

Letter Health Consultation

Review of Vapor Intrusion Sampling Data

BANDERA ROAD GROUNDWATER PLUME

LEON VALLEY, BEXAR COUNTY, TEXAS

EPA FACILITY ID: TXN000606565

MARCH 4, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation 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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LETTER HEALTH CONSULTATION

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BANDERA ROAD GROUNDWATER PLUME

LEON VALLEY, BEXAR COUNTY, TEXAS

EPA FACILITY ID: TXN000606565

Prepared By:

Texas Department of State Health Services
Health Assessment & Toxicology Program
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry



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**RE: Review of Vapor Intrusion Sampling Data
Bandera Road Groundwater Plume
Leon Valley, Bexar County, Texas 78238**

Mr. Villarreal:

Background and Statement of Issues

Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Texas Department of State Health Services (DSHS) Health Assessment and Toxicology Program (HAT) completed a Public Health Assessment of the Bandera Road Groundwater Plume on September 28, 2007 [1]. During follow-up activities at this site, the Environmental Protection Agency (EPA) collected soil gas and indoor air samples from several commercial buildings, proximal to the plume, to determine if contaminants in the groundwater were migrating through the subsurface into the indoor air. This consultation addresses potential public health implications associated with the indoor air sampling data collected by EPA in January 2009.

Discussion

The EPA collected and analyzed 16 indoor air samples from eight different occupied areas in five different commercial buildings near the Bandera Road tetrachloroethylene (PCE) groundwater plume. Indoor air samples were not collected from residential dwellings during this investigation. EPA also collected two outdoor air samples from the same area to estimate the background concentrations of the contaminants being measured.

Time weighted indoor air samples of approximately 8 hours were collected using SummaTM canisters. According to field logbooks and communications with EPA [2, 3], the heating, ventilation, and air conditioning (HVAC) units were on during sampling and the indoor temperature was normal (65 to 75°F). Indoor air samples were collected during normal business hours at one business (Advance America Cash Advance) but after hours at all the other businesses. Cleaning products, air fresheners, and other volatile organic compound (VOC) containing items were removed from the businesses 48 hours prior to sample collection. Weather conditions during the sampling were cloudy to overcast and cold, with outdoor

temperatures ranging from 25 to 40°F in the morning and 50 to 75°F in the afternoon. Indoor air samples were analyzed for VOCs by gas chromatography/mass spectrometry (GC/MS) using EPA Method TO-15.

We screened each of the VOCs found in the indoor air by comparing the reported concentrations to appropriate health-based screening values for non-cancer and cancer endpoints. The non-cancer screening values are based on ATSDR's Minimal Risk Levels (MRLs) for chronic (1 year and longer), intermediate (2 weeks to 1 year), and acute (less than 2 weeks) exposures. For contaminants in air, the MRLs are the concentrations that are likely to be without appreciable risk of adverse non-cancer health effects over the specified duration of exposure [4]. For the contaminants considered to be known human carcinogens, probable human carcinogens, or possible human carcinogens we used ATSDR's cancer risk evaluation guides (CREGs) or calculated CREGs using EPA's chemical-specific cancer inhalation unit risk (IUR) factors and an estimated excess increased lifetime cancer risk of one-in-one million persons exposed for a lifetime. For both non-cancer and cancer endpoints we used standard assumptions for body weight (70 kg adult) and inhalation rate (20 m³/day).

The standard exposure assumptions used to establish these screening levels are chosen to be conservative with respect to protecting public health; therefore, actual exposures are likely to be lower. Because of this, exceeding a screening value does not mean that a contaminant represents a public health threat, rather it suggests that the contaminant warrants further consideration. To assess the potential public health significance of contaminants that exceed their respective non-cancer screening levels we review and integrate relevant toxicological information with plausible exposures and estimate the magnitude of the public health significance by comparing the estimated exposures to reported "No Observed" and Lowest Observed" Adverse Effects Levels (NOAELs and LOAELs) in animals and to known effect levels in humans, when available. To assess the potential public health significance of the carcinogens we used EPA's IUR factors and exposure assumptions appropriate for an occupational setting¹ to calculate the theoretical increased lifetime cancer risk associated with each contaminant. The theoretical increased lifetime cancer risk is the proportion of a population that may be affected by a carcinogen during a lifetime of exposure. The true or actual risk is unknown and may be as low as zero [4].

Results

The only reported indoor air contaminant that exceeded its non-cancer screening values was PCE. Benzene, carbon tetrachloride, chloroform, 1,2-dichloroethane, methylene chloride, PCE, trichloroethylene or TCE, and vinyl chloride each exceeded their respective CREG value. The potential public health implications of exposure to these contaminants in indoor air are discussed below (see Table 1).

Tetrachloroethylene (PCE)

PCE is a man-made chemical that is commonly used in dry cleaning and metal-degreasing operations. It also is found in some household products such as water repellants, spot removers, adhesives, and wood cleaners [5]. PCE is a liquid at room temperature but evaporates easily into the air; thus, exposure to PCE generally occurs by inhalation or ingestion. Regardless of the

¹ In this case, we used an occupational exposure scenario in which people are exposed to carcinogens for 8 hours a day, 6 days a week, 50 weeks per year, for 10 years.

exposure route (breathing, eating, drinking, or touching), most PCE leaves the body from the lungs during exhalation. A small amount of PCE travels to the liver and is broken down to other compounds and excreted in urine within a few days [5].

Studies have shown that high concentrations of PCE in air (over 678,000 $\mu\text{g}/\text{m}^3$) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Observations of dry cleaning workers, exposed to an average concentration of 102,000 $\mu\text{g}/\text{m}^3$ in air, indicated that response times to stimuli were longer after exposure for approximately 10 years. Studies with pregnant rats have shown behavioral changes, consisting of decreased neuromuscular ability, in offspring when the mother is exposed to 6,100,000 $\mu\text{g}/\text{m}^3$ PCE in air during the first 20 days of gestation. No changes were observed in rats exposed to 678,000 $\mu\text{g}/\text{m}^3$ PCE in air [5].

The National Toxicology Program has categorized PCE as reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity in animals. Inhalation of PCE has resulted in an increased incidence of liver tumors in male and female mice. Increased incidences of leukemia in male and female rats and rare kidney tumors in male rats have been noted [6].

Animal studies using inhalation and ingestion exposures have shown that PCE can cause liver and kidney damage or liver and kidney cancer. These studies were conducted using levels of PCE that are much higher than those most people are exposed to and the relevance of these studies to humans is unclear. The human health effects of breathing air or drinking water with low levels of PCE are not known [5].

Two indoor air samples collected in Building 1 exceeded ATSDR's chronic inhalation MRL of 300 $\mu\text{g}/\text{m}^3$ and acute inhalation MRL of 1,000 $\mu\text{g}/\text{m}^3$ for PCE. Although levels of PCE in indoor air exceed these health-based screening values, they are well below the levels at which noncarcinogenic health effects have been observed. Acute exposure studies indicate no neurological effects in people exposed to 67,800 $\mu\text{g}/\text{m}^3$ PCE for 4 hours per day for 4 days (the study upon which the acute inhalation MRL is based). In this study, increased pattern reversal visual-evoked potential latencies, and deficits for vigilance and eye-hand coordination were noted in people exposed to 339,000 $\mu\text{g}/\text{m}^3$ PCE. Chronic exposure studies indicate no neurological effects in people exposed to 1,360 $\mu\text{g}/\text{m}^3$ PCE after thirty years of exposure. Color vision loss was noted in people exposed to 49,500 $\mu\text{g}/\text{m}^3$ PCE for 8 years. Increased reaction time on neurobehavioral tests was noted in people exposed to 102,000 $\mu\text{g}/\text{m}^3$ PCE for 10 years in an occupation setting (the study upon which the chronic inhalation MRL is based). Another study found an increase in subjective symptoms such as dizziness in people exposed to 136,000 $\mu\text{g}/\text{m}^3$ for 10 years in an occupational setting. Other studies found no neurological or other systemic effects at these levels. Systemic adverse health effects occurred at much higher levels. However, these studies are based upon exposure to high levels of PCE under occupational (dry cleaners) or laboratory settings. The health effects associated with exposure to lower levels of PCE are not well understood [5].

Levels of PCE in indoor air also are well below occupational standards set forth by the Occupational Safety and Health Administration (OSHA). The OSHA's permissible exposure limits (PELs) include time-weighted average (TWA) and ceiling (C) concentrations. The PEL

TWA must not be exceeded during any 8-hour work shift of a 40-hour workweek. The PEL C must not be exceeded during any part of the workday. For PCE, the PEL TWA is $678,000 \mu\text{g}/\text{m}^3$ and the PEL C is $1,360,000 \mu\text{g}/\text{m}^3$. The National Institute for Occupational Safety and Health (NIOSH) policy on carcinogens is to minimize workplace exposure concentrations [7]. Even though this is an occupational setting, unlike people who work in a facility that uses PCE, the workers at this business have no expectation of exposure to PCE, and health effects endpoints for determining occupational exposure standards are different than those used for residential or office settings.

Although EPA has not classified PCE for its carcinogenicity, EPA Regional Screening Levels (RSLs) are available. We used a Regional IUR for this contaminant. All 16 samples exceeded the calculated CREG ($0.2 \mu\text{g}/\text{m}^3$) for PCE. Using the average concentration of PCE found in the building with the highest concentrations ($1,750 \mu\text{g}/\text{m}^3$), the theoretical excess lifetime cancer risk associated with exposure to PCE in the indoor air was 4.1×10^{-4} . Qualitatively, we describe this as a low increased risk for cancer. Theoretical cancer risks for all other occupied spaces indicated a no apparent to no increased risk for cancer (Table 2).

Benzene

Benzene is a colorless liquid with a sweet odor that is used in the manufacturing of rubbers, lubricants, dyes, detergents, and to make other chemicals such as styrene (for Styrofoam® and other plastics) and cyclohexane (for nylon and synthetic fibers) [8]. Health effects associated with breathing benzene include drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. When exposure stops, most of these health effects cease. Inhalation of benzene can effect the immune system and also may result in harmful effects in the tissues that form blood cells (bone marrow), resulting in anemia or excessive bleeding. The EPA has determined that benzene is a human carcinogen [8].

Benzene exceeded its CREG ($0.1 \mu\text{g}/\text{m}^3$) in 13 of the indoor air samples. Using the average concentration of benzene found in the building with the highest concentrations ($1 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to benzene in these occupational settings to be 3.1×10^{-7} . We would interpret this risk as posing no increased risk for developing cancer.

Carbon Tetrachloride

Carbon tetrachloride is a clear liquid with sweet odor that evaporates easily and is typically found as a gas [9]. Carbon tetrachloride has been used to make refrigeration fluid and propellants for aerosol cans; in the past it was used as a cleaning fluid (a degreaser and spot remover), in fire extinguishers, and as a fumigant to kill insects in grain. Because of its effects on the ozone layer, the use of carbon tetrachloride is being phased out [9]. The effects of long-term exposure of low levels of carbon tetrachloride are not known. Exposure to high levels of carbon tetrachloride can lead to liver, kidney, and brain/nervous system damage. If the damage is not too severe, liver and kidney function generally returns to normal within a few days or weeks after the exposure stops. The EPA has determined that carbon tetrachloride is a probable human carcinogen [9].

Carbon tetrachloride exceeded its CREG ($0.07 \mu\text{g}/\text{m}^3$) in 14 of the indoor air samples. Using the average concentration of carbon tetrachloride found in the building with the highest concentrations ($0.75 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to carbon tetrachloride in these occupational settings to be 4.4×10^{-7} . We would interpret this risk as posing no increased risk for developing cancer.

Chloroform

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste [10]. Chloroform was one of the first inhaled anesthetics to be used during surgery, but it is no longer used for the purpose. Chloroform is used to make other chemicals and often enters the environment from chemical companies and paper mills; it also is found in waste water from sewage treatment plants and chlorinated drinking water [10]. Inhalation or ingestion of large amounts of chloroform can cause brain, liver, and kidney damage. The EPA has determined that chloroform is a probable human carcinogen [10].

Chloroform exceeded its CREG ($0.04 \mu\text{g}/\text{m}^3$) in 8 of the indoor air samples. Using the average concentration of chloroform found in the building with the highest concentrations ($2.45 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to carbon tetrachloride in these occupational settings to be 2.2×10^{-6} . We would interpret this risk as posing no increased risk for developing cancer.

1,2-Dichloroethane

1,2-Dichloroethane is a clear liquid that has a pleasant smell and a sweet taste [11]. It is used to make vinyl chloride, which is used in plastic and vinyl products such as polyvinyl chloride (PVC) pipes, construction materials, packaging materials, furniture upholstery, and wall coverings. It has also been used in cleaning solutions, adhesives, paint, and varnish [11]. Health effects associated with breathing high concentrations of 1,2-dichloroethane include nervous system disorders, liver and kidney disease, and lung effects. The EPA has determined that 1,2-dichloroethane is a probable human carcinogen [11].

1,2-Dichloroethane exceeded its CREG ($0.04 \mu\text{g}/\text{m}^3$) in 13 of the indoor air samples. Using the average concentration of 1,2-dichloroethane found in the building with the highest concentrations ($0.4 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to 1,2-dichloroethane in these occupational settings to be 4.1×10^{-7} . We would interpret this risk as posing no increased risk for developing cancer.

Methylene Chloride

Methylene chloride is a colorless liquid that has a mild sweet odor [12]. It is used as an industrial solvent and a paint stripper, and is found in aerosol and pesticide products, spray paint, automotive cleaners, and other household products. Methylene chloride also is used in the manufacture of photographic film [12]. Inhalation of large amounts of methylene chloride may cause a decreased reaction time, loss of balance, and reduced hand coordination. Exposure to methylene chloride for long periods of time may cause dizziness, nausea, tingling or numbness of the fingers and toes, and drunkenness. These effects generally disappear after exposure stops. Animal studies have indicated that exposure to methylene chloride can cause irritation to the

eyes and damage to the cornea, liver, and kidney. The EPA has determined that methylene chloride is a probable human carcinogen [12].

Methylene chloride exceeded its CREG ($2 \mu\text{g}/\text{m}^3$) in 2 of the indoor air samples. Using the average concentration of methylene chloride found in the building with the highest concentrations ($5.2 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to methylene chloride in these occupational settings to be 9.6×10^{-8} . We would interpret this risk as posing no increased risk for developing cancer.

Trichloroethylene (TCE)

TCE is a colorless liquid with a somewhat sweet odor and a sweet, burning taste [13]. TCE is used as a solvent to remove grease from metal parts and can be found in household products such as typewriter correction fluid, paint remover, adhesives, and spot removers [13]. TCE was once used as an anesthetic for surgery, and people that are exposed to large amounts of TCE may become dizzy or sleepy; unconsciousness or death may result in people exposed to very high levels. Inhalation of moderate levels of TCE (such as for those that work with the chemical) may cause headaches or dizziness and can damage some of the nerves in the face. Other health effects associated with exposure to TCE include liver and kidney damage and changes in heart beat. However, the levels at which these effects occur in humans is not well characterized [13]. The National Toxicology Program has categorized TCE as reasonably anticipated to be a human carcinogen [6].

Although EPA has not classified TCE for its carcinogenicity, EPA RSLs are available. We used a Regional IUR for this contaminant. Eight samples exceeded the calculated CREG ($0.5 \mu\text{g}/\text{m}^3$) for TCE. Using the average concentration of TCE found in the building with the highest concentrations ($29 \mu\text{g}/\text{m}^3$), we estimate the theoretical excess lifetime cancer risk associated with exposure to TCE in these occupational settings to be 2.3×10^{-6} . We would interpret this risk as posing no increased risk for developing cancer.

Vinyl Chloride

Vinyl chloride is a colorless gas at room temperature and exists as a liquid if kept under high pressure or at low temperatures. It has a mild, sweet odor [14]. Vinyl chloride is a manufactured substance that does not occur naturally in the environment; however, it can be formed as a breakdown product of PCE and TCE. Most of the vinyl chloride produced in the United States is used to make PVC. PVC is then used to make a variety of plastic products such as pipes, wire and cable coatings, and packaging material [14]. Inhalation of high concentration of vinyl chloride can cause dizziness or sleepiness. Recovery from these effects is usually quick once the exposure stops; however, some people get a headache when they breathe fresh air immediately after being exposed to high levels of vinyl chloride. Animal studies have shown that exposure to very high levels of vinyl chloride can damage the liver, lungs, and kidneys, and can damage the heart and prevent blood clotting. Long term exposure to vinyl chloride can cause liver and nerve damage or an immune reaction. The levels at which these effects occur are not known. The EPA has determined that vinyl chloride is a human carcinogen [14].

Vinyl chloride exceeded its CREG ($0.1 \mu\text{g}/\text{m}^3$) in 4 of the indoor air samples. Using the average concentration of vinyl chloride found in the building with the highest concentrations ($4.8 \mu\text{g}/\text{m}^3$),

we estimate the theoretical excess lifetime cancer risk associated with exposure to vinyl chloride in these occupational settings to be 1.7×10^{-6} . We would interpret this risk as posing no increased risk for developing cancer.

Chemical Mixtures

As most of the compounds detected in the indoor air have similar noncancerous adverse health effects (liver and kidney damage and nervous system effects) and are carcinogens or potential carcinogens, it is important to consider the potential for adverse health effects to occur due to exposure to mixtures of these substances. Although there are substances detected in the indoor air that could contribute, the public health conclusions for this site are driven by the levels of PCE detected in the indoor air at Advance America Cash Advance.

Conclusions

The conclusions reached in this report are based on limited sampling data and assumptions that the reported levels represent chronic exposures. In reality, the indoor air sample results used for this report represent the concentrations measured in the air at a point in time and may not be representative of chronic exposures.

Based on available information, the reported concentrations of PCE from Building 1 (in the area of Advance America Cash Advance) exceed health-based screening levels. After reviewing available toxicological information we would not expect the reported concentrations to result in observable adverse non-cancer health effects. Because there is a low increased risk for cancer associated with the reported concentrations, we have categorized this area of Building 1 as posing a public health hazard. The other occupied spaces that were evaluated pose no apparent public health hazard.

Due to a paucity of data, past exposures to PCE in the indoor air pose an indeterminate public health hazard.

Recommendations

- The flow of fresh air into the Advance America Cash Advance space should be increased and the air from the Advance America Cash Advance space should be isolated from the other leasehold spaces.
- Occupants from the Advance America Cash Advance space should be relocated until a suitable remedy is in place.
- Building owners, tenants, and employees should be provided with information on the potential health hazards associated with exposure to PCE at the reported levels.

Public Health Action Plan

Actions Completed

1. The DSHS HAT completed a Public Health Assessment of the Bandera Road Groundwater Plume on September 28, 2007.
2. During follow-up activities at this site, the EPA collected soil gas and indoor air samples from several commercial buildings.
3. The DSHS HAT evaluated the indoor air data collected by EPA from commercial buildings and prepared this report.

Actions Planned

1. This report will be made available to the EPA and owners, tenants, and employees of the commercial buildings that were investigated.
2. The DSHS will attend the EPA availability session on March 10, 2009 and talk with those concerned about indoor air issues.
3. The DSHS and ATSDR will follow-up on recommendations provided in this report.

If you have any questions, please contact me at (512) 458-7111 extension 3004.

Sincerely,

Carrie Bradford, MS, PhD
Toxicologist
Exposure Assessment, Surveillance, and Toxicology Group

cc: Robert Musick, Project Manager, TCEQ
Tracie Phillips, Toxicologist, TCEQ
Jeff Kellam, Environmental Health Scientist, ATSDR, Atlanta, Georgia
George Pettigrew, Senior Regional Representative, ATSDR, Dallas, Texas
Jennifer Lyke, Regional Representative ATSDR, Dallas, Texas

References

1. Agency for Toxic Substances and Disease Registry. Public Health Assessment. Bandera Road Groundwater Plume. Leon Valley, Bexar County, Texas. September 28, 2007.
2. Correspondence. Doug McReynolds, Project Manager, EA Engineering, Science, and Technology, Inc. February 6, 2009.
3. Personal communication. Chris Villarreal, Project Manager, Environmental Protection Agency. February 17, 2009.
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12. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Methylene Chloride. Atlanta: US Department of Health and Human Services. September 2000.
13. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. Atlanta: US Department of Health and Human Services. September 1997.
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Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
C	ceiling
CREG	Cancer Risk Evaluation Guide
DHSS	Texas Department of State Health Services
EPA	United States Environmental Protection Agency
F	Fahrenheit
GC/MS	gas chromatography/mass spectrometry
HAT	DHSS Health Assessment and Toxicology Program
HVAC	heating, ventilation, and air conditioning
IUR	inhalation unit risk
kg	kilograms
LOAEL	Lowest Observed Adverse Effects Level
µg/m ³	micrograms per cubic meter
MRL	minimum risk level
m ³ /day	meters cubed per day
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
NOAEL	No Observed Adverse Effects Level
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethylene
PEL	Permissible Exposure Limit
PVC	polyvinyl chloride
RSL	EPA Regional Screening Levels
TCE	trichloroethylene
TWA	time-weighted average
VOC	volatile organic compounds

Table 1. Indoor air data that exceed comparison values. All other data points were below comparison values (where available) or other evaluation criteria.

Contaminant	Concentration Range ($\mu\text{g}/\text{m}^3$)	Average Concentration ($\mu\text{g}/\text{m}^3$) ^a	Number of Samples Detected	Number of Samples that Exceed Comparison Value	Comparison Value ($\mu\text{g}/\text{m}^3$)	Comparison Value Source	Theoretical Excess Lifetime Cancer Risk ^b
PCE	0.32-2,400	1,750	16	16 2 2	0.2 300 1,000	CREG chronic MRL acute MRL	4.1×10^{-4}
Benzene	ND-1.5	1	13	13	0.1	CREG	3.1×10^{-7}
Carbon Tetrachloride	ND-0.75	0.75	14	14	0.07	CREG	4.4×10^{-7}
Chloroform	ND-3.2	2.45	8	8	0.04	CREG	2.2×10^{-6}
1,2-Dichloroethane	ND-0.51	0.4	13	13	0.04	CREG	4.1×10^{-7}
Methylene Chloride	ND-5.2	5.2	13	2	2	CREG	9.6×10^{-8}
TCE	0.10-39	29	16	8	0.5	CREG	2.3×10^{-6}
Vinyl Chloride	ND-4.8	4.8	6	4	0.1	CREG	1.7×10^{-6}

^aThis value represents the highest average concentration from each area sampled.

^bThe theoretical excess cancer risk is based upon the maximum concentration of each contaminant, assuming people are exposed to the carcinogen for 8 hours a day, 6 days a week, 50 weeks per year, for 10 years. Cancer risks greater than 1×10^{-4} indicate an increased risk for cancer.

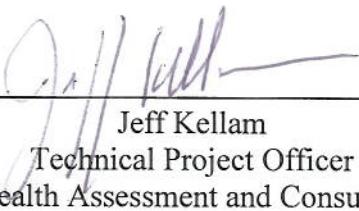
Table 2. Indoor air concentrations of tetrachloroethylene (PCE) associated with vapor intrusion from the Bandera Road Groundwater Plume site.

Building	Sample Location	PCE Concentration ($\mu\text{g}/\text{m}^3$)	Average PCE Concentration for Occupied Space ($\mu\text{g}/\text{m}^3$)	Theoretical Excess Lifetime Cancer Risk^a
1	Advance America Cash Advance	2,400	1,750	4.1×10^{-4}
		1,100		
	Freedom Debt Dot Com	150	205	4.7×10^{-5}
		260		
	Justice of the Peace Precinct No. 2 and Constable's Office	84	139	3.2×10^{-5}
		270		
		130		
		71		
2	Telemarketing Office	0.84	0.84	1.9×10^{-7}
	Tucasa	0.86	0.86	2.0×10^{-7}
3	Leon Valley Veterinary Clinic	19	12.7	2.9×10^{-6}
		6.4		
A	Northside Learning Center – Building A	0.39	0.41	9.5×10^{-8}
		0.42		
B	Northside Learning Center – Building B	0.32	0.42	9.7×10^{-8}
		0.52		

^aThe theoretical excess cancer risk is based upon the average concentration of PCE in each occupied space, assuming people are exposed to PCE for 8 hours a day, 6 days a week, 50 weeks per year, for 10 years. Cancer risks greater than 1×10^{-4} indicate an increased risk for cancer.

CERTIFICATION

This Letter Health Consultation was prepared by the Texas Department of State Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedure existing at the time the health consultation was initiated.

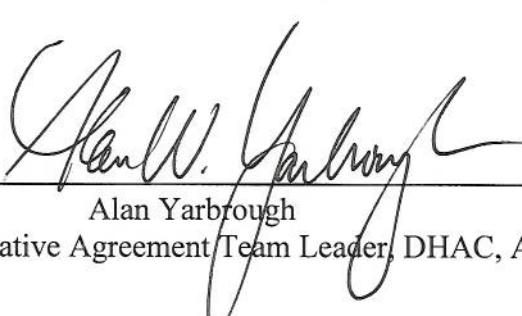


Jeff Kellam

Technical Project Officer

Division of Health Assessment and Consultation (DHAC)
ATSDR

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



Alan Yarbrough

Cooperative Agreement Team Leader, DHAC, ATSDR