Public Health Assessment for

CINNAMINSON GROUND WATER CONTAMINATION
CINNAMINSON TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY
EPA FACILITY ID: NJD980785638
DECEMBER 26, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PUBLIC HEALTH ASSESSMENT

CINNAMINSON GROUND WATER CONTAMINATION

CINNAMINSON TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

EPA FACILITY ID: NJD980785638

Prepared by:

Hazardous Site Health Evaluation Program
Consumer and Environmental Health Services
Division of Epidemiology, Environmental and Occupational Health
New Jersey Department of Health and Senior Services
Under 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, full-scale 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 (E-56), Atlanta, GA 30333.

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Summary

Cinnaminson Groundwater Contamination (CGC) site is located in Cinnaminson and Delran Townships in Burlington County, New Jersey. The CGC site is situated on approximately 400 acres and is bounded by Union Landing Road, U.S. Route 130, River Road and Taylors Lane.

CGC site consists of two inactive landfill areas, residential properties, and light to heavy industrial properties. The landfill portion of the CGC site was originally operated as a sand and gravel mining pit. After the mining operation ceased, large amounts of waste materials were landfilled at the site. Wastes included municipal wastes, vegetable and food processing wastes, industrial wastes and hazardous waste. The NJDEP ordered the landfill closed in 1980 and operations ceased. In 1981, the landfill was capped. The landfill area is not the only source of groundwater contamination. Various on-site industrial activities are believed to have caused the development of multiple plumes of area groundwater contamination. The CGC site groundwater is known to be contaminated with arsenic, manganese, and volatile organic compounds, including chloroform, benzene, tetrachloroethylene, trichloroethylene, and vinyl chloride. The site is currently being remediated by a pump, treat, and re-injection program.

Groundwater is considered to be the only major contaminated environmental media that is potentially related to human exposure pathways at the site. Groundwater contaminants have been detected in a few private wells and three public supply wells in the vicinity of the site. However, the contaminated private wells are not being used for a source of potable water. Although it is possible that exposure did occur through non-potable use of the wells, it is unlikely that the magnitude of such exposures would be of public health concern. Moreover, any contaminated water from the downgradient public supply wells is piped to the Pomona Road station and treated with granular activated carbon to remove VOCs before being distributed. Therefore, based upon current site conditions and data available, there are no completed human exposure pathways associated with the CGC site.

Community concerns about perceived increase in cancers in their neighborhoods have been answered by the NJDHSS. Residents' concerns and fears have been addressed by performing two analyses of cancer incidence in the East Riverton section of Cinnaminson. The results of both cancer incidence analyses indicated that cancer incidence rates, and the proportional distribution of most cancer types, were similar when comparing East Riverton to the entire State.

The ATSDR and NJDHSS have determined that the CGC site represents no apparent public health hazard because of no documented exposure to site-related contaminants at levels of health concern. The results of two analyses of cancer incidence in the East Riverton section of Cinnaminson indicate that cancer rates are similar to the rest of the State. The NJDHSS will prepare a site-specific Citizen's Guide for the CGC site which will be made available to the BCHD and other interested parties.

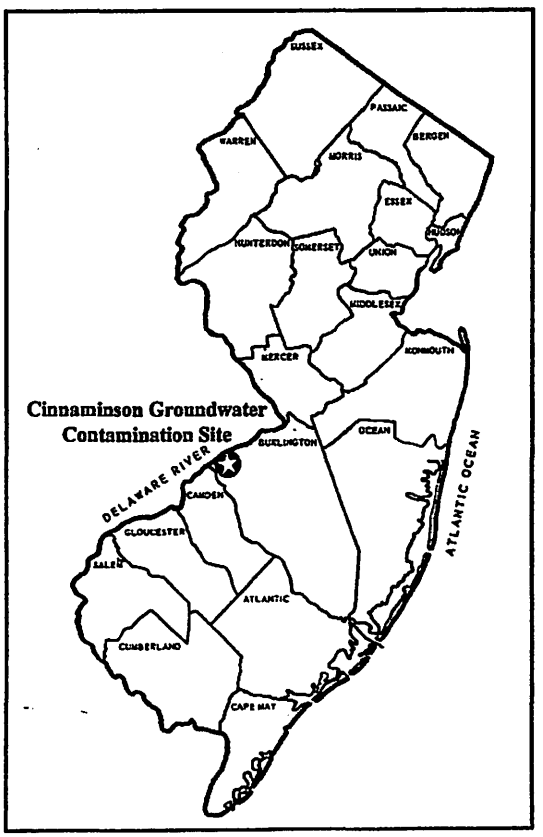
Purpose and Health Issues

This Public Health Assessment evaluates the public health issues associated with the Cinnaminson Groundwater Contamination site. Health concerns associated with the site were brought to the attention of the Agency for Toxic Substances and Disease Registry (ATSDR) by Congressional referral (letter from Senator Frank Lautenberg on December 22, 1998).

As a response to community concerns from East Riverton residents about a perceived elevated cancer rate, the ATSDR was requested to perform an evaluation of the potential health threat posed by the Cinnaminson Groundwater Contamination site.

This document will comprehensively evaluate human exposure pathways associated with known contaminated environmental media within or associated with the Cinnaminson Groundwater Contamination site and take action consistent with protection of the public health. At the Cinnaminson Groundwater Contamination site, the contaminated medium of public health significance is groundwater.

The New Jersey Department of Health and Senior Services (NJDHSS) will collaborate with environmental agencies such as the U.S. Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) to contribute a health component to proposed and ongoing remedial activities.



Background

A. Site Description and History

The Cinnaminson Groundwater Contamination (CGC) site is a "Superfund" site located in Cinnaminson and Delran Townships in Burlington County, New Jersey (inset). "Superfund" or National Priorities List (NPL) sites represent those sites which 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 populations in their vicinity.

The CGC site is situated on approximately 400 acres in an area of residential and light to heavy industrial properties.[10] The site is bounded by Union Landing Road, U.S. Route 130, River Road and Taylors Lane.

The Delaware River is about 5,000 feet northeast of the site (Figure 1).

The CGC site consists of an inactive landfill, residential properties, and light to heavy industrial properties. Some of the industrial facilities are known to have petroleum underground storage tanks. One industrial facility has an unlined slurry pit and cooling ponds. The landfill portion of the CGC site was originally operated as a sand and gravel mining pit. Beginning in the late 1950s, municipal solid wastes were disposed of in the completed unlined mining pits. Sand and gravel mining continued on other portions of the property until the late 1960s. After the mining operation ceased, large amounts of waste materials continued to be landfilled in two areas of the site. These wastes included: municipal waste, vegetable and food processing wastes, and industrial wastes. Starting in 1970, Sanitary Landfill Inc. (SLI) operated an on-site sanitary landfill. SLI accepted industrial wastes and hazardous waste. During the 1970s, SLI was cited several times by the New Jersey Department of Environmental Protection (NJDEP) for violations of landfill regulations. In 1979, analysis of on-site groundwater revealed that it was contaminated. The NJDEP ordered the landfill closed in 1980 and operations ceased. In 1981, as part of the closure plan, SLI capped the landfill with 18" of clay, installed a gas collection and venting system, and began a groundwater monitoring program. Groundwater studies conducted by SLI, and the USEPA, confirmed on-site groundwater contamination in the landfill area.[10]

Releases from several sources at the CGC site, including various on-site industrial activities, have resulted in of multiple plumes of area groundwater contamination. The CGC site groundwater is known to be contaminated with arsenic, manganese and volatile organic compounds, including chloroform, benzene, chlorobenzene, 1,2-dichloroethylene, tetrachloroethylene, trichloroethylene and vinyl chloride.[10]

In 1989, the USEPA completed a Remedial Investigation (RI) at the CGC site. The RI included the installation of monitoring wells and sampling of groundwater to characterize the site. The study revealed that the hydrogeology of the site is complicated by the presence of clay layers, called "lenses," beneath the site. These clay lenses tend to create a shallow aquifer above a deep aquifer. The RI noted that both the shallow and the deep aquifers were contaminated.[5]

The USEPA completed its Feasibility Study (FS) at the CGC site in 1990. A Record of Decision (ROD), signed on September 28, 1990, selected a remedy from the FS for the first operable unit (Groundwater Remediation) at the site. The selected remedy includes: pumping contaminated groundwater from both the shallow and the deep aquifers, treating it to remove contamination, and re-injecting the treated groundwater into the deep aquifer.[11]

On July 9, 1991, an Administrative Order (AO) was issued to SLI by the USEPA. The AO required SLI to proceed with the remedial design and clean-up of the site. The remediation plan was approved by the USEPA on May 28, 1993. As mentioned above, remediation is being addressed in two stages, known as operable units. The first operable unit is directed at the cleanup of the site's contaminated groundwater. The second operable unit will address the effectiveness of the clay cap in reducing the generation of leachate. The USEPA also required SLI to conduct groundwater

monitoring and various hydrogeologic investigations. The SLI groundwater monitoring program began in February 1994 and continues as of this date. [10]

The final remedial design report was completed in December 1998 and construction of the treatment facilities started. Construction of the groundwater pump and treat system is complete and the operation of this unit began in February 2000.[10]

B. Demography and Land Use

The Cinnaminson Groundwater Contamination site is located in an area of mixed residential, and light to heavy industrial properties. In addition to the two former landfill areas owned by Sanitary Landfill Inc. (SLI), there are several other companies located on the site. These include: Del-Val Ink and Color, Hoeganaese Corporation, BOC Group (formerly Airco Industrial Gases), L and L Redimix, Meredith Paving and AFG Industries, Inc. (Figure 3).[5] There are no school or day care facilities within 200 feet of the property. The Cinnaminson High School is about 3,500 feet southwest of the site. The high school is on the public water supply.

The site lies within an outcrop area of the Potomac Group and Magothy formation. Groundwater flow under the site is very complicated due to hydrogeologic formations under the site (e.g. clay lenses) and the effects of the nearby Delaware River. The groundwater, however, generally moves in a southerly direction towards a regional groundwater cone of depression in the Camden, New Jersey area.

There are both public and private water supply wells within a mile of the site; however, the private wells are not being used for potable purposes. The closest public supply well belongs to the New Jersey American Water Company (NJAWC). These supply wells (wells 14 and 26) are located on New Albany Road directly down gradient of the CGC site about 5000 feet south of Route 130 (Figure 4).[6]

Population demographics based upon the 1990 census have been prepared by the ATSDR using area-proportion spatial analysis, and are presented in Figure 2. Within a one mile radius there are approximately 4687 homes with as many as 13,022 people.

C. Past ATSDR/NJDHSS Involvement

The ATSDR/NJDHSS completed an initial Health Assessment for the Cinnaminson Groundwater Contamination site, dated July 30, 1990. In addition to the 1990 Health Assessment, the NJDHSS has conducted two analyses of cancer incidence in residents of the East Riverton section of Cinnaminson. These studies, conducted in April 1986 and December 1999, were a response to local citizens' concerns about perceived excess cancer incidences in their community.
The following is a review of these three documents :

1990 Health Assessment [7]

In this initial Health Assessment, the ATSDR/NJDHSS determined that the environmental media of concern at the CGC site was the contamination of the area groundwater. The report noted that, at that time, data from nearby potable wells showed that the contaminant plume(s) had not yet reached these wells. Therefore, the Health Assessment found that there was no documentation of any current human exposures to contaminants from the site. The ATSDR/NJDHSS concluded that the CGC site was a "potential public health concern." This hazard category was selected because of the possibility that at some future date site contaminants might reach nearby potable wells. The Health Assessment went on to recommended the need for additional groundwater sampling to further delineate the contaminant plume and to assess what actions might be needed to avoid future contamination of potable wells.

1986 Cancer Incidence Study [12]

In 1986, the NJDHSS conducted an analysis of cancer incidence data among residents of the East Riverton section of Cinnaminson. The East Riverton section of Cinnaminson is the residential section that borders the CGC site to the southwest. In this study, the NJDHSS used cancer incidence data that were available at that time. The study concluded that there was no statistically significant excess of cancer incidence in East Riverton as compared with the rest of New Jersey. The conclusions of this study were given, by letter, to the Health Officer of the Burlington County Health Department (BCHD).

1999 Cancer Incidence Study [13]

In 1999, the NJDHSS conducted a second analysis of cancer incidence data among residents of the East Riverton section of Cinnaminson. East Riverton residents were concerned about various cancers in their community. The Department used cancer incidence data from the years 1979 through 1997, inclusive. The study evaluated data for 19 different types of cancer. The results of the analysis indicated that cancer incidence rates and the proportional distribution of most cancer types were similar when comparing East Riverton and the entire State. The results showed some types of cancers, such as esophagus and bladder, to be higher than expected, and other types of cancers, such as leukemia and uterine, were determined to be lower than expected. It was concluded that there was no evidence to suggest that any of the cancers are related to environmental contamination in the East Riverton area. The conclusions of this study were presented to East Riverton residents by staff of the NJDHSS, at a public meeting on December 6, 1999.

D. Site Visit

On December 10, 1999, S. Hooper, N.P. Singh and J. Winegar of the NJDHSS visited the CGC site. The NJDHSS was accompanied by T. Mignone of the ATSDR. In addition, representatives of the USEPA and the Burlington County Health Department were also present. The following observations were made during the site visit:

- The site area was a mix of light to heavy industrial and residential properties.

- The two former landfill sections of the site still can be seen as large mounds. These mounds have been covered with clean soil and then seeded. A gas collection system can also be seen on the mounds.

- The "Pump and Treat" building appeared to be almost completed and ready to begin operation.

- The fence around the landfill appeared to be in excellent repair and would make trespassing in this section difficult. In fact, there was no evidence of trespassing at the former landfill. In addition, each of the facilities located on the site appear to be fenced to prevent trespassing.

During the site visit it was established that there were no known or suspected radiological or biological hazards associated with the site. Several private residences in the vicinity of the site are known to have private wells. These wells, however, are not used as a source of potable water.

Discussion

Environmental Contamination and Pathways Analysis

This section contains a discussion of the site-related contamination and the exposure pathways at the site. An exposure pathway is the process by which an individual is exposed to contaminants that originate from some source of contamination.

ATSDR/NJDHSS classifies exposure pathways into three groups: (1) **"completed pathways,"** that is, those in which exposure has occurred, is occurring, or will occur; (2) **"potential pathways,"** that is, those in which exposure might have occurred, may be occurring, or may yet occur; and (3) **"eliminated pathways,"** that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified.[14]

A completed exposure pathway must include each of five elements that link a contaminant source to a receptor population. The five elements of a completed exposure pathway are the following:

(1) source of contamination;
(2) environmental media and transport mechanisms;
(3) point of exposure;
(4) route of exposure; and
(5) receptor population.

A. On-Site Groundwater

On-site groundwater is known to be contaminated. Releases from several sources at the Cinnaminson Groundwater Contamination site, including various on-site industrial activities and landfilling of wastes, have resulted in a contaminant plume.[6] This plume actually consists of three smaller plumes (Figure 4). The first plume, or East Central Plume, moves from the "core area" near the mounds, towards the south-southeast. The second, or West Central Plume, migrates from the middle of the site, just west of the landfill mounds and it also migrates towards the south-southeast. The third, and largest plume, moves along the southwestern border of the site. This plume, which may originate under the AFG Industries property, is referred to as the Union Landing Road Plume. Groundwater from this plume mixes with groundwater flowing from beneath the landfill area. The Union Landing Road Plume contains some of the highest concentrations of contaminants measured at the CGC site. As with the other plumes, it generally moves towards the south-southeast. Groundwater contamination specifically associated with the AFG Industries property is also being overseen by the New Jersey Department of Environmental Protection, under the Voluntary Cleanup Program, in coordination with the USEPA. As noted previously, the groundwater flow under the site is very complicated and movement may occur in other directions.

Groundwater collected from the numerous monitoring wells at the CGC site has been shown to be heavily contaminated with arsenic, manganese and many volatile organic compounds, including chloroform, benzene, chlorobenzene, 1,2-dichloroethylene, tetrachloroethylene, trichloroethylene and vinyl chloride..[4,6] Table 1 is a listing of the more important contaminants of concern collected from monitoring wells during the two most recent sampling events.

B. On-Site Soil

The CGC site consists of two inactive landfills, and light to heavy industrial properties. Some of the industrial facilities are known to have petroleum underground storage tanks. One industrial facility has an unlined slurry pit and cooling ponds. The landfill portion of the CGC site is known to have accepted industrial wastes and hazardous waste.

The contaminated soil in the landfill areas are inaccessible. In 1981, as part of the closure plan, SLI capped the landfill with 18" of clay, and installed a gas collection and venting system. The landfill is also fenced off to prevent public access. The fence around the landfill appeared to be in excellent repair and would make trespassing in this section difficult.

C. Off-Site Groundwater

Data collected from monitoring wells have identified a "core area" of contamination under the CGC site, and most of the extent of the south-southeastern movement of the three plumes has been

characterized. Additional monitoring wells south of Route 130 are planned to further delineate the outer edge of the plume.[6]

The USEPA noted in 1986 [8] that approximately 52,700 people were served by individual home and public wells within a 3 mile radius of the site. While contamination, at that time, could not be attributed to the CGC site, the USEPA did acknowledge the potential for such contamination, due to the proximity of these wells to the site.

Contaminated groundwater may have reached the public supply in 1990. Specifically, the USEPA has suspected that the edge of the contaminant plume may have reached the New Jersey American Water Company (NJAWC) supply wells (wells 14 and 26) located on New Albany Road. The New Albany Road supply wells are located directly downgradient of the CGC site about 5000 feet south of Route 130. Based on currently available data, however, this contamination cannot be attributed to the site. The USEPA and the NJDEP are currently gathering downgradient monitoring well data for a study that will try to delineate the extent of the contamination plume south of Route 130.

According to NJAWC, they first began detecting volatile organic compounds, specifically trichloroethene (TCE), in the supply wells beginning early in 1990. These supply wells are currently only being used on an intermittent basis on weekends, during the summer, and for a few hours during the week. It is important to note that any drinking water extracted from the New Albany Road supply wells is first piped to the Pomona Road station (located about 2 miles to the west). The water is then treated with granular activated carbon to remove any VOCs before entering the distribution system.[6]

D. Ground Water/Private Wells

The NJAWC began providing public water to residents and businesses near the CGC site in the early 1980s. In 1995, the USEPA had reported that all but two residences received drinking water from NJAWC.[9] Early in 1999, the Burlington County Health Department (BCHD) conducted a private well survey of the East Riverton community near the CGC site.[15] Of the 128 residents responding to the survey, 12 respondents indicated that they had operable private wells. Under the direction of the BCHD, the New Jersey American Water Company was able to sample 9 of the 12 wells. The three remaining wells were not tested due to various problems such as broken pumps or canceled appointments. Table 2 below is a summary of analytical results from these private wells.

The results of the residential well testing has shown that some of these wells have been impacted by the site, specifically, those contaminated private wells that appear to be downgradient of the CGC site. These residences are connected to the public water supply system in the area. The contaminated wells are not being used as a source of potable water.

Past exposure to contaminated drinking water from private wells is difficult to evaluate. In 1990, the NJDHSS health assessment indicated that "it did not appear that the groundwater plume (s) have reached the potable wells."[7] Most residences are reported to have been connected to public water

prior to that date (since the early 1980s). While exposures to contaminated drinking water were possible (albeit not site-related) before residences were connected to public water, there are no data describing private well quality available for review by the ATSDR/NJDHSS. In addition, there are no data describing residential well quality between 1990 and the recent well survey in 1999 which would indicate the time of the plume's arrival at these wells. Sporadic exposure may have occurred among residents with access to private wells, through non-potable domestic uses.

Environmental Contamination and Exposure Pathways Summary

Groundwater contamination is considered to be the only major environmental media that is potentially related to a human exposure pathway at the site. Site-related groundwater contamination, possibly in combination with non-site sources, may be adversely impacting a few private and public supply wells in the vicinity of the site. As noted above, the USEPA and the NJDEP are currently collecting data to further characterize the nature and extent of the plume and determine if this nearby contamination is definitively site related. The contaminated private wells are not being used for a source of potable water.

Potential pathways may currently exist for those residents who still have access to contaminated private wells. However, potential exposure doses associated with non-potable uses (e.g., irrigation, washing of cars) through dermal contact or inhalation would not likely occur at a level of public health significance. Moreover, any contaminated water from down gradient public supply wells is first piped to the Pomona Road station and then treated with granular activated carbon to remove any detected VOCs before being used. Therefore, based upon current site conditions and data available, there are no completed human exposure pathways associated with the CGC site.

Public Health Implications

Toxicological and Epidemiological Evaluation

There were no completed exposure pathways associated with the CGC site which merit toxicological and epidemiological evaluation.

Health Outcome Data

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

The results of the cancer incidence analyses conducted of the East Riverton section of Cinnaminson indicated that cancer incidence rates and the proportional distribution of most cancers were similar when comparing East Riverton to the entire State.

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.

There were no completed exposure pathways associated with the CGC site. Therefore, the NJDHSS/ATSDR have determined that children are not presently considered to be at risk from this site. If site conditions change that result in potential exposures to children or pregnant women, the NJDHSS/ATSDR will re-examine childhood health issues.

Community Health Concerns

In order to gather information on community health concerns at the Cinnaminson Groundwater Contamination site (CGC), NJDHSS spoke with staff of the Burlington County Health Department (BCHD). The residents are specifically concerned about perceived increases in cancers among residents in their neighborhoods. These concerns have been addressed by the NJDHSS through two analyses of cancer incidence in the East Riverton section of Cinnaminson. These studies, described above, were a direct response to local citizen's concerns about cancer in the community.

The ATSDR and the NJDHSS will review and evaluate any community health concerns which may arise. Current remedial work at the site and the release of the public health assessment may generate interest among the public during the public comment period. Any comments thus received will be addressed in a subsequent responsiveness summary.

Public Comment

Public comment was solicited from September 18 - October 18, 2000. No comments were received.

Conclusions

Hazard Category: Cinnaminson Groundwater Contamination Site

Based on the information reviewed, the ATSDR and NJDHSS have concluded that the Cinnaminson Groundwater Contamination (CGC) site currently poses **no apparent public health hazard.** Evaluation of site data does not indicate the presence of completed human exposure pathways associated with the site. Although is is possible that exposure could occur through non-potable uses of private wells, it is unlikely that the magnitude of such exposures would be of public health concern.

Community concerns associated with the CGC site have been centered on some residents' perceived increase in cancer incidence in their neighborhoods. These concerns were addressed by the NJDHSS by performing two analyses of cancer incidence in the East Riverton sub-section of Cinnaminson. The results of these analyses indicated that cancer incidence rates, and the proportional distribution of most cancer types, were similar to rates found for the entire State.

Although the ATSDR and the NJDHSS have not identified a completed human exposure pathway associated with the CGC site, groundwater contamination is present at levels of potential public health concern. Data collected from monitoring wells have identified a "core area" of contamination under the CGC site. USEPA has suspected that the edge of the contaminant plume may have reached the New Jersey American Water Company supply wells located on New Albany Road, about 5000 feet south of Route 130. Based on currently available data, however, this contamination cannot be attributed to the site. The USEPA and the NJDEP are currently gathering downgradient monitoring well data for a study that will try to delineate the extent of the contamination plume south of Route 130. According to NJAWC, they first began detecting volatile organic compounds, specifically trichloroethylene (TCE), in the New Albany Road supply wells in early 1990. These supply wells are currently only being used on an intermittent basis and any drinking water extracted from the New Albany Road supply wells is treated to remove any detected VOCs.

The results of recent (1999) private residential well testing by the Burlington County Health Department have shown that some of these private wells may have been impacted by the site. These residences have been connected to the public water supply system in the area since the early 1980s. There are no data describing private potable well quality in the past (before residences were connected to the public water supply). Current information indicates that private wells are not being utilized for potable purposes. However, some private wells may remain in use for non-potable domestic purposes.

Recommendations

A. Cease/Reduce Exposure Recommendations

Based upon available data and information, there are no identifiable exposures occurring associated with the Cinnaminson Groundwater Contamination (CGC) site.

1. The BCHD should continue, through regulation and testing of existing or new private potable wells in potentially affected areas, to ensure that the groundwater exposure pathway remains interrupted.

B. Site Characterization

The following should occur to provide information needed to further evaluate the public health impact of the Cinnaminson Groundwater Contamination (CGC) site:

1. Continue hydrogeologic investigations of area groundwater to fully characterize the extent of contaminant migration from the site, particularly south of Route 130 and near the New Albany Road supply wells.

2. Continue remedial investigations at the AFG/BOC site to fully characterize the nature and extent of the contamination.

Public Health Actions

The Public Health Action Plan (PHAP) for the Cinnaminson Groundwater Contamination (CGC) site contains a description of the actions to be taken by ATSDR and/or NJDHSS at or in the vicinity of the site subsequent to the completion of this Public Health Assessment. The purpose of the PHAP is to ensure that this 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/NJDHSS to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by ATSDR/NJDHSS are as follows:

A. Public Health Actions Taken

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

2. The NJDHSS has conducted two analyses of cancer incidence in the East Riverton section of Cinnaminson. These studies were a direct response to local citizens' concerns about cancer in their community. These data from the recent study were presented to area residents by NJDHSS staff at a public meeting.

B. Public Health Actions Planned

1. ATSDR and the NJDHSS will, if necessary, coordinate with the appropriate environmental agencies to develop plans to implement the cease/reduce exposure and site characterization recommendations contained in this public health assessment.

2. The NJDHSS will prepare a site specific Citizen's Guide for the CGC site which will be made available to the BCHD and other interested parties.

3. The ATSDR/NJDHSS will remain available to the BCHD to address community needs and concerns.

4. This Public Health Assessment will be placed in a local repository, and will be provided to persons who request it.

5. The ATSDR and the NJDHSS will reevaluate and expand the Public Health Action Plan (PHAP) as warranted. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions, may determine the need for additional actions at these sites.

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 RG

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References

Cinnaminson Groundwater Contamination (CGC) Site

1. Golder Associates, Remedial Design Work Plan, Cinnaminson Groundwater Contamination Site, Burlington County, New Jersey, November 1992.

2. Golder Associates, Groundwater Monitoring Report, February 1994 Sampling Event, Cinnaminson Groundwater Contamination Site, Burlington County, New Jersey, May 1994.

3. Golder Associates, Groundwater Monitoring Report, November 1995 Sampling Event, Cinnaminson Groundwater Contamination Site, Burlington County, New Jersey, March 1996.

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11. US Environmental Protection Agency, Superfund Record of Decision (ROD) Abstract, Cinnaminson Groundwater Contamination Site, Burlington County, New Jersey, January 14, 1999.

12. New Jersey Department of Health, Letter from Joseph E. Rizzo to Walter Trommelen, H.O., RE: Analysis of Cancer Incidence in East Riverton, Burlington County, New Jersey, April 10, 1986.

13. New Jersey Department of Health and Senior Services, Letter from Eddy A Bresnitz, MD, MPH to East Riverton Residents, RE: Survey of Cancer Incidence in East Riverton Section of Cinnaminson, Burlington County, New Jersey, December 6, 1999.

14. Agency For Toxic Substances and Disease Registry. Health Assessment Guidance Manual. Chelsea, Michigan: Lewis Publishers, 1992.

15. Burlington County Health Department, Letter from Frank Ripoli, Jr. to Kevin Dixon, RE: Water Testing of Private Wells in East Riverton, Cinnaminson, February 8, 1999.

Tables

Table 1. Groundwater Contamination, CGC Site Monitoring Wells

CONTAMINANT	Maximum Detected (PPB)		COMPARISON VALUE	
	1997 [a]	1998 [b]	PPB	SOURCE
Benzene	320	4	1	NJ MCL
Chlorobenzene	780	15	4	NJ MCL
Chloroform	2100	1	100	Child EMEG
1,1-Dichloroethane	440	7.3	50	NJ MCL
1,2-Dichloroethane	59	2.3	0.4	CREG
1,1-Dichloroethylene	9	15	.06	CREG
cis-1,2-Dichloroethylene	3200	17,000	70	NJ MCL
trans-1,2-Dichloroethylene	260	210	100	NJ MCL
Dichloromethane	87	N/A	-	N/A
1,2-Dichloropropane	35	ND	5	NJ MCL
Methylene Chloride	180	3.4	3	NJ MCL
Tetrachloroethylene	80	7	.7	CREG
Trichloroethylene	470	15,000	1	NJ MCL
Vinyl Chloride	1300	20,000	.2	Child EMEG
Xylenes (Total)	1100	3	1000	NJ MCL
Arsenic	83	6.9	3	Child EMEG
Manganese	15,900	11,600	50	Child RMEG

Source: [a] September 1997, Preliminary (50%) Revised Remedial Design, Cinnaminson Groundwater Contamination site.

[b] December 1998, Final (100%) Revised Remedial Design, Cinnaminson Groundwater Contamination site.

Table 2. Results of Private Well Testing in Vicinity of the CGC Site, 3/99.

CONTAMINANT	Maximum Detected (PPB)	COMPARISON VALUE	
		PPB	SOURCE
1,1,1-Trichloroethane	11.6	30	NJ MCL
1,1-Dichloroethylene	5.9	.06	CREG
Tetrachloroethylene	89.1	.7	CREG
Trichloroethylene	299	1	NJ MCL
Arsenic	3	3	Child EMEG
Manganese	5,600	50	Child RMEG

Source: Private Well Testing, BCHD, March 1999, Cinnaminson Groundwater Contamination Site [15].

Figures

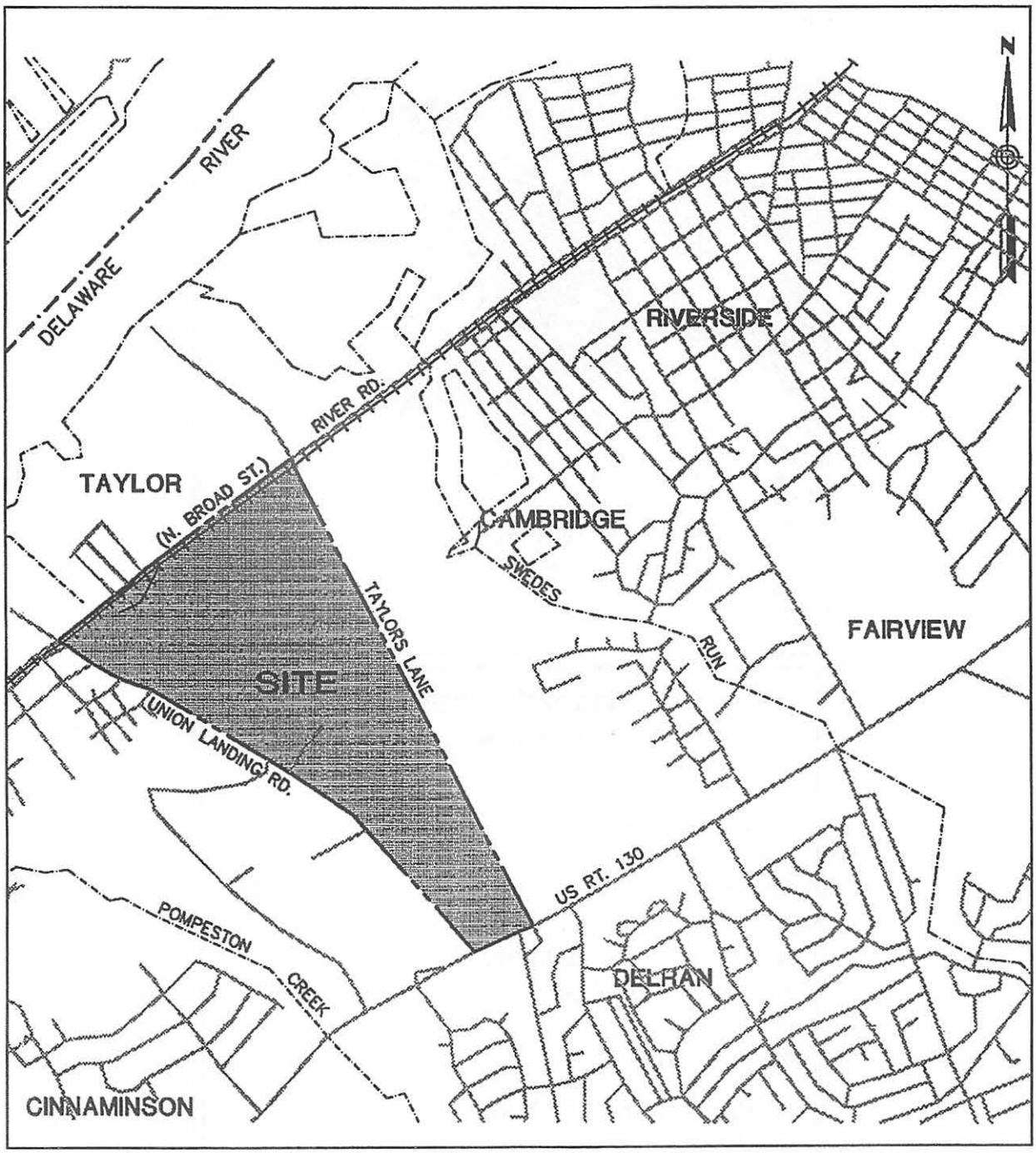
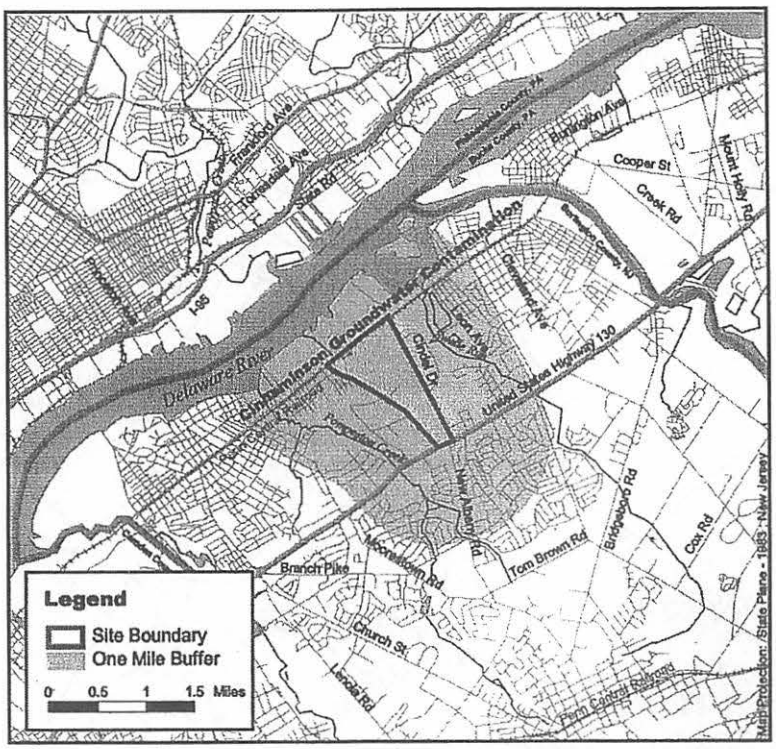


Figure 1. Cinnaminson Groundwater Contamination, Site Map

(Adapted from Golder Associates, December 1998.)



Demographic Statistics
Within One Mile of Site*

Total Population	13022
White	11108
Black	1587
American Indian, Eskimo, Aleut	35
Asian or Pacific Islander	251
Other Race	40
Hispanic Origin	196
Children Aged 6 and Younger	1180
Adults Aged 65 and Older	1552
Females Aged 15 - 44	2866
Total Housing Units	4687

Demographics Statistics Source: 1990 US Census
*Calculated using an area-proportion spatial analysis technique

Figure 2. Demographics

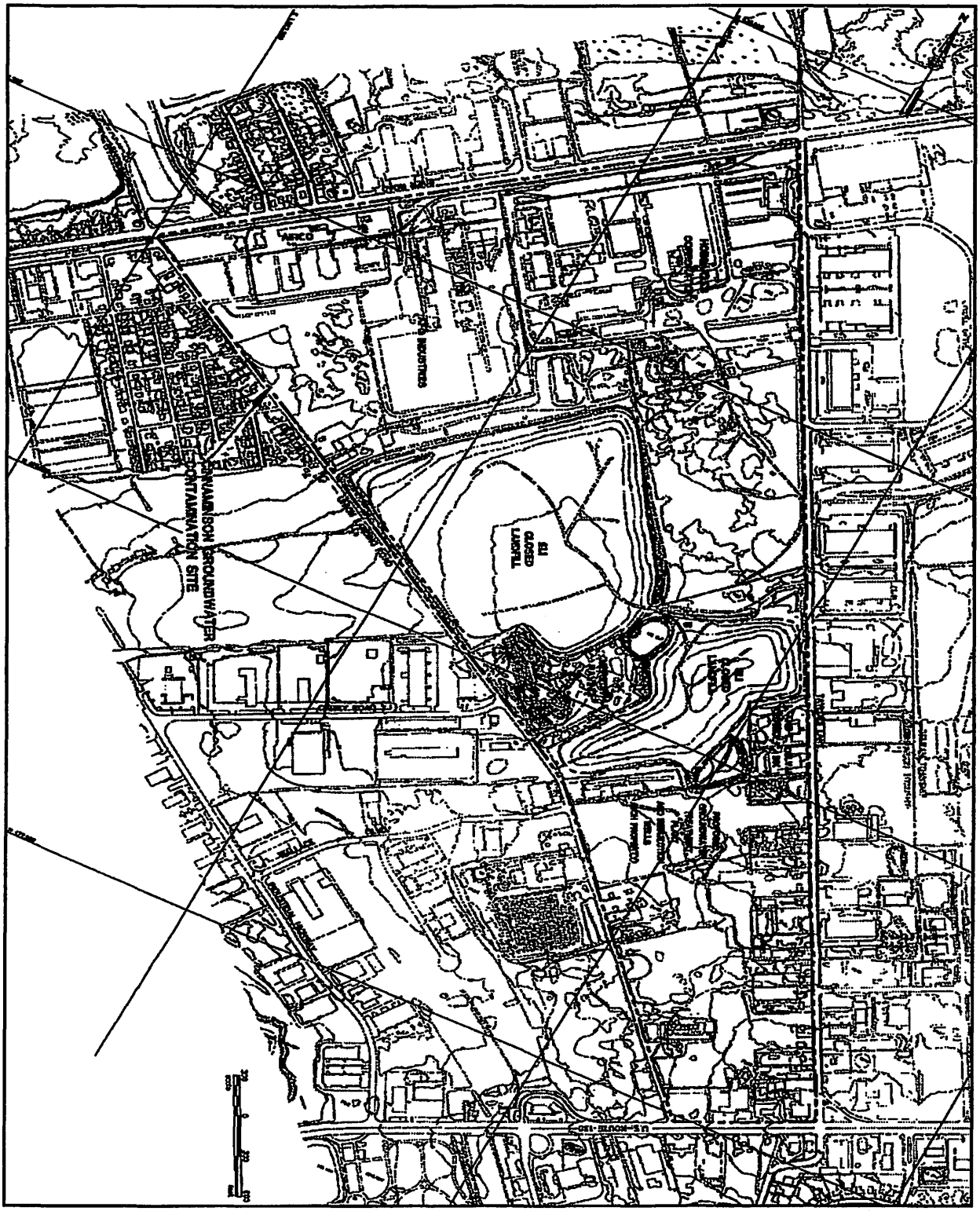


Figure 3. Cinnaminson Groundwater Contamination Site - Industrial Areas at Site

(Adapted from Golder Associates, December 1998.)

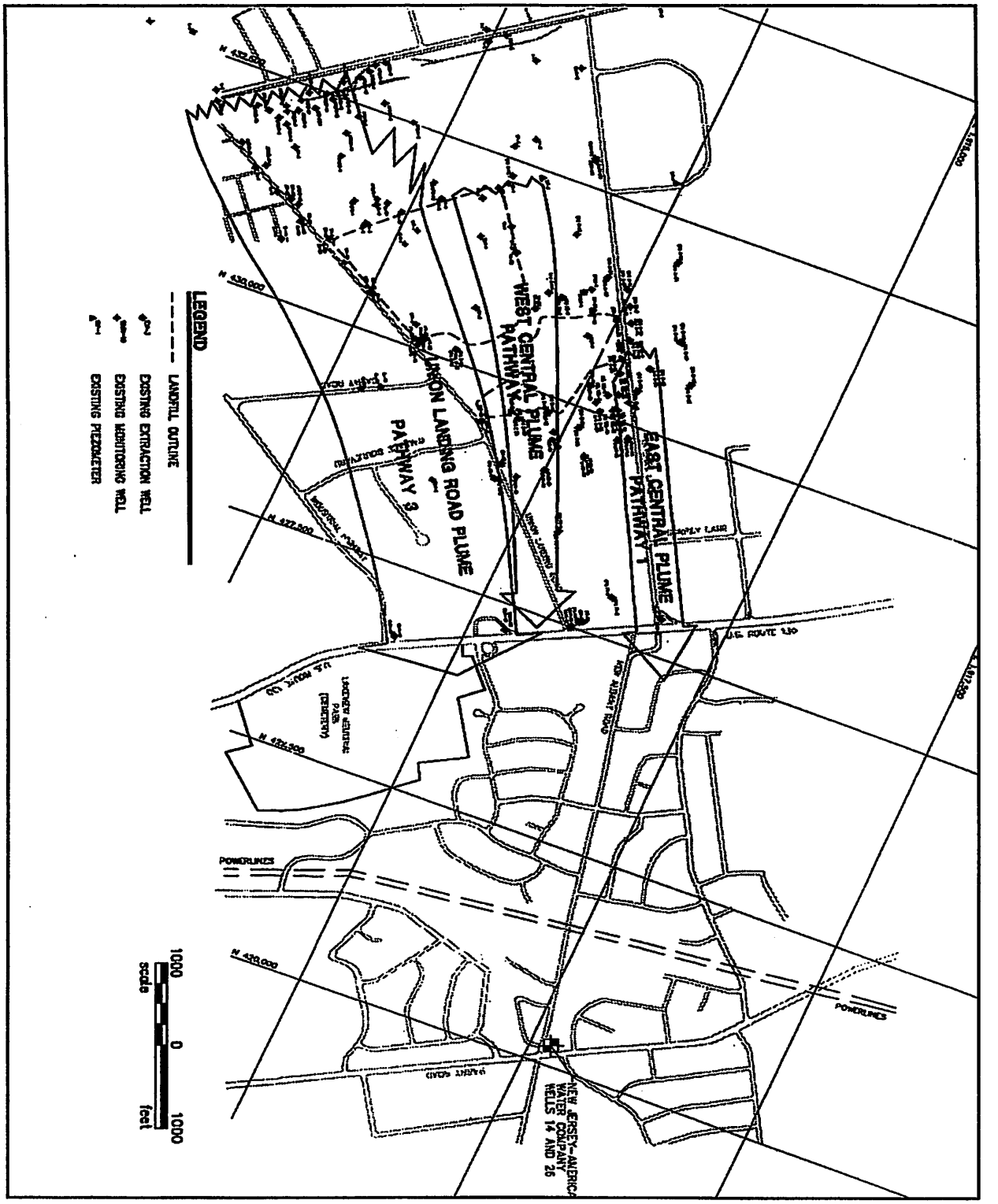


Figure 4. **Cinnaminson Groundwater Contamination Site, Groundwater Contamination Plumes** (Adapted from Golder Associates, December 1998.)

Glossary

ATSDR Plain Language Glossary
of Environmental Health Terms
Revised -15Dec99

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: 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 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.