

Letter Health Consultation

Evaluation of Contaminants in Indoor Air and Groundwater:
Residential Sampling Location 0065H

700 South 1600 East PCE Plume

Operable Unit 1 (OU-1): 0065H

Salt Lake City, Salt Lake County, Utah

EPA FACILITY ID: UTD981548985

October 28, 2024

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Office of Community Health Hazard Assessment
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Office of Community Health Hazard Assessment
Atlanta, Georgia 30333

October 11, 2024

Shannon Smith
CERCLA Program Manager
Utah Department of Veterans Affairs Salt Lake City
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Salt Lake City, UT 84113

Dear Shannon Smith:

In 2019, the Department of Veterans Affairs Medical Center (VAMC) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review the results of indoor air, soil, and surface water samplings from a groundwater plume beneath the East Side Springs section of Salt Lake City, UT. The plume and homes associated with the contaminated groundwater are part of the 700 South 1600 East PCE Plume Superfund Site. When ATSDR's 2023 public health assessment (PHA) was originally written, data were not available for residential sampling location 0065H [ATSDR 2023]. This document follows up on that original PHA, now assessing indoor air and groundwater data of residential sampling location 0065H.

ATSDR's evaluation of the air sampling data indicates that breathing tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride (VC), or 1,4-dioxane in the air inside residential sampling location 0065H is not expected to harm people's health. These levels in the air were below levels of health concern. Vapor intrusion tends to be worst during cold and hot weather when doors and windows remain mostly shut. No indoor air samples were collected during hot weather. This means ATSDR cannot evaluate the potential for vapor intrusion during the summer.

ATSDR's evaluation of the groundwater sampling data indicates PCE found in the groundwater was either not detected or detected below ATSDR's soil vapor intrusion-groundwater comparison value (CV). ATSDR CVs are concentrations which human exposure would not likely cause harmful health effects. Therefore, concentrations below ATSDR's CV suggest vapor intrusion into residential sampling location 0065H is not expected to occur at levels of concern.

ATSDR recommends VAMC continue to monitor the concentration and boundary of the PCE plume in relation to residential sampling location 0065H. The indoor air of the residence should be re-sampled if (1) contaminant concentrations of the PCE plume increase above soil vapor intrusion-groundwater CVs, or (2) the PCE plume migrates within 100 feet of the home. ATSDR will continue to follow up on other public health action recommendations published in the original 2023 PHA.

Background

The 700 South 1600 East PCE Plume site covers approximately 300 acres on the east side of Salt Lake City. The site contains a groundwater plume contaminated with volatile organic compounds. From approximately 1976 to 1984, the Department of Veterans Affairs Medical Center (VAMC) operated a dry-cleaning facility on this site [EPA 2012]. At the time, most dry cleaners used PCE as a dry-cleaning solvent [ATSDR 2019]. The dry cleaner disposed of condensate from the dry-cleaning solvent recovery system into a drain connected to the municipal sewer system. Sewer system leaks are believed to be the source of PCE that entered the aquifer [EPA 2012].

Since 2013, this site has been listed as the 700 South 1600 East PCE Plume Superfund Site. For cleanup purposes, site regulators divided the site into two operable units. Accelerated Operable Unit 1 (AOU-1) contains the shallow groundwater PCE plume (less than 50 feet below ground surface), and residential homes built above the contaminated groundwater. The groundwater PCE plume and source were labeled as Operable Unit 2 (OU-2). In 2019, the VA determined, with regulatory approval, that AOU-1 and OU-2 would be combined into a single operable unit, OU-1.

Environmental Data and Health Implications

The Environmental Protection Agency (EPA) identified five chemicals as initial contaminants of concern. In environments with limited oxygen, PCE breaks down into TCE, cis-1,2-DCE, and VC. 1,4-dioxane has also been associated with chlorinated solvent manufacturing, so it became a concern during this data review [EPA 2017].

The PCE-contaminated plume is concerning because of its potential for vapor intrusion. Vapor intrusion occurs when volatile chemicals evaporate from the groundwater, turn into gas, and enter buildings through cracks in foundations or utility lines.

Air Data and Evaluation of Residential Sampling Location 0065H

On December 16, 2019, and January 9, 2020, VAMC collected air samples in and around residential sampling location 0065H. VAMC collected twelve indoor air samples and one outdoor air sample using HAPSITE®, SUMMA®, and Radiello® passive absorbent sample techniques. Time-integrated sampling technique, such as SUMMA® stainless canister air sampling, is the standard for vapor intrusion studies [EPA 2014]. Each sample technique was used in various locations throughout the home, including the living room, basement crawl space, basement family room, and basement laundry room (Table 1).

Table 1: Indoor and Outdoor Air Samples at Residential Sampling Location 0065H

Location	Sample Type	Sample Year	PCE (µg/m ³)	TCE (µg/m ³)	Cis-1,2-DCE (µg/m ³)	VC (µg/m ³)	1,4-Dioxane (µg/m ³)
Living Room	HAPSITE®	2019	0.1 U	0.1 U	0.1 U	NS	NS
Living Room	Radiello®	2020	0.082	0.044 U	NS	NS	NS
Living Room	SUMMA®	2020	0.092 J	0.26 U	0.19 U	0.12 U	0.88 U
Basement Crawl Space	HAPSITE®	2019	0.1 U	0.1 U	0.1 U	NS	NS
Basement Crawl Space	Radiello®	2020	0.11	0.044 U	NS	NS	NS
Basement Crawl Space	SUMMA®	2020	0.12 J	0.22 U	0.16 U	0.1 U	0.74 U
Basement Family Room	HAPSITE®	2019	0.1 U	0.1 U	0.1 U	NS	NS
Basement Family Room	Radiello®	2020	0.12	0.044 U	NS	NS	NS
Basement Family Room	SUMMA®	2020	0.16 J	0.25 U	0.18 U	0.12 U	0.83 U
Basement Laundry Room	HAPSITE®	2019	0.1 U	0.1 U	0.1 U	NS	NS
Basement Laundry Room	Radiello®	2020	0.12	0.044 U	NS	NS	NS
Basement Laundry Room	SUMMA®	2020	0.12 J	0.22 U	0.16 U	0.1 U	0.74 U
Outdoor	SUMMA®	2020	0.083 J	0.21 U	0.16 U	0.1 U	0.71 U

U: Analyte was not detected at the associated value, which is the reporting limit

J: Result is estimated

NS: Not sampled

Bolded text indicates maximum concentration for each contaminant

CVs are concentrations of contaminants which human exposure would not likely cause harmful health effects. Each CV is specific to an environmental medium, such as air, soil, or water. Although concentrations below the CV are considered safe, it cannot be assumed that concentrations above the CV would cause harmful health effects. ATSDR uses inhalation CVs to either identify contaminants that are not expected to cause harmful health effects or if contaminants should be further evaluated.

In this evaluation, ATSDR compared the air sampling results to two ATSDR CVs: the cancer risk evaluation guide (CREG) and minimal risk level (MRL), also known as environmental media evaluation guide (EMEG).

- ATSDR CREGs are estimated concentrations of carcinogens that would be predicted to cause no more than one excess cancer in a million people exposed in a lifetime.
- ATSDR MRLs/EMEGs are estimated concentrations of contaminants that would be predicted to not cause noncancer health effects during acute (14 days or less), intermediate (between 15 and 364 days), and chronic (365 days or more) exposures.

ATSDR compared the maximum concentration of each indoor air contaminant with its respective CV (Table 2). ATSDR does not have an inhalation CV for cis-1,2-DCE, but there is a CV for its isomer, trans-1,2-DCE. An isomer is a compound with the same chemical formula but different arrangement of atoms leading to different properties. Trans-1,2-DCE is more likely to cause harmful human health effects than cis-1,2-DCE [ATSDR 2023]. The maximum detected concentration of cis-1,2-DCE (0.19 µg/m³) was notably less than the CV of trans-1,2-DCE (12,000 µg/m³). Therefore, ATSDR would not expect adverse health effects from breathing this concentration of cis-1,2-DCE.

ATSDR retained three indoor air contaminants (TCE, VC, and 1,4-dioxane) for further evaluation because the maximum concentrations were above the CREGs (see Table 2). This is based on U-qualified data, meaning concentrations were not detected above the method detection

limit. Assuming contaminants are present at the detection limit provides a maximum estimate of the potential health risks.

Table 2: Screening of Maximum Indoor Air Values Against ATSDR CVs

	Maximum concentration (µg/m ³)	CREG (µg/m ³)	MRL/ EMEG (µg/m ³)	Exceeds ATSDR CREG?	Exceeds ATSDR MRL?	Further Risk Evaluation?
PCE	0.16 J	3.8	41	No	No	No
TCE	0.26 U	0.21	2.1	Yes	No	Yes
Cis-1,2-DCE	0.19 U	N/A	N/A	N/A	N/A	No
Trans-1,2-DCE	N/A	N/A	12,000 (Acute)	N/A	No	No
VC	0.12 U	0.11	51 (Intermediate)	Yes	No	Yes
1,4-Dioxane	0.88 U	0.2	110	Yes	No	Yes

U: Analyte was not detected at the associated value, which is the reporting limit

J: Result is estimated

ATSDR estimates the risk scenario for residential exposures of 24 hours per day, seven days per week, and 52.14 weeks per year:

- Cancer risk:
 - Cancer risk is used to evaluate the potential for an increase in cancer cases from exposure to a contaminant.
 - TCE is a carcinogen with a mutagenic mode of action. Children are more likely to develop cancer when exposed to carcinogens with a mutagenic mode of action. For this reason, ATSDR adjusts cancer risk using an age-dependent adjustment factor (ADAF) of three for children under age 16.
 - Reasonable maximum exposure (RME) refers to people who are at the high end of the distribution for exposure to a contaminant (approximately the 95th percentile). ATSDR’s default RME residential occupancy period is up to 33 years.
 - Central tendency exposure (CTE) refers to people who have average or typical exposure to a contaminant. ATSDR’s default CTE residential occupancy period is up to 12 years.
 - Cancer risk greater than 1E-06, or one excess cancer in a million people, indicates the need for further in-depth toxicological evaluation of the potential for cancer-related health effects.
- Noncancer risk:
 - Hazard quotient (HQ) is calculated to evaluate the potential for noncancer health hazards to occur from exposure to a contaminant.
 - HQ greater than one indicates the need for further in-depth toxicological evaluation of the potential for noncancer health effects.

Cancer and noncancer risk associated with indoor air samples collected from residential sampling location 0065H are shown in Table 3 for TCE, Table 4 and Table 5 for VC, and Table 6 for 1,4-Dioxane.


The estimated cancer risk of 1,4-dioxane differs depending on level of exposure (see Table 6). Exposure to the RME indicate a potential low increased risk of cancer-related health effects, up to two excess cancers in a million people with high-end exposure. However, exposure to the

CTE, indicate the risk of cancer decreases to seven excess cancers in 10 million people with more average levels of exposure. The estimated risk assessment for 1,4-dioxane is based on the maximum method detection limit for U-qualified data. This is a conservative assessment which might overestimate exposure risk. Note, this is a theoretical estimate of cancer risk that ATSDR uses as a tool for deciding whether public health actions are needed to protect health – it is not an actual estimate of cancer cases in a community.

Background air concentrations represent naturally occurring levels of contaminations, or human-made levels of contamination not related to site specific activities. 1,4-dioxane background air concentrations averaged about 4 µg/m³ in the mid-1980s [ATSDR 2012]. When background air concentrations are higher than measured air concentrations, this makes it difficult to differentiate increased cancer rates due to normal background levels or due to chemical exposure. Overall, ATSDR estimates cancer risk for 1,4-dioxane indicate a low risk of cancer and does not expect exposure to cause a health concern.

The cancer risk for TCE and VC is both less than 1E-06. Therefore, ATSDR does not expect cancer related health effects from exposure to TCE or VC. The noncancer HQ for each contaminant is less than one. Therefore, ATSDR also does not expect noncancer health effects to be seen.

Table 3. Residential: Default estimates for chronic exposure to trichloroethylene in air at 0.26 µg/m³*

	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.12	-	1	0.12	-	1
1 to < 2 years	0.12	-	1	0.12	-	1
2 to < 6 years	0.12	-	4	0.12	-	4
6 to < 11 years	0.12	-	5	0.12	-	5
11 to < 16 years	0.12	-	1	0.12	-	5
16 to < 21 years	0.12	-	0	0.12	-	5
Total Child	-	2.9E-7	12	-	4.4E-7	21
Adult	0.12	1.6E-7	12	0.12	4.5E-7	33
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	6.0E-7	33


Source: [VAMC]

Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; µg/m³ = micrograms per meter cubed; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.4.2.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 2.1 $\mu\text{g}/\text{m}^3$ and the cancer risks were calculated using the inhalation unit risks of 2.1E-06 [NHL], 1.0E-06 [liver], 1.0E-06 [kidney] ($\mu\text{g}/\text{m}^3$)⁻¹ and age-dependent adjustment factors.

§ This cancer risk represents a scenario where children are likely to continue to live in their childhood home as adults.

Table 4. Residential: Default estimates for chronic exposure to vinyl chloride in air at 0.12 $\mu\text{g}/\text{m}^3$ *

 Exposure Group	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
	Birth to < 1 year	-	-	1	-	-
1 to < 2 years	-	-	1	-	-	1
2 to < 6 years	-	-	4	-	-	4
6 to < 11 years	-	-	5	-	-	5
11 to < 16 years	-	-	1	-	-	5
16 to < 21 years	-	-	0	-	-	5
Total Child	-	1.6E-7	12	-	2.8E-7	21
Adult	-	8.1E-8	12	-	2.2E-7	33
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	4.5E-7	33

Source: [VAMC]

Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; $\mu\text{g}/\text{m}^3$ = micrograms per meter cubed; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.4.2.0.

§ This cancer risk represents a scenario where children are likely to continue to live in their childhood home as adults.

Table 5. Residential: Default estimates for intermediate exposure to vinyl chloride in air at 0.12 µg/m³*


Exposure Group	Noncancer Hazard Quotient
Birth to < 1 year	0.0024
1 to < 2 years	0.0024
2 to < 6 years	0.0024
6 to < 11 years	0.0024
11 to < 16 years	0.0024
16 to < 21 years	0.0024
Adult	0.0024

Source: [VAMC]

Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; µg/m³ = micrograms per meter cubed

* The calculations in this table were generated using ATSDR's PHAST v2.4.2.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 51 µg/m³.

Table 6. Residential: Default estimates for chronic exposure to 1,4-dioxane in air at 0.88 µg/m³*

 Exposure Group	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
	Birth to < 1 year	0.0080	-	1	0.0080	-
1 to < 2 years	0.0080	-	1	0.0080	-	1
2 to < 6 years	0.0080	-	4	0.0080	-	4
6 to < 11 years	0.0080	-	5	0.0080	-	5
11 to < 16 years	0.0080	-	1	0.0080	-	5
16 to < 21 years	0.0080	-	0	0.0080	-	5
Total Child	-	6.8E-7	12	-	1.2E-6 ‡	21
Adult	0.0080	6.8E-7	12	0.0080	1.9E-6 ‡	33
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	1.9E-6 ‡	33

Source: [VAMC]

Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; µg/m³ = micrograms per meter cubed; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years

* The calculations in this table were generated using ATSDR’s PHAST v2.4.2.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 110 µg/m³ and the cancer risks were calculated using the inhalation unit risk of 5.0E-06 (µg/m³)⁻¹.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ This cancer risk represents a scenario where children are likely to continue to live in their childhood home as adults.

Groundwater Data and Evaluation of Residential Sampling Location 0065H

In 2021, a hydrogeology report estimates the PCE concentration of the groundwater plume and approximates the plume’s boundaries (see Appendix A). The residential sampling location 0065H is located near monitoring well 32 (MW-32) (see Appendix B). MW-32 is located more than 100 feet from the 5 µg/L boundary of the groundwater plume. During June 2021 and June 2022, MW-32 did not detect PCE in the groundwater. In November 2022, MW-32 detected PCE at 0.46 µg/L.

The detectable level of PCE found in MW-32 was compared to ATSDR’s soil vapor intrusion-groundwater CV of 5.3 µg/L. ATSDR’s soil vapor intrusion-groundwater CVs are derived using indoor air CVs that have no known or anticipated adverse human health effects. These CVs are protective estimates allowing for a margin of safety to the human population. The groundwater samples VAMC collected are well below the soil vapor intrusion-groundwater CV. Therefore,

ATSDR does not expect a complete groundwater-to-indoor air vapor intrusion pathway into residential sampling location 0065H.

Limitations

As part of this assessment ATSDR made several assumptions that could lead to the over- or underestimating of risk. Some limitations of this assessment include

1. During vapor intrusion, contaminants may travel over distances greater than 100 feet through sewer lines or utility conduits that pass through groundwater or soil gas contamination. Generally, ATSDR assumes buildings greater than 100 feet from a contaminated groundwater plume have low potential for vapor intrusion.
2. Long-term sampling is needed to assess temporal trends of vapor intrusion concentrations due to seasonal factors, such as temperature, weather, and barometric pressure. Indoor air samples were not obtained during the summer season, as recommended in the original PHA.
3. ATSDR's assessment of residential sampling location 0065H is based on the limited indoor air sampling investigation of five discrete locations. Five to 13 air samples of each contaminant were obtained over two days during one winter season.
4. J-qualified indoor air data for PCE indicate some sampled concentrations were estimated values, which could over- or underestimate risk.
5. U-qualified indoor air data indicate the sampled concentrations were not detected above the method detection limit. Subsequent risk analysis that assumes contaminants were present at the detection limit could overestimate exposure risk.

Despite these limitations, ATSDR believes the exposure estimates assumed in this evaluation are reasonable. Cancer and noncancer health effects may have been substantially greater before air and groundwater sampling were conducted, but historical risk cannot be evaluated with available data.

Conclusions

ATSDR reaches the following conclusions:

Conclusion 1: Air data from December 2019 and January 2020 indicate that breathing PCE, TCE, cis-1,2-DCE, VC, or 1,4-dioxane in the air inside residential sampling location 0065H is not expected to harm people's health.

Basis for conclusion: Concentrations of contaminants in the air during the winter of 2019 to 2020 were below levels of health concern. Sampling was not available to evaluate vapor intrusion during past summers when people may have kept doors and windows mostly closed, which can allow vapors to build up indoors.

Conclusion 2: The groundwater data from 2021 and 2022 indicate the groundwater PCE concentration near the residence is below levels of concern. Therefore, vapor intrusion is not expected to occur at levels that cause potential health effects.

Basis for conclusion: During that time, PCE was either not detected, or detected below ATSDR's soil vapor intrusion-groundwater CV.

Recommendations

ATSDR recommends VAMC continue to monitor the concentration and boundary of the PCE plume in relation to residential sampling location 0065H. The indoor air of the residence should be re-sampled for vapor intrusion if (1) groundwater contaminant concentration increases above soil vapor intrusion-groundwater CVs, or (2) the PCE plume migrates within 100 feet of the home. ATSDR will continue to follow up on other public health actions recommended in the original 2023 PHA.

Sincerely,

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Office of Community Health Hazard Assessment, Western Section
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Technical Consultants

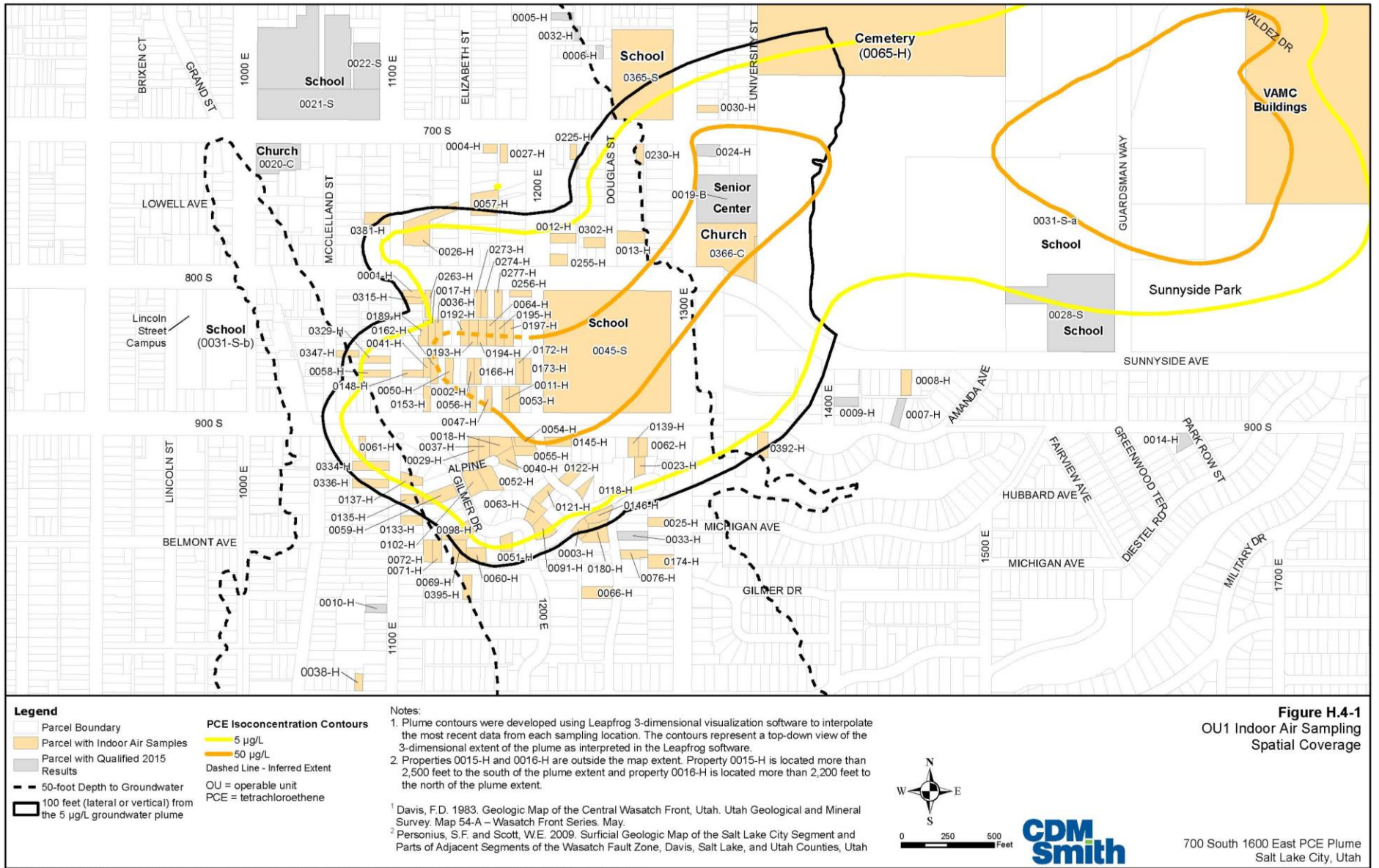
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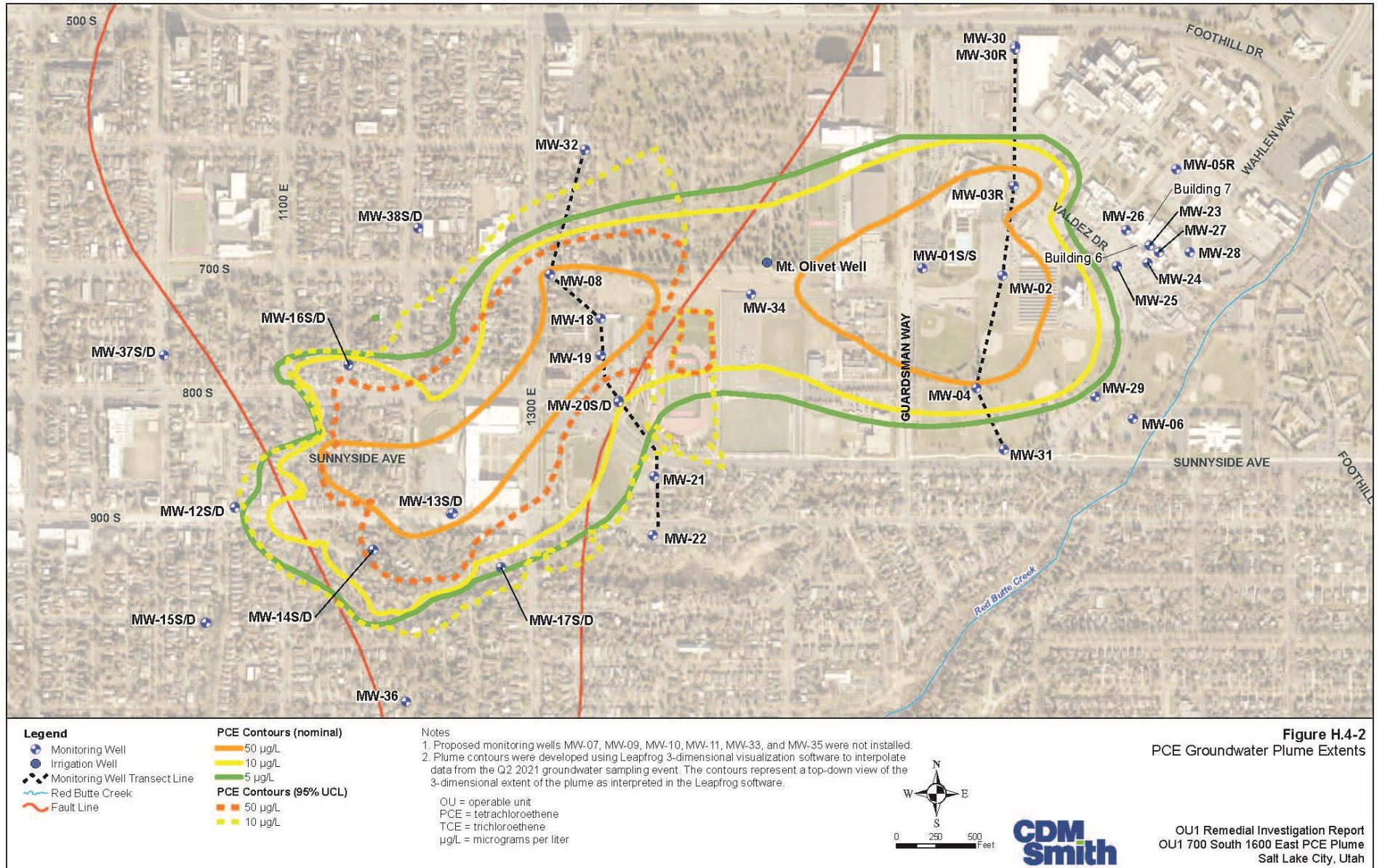
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Appendix A: Estimated PCE Groundwater Plume Boundaries in Relation to Sampling Locations in 2021



Source: [VA 2022]

Appendix B: Estimated PCE Groundwater Plume Boundaries Based on Groundwater Data from Monitoring Wells in 2021



Source: [VA 2022]