

Health Consultation

GRANTS CHLORINATED SOLVENT PLUME

GRANTS, CIBOLA COUNTY, NEW MEXICO

EPA FACILITY ID: NM0007271768

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
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Health Consultation: A Note of Explanation

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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HEALTH CONSULTATION

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Prepared by:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation and
Division of Regional Operations

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Purpose

The Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, is part of the US Department of Health and Human Services. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund), ATSDR conducts public health assessments at sites which the US Environmental Protection Agency (USEPA) places on the National Priorities List (NPL). This health consultation for the Grants Chlorinated Solvents Plume (Grants CSP) site was prepared in accordance with this statutory requirement.

ATSDR reviewed available documents, conducted a site visit in 2005, and met with USEPA to gather site-related information, issues, and concerns. This health consultation presents our findings and conclusions, identifies site-related public health issues, and recommends follow-up actions to mitigate exposures. It also describes the methods and data used to evaluate exposures.

Background

Site Description

The Grants CSP site is in a mixed commercial/residential area of the City of Grants, Cibola County, New Mexico. The site area is defined by a zone of shallow groundwater contaminated by chlorinated solvents that include tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and vinyl chloride (VC).

The site area is approximately 12.25 acres with the following approximate street and property boundaries: Second Street to the west; Adams Avenue and Jefferson Avenue to the north; Anderman Street, Washington Avenue, and Mesa View Elementary School property to the east; and Stephens Avenue and the Rio San Jose to the south. The Grants CSP site contains former, current, and potential users of chlorinated solvents.

The City of Grants has about 8,800 people. The city is served by municipal water supply from two wells located between 1-2 miles west of the site. The wells draw water from the San Andres/Glorieta Aquifer with the shallowest screen interval at about 149 feet below ground level. These wells have not been impacted by site groundwater contaminants (NMED 2004).

There is a local prohibition against use of private wells for drinking water within the city limits by the City of Grants (USEPA 2005). A search of well records maintained by the New Mexico Office of the State Engineer revealed eight domestic wells between 0.5 and 1 mile of the site, and no domestic wells closer than 0.5 miles. Three private wells were located in the site area during the course of the groundwater investigations. None of these wells are reported as currently in use for any purpose. Although some wells within the site area are used for irrigation, no one is known to be drinking water from a private well (NMED 2001).

Site History

Chlorinated solvents in groundwater were discovered in 1993 by the New Mexico Environmental Department (NMED) during an investigation of service lines for unleaded gasoline tanks at a

Figure 1. Map showing Grants CSP Site, Grants, Cibola County, New Mexico

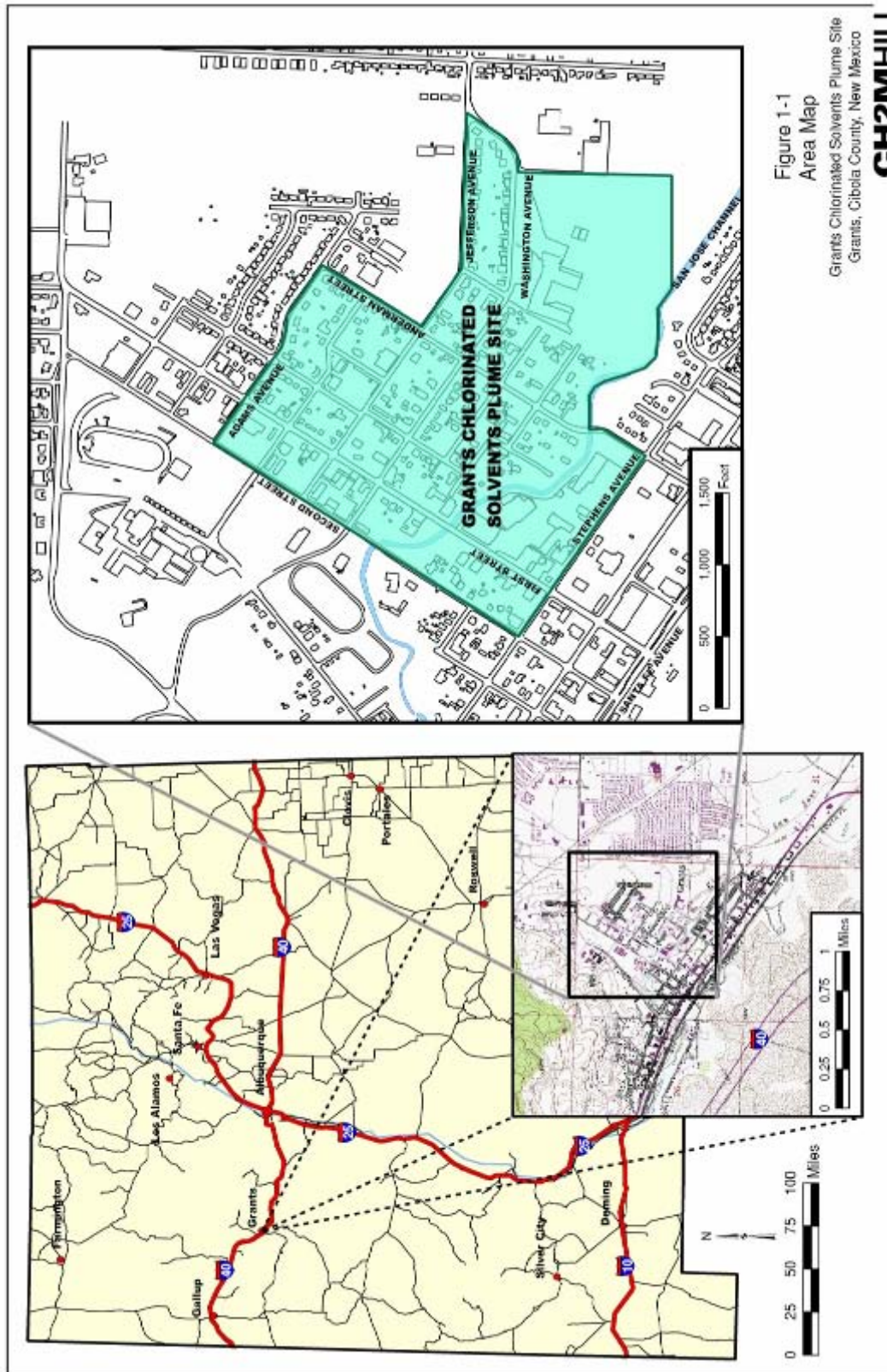


Figure taken from EPA Remedial Investigation Report

local service station. NMED confirmed the presence of chlorinated solvents in shallow groundwater (NMED 2004). In addition dissolved-phase gasoline constituents, including methyl tert-butyl ether (MTBE), benzene, toluene, ethylbenzene, and xylenes (BTEX), were detected in groundwater, probably from some service stations in the area. The NMED Ground Water Quality Bureau – Superfund Oversight Section (NMED-SOS) subsequently conducted a two-year Site Inspection (SI) investigation.

Multiple sources of contaminants are suspected, including former and current dry cleaning operations along First Street (USEPA 2005). In March 2004, the Grants CSP site was proposed to the NPL as a result of NMED investigations and additional information from EPA. The site became final in September 2004.

In cooperation with NMED, EPA initiated a remedial investigation (RI) in October 2003. Additional subsurface soil, soil vapor, and groundwater samples were collected. Indoor and outdoor air samples were obtained to further characterize the nature and extent of contamination identified in previous investigations. The RI also provided details on the stratigraphy and hydrogeology, which were previously unavailable.

After the first series of indoor air sampling in October 2003, EPA requested ATSDR to determine whether exposure to indoor air contamination from site-related solvents posed a health hazard to occupants of the homes. ATSDR (2004) concluded that concentrations of TCE and PCE detected during one round of indoor air sampling were below levels that would be expected to pose a public health hazard for non-cancer health effects. Information available at that time was not sufficient to determine if the site posed a public health hazard for indoor air. ATSDR also concluded that it would be prudent public health policy to implement remedial actions in homes where VOC concentrations exceeded EPA Action Levels. ATSDR recommended additional air monitoring to better assess long-term exposure to VOCs in indoor air.

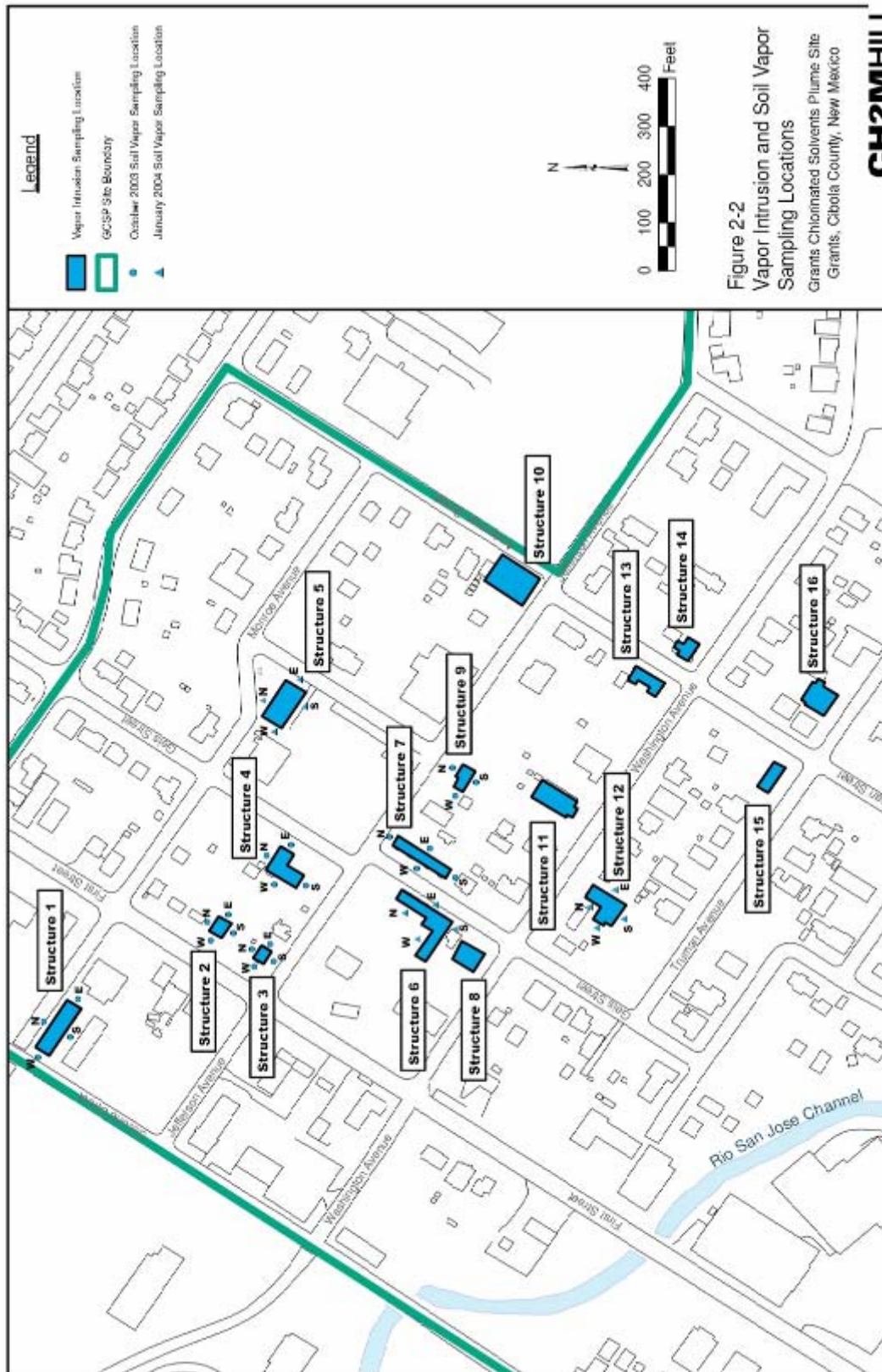
EPA contractors conducted additional sampling in 2004 (January and June) and in January 2005 (EPA RI Report). Sixteen structures, mostly residences, have been sampled during the four rounds of indoor air sampling. Outdoor air and offsite background samples were also collected.

Site Visit

ATSDR staff visited the Grants Chlorinated Plume site and the surrounding areas during the week of 23 August 2005. The site tour included the source of contamination (Holiday Cleaners, 715 First Street) and nearby areas along First Street, Second Street and Geis Streets. Cross streets were Monroe Avenue, Jefferson Avenue, and Washington Avenue.

Mixed commercial and residential buildings (apartments) were located on the northwest side of First Street. A residential housing apartment was located directly behind Holiday Cleaners. Residential housing and mixed commercial buildings were located on the opposite side of First Street. Four unoccupied or abandoned residential and commercial buildings were located directly across from Holiday Cleaners along First Street starting at the intersection of Monroe Ave and First Street. Mobile home units and residential housing were located behind the abandoned residential and commercial buildings located along Geis Street. At the time of the site visit, the residential structures appeared to be occupied.

Figure 2. Air Sampling locations (Figure taken from EPA Remedial Investigation Report)



The ATSDR Team evaluated groundwater monitoring wells in relation to existing buildings to determine whether they were located on top of the groundwater plume. In addition, ATSDR evaluated structures above the plume to determine if they contained basements, crawlspaces, or sump spaces that could trap vapors rising from the contaminated groundwater water and soil. For example, the bottom skirting used around mobile homes to cover tires and piping may trap vapors. This visual inspection was non-intrusive and was done visually from public streets.

During the site visit, the ATSDR Team noted that the City utility trench located in front of the Holiday Cleaners paralleling First Street did not appear to have monitoring or sampling wells installed. A surface inspection did not indicate or reveal any past disturbance on road surface to indicate past sampling events had occurred. In addition, no visible signs of existing monitoring wells were located in or adjacent to line the utility trench.

The ATSDR Team also noted the presence of a few private wells reported and sampled by NMED and EPA. An ATSDR team member spoke with one long-term resident about the wells and learned that a few residents used the wells to irrigate their lawns.

Discussion

Evaluation of Environmental Contaminants and Exposure Pathways

Our review of environmental information reported by NMED and EPA indicated that people living and working in the site area could come in contact with site-related contaminants in three ways. These are 1) breathing indoor air with VOC vapors which have migrated inside from groundwater, 2) drinking contaminated groundwater, and 3) having direct contact with contaminated water. Direct contact with contaminated water could occur from using shallow groundwater wells to irrigate lawns and gardens, when basements are flooded by the rising groundwater table, or during work on buried utilities where the utility trench intersects the contaminated water table.

Of these three exposure pathways, only exposure to contaminated indoor air is considered to be a completed pathway at present. Based on city ordinances, well surveys and our site visit, no one is currently known to be drinking site contaminated groundwater. There is a possibility of future exposures if groundwater contamination persists. Direct contact with contaminated groundwater through irrigation wells and flooded basements is also a slight possibility. While contact with contaminants by utility workers during maintenance and repair work on buried water, sewer, and telephone lines is possible, no environmental sampling has been performed to determine if contaminants are entering any of the utility trench areas.

Domestic Well Water

No one within the site area is known to be drinking water from a private well because of local prohibition against using private wells for a water supply. Ingestion of contaminated well water is considered a future exposure pathway because of the known persistence of chlorinated solvents in groundwater. PCE and TCE are denser than water and tend to sink in groundwater until reaching a bottom boundary barrier, such as a dense clay layer or bedrock.

Some of the chlorinated solvents will continue to volatilize and move upward, through the top of the water table and overlying soils. The dissolution and volatilization of chlorinated solvents is a

slow process that can last decades as the dissolved portion spreads with the flow of the groundwater. If left unremediated, in time the contaminated groundwater could spread beyond the boundaries of the current site area. The contaminants might also move downward into the drinking water aquifer below the current zone of contamination. There is also a slight possibility of a domestic drinking water well being installed into a contaminated groundwater zone in violation of the local ordinance.

Maximum concentration of contaminants of concern from results of monitoring well sampling conducted in 2004 and 2005 are shown in Appendix A Table 2.

The few residents irrigating their lawns with shallow groundwater may be exposed to contaminants from direct contact and accidental ingestion. Results (Table 3 in Appendix A) from sampling of 4 irrigation wells in 2004 indicated only 1 of the 4 wells contaminated by VOCs.

Indoor Air

Indoor air samples were collected at 16 structures during four separate sampling events (USEPA 2005). There are about 400 to 500 occupied structures within the Grants CSP site. The majority of the sampled structures overlie the area with the highest levels of groundwater contaminants.

The chlorinated solvents and petroleum products contaminating the shallow groundwater tend to volatilize and move vertically; moving from the water table, through the few feet of soil (5-8 ft) then into basements, crawlspaces, and eventually into living spaces. As the contaminants move upward, the concentrations are greatly reduced (attenuated) by various natural processes such as dilution and dispersion. These attenuation mechanisms can reduce the concentrations of contaminants by an order of magnitude (divide by 10) to two orders of magnitude (divide by 100) or more. Such is the case with VOCs in groundwater and soil gas at GCPS.

The highest indoor air concentration of PCE (179 ug/m^3) was from the living room of a home with a basement overlying groundwater with PCE concentrations of 5800 ug/L and PCE soil gas concentrations of 5289 ug/m^3 . In moving from soil gas to indoor air, PCE gas concentrations were attenuated to 179 ug/m^3 . Other contaminants were also attenuated in a similar fashion. The same residence also had the highest indoor air concentration of TCE (103 ug/m^3) which was reduced from a nearby soil gas measurement of $23,038 \text{ ug/m}^3$. Maximum indoor air contaminant levels and corresponding nearby maximum soil gas concentrations are shown in Table 1.

The building with the highest reported levels of petroleum chemicals (benzene, ethylbenzene, toluene, and xylenes) did not have corresponding high levels of the same chemicals in the soil gas. For a majority of the petroleum chemicals, levels were an order of magnitude lower in the soil gas as compared to the indoor air. This indicates that the likely source was not groundwater or soil gas. The EPA sampling team reported observations of a fuel spill at an adjacent service station (USEPA 2005). This fuel spill was likely the primary source of the air contamination measured at that time. If similar fuel spills re-occur, they will likely serve as a source of air contamination as well.

Table 1. Maximum indoor contaminant concentrations with corresponding health comparison values and maximum soil gas concentrations (ug/m³).

Contaminant	Indoor Air Concentration	Comparison Value*	Additional Evaluation Needed	Soil Gas Concentration
PCE	179	270 (EMEG-c)	No	5,289
TCE	103	537 (EMEG-i)	No	23,038
cis-1,2-DCE	30	Not available	Yes	19,427
Vinyl chloride	0.015	77 (EMEG-i) 0.1 (CREG)	No	5.7 (estimated)
MTBE	25	2,527 (EMEG-c)	No	no samples
Benzene	15	13 (EMEG-i) 0.1 (CREG)	Yes	20.7
Ethylbenzene	214	4,340 (EMEG-i)	No	26
Toluene	282	302 (EMEG-i)	No	85
m/p xylene	606	---	---	70.3
o-xylene	244	---	---	18
Total xylene	850	3,087 (EMEG-i) 441 (EMEG-c) 100 (RfC)	Yes	88.3

* Detailed information on environmental media guidelines (EMEGs), reference concentrations (RfCs) and cancer risk evaluation guidelines (CREGs) is provided in Appendix B.

Public Health Implications

Indoor Air

As noted in Table 1, the maximum levels reported for most contaminants were below respective health comparison values. Information on comparison values is provided in Appendix B.

Neither ATSDR nor USEPA currently have an inhalation comparison value for cis-1,2 DCE (ATSDR 1996, USEPA-IRIS web site). The maximum reported cis-1,2 DCE level to date (Table 1) is well below state regulatory guidelines compiled by ATSDR (1996) and well below occupational guidelines published by NIOSH (2003). Based on available information, exposures to cis-1,2 DCE are not likely to result in adverse health effects.

The maximum level for total xylene was above the chronic EMEG and the RfC. The presence of xylene, a BTEX component, was found in background and outdoor air samples. Its presence could be due to other sources, such as storing gasoline, paints, and cleaners in a basement or other enclosed area. Individuals are not likely to be exposed on a routine basis to xylene at the maximum level shown in Table 1. The maximum level of xylene was well below the intermediate EMEG which applies to an exposure period of 15-364 days, which is considered a more likely exposure period. We do, however, recommend that people store gasoline and other petroleum products outside their homes, especially if children live in the home.

The maximum indoor air level of benzene exceeded the CREG. Other possible indoor sources for this chemical include cigarette smoke, gasoline, and paint. Likely sources of benzene, a BTEX component, also include automotive repair and hobby activities, and overfilling of nearby underground storage tanks (USEPA 2005). People are not likely to be exposed to the maximum benzene level shown in Table 1 on a routine basis. We recommend that paint, gasoline and petroleum based products be stored outside residences.

Direct Contact with Contaminated Groundwater

A few residents use shallow wells to irrigate lawns. The private well located near the high concentrations along First Street was sampled in 2004 with results (9.7 ug/l for PCE and 19 ug/l for TCE) well below any health concern level for direct contact or infrequent ingestion. The remaining irrigation wells are currently too far from the high concentrations to be impacted. Therefore there is no current public health hazard from the use of the irrigation wells. However, concentrations could increase in the future if the concentrations of groundwater contaminants are not reduced by natural attenuation or remedial measures.

Utility workers might also be exposed to VOCs while maintaining or repairing water, sewer, or other utility lines buried in the utility trenches adjacent to suspected sources of VOCs, such as Holiday cleaners. Because the utility trenches have not been sampled, it is unknown if contaminants are present in the trenches. Information is insufficient to evaluate the public health implication for utility workers potentially exposed to contaminants in utility trenches.

Child Health Considerations

One way for children to be exposed to site-related contaminants is by direct contact with contaminated groundwater used to irrigate lawns. Residences with children, or day care facilities, should not use shallow groundwater wells for lawn or yard irrigation when children are playing.

Another way for children to children to be exposed to site-related contaminants is by breathing indoor air with VOC vapors which have migrated inside from groundwater. Based on available information, we do not think that current exposures to children are likely to result in adverse health effects.

Conclusions

Because no one is known to use groundwater as a drinking water source at present, this pathway is considered to pose no current public health hazard. Information is not available to evaluate past exposures and they are considered indeterminate health hazards. Assessing future exposures is contingent on remedial actions that are completed and actual future groundwater uses.

Current use of groundwater for irrigation of gardens and yards is considered to pose no apparent public health hazard. The low frequency and duration of exposures are not likely to result in adverse health effects.

Potential exposure of utility workers to contaminants in utility trenches adjacent to source areas is considered an indeterminate public health hazard because no sample results from the utility trenches are available.

Exposure to contaminants in indoor air is occurring, but the levels of contaminants coupled with the low frequency and duration of exposure are not likely to result in adverse health effects. The Grants CSP site is considered to currently pose no apparent public health hazard for exposure to VOCs in indoor air. Because future site use is unpredictable (construction of new buildings with basements), future exposure to VOCs in indoor air is an indeterminate public health hazard.

Recommendations

- 1) As a prudent public health practice, we recommend that the City of Grants modify the city building codes for the site area to include installation of vapor barriers for any new buildings over the highest concentrations of groundwater contaminants in the area bordered by First Street, Geis Street, Monroe Avenue, and Jefferson Avenue.
- 2) We also recommend remedial measures to prevent infiltration of contaminated groundwater into structure #3 to prevent an increase in VOC infiltration into indoor air.
- 3) We recommend that EPA apply appropriate remedial measures to prevent future contamination of drinking water wells.
- 4) The utility trenches adjacent to source areas should be sampled to determine if contaminants have seeped into the trenches in sufficient concentrations to pose a health hazard to utility workers.

Public Health Action Plan

ATSDR will review new groundwater or indoor air data as they become available.

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References

ATSDR. 1996. Toxicological Profile for 1,2-dichloroethene. ATSDR, Atlanta: US Department of Health and Human Services. August, 1996.

ATSDR. 2004. Health Consultation: Grants Chlorinated Solvents Plume, Grants, Cibola County, New Mexico. Atlanta: US Department of Health and Human Services. February 3, 2004.

NIOSH. 2003. Pocket Guide to Chemical Hazards. National Institute for Occupational Safety and Health, Cincinnati, OH. January, 2003.

NMED. 2001. Site Inspection Report, Grants Chlorinated Solvents Plume Site, CERCLIS ID: NM0007271768, Cibola County, New Mexico. New Mexico Environmental Department, Albuquerque, NM.

NMED. 2004. HRS Documentation Record. Grants Chlorinated Solvents Plume Site, CERCLIS ID: NM0007271768, Cibola County, New Mexico. New Mexico Environmental Department, Albuquerque, NM. February, 2004.

USEPA. 2005. *Draft* Remedial Investigation Report for Grants Chlorinated Solvents Plume Site. Prepared by CH2M Hill and Science Applications International Corporation. July 2005.

Appendix A-Summary Tables

Table 2. Monitoring well results for 2004 and 2005 displaying maximum concentrations

station_name	sample_date	Chemical	results	units
W-2	3/20/2005	cis-1,2-Dichloroethene	2700	ug/L
W-7	2/11/2004	Cyclohexane	860	ug/L
W-1	2/10/2004	Methyl tert-butyl ether (MTBE)	350	ug/L
W-6	3/22/2005	Tetrachloroethene (PCE)	40000	ug/L
W-2	3/20/2005	Trichloroethene (TCE)	6100	ug/L
W-11	3/21/2005	Vinyl Chloride	16	ug/L
W-1	2/08/2004	Methylcyclohexane	860	ug/L
W-11	3/21/2005	1,1-Dichloroethene	8.5	ug/L

Source: EPA Remedial Investigation Report, 2006; Table 5-6

Table 3. Results of irrigation well sampling

Sample date	Chemical	Results	units
2/11/2004	Bromoform	1.5	ug/L
2/11/2004	cis-1,2-Dichloroethene	5.3	ug/L
2/11/2004	Tetrachloroethene (PCE)	9.7	ug/L
2/11/2004	Trichloroethene (TCE)	19	ug/L

Source: EPA Remedial Investigation Report, 2006; Table 5-6

Appendix B

Exposure Pathways

An exposure pathway is a route by which people can have contact with chemicals originating from a contamination source. An exposure pathway consists of the following five elements: 1) a source of contamination, 2) a media such as air or soil through which the contaminant is transported, 3) a point of exposure where people can contact the contaminant, 4) a route of exposure by which the contaminant enters or contacts the body, and 5) a receptor population. Exposure pathways are complete if all five elements are present and connected. If one of these elements is missing, the pathway is considered incomplete, and human exposure is not possible.

ATSDR evaluated the potential for human exposure to VOCs from Grants Chlorinated Plume site in a 4-step process. We first examined the pathways by which people could come in contact with contaminants. Then we screened the contaminants found in the exposure pathway to determine if levels were sufficient to warrant further health evaluation. For contaminants present at levels above screening values, we then reviewed likely exposure scenarios that could exist. In the final step, we determined whether a reasonable combination of dose and duration (amount of time a person might be exposed) was sufficient to cause illness or other adverse health problems.

Comparison Values

These are very conservative levels derived for chemicals on the basis of toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are intended to protect the most sensitive populations and are not clean-up levels. They do not consider chemical interactions or multiple routes of exposure.

We used ATSDR inhalation EMEGs and EPA reference concentrations (RfCs) to evaluate the potential for non-cancer health effects. EMEGs are based on ATSDR MRLs which are estimates of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), non-cancer effects. MRLs are calculated for specific routes of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs are not used as predictors of harmful health effects. RfCs are EPA estimates — with uncertainty or safety factors built in — of daily lifetime exposures to substances that are unlikely to cause harm in humans.

Cancer risk evaluation guide (CREG) values are based on EPA chemical-specific cancer slope factors. CREG values are based on an estimated risk of one additional cancer in one million people exposed over a 70-year lifetime. Many assumptions used to calculate health guideline values are conservative with respect to protecting public health. Consequently, exceeding a health guideline value does not necessarily indicate that adverse health effects will occur.

MRLs and RfDs are based on the assumption of a chemical exposure threshold below which adverse health effects are not likely. MRLs and RfDs are conservative estimates of the daily exposure to contaminants that are unlikely to cause adverse health effects — even if exposure occurs for a lifetime.