Public Health Assessment for

SANDY BEACH ROAD GROUNDWATER PLUME
AZLE AND PELICAN BAY, TARRANT COUNTY, TEXAS
EPA FACILITY ID: TXN000605649
JANUARY 17, 2007

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

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

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

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PUBLIC HEALTH ASSESSMENT

SANDY BEACH ROAD GROUNDWATER PLUME

AZLE AND PELICAN BAY, TARRANT COUNTY, TEXAS

EPA FACILITY ID: TXN000605649

Prepared by:

Texas Department of State Health Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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 (CERCLA), also known as the Superfund law. This law set up a fund to identify and clean up our country's hazardous waste sites. The U.S. 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 health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment process allows ATSDR scientists and public health assessment cooperative agreement partner's flexibility in document format when presenting findings about the public health impact of hazardous waste sites. The flexible format allows health assessors to convey to affected populations important public health messages in a clear and expeditious way.

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 evaluate the possible 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.

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 public comments that related to the document are addressed in the final version of the report.

Conclusions: The report presents conclusions about the public health threat posed by contamination at a site. 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 or other responsible parties. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also recommend health education, or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

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, Records Center, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, Georgia 30333.

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Summary

The Sandy Beach Road Groundwater Plume (formerly the Pelican Bay Groundwater Plume) site is located in Tarrant County, Texas, approximately 20 miles northwest of Fort Worth. The designated plume area is beneath the cities of Azle and Pelican Bay as well as unincorporated areas of the county. The areas affected by the plume include residences, light industrial and commercial businesses.

Groundwater from the plume area is used by residents and businesses for drinking and other household and business purposes. Trichloroethene (trichloroethylene, TCE) and cis-1,2-dichloroethene (cis-1,2-dichloroethylene, DCE) have been found in a public drinking water system and private residential water wells.

The Texas Department of State Health Services (DSHS) and the Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the environmental information available for the site and evaluated the exposure pathways through which the public could contact contaminants from the site.

Data for air, soil, and surface water exposure pathways were not available for review; however, since contact with these media would be minimal, we would anticipate that they would not pose a public health hazard. A review of groundwater data indicated that in the past, the public was exposed to contaminants at concentrations above the U.S. Environmental Protection Agency (EPA) drinking water standards. In the past the contaminants in the groundwater could have posed a public health hazard. The contaminated public water supply wells are no longer active and the affected private wells have been provided with filtration systems. Based on the assumption that the filtration systems will be properly maintained, we have concluded that the contaminants in the groundwater currently pose no apparent public health hazard.

As data become available, DSHS and ATSDR will re-evaluate the public health significance of this site, particularly if conditions change in the future.

Purpose and Health Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) was established under the mandate of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. This act, also known as the "Superfund" law, authorized the U. S. Environmental Protection Agency (EPA) to conduct clean-up activities at hazardous waste sites. EPA was directed to compile a list of sites considered hazardous to public health. This list is termed the National Priorities List (NPL). The 1986 Superfund Amendments and Reauthorization Act (SARA) directed ATSDR to prepare a public health assessment (PHA) for each NPL site. In 1990, federal facilities were included on the NPL. [Note: Appendix A provides a list of abbreviations and acronyms used in this report]

In conducting the PHA, three types of information are used: environmental data, community health concerns, and health outcome data. The environmental data are reviewed to determine whether people in the community might be exposed to hazardous materials from the NPL facility. If people are being exposed to these chemicals, ATSDR will determine whether the exposure is at levels that might cause harm. Community health concerns are collected to determine whether health concerns expressed by community members could be related to exposure to chemicals released from the facility. If the community raises concerns about specific diseases in the community, health outcome data (information from state and local databases or health care providers) can be used to address the community concerns. If ATSDR finds harmful exposures existed, health outcome data also can be used to determine if illnesses are occurring and whether they could be associated with the hazardous chemicals released from the NPL facility.

In accordance with the Interagency Cooperative Agreement between ATSDR and the Texas Department of State Health Services (DSHS), this PHA was prepared for the Sandy Beach Road Groundwater Plume site. This PHA presents conclusions about whether exposures are occurring, and whether a health threat is present. *In some cases, it is possible to determine whether exposures occurred in the past. However, a lack of appropriate historical data often makes it difficult to quantify past exposures. If a threat to public health exists, recommendations are made to stop or reduce the threat to public health.*

Background

Site Description

The Sandy Beach Road Groundwater Plume (formerly the Pelican Bay Groundwater Plume) site is located in Tarrant County, approximately 20 miles northwest of Fort Worth, Texas. The site is situated on the western side of Eagle Mountain Lake. The 8,738-acre reservoir is a drinking water source for other area communities and is popular for recreational activities [1]. The plume, centered along Sandy Beach Road and the intersection of Allison Avenue, is beneath the cities of Azle and Pelican Bay in addition to unincorporated areas of the county [2].

Site History

On July 30, 2004, the Texas Commission on Environmental Quality (TCEQ) notified the US EPA Region 6 of a contaminated aquifer and drinking water problem in the City of Pelican Bay. Water samples from public drinking wells contained trichloroethene (TCE) that exceeded health-based standards. Water samples from private (residential) groundwater wells contained TCE and cis-1, 2-dichloroethene (DCE) that exceeded health-based standards. The TCEQ and EPA determined that there was a human health threat from drinking water from the wells contaminated with high levels of TCE. On August 9, 2004, the TCEQ met with residents to discuss the sampling data results and the potential health impacts. The EPA began supplying bottled water to the affected residents on August 10, 2004; the TCEQ subsequently installed filtration systems on the affected wells. A groundwater assessment was conducted to determine the plume migration and the source of the contamination. On February 25, 2005, the EPA ceased supplying bottled water as the TCEQ had tested the filtration systems and found them to be operating properly [3].

The Sandy Beach Road Groundwater Plume site was proposed to the National Priorities List (NPL) on April 27, 2005 and added to the final list on September 14, 2005. Inclusion on the NPL allows federal funds and personnel to become available to further assess the nature and extent of the public health and environmental risks associated with the site.

Land and Natural Resource Use

There are two aquifers at the site from which groundwater is obtained and used for human consumption. These aquifers are known as the Paluxy Formation and the Twin Mountain Formation. The Paluxy Formation, which is the shallower aquifer of the two, provides groundwater to most of the private wells and some public wells. The Twin Mountain Formation, the deeper aquifer, serves mostly as the public water supply. The contaminated groundwater has only been found in wells which use the shallower Paluxy Formation [2].

The depth to the groundwater at the site varies from 24 to 96 feet below the ground surface for the Paluxy Formation to approximately 400 feet below ground surface for the Twin Mountain Formation. An annual average rainfall of 31 inches per year is the primary source for recharge to the aquifer. Most of the potential recharge is lost due to runoff and evapotranspiration. Secondary recharge is from streams and surface water seepage from Eagle Mountain Lake [2]. Groundwater beneath the site generally moves in an east-southeasterly direction [4].

The TCEQ/EPA Hazard Ranking System Documentation Report indicates that an abandoned landfill is located on Mountain View Drive (north of Sandy Beach Road). This landfill may have operated prior to 1964 until 1970. Another landfill, located along Sandy Beach Road and west of Rhoades Street, was observed in the past to contain drums, auto parts and automotive gasoline tanks [2]. The Mountain View and Rhoades Street landfill areas are located approximately 0.2 mile northwest and 0.4 mile west, respectively, from the intersection of Sandy Beach Road and Allison Avenue.

Demographics

The cities of Azle and Pelican Bay encompass 8.2 and 0.6 square miles, respectively. The 2005 population estimate for Azle was 10,150 and Pelican Bay had 1,750 residents [5]. According to the 2000 U.S. Census, 979 people were residing within a ½ mile radius of the intersection of Sandy Beach Road and Allison Avenue. Within one mile of the site there were 2,711 people [Figure 1].

Site Visit

On June 6, 2005, DSHS personnel visited the site and surrounding neighborhoods to collect information on potable water sources and information on community awareness of the contaminant plume. DSHS explained that residents with elevated levels in their wells received bottled water and had filtration systems installed on their wells. Potential health effects also were explained [6]. On February 22, 2006, DSHS conducted a second site visit. The residential area surrounding the plume site appeared to be in the lower to upper middle socioeconomic range. Some commercial industries observed were gasoline/convenience stores, and a wrecker service/auto shop. Elementary and junior high schools were estimated to be approximately 1 mile from the site's designated center.

Community Health Concerns

One resident was concerned that the contaminants in the groundwater could be a cause of pulmonary fibrosis. Another resident was concerned about using a contaminated groundwater well to irrigate their lawn and vegetable garden, and to fill a swimming pool and a fish pond.

This document was presented to the community and local governments in order to provide information regarding the public health assessment of this site. No comments or concerns were received by the Texas DSHS.

Environmental Contamination/Pathways Analysis/Public Health Implications

Introduction

Chemical contaminants in the environment do not always result in adverse health effects in people. Adverse health effects only are possible when people actually come into contact with the chemicals. It is this contact (exposure) that people have with the contaminants that determines the potential health hazards and drives the public health assessment process.

People can be exposed to contaminants by breathing, eating, drinking, or coming into direct contact with a substance containing the contaminant. This section reviews available information to determine whether people in the community have been, currently are, or could in the future be exposed to contaminants associated with this site.

To determine whether people are exposed to site-related contaminants, investigators evaluate the environmental and human components leading to human exposure. This analysis consists of

evaluating the five elements of an exposure pathway:

1) The source of contamination,
2) How the contaminant is transported through an environmental medium,
3) Where the exposure occurs,
4) How the contaminant gets into the body, and
5) Whether people are being exposed.

Exposure pathways can be complete, potential, or eliminated. For a person to be exposed to a contaminant, the exposure pathway must be complete. A **completed pathway** is when all five elements in the pathway are present and exposure has occurred, is occurring, or will occur in the future. A **potential pathway** is missing at least one of the five elements, but could be complete in the future. An **eliminated pathway** is missing one or more elements and will never be completed. Table 1 identifies pathways important to this site. The following discussion incorporates only those pathways relevant and important to the site.

Exposure does not always result in adverse health effects, so we also must evaluate whether the exposure could be sufficient to pose a hazard to people in the community. The factors that influence whether exposure to a contaminant or contaminants could or would result in adverse health effects include:

- The toxicological properties of the contaminant,
- How much of the contaminant the individual is exposed to,
- How often and/or how long the exposure occurs,
- The manner in which the contaminant enters or contacts the body, and
- The number of contaminants involved in the exposure.

Once exposure occurs, characteristics such as age, sex, genetics, health, nutritional status, and lifestyle, influence how that person absorbs, distributes, metabolizes, and excretes the contaminant.

When identifying plausible potential exposure scenarios, the first step is assessing the potential public health significance of the exposure. This is done by comparing contaminant concentrations to health assessment comparison (HAC) values for both noncarcinogenic and carcinogenic end points. HAC values are media-specific chemical concentrations used to screen contaminants for further evaluation. Exceeding an HAC value does not necessarily mean that a contaminant represents a public health threat, but does suggest that the contaminant warrants further consideration.

Noncancer comparison values are also known as *environmental media evaluation guides* (EMEGs) or *reference dose media evaluation guides* (RMEGs). They are based on ATSDR's minimal risk levels (MRLs) and EPA's reference doses (RfDs), respectively. MRLs and RfDs are estimates of daily human exposure to a contaminant that is unlikely to cause adverse noncancer health effects over a lifetime. Cancer risk comparison values are also known as *carcinogenic risk evaluation guides* (CREGs). They are based on EPA's chemical-specific cancer slope factors and an estimated excess cancer risk of 1-in-1-million persons exposed for a lifetime. Standard assumptions are used to calculate appropriate HAC values [7].

Environmental Contamination

This section contains site-specific information about specific contaminants associated with the site; however, inclusion in this section does not imply that a particular contaminant represents a threat to public health. We relied on the information provided in the referenced documents and assumed that adequate quality assurance/quality control (QA/QC) procedures were followed with regard to data collection, chain-of-custody, laboratory procedures, and data reporting.

Groundwater

Groundwater sampling data were collected both from the City of Pelican Bay public water supply wells (August 1994 – July 2004) and private residential wells (June – September 2004 and July 2005). These samples were analyzed for volatile organic compounds (VOCs) to document the presence and extent of chemical contamination. We compared the concentrations of chemicals in the groundwater to EPA's Maximum Contaminant Levels (MCLs). In 1974, the U.S. Congress passed the Safe Drinking Water Act which required that EPA determine safe levels of chemicals in public drinking water. We often use MCLs as a guide in assessing the potential health implications of contaminants in private wells as it provides the residents with the same protection afforded consumers who use public water systems. The EPA has set an MCL of 5 parts per billion (ppb) for TCE and 70 ppb for DCE.

Public Water Supply Wells

The Pelican Bay Public Water System (PWS ID #2200164) and the Camp Timberlake Public Water System (PWS ID #2200205) are the two public water systems that draw groundwater from the vicinity of the site. The Pelican Bay Public Water System currently has 11 active groundwater wells serving a population of 1,470 people. The Camp Timberlake Public Water System, a Girl Scouts of America camp, has one active well that serves a transient/non-community population of approximately 200 people [8]. Water samples from Camp Timberlake were not available for review.

We reviewed analysis results for 11 groundwater samples collected from six Pelican Bay PWS wells during August 1994 to September 2004 [Table 2]. During this time period, three samples from Well 12 and two samples from Well 13 exceeded the 5 ppb MCL for TCE; the levels of TCE in these wells ranged from 4.2 to 46 ppb. The results for DCE ranged from non-detect to 5 ppb with none of the samples exceeding the 70 ppb MCL for this contaminant. Wells 12 and 13 are no longer active.

Private (Residential) Water Supply Wells

We were able to review 35 groundwater samples collected from private (residential) wells at 24 addresses during June – September 2004 [Table 3]. Three additional samples were collected from two residences in July 2005 [Table 4]. TCE concentrations ranged from not detected to 644 ppb and DCE concentrations ranged from 2.53 to 531 ppb. EPA provided bottled water to residents whose well water exceeded either MCL. The TCEQ installed filtration systems on each of these wells [2]. Filtration units were installed on 10 wells; one unit was declined because the well water, which had a TCE concentration of 6 ppb, is only used to fill a swimming pool. Additional sampling was conducted to verify the effectiveness of the filtration systems;

these samples were able to verify that the filtration systems were effective at removing the contaminants. Contaminants were not detected after the affected groundwater passed through the second filter [Table 3].

Pathways Analysis

Groundwater at the site is currently used for drinking water, food preparation, bathing, and for commercial business purposes. The source (or sources) of the contamination have not been determined. It is unknown for how long residents may have been exposed to the contaminants. A possible contamination source is from the area of Mountain View and Sandy Beach Road. The contaminated groundwater plume likely migrated from northwest to the southeast. The first human exposures to the site's contaminated groundwater would have occurred from affected private wells in this area. As time progressed, the public wells (#12 and #13) were affected. Due to the plume's migration route, it is most likely that the private wells contained contaminants at a higher concentration than the public water supply wells [4].

Sampling data indicate that in the past water from both public and private wells contained TCE and DCE in excess of current drinking water standards. Contaminants, particularly volatile organic compounds that enter the home in potable water, present a situation in which residents could be exposed via multiple pathways. These include direct ingestion of the water, inhalation of the contaminant due to volatilization, and absorption of the contaminant through the skin during bathing. Thus, we would consider these all to be past completed exposure pathways. The two contaminated public wells are no longer active and filtration systems which have been installed on private wells appear to be reducing contaminant concentrations to levels below health-based standards prior to entering the homes.

Data for air, soil and surface water were not available for review. However, we do not expect exposure to these media at this site to be a significant exposure pathway. The probability of regular inhalation, ingestion or dermal contact with the contaminants is low. The frequency and duration of exposure with the contaminants would likely be low. Also, the contaminants should lack sufficient concentration due to evaporation and/or percolation. Exposure might have occurred in the past and may in the future, but it is not expected to cause any adverse health effects. Therefore we believe that the air, soil, and surface water pathways pose no apparent public health hazard.

Toxicologic Evaluation

Trichloroethene (TCE)

TCE is used mainly to remove grease from metal parts. It is also an ingredient in adhesives, paint removers, typewriter correction fluid, and spot removers. It may get into the air through the use of these products or by showering with contaminated water. TCE does not readily dissolve in water and it can remain in groundwater for a long period of time. In surface water it quickly evaporates. In soil it adheres to the soil particles for a long time. Plants and animals do not have a significant buildup of TCE [9].

Exposure to TCE can result from breathing contaminated air, ingesting contaminated water or soil, showering with contaminated water, or by using TCE containing household products. Breathing small amounts of TCE can cause headaches, lung irritation, dizziness, and poor coordination. Inhaling large amounts of TCE may impair the heart, cause unconsciousness, and cause nerve, kidney, and liver damage. Ingestion of and dermal contact with contaminated water also can result in exposure. Drinking water with large amounts of TCE may impair heart function, cause nausea, result in unconsciousness, damage the liver or cause death. Drinking water with small amounts of TCE for a long period of time may impair the immune system and cause liver and kidney damage. Dermal (skin) contact may result in rashes. Recent exposures to TCE can be detected in breath, blood, or urine using special tests [9].

The concentration of TCE in water samples reviewed for this report, ranged from not detected to 644 ppb [Tables 2, 3, 4]. There is some indication that exposure to TCE can increase the risk for adverse reproductive outcomes. Some studies have suggested that more birth defects occur among mothers who drink water containing TCE. One study, in which the population was exposed to TCE (6-239 ppb) though inconclusive, showed an increased number of children born with heart defects; this is supported by animal studies showing developmental effects of TCE on the heart. In a population potentially exposed to 267 ppb TCE in a drinking water study reported a higher number of children born with eye defects and a rare defect of the respiratory system. Still another study reported that the risk for neural tube defects and oral cleft palates was higher among mothers with TCE in their water during pregnancy [9].

It is uncertain whether exposure to TCE can increase the risk for cancer. Evidence of increased cancer was found in people exposed to high levels of TCE over a long period of time. People who used TCE contaminated well water for several years may have had a higher incidence of childhood leukemia than other people; however, these findings are inconclusive. In studies using high doses of TCE in rats and mice, tumors of the lungs, liver, and testes were found, providing some evidence that TCE can cause cancer in experimental animals. The National Toxicology Program (NTP) determined that TCE is “reasonably anticipated to be a human carcinogen.” Based on the limited data in humans and the evidence that high doses may cause cancer in animals, the International Agency for Research on Cancer (IARC) determined that TCE is “probably carcinogenic to humans” [9].

cis-1, 2-dichloroethene (DCE)

TCE eventually breaks down and becomes dichloroethene. There are two forms of dichloroethene; cis-1,2-dichloroethene (DCE) and trans-1,2-dichloroethene. DCE is used to as a solvent for waxes, resins and lacquers and also to produce other solvents. It breaks down slowly in groundwater and evaporates quickly from soil and surface water. Once in the air, DCE takes about 5-12 days to break down [10]. The concentration of DCE in water samples reviewed for this report, ranged from not detected to 531 ppb [Tables 2, 3, 4].

Exposure pathways for DCE are inhalation, ingestion, or dermal contact. These exposures occur during cooking, bathing, washing dishes, or showering with contaminated water. Breathing high levels of DCE can cause drowsiness, nausea, or death. Animals exposed to high levels had liver, heart, and lung damage. The potential long-term health effects from breathing air with low

concentrations of DCE are not known. Ingestion of high amounts (greater than 1000 milligrams per kilogram, mg/kg) of DCE by animals caused death. Ingestion of low amounts (32 mg/kg) by animals caused decreased number of red blood cells and liver effects. Long-term human health effects due to exposure to low concentrations are not known. An animal study indicated that an exposed fetus may not grow as rapidly as a non-exposed one. DCE exposures can be detected in breath, blood, and urine. These tests are not routinely used, as the breakdown products in the body are the same as with exposure to other chemicals. The EPA has determined that DCE (cis-1,2-dichloroethene) is not classifiable as to human carcinogenicity [10].

Interaction of TCE and DCE

TCE is often found along with other volatile organic compounds (VOCs) in water samples from or near hazardous waste sites. ATSDR has evaluated data on the toxicology of mixtures of 1,1,1-trichloroethane, 1,1-dichloroethane, TCE and tetrachloroethylene to help address concerns about joint toxic actions of these chemicals. Although not included in the ATSDR interaction profile, DCE can produce similar neurological effects as other VOCs [10]. While additive joint action of TCE and DCE on the liver and kidney is plausible, the potential for this interaction to occur at the Sandy Beach Road site is not known.

ATSDR is currently evaluating adverse health effects from multiple VOCs at Marines Corps base, Camp Lejeune, North Carolina. In 1997, ATSDR documented human exposures to tetrachloroethene (PCE), TCE, and 1,2-DCE in the Camp Lejeune drinking water. The time period covered 34 months but the exposures likely occurred for up to 30 years [11]. In 1998, ATSDR completed a study which found a link between fetuses exposed in the womb to drinking water contaminated with multiple VOCs and infants born weighing less than the 10th percentile [12]. It remains unclear as to whether the multiple VOCs in the water trigger this or if there are other problems associated with the condition. In 2005, ATSDR began to further study whether children exposed *in utero* had increased risk of birth defects such as spina bifida, cleft lip, cleft palate, anencephaly, or childhood leukemia/non-Hodgkin's lymphoma [13].

Public Health Implications

In the past, some residents likely were exposed to these contaminants at levels similar to levels described in studies where health effects were noted. Thus, we have concluded that in the past, the TCE and DCE in the well water could have posed a public health hazard. Since the public water wells found with elevated levels of TCE are no longer in service this exposure pathway is no longer complete. Although filtration systems have been installed on all private wells found to have elevated levels of TCE, some residents still may have very low levels of TCE in the well water. Based on the criteria that exposure may occur but is not expected to cause any adverse health effects we have concluded that currently the contaminants in the water pose no apparent public health hazard.

Community Health Concerns Evaluation

A resident expressed concerns that the contaminants in the groundwater contributed to the development of pulmonary fibrosis. Pulmonary fibrosis is the gradual scarring and thickening of lung tissue between the alveoli (air sacs). This condition impairs the ability of the lung to

transfer oxygen in the blood and the symptoms, shortness of breath and dry cough, develop over many months or years. Pulmonary fibrosis can be caused by inhaling asbestos fibers (asbestosis) or silica dust (silicosis). Other causes may be due to sarcoidosis (inflammatory disease of the lungs), scleroderma (hardening and scarring of skin and connective tissues), rheumatoid arthritis (affecting the lungs), and smoking [14]. A literature search did not reveal any studies indicating that TCE and DCE were linked to this health condition.

Another resident was concerned regarding the use of a contaminated well to irrigate a lawn and vegetable garden and also to fill a swimming pool and a fish pond. TCE and DCE and other similar chemicals are called volatile organic compounds (VOCs). These chemicals tend to volatilize or evaporate into the atmosphere. Usually during irrigation, the VOCs will quickly volatilize rather than being absorbed by plants. Research has shown that if VOCs do manage to contact and become absorbed by plants, they will not accumulate in the plant tissues as they are transferred to the plant's pores and then released into the atmosphere. VOCs in surface water (i.e. a lake, pond, or pool) also quickly volatilize. As such TCE does not accumulate significantly in animals. [9, 10, 15].

Health Outcome Data

Health outcome data record certain health conditions that occur in populations. These data can provide information on the general health of communities living near a hazardous waste site. They also can provide information on patterns of specified health conditions. Some examples of health outcome databases are tumor registries, birth defects registries, and vital statistics. Information from local hospitals and other health care providers also can be used to investigate patterns of disease in a specific population. Conditions that have prevailed for only the last 5 or 10 years are unlikely to be related to current health conditions in a community.

Children's Health Considerations

DSHS and ATSDR recognize that the unique vulnerabilities of infants and children demand special consideration. Children may be at greater risk than adults for certain kinds of exposures to hazardous substances emitted from waste sites and emergency events. Children may be more likely to be exposed because they play outdoors and often bring food into contaminated areas. They are shorter than adults, which mean they breathe dust, soil, and heavy vapors close to the ground. Children also are smaller, resulting in higher doses of chemical exposure per body weight. Children’s developing bodies may sustain permanent damage if toxic exposures occur during critical growth stages. Children depend completely on adults for risk identification, their personal welfare, housing decisions, and access to medical care.

Conclusions

1. The Texas Department of State Health Services (DSHS) has reviewed water sampling data from the Pelican Bay Public Water System and from private water wells. Various wells were reported to have TCE and/or DCE levels above their respective MCLs. Since people may have been exposed to elevated levels of these contaminants which have been

associated with health effects in several studies, we have concluded that in the past the contaminants in the water could have posed a public health hazard.

2. Groundwater samples were not available for the Camp Timberlake Public Water System. This water system is used infrequently (seasonally) for a Girls Scout recreational camp. Infrequent use and exposure would not likely pose a public health hazard.

3. Currently, the filtration systems installed on the private water wells appear to be effective at keeping contaminant levels below current health-based standards. Based on the criteria that people still may be exposed to levels not expected to cause adverse health effects, we have concluded that the contaminants in the water currently pose no apparent public health hazard.

Recommendations

1. The U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) should continue to monitor and maintain private (residential) well filtration systems to ensure proper operation until a safe alternative drinking water source can be found.

2. The U.S. EPA and TCEQ should continue to identify and sample water wells (residential and public) in the Pelican Bay area that are being used for drinking and other household purposes.

3. It would be prudent to collect groundwater samples from the nearby Camp Timberlake public water system and analyze for contaminants.

4. The DSHS and the Agency for Toxic Substances and Disease Registry (ATSDR) should review any additional environmental sampling results as they become available.

Public Health Action Plan

Actions Completed

1. On August 10, 2004, the U.S. Environmental Protection Agency (EPA) began supplying bottled water to residents whose groundwater wells exceeded the Maximum Contaminant Levels (MCLs) of 5 parts per billion (ppb) of trichloroethene (TCE) and/or 70 ppb of cis-1,2-dichloroethene (DCE).

2. The Texas Commission on Environmental Quality (TCEQ) installed filtration systems on residential wells that exceeded the MCLs for TCE and/or DCE.

3. In February 2005, the TCEQ conducted groundwater sampling to verify the effectiveness of the water filtration systems in removing TCE and DCE. The TCEQ also performed

routine maintenance of the water filtration units on residential wells that had previously exceeded the MCLs for TCE and/or DCE.

4. On February 25, 2005, the EPA stopped providing bottled water to residents, as the analysis of the well filtration systems indicated proper operation.

5. In March 2005, the TCEQ conducted a Hazard Ranking System (HRS) report for the Pelican Bay Groundwater Plume.

6. From August 24 to September 25, 2006, the public was given the opportunity to make comments regarding the conclusions and recommendations of this health assessment document. No comments or concerns regarding this public health assessment document were received by the Texas DSHS.

Actions Planned

1. As part of the EPA response action, private residences with contaminated wells will be offered to replace their existing water supply with connection to the Azle or Pelican Bay public water supply systems [4].

2. The contaminant filtration systems, installed by the TCEQ on the private wells, will be removed after the owners are connected to a public water supply, or if the connection is declined [4].

3. DSHS will send letters explaining potential health effects from ingesting contaminated groundwater to homeowners/residents that refuse to connect with a public water supply.

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Certification

This public health assessment for the Sandy Beach Groundwater Plume site located in Azle/Pelican Bay, Texas was prepared by the Texas Department of State Health Services (DSHS) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is accordance with approved methodologies and procedures existing at the time this health assessment was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

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

Team Lead, CAT, CAPEB, ATSDR

Tables and Figure

Table 1 - ATSDR Public Health Conclusion Categories

CATEGORY A. URGENT PUBLIC HEALTH HAZARD•	CATEGORY B. PUBLIC HEALTH HAZARD•	CATEGORY C. INDETERMINATE PUBLIC HEALTH HAZARD	CATEGORY D. NO APPARENT PUBLIC HEALTH HAZARD•	CATEGORY E. NO PUBLIC HEALTH HAZARD
This category is used for sites where short-term exposures (<1 year) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This category is used for sites that pose a public health hazard due to the existence of long-term exposures (>1 year) to hazardous substances or conditions that could result in adverse health effects.	This category is used for sites in which critical data are *insufficient* with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This category is used for sites where human exposure to contaminated media might be occurring, might have occurred in the past, and/or might occur in the future, but the exposure is not expected to cause any adverse health effects.	This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.
Criteria: Evaluation of available information† indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse effect on human health and requires immediate action or intervention. Such site-specific conditions or exposures might include the presence of serious physical or safety hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices which, upon rupture, could release radioactive materials.	**Criteria**: Evaluation of available relevant information† suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse effect on human health that requires one or more public health interventions. Such site-specific exposures might include the presence of serious physical hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices, which, upon rupture, could release radioactive materials.	**Criteria**: The health assessor must determine, using professional judgment, the criticality of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.	**Criteria**: Evaluation of available information† indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse effects on human health.	**Criteria**: Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future.

• Each of these designations represents a professional judgment made on the basis of critical data that ATSDR regards as sufficient to support a decision. It does not imply, however, that the available data are necessarily complete. In some cases, additional data may be required to confirm or further support the decision.

† Examples include environmental and demographic data; health outcome data; community health concerns information; and toxicologic, medical, and epidemiologic data.

Table 2
Pelican Bay Public Water System
Groundwater Sample Results: August 1994 – July 2004

Contaminant	MCL (ppb)	range of sample results (ppb)	# samples exceeding MCL per total samples
Trichloroethene (TCE)	5	nd - 46	5/11
cis-1,2-Dichloroethene (DCE)	70	nd - 5	0/11

nd = not detected

Table 3
Residential (Private)
Groundwater Sample Results: June 2004 – September 2004

Contaminant	MCL♦ (ppb)	range of sample results‡ (ppb)	# samples exceeding MCL per total samples	results after 1st filter (ppb)	results after 2nd filter (ppb)
Trichloroethene (TCE)	5	nd - 644	14/25	nd – 1.81	all nd
cis-1,2-Dichloroethene (DCE)	70	2.53 - 531	4/10	nd – 4.57	all nd

♦ no water quality regulations for private water supplies are available; therefore federal public drinking water standards (MCLs) were used.

‡ well water prior to filtration

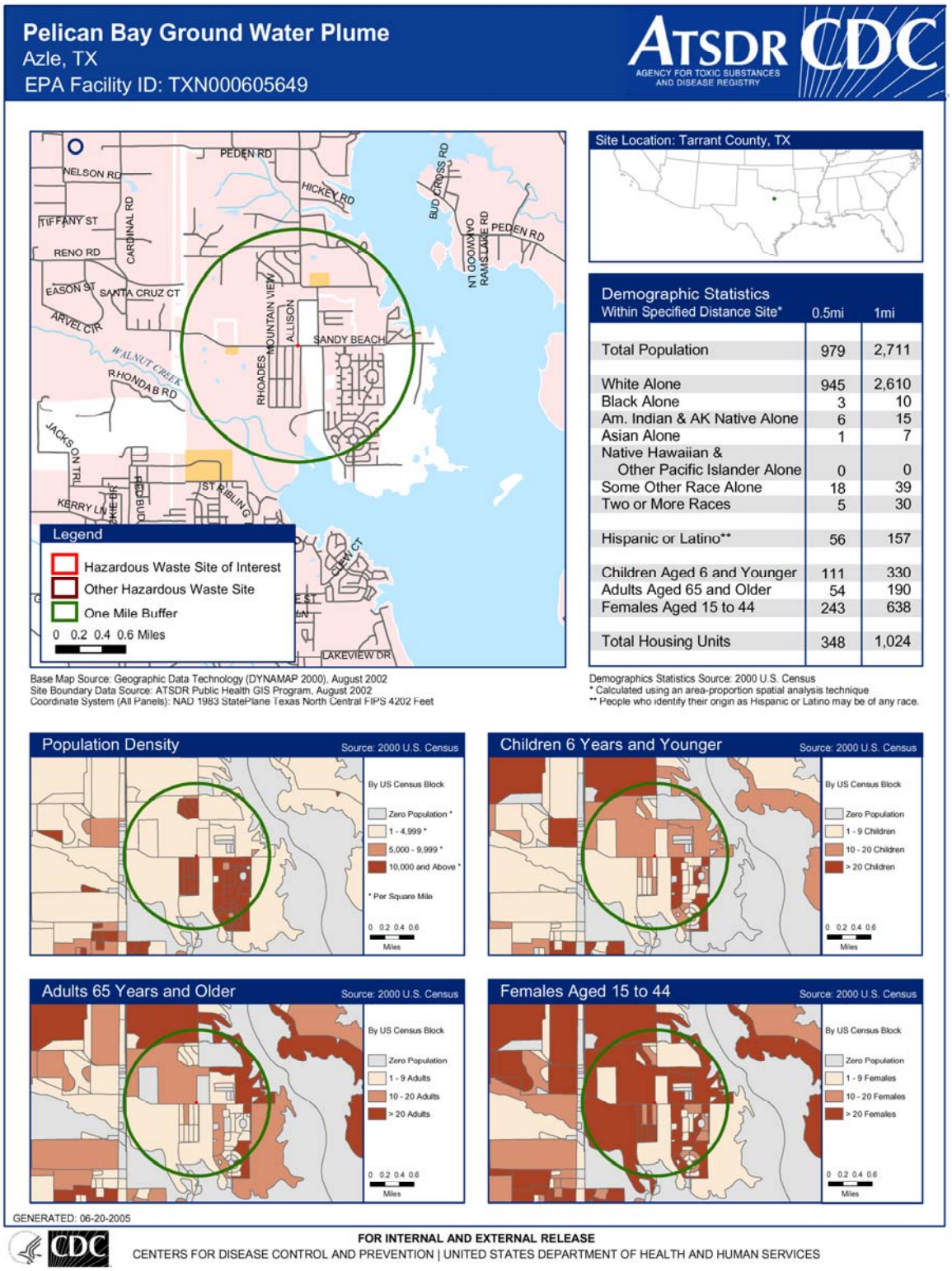
Table 4
Additional Residential (Private) *
Groundwater Sample Results: July 2005

Contaminant	MCL♦ (ppb)	range of sample results (ppb)	# samples exceeding MCL per total samples
Trichloroethene (TCE)	5	0.67 – 24.8	2/3
cis-1,2-Dichloroethene (DCE)	70	nd – 5.66	0/3

♦ no water quality regulations for private water supplies are available; therefore federal public drinking water standards (MCLs) were used.

* during the June/September 2004 sampling, residents did not allow access to their wells. Access was later granted.

Figure 1 - General Location and Demographic Information



Appendix A - Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (1980)
CREG	Cancer Risk Evaluation Guide
DCE	cis-1,2-dichloroethene, cis-1,2-dichloroethylene
DSHS	Department of State Health Services
EMEG	Environmental Media Evaluation Guide
EPA	Environmental Protection Agency
HAC	Health Assessment Comparison value
HRS	Hazard Ranking System
IARC	International Agency for Research on Cancer
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
MRL	Minimal Risk Level
NPL	National Priorities List
NTP	National Toxicology Program
PCE	tetrachloroethene, perchloroethene
PHA	Public Health Assessment
ppb	parts per billion
PWS	Public Water System
QA/QC	Quality Assurance/Quality Control
RfD	Reference Dose
RMEG	Reference Dose Media Evaluation Guide
SARA	Superfund Amendments and Reauthorization Act (1986)
TCE	trichloroethene, trichloroethylene
TCEQ	Texas Commission on Environmental Quality
VOC	Volatile Organic Compound

Appendix B – Completed Exposure Pathway Evaluation of the Sandy Beach NPL site

EXPOSURE PATHWAY ELEMENTS								
Pathway Name	Contaminants of Concern	Source	Transport Media	Point of Exposure	Route of Exposure	Exposed Population	Time	Conclusions
Groundwater								
residential (private) wells	TCE, DCE	chemical release (location unknown)	groundwater	in residences and businesses using the affected groundwater	ingestion, inhalation❖, dermal contact	affected area residents and businesses	past	**past** - may have posed a public health hazard
							present future	**No apparent public health hazard:** with properly installed, operating, and maintained filtration systems
public water supply	TCE	chemical release (location unknown)	groundwater	in residences and businesses using affected groundwater	ingestion, inhalation❖, dermal contact	affected area residents and businesses	past	**past** - may have posed a public health hazard
							present future	**No apparent public health hazard:** with the discontinued use of the affected public wells

❖ = the contaminant may volatilize (change to a gas) during the use of tap water and then become inhaled