Bandera Road Ground Water Plume Superfund Site

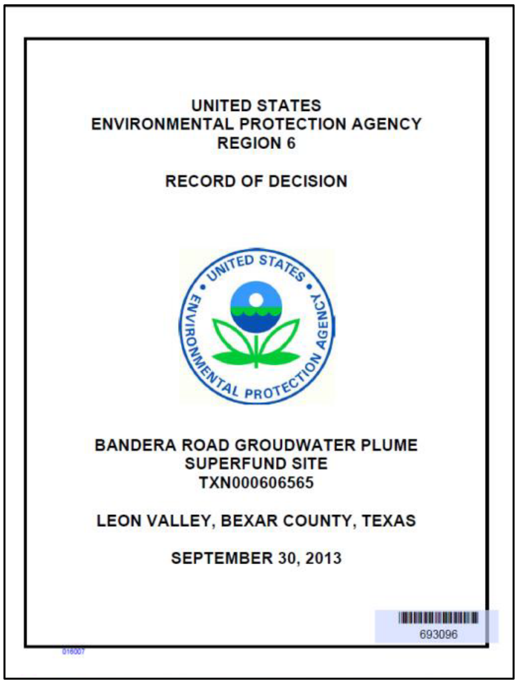
Summary of EPA's 2013 Record of Decision

March 2014

EPA Technical Assistance Services for Communities Program

Introduction

On July 18, 2011, EPA issued the Proposed Plan for the Bandera Road Ground Water Plume Superfund site (the site) to gather public input. The Proposed Plan presented EPA's preliminary recommendation for how best to address contamination at the Site. EPA solicited public comment on the Proposed Plan until October 15, 2011. On September 30, 2013, EPA issued the site's Record of Decision (ROD) after considering the public comments as well as input from the Texas Commission on Environmental Quality (TCEQ). A ROD is the primary decision document for a National Priorities List Superfund site. The ROD sets forth EPA's selected remedy for a site and the reasons for its selection. The ROD for the site establishes EPA's cleanup approach to address ground water contamination and volatile contamination present in indoor air, subsurface soils and shallow bedrock resulting from previous releases of hazardous substances.


UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6

RECORD OF DECISION

BANDERA ROAD GROUDWATER PLUME
SUPERFUND SITE
TXN000606565

LEON VALLEY, BEXAR COUNTY, TEXAS

SEPTEMBER 30, 2013

693096

Figure 1. EPA's Record of Decision. (source: EPA)

This document provides community members with a simplified version of the site's ROD. It provides a brief overview of the main parts of the ROD and its Decision Summary, and highlights parts of the ROD that may be of most interest to the community. EPA's Technical Assistance Services for Communities (TASC) program developed this document. It is not a substitute for the ROD. If you have questions about EPA's selected remedy for the site, please review the ROD and then contact EPA. The TASC program is implemented by independent technical and environmental consultants.

EPA refers to the documents that form the basis for the ROD as the Administrative Record. The Administrative Record file is available for review on compact disk (CD) at Leon Valley Public Library. The site's ROD is over 500 pages long, including appendices. The complete ROD is available for download on EPA's website: www.epa.gov/region6/6sf/6sf-decisiondocs.htm. The ROD is also available on the Administrative Record CD at Leon Valley Public Library. If you are interested in learning more about how the community has been involved in cleanup decision-making at the site, please see the Bandera Road Community Advisory Group (CAG) Web page on the City of Leon Valley's website: www.leonvalleytexas.gov/government/public_works/cag.php.

Figure 2. Leon Valley, Texas.

Overview of the Main Parts of the Site's ROD

The ROD for the site, like most EPA Superfund RODs, has three main parts: the *Declaration*, the *Decision Summary* and the *Responsiveness Summary*.

The *Declaration* spans only a few pages. It summarizes the ROD and certifies that the decision document contains key remedy selection information. The *Declaration* also serves as the formal authorizing signature page for the ROD (Figure 3).

Bandera Road Ground Water Plume Superfund Site | Record of Decision

7.0 AUTHORIZING SIGNATURE

This ROD documents the selected remedy for the contaminated vapor, soil, and ground water at the Bandera Road Ground Water Plume Superfund Site. This remedy was selected by the EPA with the concurrence of the TCEQ (Appendix F). The Director of the Superfund Division (EPA, Region 6) has been delegated the authority to approve and sign this ROD.

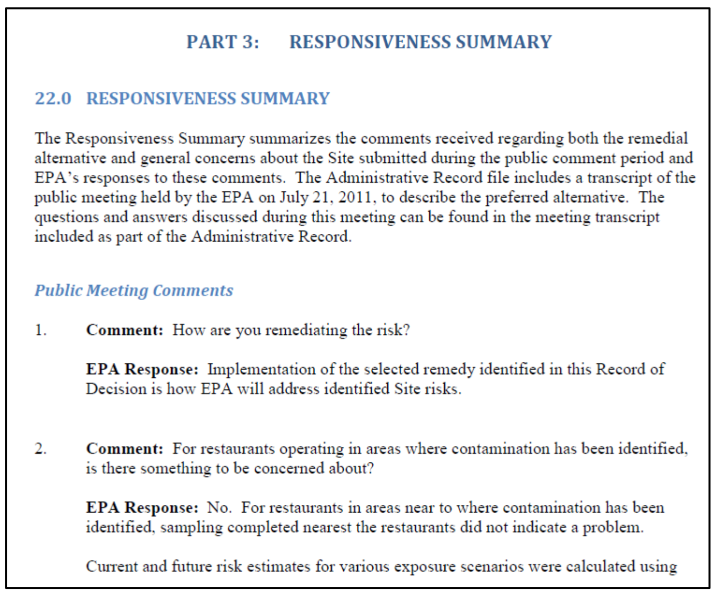
By: ______________________ Date: 9/30/13

Carl E. Edlund, P.E.
Director
Superfund Division

Figure 3. Authorizing signature in the Decision Summary section of the ROD. (source: EPA)

The *Decision Summary* is nearly 120 pages long and is the "heart" of the ROD, explaining why EPA selected a particular cleanup approach. The Remedial Investigation Report and Feasibility Study Report – EPA site documents prepared before the Proposed Plan and ROD – are the sources for much of the information in the *Decision Summary*.

The *Responsiveness Summary* includes nearly 70 pages. It summarizes comments, concerns and questions submitted by TCEQ and the community during the public comment period. It also explains how EPA integrated public comments into the decision-making process (Figure 4).



PART 3: RESPONSIVENESS SUMMARY

22.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary summarizes the comments received regarding both the remedial alternative and general concerns about the Site submitted during the public comment period and EPA's responses to these comments. The Administrative Record file includes a transcript of the public meeting held by the EPA on July 21, 2011, to describe the preferred alternative. The questions and answers discussed during this meeting can be found in the meeting transcript included as part of the Administrative Record.

Public Meeting Comments

1. **Comment:** How are you remediating the risk?

   EPA Response: Implementation of the selected remedy identified in this Record of Decision is how EPA will address identified Site risks.

2. **Comment:** For restaurants operating in areas where contamination has been identified, is there something to be concerned about?

   EPA Response: No. For restaurants in areas near to where contamination has been identified, sampling completed nearest the restaurants did not indicate a problem.

   Current and future risk estimates for various exposure scenarios were calculated using

Figure 4. Excerpt from the ROD's Responsiveness Summary. (source: EPA)

The ROD also contains nearly 400 pages of figures, tables and appendices that supplement information presented in the main body of the decision document. The figures include maps of the site and Areas of Investigation, geographic features and sampling locations. Tables summarize environmental sampling results and demonstrate figures calculated as part of the site's risk assessment. The ROD's appendices include an index for the Administrative Record, cost-estimate details for the selected remedy, detailed EPA risk information for the contaminants tetrachloroethene (PCE) and trichloroethene (TCE), human health risk assessment tables, and a letter from TCEQ describing the agency's support for EPA's selected remedy.

Overview of the ROD's Decision Summary

The *Decision Summary* provides background information on how the site was identified, its physical and cultural features, and the type of contamination present. It also discusses the history of the site's contamination, risks posed by the site contamination, and EPA's overall goals and objectives for addressing those risks and cleaning up the site. In addition, the *Decision Summary* explains the alternatives EPA considered for meeting cleanup objectives; a description of the final remedy EPA selected to meet those objectives; and how the selected remedy meets Superfund program requirements.

The *Decision Summary* includes 14 main sections:

1. *Site Name, Location and Brief Description*: provides a basic overview of the site.

2. *Site History and Enforcement Activities*: describes the site's history and EPA enforcement actions to compel potentially responsible parties to investigate and clean up the site.

3. *Community Participation*: explains efforts to involve the community in cleanup decision-making.

4. *Scope and Role of Response Action*: clarifies how EPA divided the site into several areas of investigation, contaminated media (i.e., soil, water, bedrock and indoor air) to be cleaned up, and EPA's primary cleanup objectives.

5. *Site Characteristics:* provides details on site features, including surface water hydrology, geology and hydrology. This section also explains EPA sampling activities, which identify contaminants and contaminant sources as well as where and how contamination has spread, or migrated.

6. *Current and Potential Future Land and Water Uses*: explains how the site is currently being used (i.e., for industrial, commercial and residential purposes), expectations for the site's future uses, and current and potential ground water uses.

7. *Summary of Site Risks:* explains EPA's process for determining human health and ecological risks as well as the site's primary risks.

8. *Remedial Action Objectives*: explains EPA's overall cleanup goals as well as soil, water and indoor air cleanup values EPA will use to evaluate the effectiveness of cleanup efforts.

9. *Description of Alternatives:* explains the cleanup approaches EPA considered prior to selecting the final cleanup alternative for the site.

10. *Comparative Analysis of Alternatives:* describes the results of EPA's evaluation of each of the cleanup alternatives using nine evaluation criteria.

11. *Principal Threat Wastes:* explains that it is EPA's responsibility to treat principal threat wastes and the presence of principal threat waste at the site. "Principal threats" are materials at Superfund sites acting as sources of contamination that are highly mobile and

cannot be reliably controlled in place, or would present a significant risk to human health or the environment should exposure occur.

12. *Selected Remedy:* describes the cleanup approach, or remedy, EPA has determined is most appropriate for the site. This section also summarizes the estimated costs of the remedy and expected cleanup outcomes.

13. *Statutory Determinations:* explains how EPA's selected remedy meets several requirements under the Superfund law.

14. *Documentation of Significant Changes from Preferred Alternative:* discusses major changes between the preferred remedy in EPA's Proposed Plan and EPA's selected remedy in the ROD.

Summary of Key Parts of the ROD's Decision Summary

1. Site Name, Location and Brief Description

The site is located in a commercial and industrial area of Leon Valley. Residences are located nearby. Two City of Leon Valley public water supply wells are within one mile of the center of the site. The San Antonio Water System Wurzbach and Evers Road public water supply wells are about 1.1 miles from the center of the site.

The site includes releases (e.g., spills or leaks) and sources (e.g., areas from which site contamination originated) associated with at least two facilities. As part of site investigations, EPA identified five areas of investigation (AOIs) (Figure 5).

- *AOI 1:* the area near the Savings Square Shopping Center (6709 Bandera Road) as well as commercial buildings B1 and B2. Additional commercial and public use buildings are nearby. An apartment complex is located to the north. Neighborhoods are located to the north and west. Other land uses in this AOI are commercial and industrial facilities. A dry cleaning facility that operated from 1991 to 2002 was previously located in AOI 1. The AOI also includes Source Area 1. See Figure 6 on the following page.

Figure 5. Areas of Investigation 1– 5. (source: EPA)

- *AOI 2:* the area near an active dry cleaning facility (6600 Bandera Road) and an automotive repair facility. Public use buildings are located to the southeast. Residences are located to the south and southwest. Other land uses in this AOI are commercial and industrial facilities. AOI 2 also includes Source Area 2 (Figure 6).
- *AOI 3:* the former Culver Air Field located near Uhl's Storage (6200 Grissom Road).
- *AOI 4*: a former dry cleaning facility and an active laundry facility near Kwik Wash (7007 Bandera Road).
- *AOI 5:* a former dry cleaning facility near the former Kwik-n-Neat facility (7128 Bandera Road).

AOIs 1 and 2 contain the areas EPA considers the primary sources of contamination. The cleanup approach selected in the ROD addresses these two AOIs and their respective source areas. EPA may identify, investigate and monitor more areas in the future as appropriate.

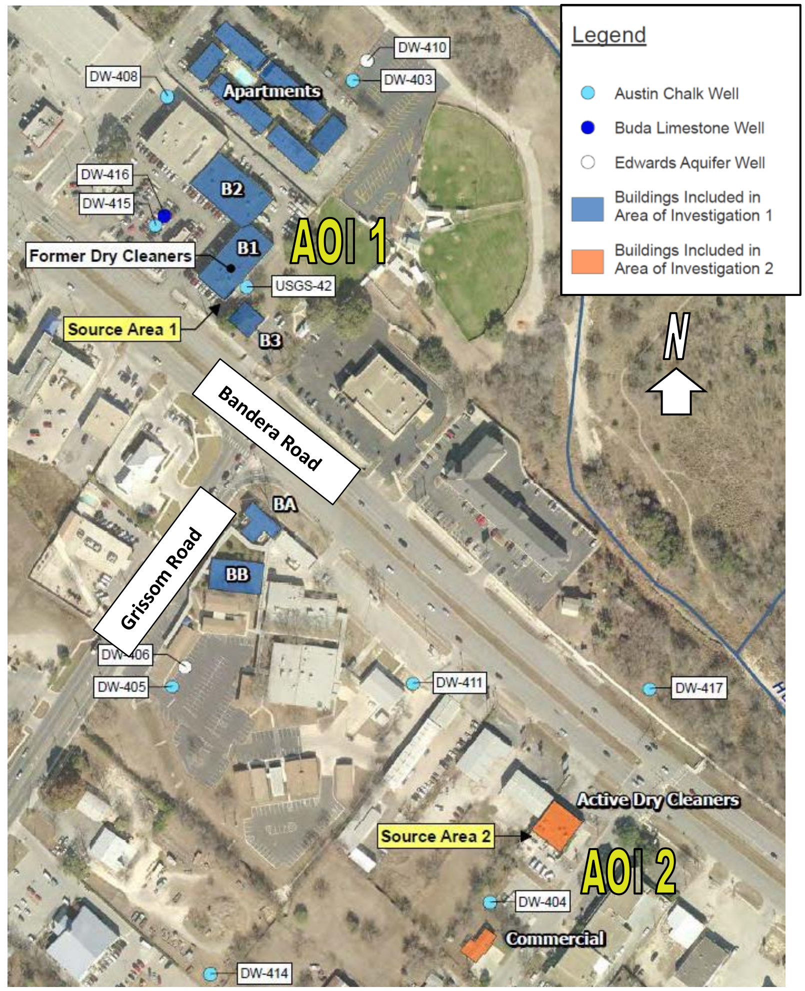


Figure 6. Areas of Investigation 1 and 2 and Source Areas 1 and 2. (source: EPA)

2. Site History and Enforcement Activities

TCEQ's Voluntary Clean-up Program identified the site.[1] An investigation identified the presence of PCE and TCE at concentrations above federal drinking water standards, also known as Maximum Contaminant Levels, or MCLs, in Edwards Aquifer wells.[2]

In 2004, TCEQ began site characterization activities. In 2006, TCEQ scored the area using EPA's Hazard Ranking System, a screening tool to identify sites that are the highest priority for further investigation and possible cleanup under Superfund. Based on the site's score, EPA placed the site on the Superfund program's National Priorities List in 2007.

[1] The TCEQ Voluntary Clean-up Program (VCP) protects non-responsible parties, including future lenders and landowners, from state liability for cleanup of sites conducted in accordance with VCP requirements. Parties entering the VCP must submit an application, an Affected Property Assessment Report, describing the contaminated area of concern, and a $1,000 application fee. Learn more on the TCEQ Voluntary Clean-up Program Web page: [www.tceq.texas.gov/remediation/vcp/vcp.html.](http://www.tceq.texas.gov/remediation/vcp/vcp.html)
[2] EPA has designated the Edwards Aquifer as the sole-source drinking water aquifer for central Texas. An EPA-designated sole-source aquifer is one that supplies 50 percent or more of the drinking water of an area.

That same year, the Agency for Toxic Substances and Disease Registry (ATSDR), a federal public health agency of the U.S. Department of Health and Human Services, conducted a Public Health Assessment for the site. The Texas Department of State Health Services (TDSHS) supported the assessment. To conduct their analysis, the agencies reviewed available environmental information and evaluated possible public exposures to contaminants. The agencies concluded that:

> Exposures to PCE and/or TCE in water wells pose an 'indeterminate public health hazard', but 'estimated exposure doses are well below levels that have been shown to cause adverse health effects in humans.' Water wells with contaminant concentrations greater than the EPA MCL that are used for domestic use are equipped with filtration systems to prevent a public health hazard. As long as these systems are maintained, contaminants in the water wells do not pose an apparent public health hazard.

The same year, EPA extended public water supplies to residents whose source of drinking water (i.e., private water wells) contained levels of PCE and TCE above federal drinking water standards. Activated carbon units previously treated water from these wells. Field activities to connect the six identified locations to public water supplies began in the spring of 2007. They finished in February 2008.

In response to a request from EPA, ATSDR and TDSHS also evaluated public health considerations associated with indoor air sampling data collected by EPA in January 2009. The agencies concluded that:

> Based on available information, the reported concentrations of PCE within the building space of the former dry cleaners exceed health-based screening levels. After reviewing available toxicological information, we would not expect 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 the building as posing a public health hazard. The other occupied spaces that were evaluated pose no apparent public health hazard.

Figure 7. Part of vapor mitigation system installed at Savings Square Shopping Center. It has been operating since March 2009.

In response to the indoor air determination, EPA directed the property owner of the Savings Square Shopping Center to abate the conditions posing an indoor air public health hazard. The building owner installed vent systems on the exterior wall of the former dry cleaner and at a nearby building; sealed utility access ports at the former dry cleaner; and removed sheetrock and sealed the floor in office space adjoining the former dry cleaner.

EPA also issued General Notice Letters to the owner of the former dry cleaner in AOI 1 and the owner of the current dry cleaner in AOI 2. General Notice Letters inform recipients that they are potentially responsible parties at Superfund sites, explain that they may be liable for cleanup costs, and explain the process for negotiating cleanup settlements with EPA.

3. Community Participation

Figure 8. 2012 meeting involving the Bandera Road Community Advisory Group and EPA at the Leon Valley Conference Center.

The Superfund program requires community involvement in the Superfund process. In Leon Valley, EPA has been actively engaged in dialogue and collaboration with the community and has focused on ensuring early and meaningful community participation during EPA's remedial and removal activities at the site. EPA did this in four primary ways:

1. Developing a Community Involvement Plan, which includes background information on the community, local concerns, community involvement activities, a communications strategy, an official contact list and local media contacts.

2. Crafting a reuse assessment in collaboration with the community to help ensure the cleanup takes future land use considerations into account.

3. Supporting local outreach by conducting community meetings, preparing fact sheets and providing technical assistance through EPA's TASC program.

4. Establishing and maintaining an information repository to provide a local resource where the community can review site information. Repositories are located at Leon Valley Public Library, EPA Region 6's office in Dallas and TCEQ's Record Management Center in Austin.

4. Scope and Role of Response Action

EPA's selected remedy addresses all contaminated environmental media at the site, with the primary objectives of preventing human contact with contaminants, preventing or minimizing further spread of contaminants, and returning ground waters to expected beneficial uses wherever practicable.

5. Site Characteristics

Surface Water Hydrology
Surface water features within the site area include ditches and streams. Huebner Creek is the main surface water feature in the area.

Geology
The site is located in the West Gulf Coastal Plain physical geographic province. This area stretches along a significant portion of southeastern Texas and is characterized by marine sedimentary deposits. Regionally, the site falls within a geologic system known as the Balcones Fault Zone. Fractures in this system can enhance or inhibit ground water flow, depending on the features and positioning of the rocks.

Hydrology

The site overlies three different water-bearing units: the Austin Chalk Aquifer, the Buda Limestone and the Edwards Aquifer (Figure 9). The spread of contaminants at the site is based on the interaction between the three aquifers. The Austin Chalk Aquifer is the uppermost aquifer. It supplies good to poor quality water for domestic and livestock use. Confined by the Eagle Ford Shale and the Del Rio Clay, the Buda Limestone Aquifer has only limited ground water production; however, it yields sufficient water locally for domestic use in a few wells. The main drinking water aquifer for Leon Valley and the greater San Antonio area is the Edwards Aquifer, which serves over a million people in south-central Texas.

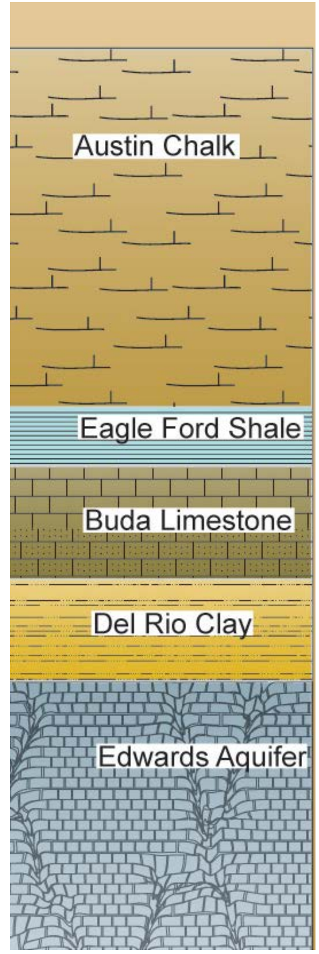


Figure 9. Leon Valley geologic formations considered in EPA investigations. (source: Edwards Aquifer Authority)

Two City of Leon Valley Public Water Supply wells, the San Antonio Water System Wurzbach and Evers Road public water supply wells, and several private wells are located within 1.5 miles of the center of the contaminated ground water plume. Recharge to the Edwards Aquifer occurs to a small extent by direct infiltration of precipitation on the outcrop (exposed bedrock). Largely, recharge occurs by discharge from the streams that cross the outcrop in the Balcones Fault Zone and by underground water flow from Medina County (located west of Bexar County).

Depth to ground water is an important factor in the connection between contaminant sources and ground water. Based on water level data from May 21 and 22, 2010, depth to water in the Austin Chalk Aquifer ranged from about 6 feet to about 88 feet below ground surface. The average depth to water at the site was about 63 feet below ground surface.

Soils

The site is situated within the Lewisville-Houston Black soil association, generally described as deep, calcareous (mostly or partly composed of calcium carbonate) clayey soils in old alluvium (loose unconsolidated soil and sediment).

Ground Water, Soil, Vapor Sampling and Additional Investigative Activities

After the site's listing on the National Priorities List in 2007, EPA started several efforts to identify the sources and extent of contamination. EPA did this by sampling an extensive network of ground water wells, sampling soil gas in and around suspected release areas, and sampling indoor air. Soil gas is the air that exists in soil between the soil surface and the top of the water table, an area frequently referred to as the vadose zone. EPA undertook sampling efforts over the course of several years. Other related efforts included conducting pilot tests to evaluate the feasibility of

Figure 10. Indoor air, soil gas and ground water sampling efforts. (source: EPA).

different remedies to address ground water and soil contamination, and properly plugging and abandoning old wells, which can act as migration pathways for contaminated water.

Migration Pathways

EPA determined that site contamination was spreading, or migrating, in the following main ways:

- Leaching from vadose zone soil to underlying ground water as rainwater enters from the soil surface.
- Evaporating from soil and ground water into soil gas (vadose zone air).
- Evaporating into outdoor air from soil gas.
- Evaporating into indoor air from soil gas located beneath building slabs via preferential pathways (e.g., utility corridors).
- Flow of contaminated ground water.

Areas of Contamination

AOI 1

Dry cleaning operations released PCE inside Building B1 (Figure 11). Other contaminants affecting soil, air and ground water associated with AOI 1 include TCE, dichloroethene (DCE) and vinyl chloride. PCE-impacted soil beneath the foundation makes up an area about 15 feet by 20 feet. Source Area 1 soil samples confirm that PCE was released to soil and is a continuing source for migration. Active soil gas samples from beneath the slab indicate that significant source material remains.

AOI 2

PCE was released at a dry cleaning facility in AOI 2. Source Area 2 soil samples confirm that PCE was released into the soil. The contaminated source material has a significant potential for leaching into ground water. Other contaminants affecting soil, air and ground water associated with AOI 2 include TCE and DCE.

Ground Water

Based on ground water sampling results, EPA identified specific ground water areas that are affected, affected at low levels, or not affected. These areas span the Austin Chalk, Buda Limestone and Edwards Aquifers. Impacted areas include parts of the Austin Chalk Aquifer associated with AOI

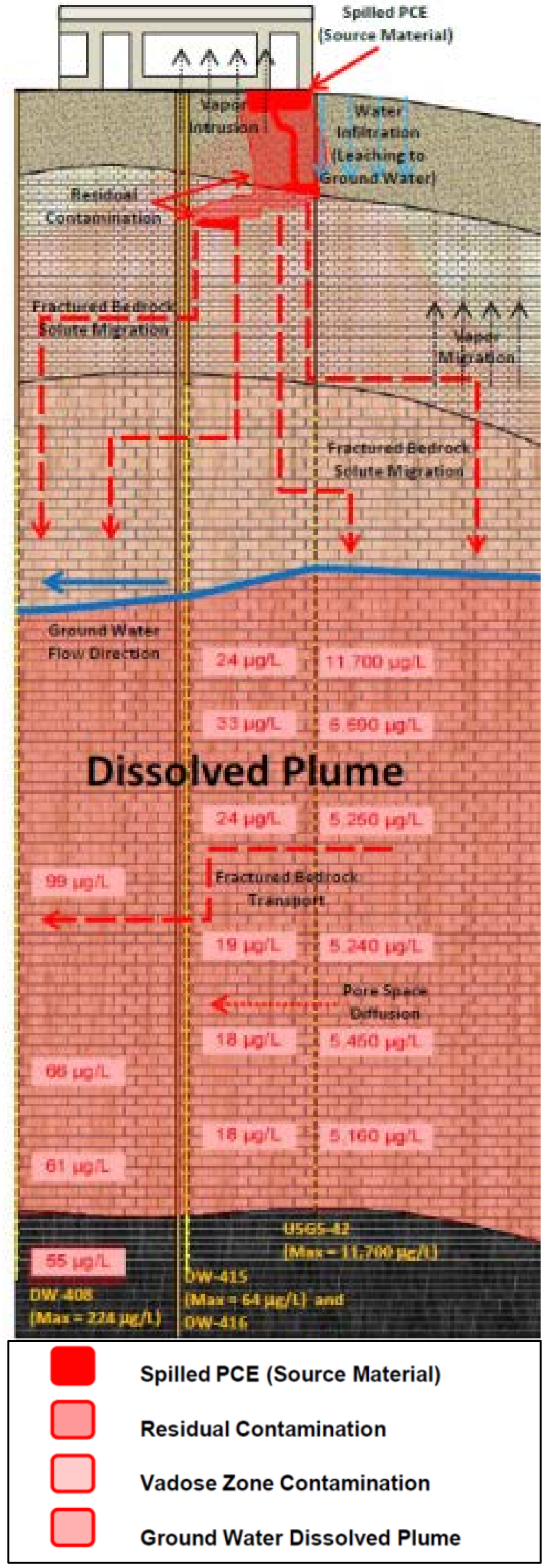


Figure 11. Movement of contamination from Source Area 1 within AOI 1. (source: EPA)

1 – Source Area 1, referred to in the ROD as Source Area 1 - Northern Plume, and AOI 2 – Source Area 2, referred to in the ROD as Source Area 2 - Southern Plume.

Ground water impacts at Source Area 1 appear to be contained within the Austin Chalk Aquifer. They have not been detected in the Buda Limestone. Existing and EPA-installed Edwards Aquifer wells in this area (i.e., wells DW-410, DW-406 and USGS-58) were sampled. EPA determined they were not affected. This indicates that there is not a complete migration pathway at these well locations to these lower water-bearing zones.

Ground water impacts at Source Area 2 are not contained within the Austin Chalk Aquifer. Austin Chalk/Buda Limestone well DW-36 is acting as a conduit (i.e., a complete migration pathway) for contamination to spread from the Austin Chalk Aquifer to the Buda Limestone Aquifer. EPA does not consider existing Edwards Aquifer wells in this area to be affected, indicating there is not a complete migration pathway to the Edwards Aquifer at these well locations.

Well DW-31 is open to the Edwards Aquifer and exceeds the federal drinking water standard for toluene and bis(2-ethylhexyl)phthalate. The origin of these detections is not known. Well DW-31 will be properly plugged and abandoned to prevent contaminant transport to the Edwards Aquifer.

Five wells open to the Edwards Aquifer were plugged and abandoned in 2009. Sampling of existing and installed Edwards Aquifer wells in the area found they were not affected by PCE.

6. Current and Potential Future Land and Water Uses

Land Uses

Land uses surrounding the site include residential, industrial and retail areas. Most of the surrounding land is currently zoned for commercial and retail uses. A small area is zoned for residential and light industrial uses. Another small area is zoned for government uses. The city's vision for the future focuses on protecting the ground water supply, integrating green infrastructure into current and future projects, and promoting sustainability through city initiatives.

Figure 12. Commercial and residential land uses at the site.

Future development plans for the area focus on green infrastructure, which is a framework for integrating nature and the environment into city and regional planning. The City of Leon Valley would like to make sure public water supplies are protected from the site's ground water plume and any possible future contaminants. Ultimately, the ROD concludes that reasonably anticipated future land uses in the area surrounding the site and the site itself will include commercial, retail, residential, and light industrial uses.

Ground Water Uses

The State of Texas considers the Austin Chalk Aquifer, the uppermost water bearing unit, a potential drinking water resource. EPA has determined that the Austin Chalk ground water exceeds federal drinking water levels for chlorinated solvents. The Buda Limestone Aquifer is the second water bearing unit; the state considers it to be a potential domestic water supply. The Edwards Aquifer is prolific, yields high quantity and quality water, and is the primary drinking water aquifer for the Leon Valley and San Antonio. Leon Valley's public water supply wells draw from the Edwards Aquifer; they supply water to Leon Valley residents and businesses.

7. Summary of Site Risks

EPA's baseline risk assessment estimates the risks posed by the site if no action was taken. It provides the basis for taking action and identifies contaminants and exposure pathways that remedial action needs to address. EPA develops risk estimates for cancer and non-cancer effects. Risk estimates for cancer are expressed in scientific notation as a probability (e.g., 1×10^{-6} for 1 in 1 million) and indicate (using this example) that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure to a particular chemical. The EPA's generally accepted risk range for site-related exposure is 10^{-4} to 10^{-6}.

To estimate the potential for adverse effects other than cancer, EPA calculates a hazard quotient by dividing the daily intake level by the reference dose (a dose that would not cause health effects in humans) or other suitable benchmark. A hazard quotient of less than 1 indicates that a receptor's dose of a single contaminant is less than the reference dose, and that toxic non-cancer effects from that chemical are unlikely. EPA calculates the hazard index by adding the hazard quotients for all site-related chemicals that affect the same target organ (e.g., the liver) within or across those media to which the same individual may reasonably be exposed. A hazard index of less than 1 indicates that toxic non-cancer effects are unlikely. A hazard index greater than 1 indicates the potential for adverse non-cancer effects.

EPA builds conservative safety margins into the risk assessment to ensure the protection of public health. Because of this conservative approach, people will not necessarily be affected even if they are exposed to chemicals at higher doses than those estimated in the risk assessment. EPA also carefully considers vulnerable receptors (e.g., children) to make sure all members of the public are protected.

EPA generally requires cleanup action to address contaminants with cancer risks greater than 10^{-4} (1 in 10,000) or hazard indices greater than 1. For the site, EPA evaluated the risks from exposure to site contaminants to both commercial-industrial workers and residents (adult and child combined), assuming they were exposed to ground water, soil and indoor air in various parts of the site, including source areas, buildings and impacted aquifers used or potentially usable for domestic water supplies. EPA's risk assessment identified five specific site areas where estimates or hazard indices were above acceptable levels. EPA determined that unacceptable risks could occur in certain contaminated areas from exposure to contaminated ground water and indoor air, but not from contaminated surface or subsurface soil.

The exposure scenarios with unacceptable exposures are:

- Exposure to ground water in the Austin Chalk Northern Plume and Southern Plume (commercial-industrial worker and resident).

- Exposure to contaminated indoor air in Building 1 and Building 3 within AOI 1 (commercial-industrial worker and resident).

- Exposure to indoor air within the Active Dry Cleaner Building within AOI 2 (commercial-industrial worker).

The table below presents the risks estimated for each of these exposure scenarios.

Table 1. Estimated increased non-cancer and cancer risks from site contaminants by site exposure area and population affected*

Exposure area	Population Affected	Estimated Non-Cancer Risk (Hazard Index)	Estimated Cancer Risk	Interpretation of Estimated Cancer Risk[a]
Austin Chalk Northern Plume	Commercial/ Industrial Worker	**62.3**[b]	**$3.2x10^{-4}$**	3.2 in 10,000
	Resident (adult and child combined)	**793**[b]	**$5.2x10^{-3}$**	5.2 in 1,000
Austin Chalk Southern Plume	Commercial/ Industrial Worker	**2.12**[b]	$1.02x10^{-5}$	1.02 in 100,000
	Resident (adult and child combined)	**26**[b]	**$1.34x10^{-4}$**	1.34 in 10,000
Building B1 (AOI 1) – Indoor Air	Commercial/ Industrial Worker	**3.0**[c]	$1.1x10^{-5}$	1.1 in 100,000
	Resident (adult and child combined)	**12.7**[c]	$6.5x10^{-5}$	6.5 in 100,000
Building B3 (AOI 1) – Indoor Air	Commercial/ Industrial Worker	**1.52**[c]	$4.45x10^{-6}$	1.6 in 1,000,000
	Resident (adult and child combined)	**6.3**[c]	$2.72x10^{-5}$	2.72 in 100,000
AOI Active Dry Cleaner (AOI 2) – Indoor Air	Commercial/ Industrial Worker	**66**[c]	**$1.9x10^{-4}$**	1.9 in 10,000
	Resident (adult and child combined)	**280**	**$1.3x10^{-3}$**	1.3 in 1,000

Notes

*Estimated cancer and non-cancer risk values in the table are from the ROD's risk characterization summary tables (pgs. 37 to 57) for site chemicals of concern. These are the site contaminants (i.e., PCE and the related chemicals TCE, DCE, and vinyl chloride) of particular concern to EPA. EPA also developed non-cancer hazard index and cancer risk estimates that take into account these chemicals as well as other chemicals detected at the site that were not associated with spills or releases or found to be significant.

In some instances, risk estimates that take this wider set of chemicals into account are higher than the risk estimates calculated for chemicals of concern only. For example, EPA calculated an estimated cancer risk of $1.6x10^{-5}$ for an indoor air sample collected in May 2012 for Building B3 within AOI 1. This estimate was higher than the cancer risk estimate calculated for the chemicals of concern only. The chemical 1,4-Dichlorobenzene, not considered by EPA to be a chemical of concern, was responsible for the higher estimate. 1,4-Dichlorobenzene is used primarily as a space deodorant in products such as room deodorizers and toilet deodorant blocks and as a fumigant for moth control. The ROD includes a detailed explanation on pages 60 to65.

[a] Indicates the increased likelihood that a person would develop cancer because of exposure to site-related contaminants.

[b] Indicates that the potential for adverse non-cancer effects could occur from exposure to contaminated ground water in the Austin Chalk Northern Plume and Southern Plume.

[c] Indicates that the potential for adverse non-cancer effects could occur from exposure to site-related contaminants in indoor air.

Bold indicates risk estimates at levels that generally require a response action under the Superfund program.

8. Remedial Action Objectives

Remedial action objectives are the overarching goals that EPA intends to achieve by putting the site's selected remedy in place. The objectives for the site are:

- Prevent exposure to site-related contaminants in ground water and indoor air above cleanup levels.
- Prevent or minimize further spread of site-related contaminants in surface soil, subsurface soil, vadose zone bedrock (i.e., below ground bedrock located above the water table) and ground water above cleanup levels.
- Return ground water to expected beneficial uses wherever practicable (aquifer restoration).

EPA selected federal drinking water standards for six contaminants to measure progress in meeting remedial action objectives for ground water cleanup. The six contaminants are PCE, TCE, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, vinyl chloride and toluene.

EPA selected human health cleanup levels for five contaminants to measure progress in meeting the cleanup's remedial action objectives for indoor air. The five contaminants are PCE, 1,1,2,2-Tetrachloroethane, TCE, 1,2-Dichloroethane and vinyl chloride. The goal of the human health cleanup levels is to make indoor air safe for commercial and industrial workers.

9. Description of Alternatives

EPA developed remedial alternatives to address the site's remedial action objectives. EPA developed four alternatives for surface and subsurface soils, four alternatives for vadose zone bedrock, five alternatives for ground water, and five alternatives for indoor air. EPA included cost and time estimates for each remedial alternative. Each set of alternatives include "no further action" and "limited action" alternatives as well as more intensive alternatives. EPA uses the "no further action" alternative as a baseline for evaluating the other remedial alternatives. The "limited action" alternatives generally include remedies that require no or minimal invasive remedial work, such as legal or administrative requirements limiting use of a site, and engineering controls such as site fencing. They also typically require long-term monitoring to make sure site conditions do not worsen.

Intensive Alternatives for Soil

One intensive remedial alternative includes excavation and off-site disposal of contaminated surface and subsurface soils in Source Area 1 within AOI 1 and Source Area 2 within AOI 2. The other intensive remedial alternative includes addressing contaminated soils in both source areas using soil vapor extraction. This process involves applying a vacuum to contaminated soils to create airflow below ground. As the air flows, the contaminated material stuck to soil particles evaporates. The evaporated material is then swept away to extraction wells and treated.

Intensive Alternatives for Vadose Zone Bedrock

One intensive remedial alternative includes soil vapor extraction to remove contaminants from the vadose zone bedrock. The other alternative includes heating the vadose zone bedrock in place. The process evaporates contaminants so that they are ready for collection and treatment. EPA would require the treatment processes for both source areas.

Intensive Alternatives for Ground Water

If additional affected private wells are identified, one intensive remedial alternative would involve providing residents with a source of water to ensure that they do not need to use contaminated ground water There are no known residences requiring connection to the public water supply at this time. EPA has already provided connections to residents who were getting their drinking water from private wells containing contamination above federal drinking water standards. Another intensive ground water remedial alternative involves injecting specialized material into the Austin Chalk Aquifer's Northern Plume and Southern Plume. This would promote the natural breakdown of contaminants. The final intensive ground water remedial alternative involves using extraction wells to remove contaminated ground water, treating the collected ground water and then reinjecting the treated water back into the ground or discharging it.

Intensive Alternatives for Indoor Air

One intensive remedial alternative for indoor air involves reducing contaminant concentrations within indoor air for Building B1 within AOI 1 by retrofitting or installing a system that brings in more outside air and pressurizes the building. Referred to as a positive pressure system, the goal is to create enough back-pressure to prevent soil gas from entering the building. The system would run continuously to prevent intrusion. Another alternative would divert vapor emissions away from the contaminated concrete floor in the office space of the existing building within Source Area 1 with the use of a protective barrier. Passive vapor vents installed underneath the protective barrier would redirect the vapors away from the building. The ventilation exit would be routed above the roofline to prevent pedestrians from breathing the vapors. The final intensive remedial alternative uses a sub-slab depressurization system in the existing structure next to the source area within AOI 1. This system would depressurize the area underneath the concrete foundation and redirect contaminants to an exhaust vent above the roofline.

10. Comparative Analysis of Alternatives

This section of the ROD describes results from EPA's process to evaluate each of the cleanup alternatives using nine evaluation criteria. The criteria are: 1) overall protection of human health and the environment; 2) compliance with applicable or relevant and appropriate requirements; 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, or volume of contaminants through treatment; 5) short-term effectiveness; 6) implementability; 7) costs; 8) state/support agency acceptance; and 9) community acceptance.

Vadose Zone and Bedrock Alternatives

B-1 No Action Alternative
Not applicable.

B-2 Limited Action Alternative
Institutional controls may be difficult to implement because they often require consent by the landowner. This is particularly difficult for landowners that are not potentially responsible parties.

B-3 Soil Vapor Extraction
SVE treatment is technically feasible, but the placement of SVE wells is complicated in highly developed areas. Equipment and specialists are available for implementation of is alternative. Ability to obtain approvals and coordinate with other agencies assumed to be possible.

B-4 *In situ* Thermal Desorption
In situ thermal treatment is technically feasible, but the placement of SVE wells is complicated in highly developed areas. Equipment and specialists are available for implementation of is alternative, but may be more difficult to obtain than for Alternative B-3. Ability to obtain approvals and coordinate with other agencies assumed to be possible.

The no action alternative would be the easiest to implement. The limited action alternative would follow because it relies on institutional controls, which are easier to implement than an intrusive remedy. The soil vapor extraction and *in situ* thermal desorption alternatives are harder to implement than the no action and limited action alternatives, but the *in situ* thermal desorption alternative will be more difficult to implement because the system to heat the rock is more complicated.

Figure 13. ROD excerpt showing evaluation of the extent to which the vadose zone and bedrock alternatives meet EPA's implementability criterion. (source: EPA)

11. Principal Threat Wastes

EPA expects that treatment address the principal threats posed by a site wherever practical. The principal threat concept applies to source materials at a Superfund site that are highly mobile and cannot be reliably controlled in place, or would present a significant risk to human health or the environment should exposure occur. A source material includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for the spread of contamination to ground water, surface water or air, or that act as a source for direct exposure. This section of the ROD documents that, based on past studies, principal threat waste is present in both Source Area 1 and Source Area 2. Specifically, the ROD explains that PCE and related contaminants in both source areas are highly mobile, cannot be reliably controlled in place, and present a significant risk to human health.

12. Description of the Selected Remedy

After considering Superfund requirements, the detailed analysis of the alternatives, and state and public concerns, EPA selected the following remedial alternatives for the site:

- Soil vapor extraction to address contaminated surface and subsurface soils for Source Areas 1 and 2.
- Soil vapor extraction to address contaminated vadose zone bedrock for Source Areas 1 and 2.
- Bioremediation to address the Austin Chalk Aquifer's Northern Plume and Southern Plume.
- Installation of a protective barrier to address contaminated indoor air for Source Area 1 – Building 1.

In implementing the remedy components, EPA may use a phased approach. In a phased approach, response activities take place in a sequence of steps, or phases, so that information from earlier phases can help inform later investigations, objectives and actions. If new information from the remedial design or construction process merits significant changes to the remedy, EPA will document the changes using a technical memorandum in the Administrative Record, an Explanation of Significant Differences or a ROD Amendment, as appropriate and consistent with the applicable regulations. More details about each of the remedy components are listed below.

Surface and Subsurface Soils

The selected remedial approach for surface and subsurface soils involves use of soil vapor extraction wells to remove contaminants by inducing a vacuum in the wells, collecting the vapors swept away to the wells and then treating them. To address contamination at Source Area 1, EPA estimates that 12 horizontal soil vapor extraction wells will need to be drilled underneath Building B1. See Figure 14 on the following page. EPA estimates that 27 vertical soil vapor extraction wells will be used to address the contamination at Source Area 2. The soil gas collected in both source areas will be treated. EPA estimates it will take 3.5 years to complete soil vapor extraction activities for Source Area 1 and three years to complete soil vapor extraction activities for Source Area 2.

The remedy also calls for institutional controls to prevent access or use of areas that present unacceptable risk to human health during the construction and operation of the soil vapor extraction system. Institutional controls may also impose restrictions on the development of residences and unauthorized drilling, excavating, digging, trenching or any other activities that might otherwise compromise the remedy. The remedy also includes long-term monitoring.

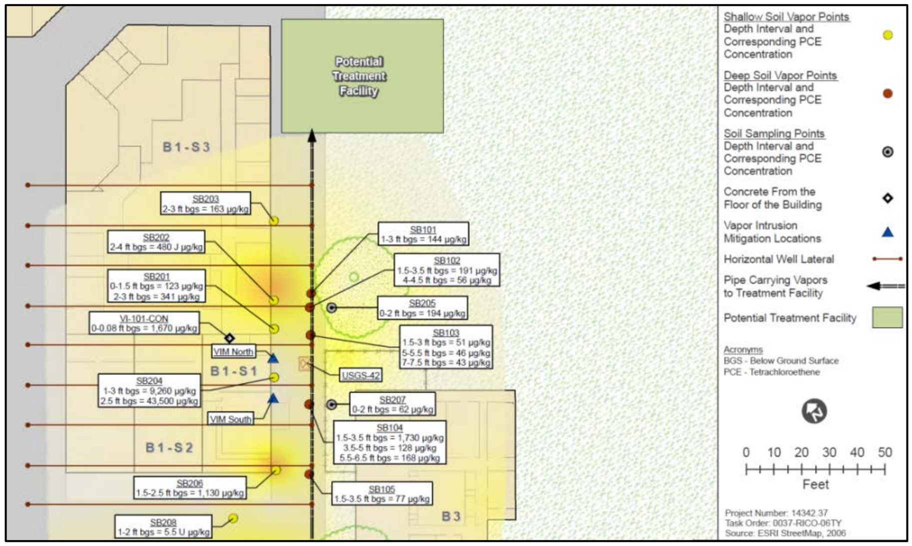


Figure 14. Sample layout of the horizontal soil vapor extraction wells planned for Source Area 1. (source: EPA)

Vadose Zone Bedrock

The selected remedial approach for removing contaminants from vadose zone bedrock involves using soil vapor extraction wells by inducing a vacuum, collecting the soil gas swept to the extraction wells and then treating it. In addition to addressing vadose zone bedrock, this alternative will help achieve EPA's remedial action objective for ground water. It prevents further impacts to ground water by removing the primary source material.

To address the contamination, up to 12 vertical soil vapor extraction wells could be used in both Source Area 1 and Source Area 2. EPA estimates it will take four years for this operation.
The remedy also calls for institutional controls to prevent access to or use of areas that present unacceptable risk to human health during the construction and operation of the soil vapor extraction system.

Ground Water

The selected remedial approach for ground water involves injecting amendments into the Austin Chalk Aquifer to promote the natural breakdown of contaminants. This is a process called bioremediation. EPA estimates that 12 injection wells will need to be installed in both the Northern Austin Chalk Plume and Southern Austin Chalk Plume. An amendment such as 3D Microemulsion™ will then be injected into wells. The treatment areas extend beyond the injection areas because the amendment migrates downgradient via fractures and channels in the bedrock formation.

EPA anticipates two rounds of injections, with the second event following 18 months after the first one. EPA may require additional injections. The remedy also calls for institutional and engineering controls (e.g., plugging and abandoning impacted wells) to restrict the use of ground water in affected areas to prevent unacceptable risk from exposure to ground water, as well as post-injection monitoring to determine the effectiveness of the injections. In addition, EPA may require the connection of additional residents to the public water supply if they are found to be

Figure 15. 3D Microemulsion™ applied by EPA in January 2011 as part of EPA's bioremediation pilot study. (source: EPA)

using private wells located in contaminated areas or in the path of contaminated ground water flow and they are using the wells as a source of drinking water.

Indoor Air

The selected remedial approach for indoor air is to prevent vapor intrusion into existing Building 1 within Source Area 1 with the use of a protective barrier. A chemically impermeable gel inserted between two chemically resistant woven fibers will be applied over the concrete foundation of the structure in the immediate vicinity of the contaminant source area. The removal of carpeting and demolition of interior walls is required in order to create a single continuous coat over the concrete foundation. The protective barrier will prevent contaminants from penetrating through the cracks in the concrete foundation. Another layer of concrete above the sealant will protect against potential breakage of the protective barrier.

Passive vapor vents underneath the protective barrier will redirect the vapors away from the building. The ventilation exit will be routed above the roofline to prevent pedestrians from breathing the vapors. EPA estimates that the barrier will be applied over a 5,000-square-foot area. However, it may be necessary to line the entire building to eliminate the potential for vapor intrusion. Periodic indoor air sampling will confirm the effectiveness of this approach. The remedy also calls for institutional controls to protect the barrier from damage.

Institutional Controls

Site owners will be responsible for implementing and maintaining institutional controls. TCEQ will be responsible for enforcing these controls. The institutional controls that TCEQ can implement and enforce are a restrictive covenant or a deed notice.

Summary of Estimated Remedy Costs

The ROD calculates the total present worth cost of the remedy using a 7 percent discount rate. This is an order-of-magnitude engineering cost estimate. It is expected to be within a range of about 50 percent more or 30 percent less than the actual project cost. The total estimated present worth cost of the selected remedy is $9,429,000.

13. Statutory Determinations

Under the Superfund law, EPA must select remedies that protect human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, the Superfund law prioritizes remedies that use treatments that permanently and significantly reduce the volume, toxicity or mobility of hazardous wastes as their principal element. This section of the ROD summarizes how the selected remedy meets these statutory requirements.

14. Documentation of Significant Changes from Preferred Alternative

EPA determined that a significant change to the remedy, as originally identified as a component of the preferred remedial alternative in the Proposed Plan, was necessary and appropriate. The Proposed Plan identified excavation and off-site disposal as the preferred alternative for Source Area 2 surface and subsurface soils. Based on a recalculation of cancer and non-cancer risks using updated PCE and TCE toxicity values, EPA determined the excavation and off-site disposal of the Source Area 2 surface and subsurface soils was no longer necessary. The revised toxicity calculations for a commercial-industrial worker for surface and subsurface soils did not exceed the non-cancer hazard index of one. The revised increased cancer risk for surface and subsurface soils did not indicate a risk greater than 1 in 1,000,000.

Vapor intrusion and leaching to ground water is still a concern. The calculated non-cancer indoor air inhalation risk for the active dry cleaner resulted in a hazard index that exceeded EPA's acceptable level for a commercial-industrial worker. The Austin Chalk Aquifer's Southern Plume and the shallow monitoring wells directly behind the active dry cleaner had PCE, TCE and cis-1,2-Dichloroethene concentrations exceeding federal drinking water standards. To address the non-cancer risk and federal drinking water standard exceedances, EPA selected soil vapor extraction to address principal threat waste in Source Area 2 surface and subsurface soils. The ROD includes no other significant changes to the remedy identified in the Proposed Plan.

EPA Superfund Information Resources

Superfund Overview

The Superfund Process. www.epa.gov/superfund/community/process.htm.

A Citizen's Guide to the Superfund Program. www.epa.gov/reg3hwmd/super/guide.htm.

Writing Records of Decision

Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. www.epa.gov/superfund/policy/remedy/rods.

Superfund Risk Assessment

Risk Assessment Guidance for Superfund (RAGS) Part A. www.epa.gov/oswer/riskassessment/ragsa.

Cleanup Approaches and Institutional Controls

A Citizen's Guide to Bioremediation.
www.epa.gov/tio/download/citizens/a_citizens_guide_to_bioremediation.pdf.

A Citizen's Guide to Soil Vapor Extraction and Air Sparging.
www.epa.gov/tio/download/citizens/a_citizens_guide_to_soil_vapor_extraction_and_air_sparging.pdf.

A Citizen's Guide to Vapor Intrusion Mitigation.
www.epa.gov/tio/download/citizens/a_citizens_guide_to_vapor_intrusion_mitigation_.pdf.

A Citizen's Guide to Understanding Institutional Controls at Superfund, Brownfields, Federal Facilities, Underground Storage Tank, and Resource Conservation and Recovery Act Cleanups.
www.epa.gov/superfund/policy/ic/guide/citguide.pdf.