contaminants**
Private Wells (VOCs)	ICL site	Groundwater	Residences served by private potable wells	Ingestion, dermal contact, inhalation	Residents receiving water from private potable wells in the past (approximately 165)	VOCs (1963 to 1996)
Private Wells (Mercury)	Unknown	Groundwater	Residences served by private potable wells	Ingestion, dermal contact, inhalation	Residents receiving water from private potable wells in the past	Mercury

Figures

Iceland Coin Laundry Area Groundwater

Vineland, New Jersey

CERCLIS No. NJ0001360882

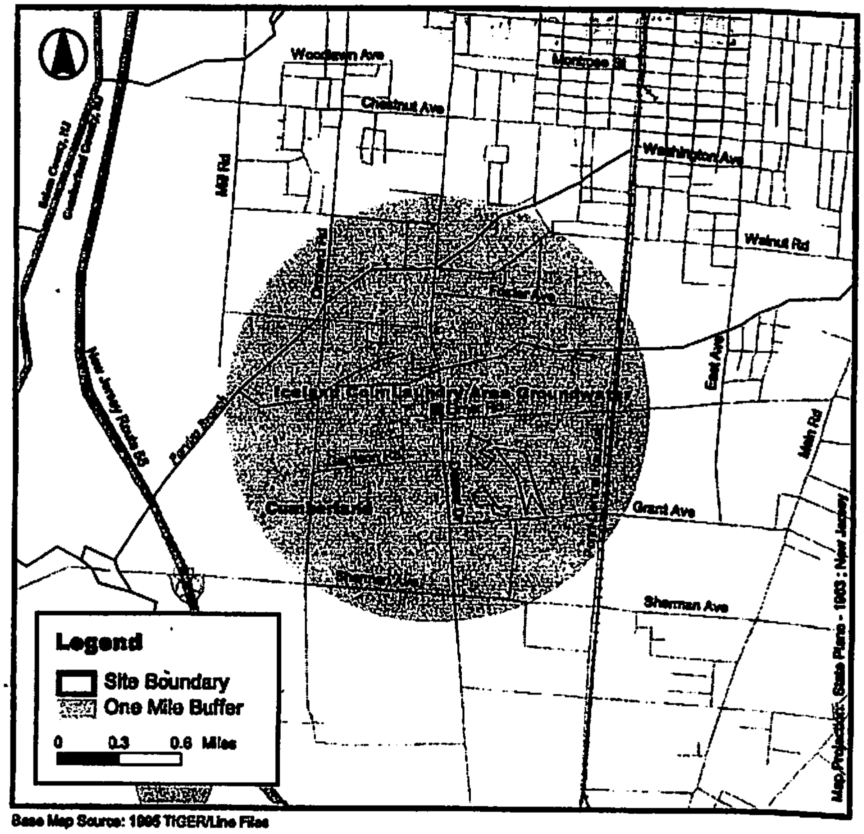

Figure 1 - Iceland Coin Laundry Area Groundwater Plume Site

Total Population	1,939	Total Housing Units	716
White	1,424	Children aged 6 and Younger	205
Black	259	Adults Aged 65 and Older	196
American Indian	6	Females Aged 15 - 44	494
Asian	17		
Hispanic	470		
Other	231		

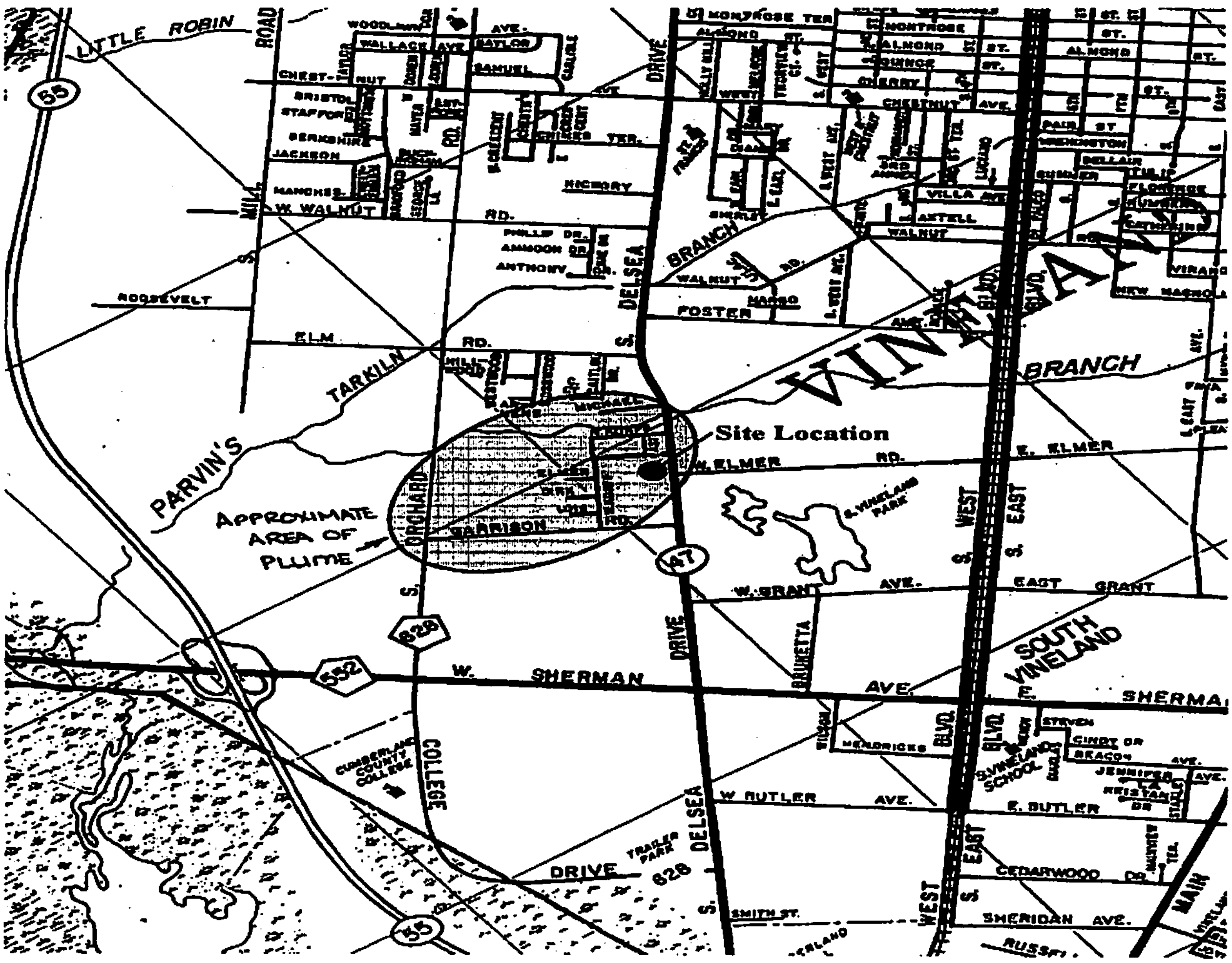

Figure 2 - Iceland Coin Laundry Area Groundwater Plume

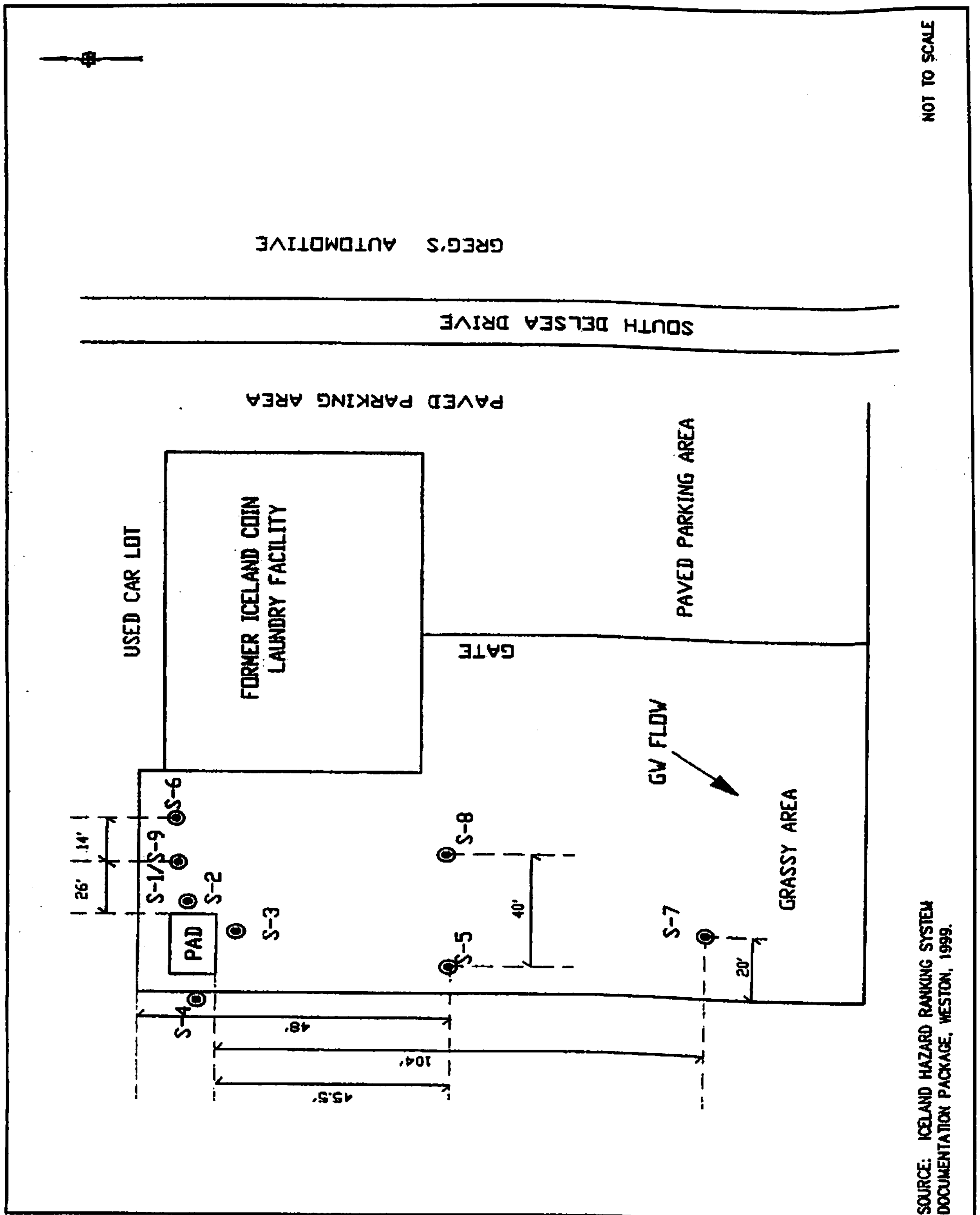

Figure 3 - Soil sampling locations.

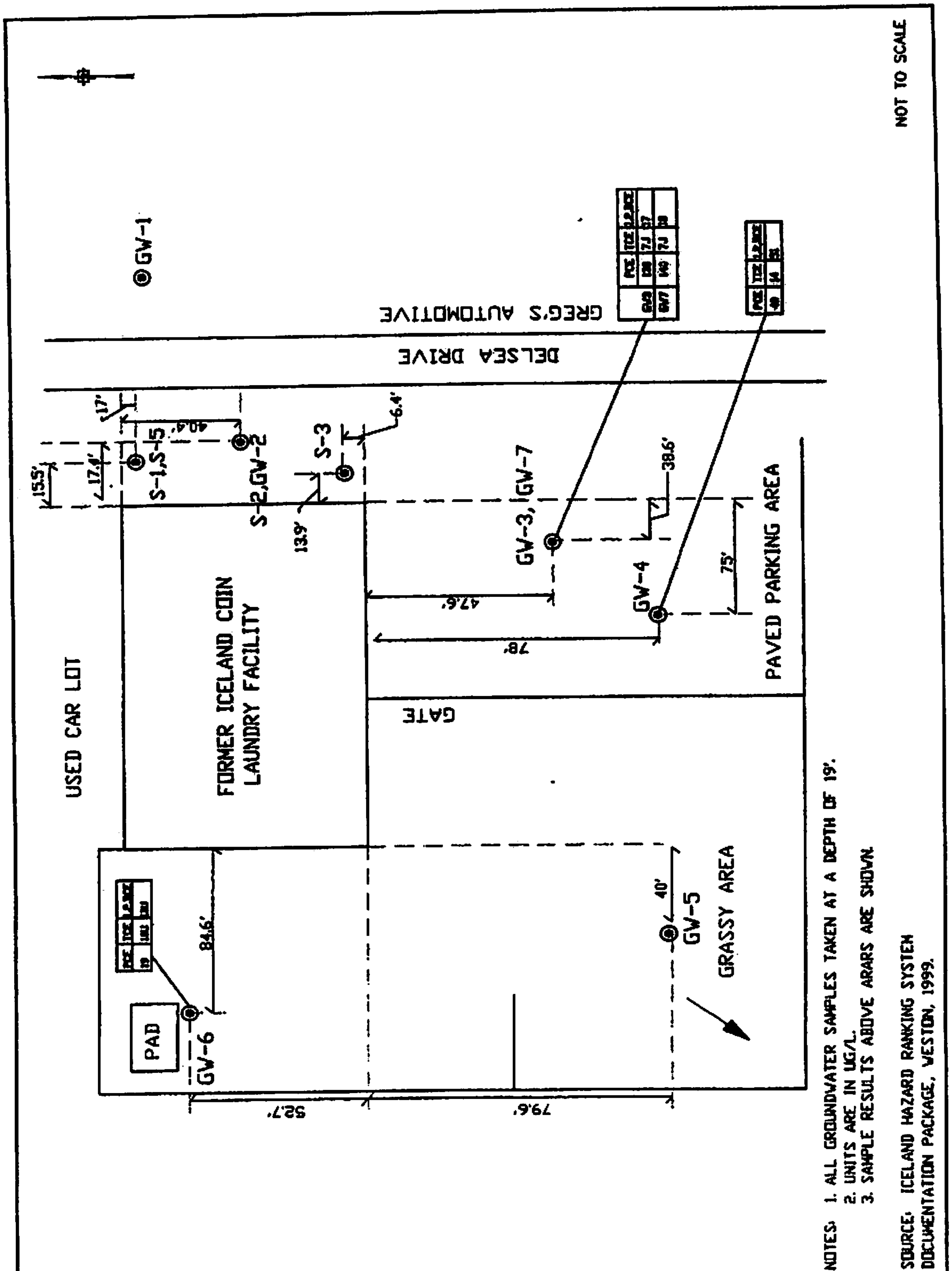

Figure 4 - Groundwater sampling locations.

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 chemical 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: Potentially **Responsible** Party. 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:

1. Urgent Public Health Hazard

2. Public Health Hazard
3. Indeterminate Public Health Hazard
4. No Apparent Public Health Hazard
5. 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 <u>not</u> 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.