

**Griggs and Walnut
Ground Water Plume
Las Cruces, NM
Doña Ana County**



**Region 6
December 2006**

Introduction

This Proposed Plan identifies the Preferred Alternative for remediation of the contaminated ground water at the Griggs and Walnut Ground Water Plume Superfund Site (GWP, or the Site). This Proposed Plan also includes the summaries of other cleanup alternatives evaluated for use at this Site and compares them against one another and to the eligibility criteria. This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for Site activities. The New Mexico Environment Department (NMED), the supporting agency, and the Joint Superfund Project, (JSP), comprised of the City of Las Cruces and Dona Ana County, participated in this project and are integral partners in the process. EPA, in consultation with the JSP and the NMED, will select a final remedy for the Site after reviewing all comments received during the 30 day public comment period.

EPA, in consultation with the JSP and NMED, can modify the Preferred Alternative or select another response action presented in the Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this document.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document summarizes information that can be found in greater detail in the Remedial

Investigation and Feasibility Study (RI/FS) Reports and other documents contained in the Administrative Record file for this Site. EPA, the JSP, and the NMED encourage the public to review these documents to gain a more comprehensive understanding of the Superfund activities at the Site and in their community.

**Public Comment Period:
December 4 – January 5, 2007**

US EPA will accept written comments on the Proposed Plan during the public comment period.

**The Administrative Record File is
available at the following
information repositories:**

Thomas Branigan Memorial Library

200 E. Picacho Ave.
Las Cruces, NM 88001
HOURS: M-Thurs. 8:00 am – 9:00 pm
Fri. 8:00 am – 6:00 pm
Sat. 10:00 am – 6:00 pm
Sun. 1:00 pm – 5:00 pm
505-528-4005

New Mexico Environment Department

Mr. Sabino Rivera
Superfund Oversight Section
1190 St. Francis Dr.
Santa Fe, NM 87501
Call for an appointment: 505-827-0387

**U.S. Environmental Protection
Agency Region 6**

1445 Ross Avenue Suite 700
Dallas, Texas, 75202-2733
Call for an appointment
214-665-6686

Comment Sheet

Your comments on the Proposed Plan for the Griggs & Walnut Ground Water Plume Site are important to the EPA, JSP, and the NMED and will help us evaluate EPA's preferred alternative for the Site. You may use the space below to write your comments. Use additional sheets if necessary.

Please mail your comments to:

Petra Sanchez, Remedial Project Manager
U.S. Environmental Protection Agency; Superfund Division (6SF-RL)
1445 Ross Avenue, Suite 1200; Dallas, TX 75202-2733

Your comments **must** be postmarked **on or before January 5, 2007**, the end of the 30-day public comment period. You may also provide oral or written comments during the scheduled public meeting announced in this Proposed Plan. Those who prefer may submit their comments to the EPA via the Internet to negri.beverly@epa.gov. The EPA will respond to all significant comments in a "Responsiveness Summary" that will be included with the Record of Decision, identifying the Selected Remedy, for the Site. If you have any questions about the comment period or the Griggs & Walnut Site, please contact Beverly Negri at (214) 665-8157, or Petra Sanchez at (214) 665-6686 or the EPA's toll-free number at 1-800-533-3508.

Comments:

Your Name:
Address:
City:
State:
Zip Code:
Telephone No.:
E-Mail Address:

Site Background

Tetrachloroethylene (PCE) (also known as tetrachloroethene, perchloroethene, perc, perchlor, or perclene), a potential human carcinogen, was first detected in the municipal water supply on August 8, 1993 in City of Las Cruces (CLC) Wells No. 21 and 27. The contaminant was first discovered in samples collected by the NMED Drinking Water Bureau (DWB) during routine compliance monitoring requirements of the Federal Safe Drinking Water Act (SDWA). PCE was detected at concentrations below the Maximum Contaminant Level (MCL) of 5 µg/L (5 micrograms per liter). The SDWA requires the maximum permissible concentration level of a contaminant in water delivered to any user of a public water supply not to exceed the MCL.

Source Control

On January 10, 1995, PCE was detected by the DWB in CLC Well No. 18 at a concentration of 32 µg/L. A follow-up sample was collected on February 22, 1995 by the NMED indicated some fluctuations in concentrations and the need for more frequent monitoring and analysis. On September 26, 1996, after several sampling events data continued to indicate fluctuations in PCE concentrations. CLC Well No. 18 was therefore removed from the public distribution system. Wells No. 21 and 27 remained on the public distribution system, but required more frequent monitoring to ensure compliance with the Safe Drinking Water Standards. As of November 2006, only CLC well No 21 remains in service. Water from CLC No. 21 is blended with ground water from unaffected wells prior to entering the public drinking water distribution system, and complies with the Drinking Water Standards and other requirements of the SDWA.

Regulatory Response

From May through October 1997, the NMED Superfund Oversight Section performed a Site Assessment and a Preliminary Assessment of the conditions existing in the PCE affected ground water in Las Cruces. On October 30, 1997, NMED submitted a report to EPA entitled "Preliminary Assessment, Las Cruces PCE, Dona Ana County, New Mexico" as a first step toward consideration of the Site for the National Priority List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In June 1997, the NMED and the Dona Ana County Transportation Department (DACTD) facility began efforts to address a fuel spill that occurred on East Griggs Avenue. PCE was detected, and appeared co-mingled with the petroleum products in several wells installed within the County facility. Based on these detections, NMED performed a Focused Site Inspection between February 1998 and July 2000, for what was then referred to as the "Las Cruces PCE Site" under the CERCLA Site Assessment Program. PCE became the primary contaminant of interest. EPA issued a Superfund Site Strategy Recommendation for the Las Cruces PCE Site to NMED. NMED continued the investigation and detected PCE in several soil vapor samples collected at the DACTD Facility and in ground water samples collected from the 10 monitoring wells installed. The DACTD facility addressed the petroleum spill primarily under the NMED Underground Storage Tank Program, however, the PCE detections were deferred to the NMED Ground Water Superfund Oversight Section for further action.

The Site was listed on the National Priorities List on June 14, 2001 (66 Fed. Reg. 32235 (June 14, 2001)).

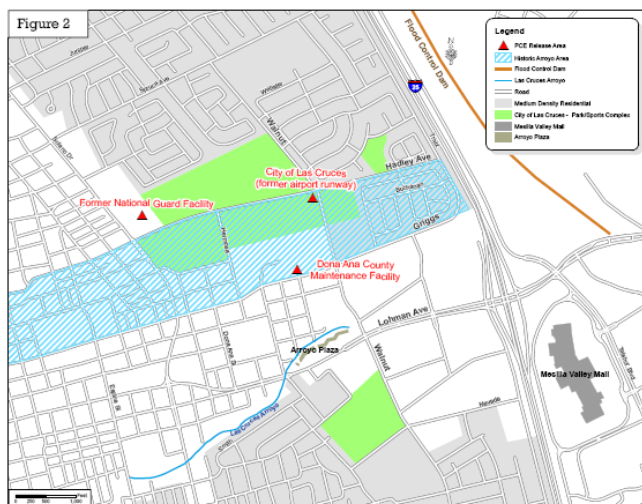
Areas of Contaminant Release Identified

EPA identified three primary areas of PCE contaminant release in the Identification of PCE Release Areas Report (IDRA Report) issued in November of 2001. Two of the PCE release areas are properties owned by the City of Las Cruces. One of these locations was once occupied by the New Mexico National Guard. The third area of PCE release identified in the IDRA Report is the DACTD owned and operated by Dona Ana County. (Fig.1)

The detections of PCE in ground water have been found on the Site in an area approximately one-half mile by 1.8 miles.

EPA signed a Settlement Agreement with the City of Las Cruces and Dona Ana County (JSP) on April 20, 2005, for completing the RI/FS for the Site. The Settlement Agreement outlined the roles and responsibilities of each agency and memorialized the collaborative efforts that would occur for purposes of completing the RI/FS.

Site Characteristics



Doña Ana County is located in the south central part of New Mexico, and on its south side borders Mexico and Texas. Las Cruces is located in the central portion of

the county. The elevation at the Site varies from a maximum of about 4,080 ft above mean sea level (MSL) to 3,930 ft MSL. The topography at the Site generally slopes towards the Rio Grande west of the Site.

The eastern area of the Site (just north of East Hadley Avenue and south of East Griggs Avenue, just west of I-25) includes two topographically elevated areas with an arroyo drainage extending east-west in between. Water in the arroyo once flowed east to west parallel to and south of the present-day East Hadley Avenue. The topographically elevated areas on either side of this feature were aligned approximately along East Hadley Avenue and East Griggs Avenue. This arroyo no longer serves as a channel for surface water flow, and is currently intersected by parks, streets, and storm-water retention basins.

Parts of a separate and larger arroyo (the Las Cruces Arroyo) are still present south of the Site. The Las Cruces Arroyo trends east-to-west from I-25 to near East Lohman Avenue west of North Walnut Street, with some remnants of the original arroyo running just north and parallel to the Arroyo Plaza Shopping Center. The Las Cruces Flood Control Dam and I-25 truncate the original eastern extent of Las Cruces Arroyo, reducing the drainage areas of this arroyo to drainage from the area west of I-25.

The average annual precipitation in the Mesilla Valley ranges between 8.0 and 9.0 inches per year, with most precipitation in the form of rain and small amounts of snowfall during winter months. Most rain is limited to brief, sometimes intense, thunderstorms, with more than half of the annual precipitation falling during the period July through September. Nearly three-fourths of the annual precipitation occurs in the warmest six months of the year (May through October). Evaporation and transpiration potential greatly exceeds rainfall. Evaporation and transpiration rates limit the amount of surface recharge the

aquifer receives from rainfall. The low amount of precipitation received in the area also limits the surface water availability to the Site. Surface water flow at the Site can be characterized as ephemeral. Most surface water flow resulting from rainfall is channeled along streets into the CLC's storm water sewer system. Several storm water retention basins are present throughout the vicinity of the Site and accumulate surface runoff during (monsoon) rain events.

The regional geology is composed of the Quaternary flood plain alluvium and the Miocene to Middle Pleistocene Santa Fe Group. The flood plain alluvium was deposited by the Rio Grande. It generally consists of a thick basal sand and gravel channel unit overlain by finer-grained flood plain deposits. The flood plain alluvium is generally about 4 miles wide and 80 ft thick. The Santa Fe Group is a stratigraphic unit composed of sequences of unconsolidated to moderately consolidated sedimentary deposits of clay, silt, sand, and gravel, with some basalts, and minor ash-fall deposits up to 4,000 ft thick.

Ground water basins are situated in the intermontane basins between the uplifted fault-block mountain ranges. The major ground water basins in the Las Cruces area are the Mesilla Ground Water Basin and the Jornada Del Muerto Ground Water Basin. The two basins are separated by the subsurface high in the less permeable bedrock. The Mesilla Ground Water Basin is located primarily within Doña Ana County, but it also extends further south into El Paso County, Texas, and the State of Chihuahua, Mexico.

The Rio Grande flood plain alluvium and the Santa Fe Group are the two major ground water reservoirs in the area. In the Mesilla Ground Water Basin, the two units form a complex aquifer system. Ground water recharge is primarily from the Rio Grande into the flood plain alluvium; minor amounts of recharge also occur along irrigation canals and as mountain and slope-front recharge. The ground water migrates

downward through the shallow alluvium to the upper Santa Fe Group through a series of interconnected gravel, sand, and clay lenses. Vertical flow within the system is restricted by thin, interbedded clay lenses in the lower part of the flood plain alluvium and the upper part of the Santa Fe Group. The resultant vertical heterogeneity would promote horizontal permeability over vertical permeability.

Ground water is unconfined within the flood plain alluvium and is unconfined to semi-confined within the Santa Fe Group. Ground water flow within the Mesilla Ground Water Basin is generally to the southeast. The primary use of ground and surface water within the Mesilla Basin is for irrigation. During non-drought years, most irrigation water is diverted from the Rio Grande. During years of drought, ground water is used to make up for the shortfall in surface water supplies for irrigation. Prior to about 1975, most irrigation wells were completed within the Rio Grande alluvium, but after this time, wells were drilled deeper into the Santa Fe Group to acquire better quality water.

The Mesilla Ground Water Basin aquifer has excellent recharge, transmission, and storage capacity. These characteristics indicate that the aquifer system is capable of producing large quantities of high quality water for agricultural, municipal, and industrial uses. The aquifer is the primary source of drinking water for the City of Las Cruces.

EPA began collecting field data on April 29, 2002, and continued to investigate the Site through December 27, 2005. EPA's efforts in the field included installation of monitoring wells, collection of ground water and, soil vapor data, and other information necessary for evaluating the nature and extent of contamination and for performing a baseline human health risk assessment. The data collected for the RI/FS indicated that:

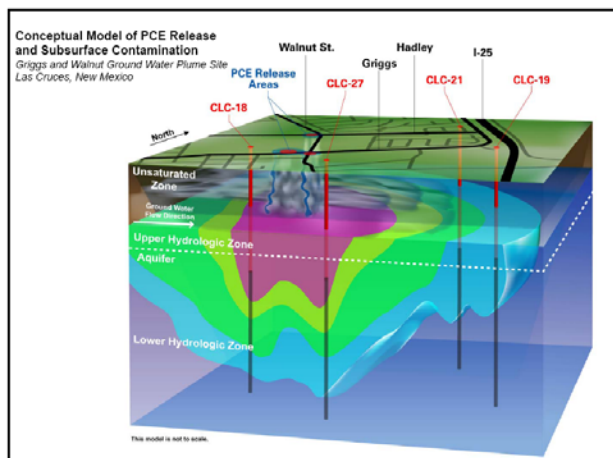
- The contaminated ground water plume is the result of PCE releases that occurred in three areas: 1) on

property owned by the City of Las Cruces, located near Griggs and Walnut Avenue, and formerly occupied by Crawford Municipal Airport property in the same vicinity; 2) on property owned by the City of Las Cruces once occupied by the New Mexico National Guard formerly located on the intersection of East Hadley Avenue and North Solano Drive; and 3) on property owned and occupied by the Dona Ana County Maintenance facility located on East Griggs Avenue.

- The Site can be characterized as having three major hydrostratigraphic zones. PCE is detected in all three major zones and ranges in depth at monitor well GWMW 10 from the water table (at approximately 3840 feet above mean sea level) to a depth of approximately 400 feet below the water table (635 feet bgs). The land surface at monitor well GWMW 10 is approximately 4,070 feet above sea level.
- The PCE is present in ground water and as soil vapor within the unsaturated zone. A limited amount of soil samples were collected early in the investigation, however negligible quantities of PCE were found as a result of extensive surface soil disturbance. Ground water contamination extends to approximately 635 feet bgs.
- The ground water flow direction at the Site is strongly influenced by municipal wells pumped to meet water supply needs. The flow direction is southeasterly within the upper aquifer but appears to be more southerly, within the lower aquifer units, based on ground water modeling analyses performed for the RI/FS by the JSP.
- PCE can exist in the subsurface as a dense non-aqueous phase liquid (DNAPL) in the aquifer. PCE concentrations detected in ground water however, do not support the presence of a DNAPL at the Site.
- The PCE identified at the GWP Site is dissolved in the ground water. The highest concentrations of PCE detected in the aquifer occurred in monitor well GWMW 10 and measured 53 µg/L in December 2002. The highest concentration of PCE detected in a CLC water supply well was detected in CLC Well No. 18 and measured 50 µg/L in February 2006.
- Two-hundred and forty soil vapor samples were completed during the first mobilization. In each boring, soil vapor samples were collected at depths ranging between 5 and 50 ft bgs. PCE concentrations in soil vapor ranged from 0.06 to 29 µg/L [8.3 to 4,203 parts per billion by volume (ppbv)]. Soil vapor samples also were collected at depths ranging from 12 to 115 ft bgs from the seven soil vapor monitor points (SVMP). PCE was detected at six of the seven SVMP locations. The range of PCE concentrations detected was 0.07 to 7.83 µg/L (10 to 1135 ppbv). During the second mobilization, 17 deeper samples were collected from two existing and one new soil vapor monitor point. The range of PCE concentrations detected was 1.25 to 8.18 µg/L (207 ppbv to 1186 ppbv).
- The PCE does not appear to undergo significant degradation although some low concentrations of Trichloroethylene (TCE), a common degradation product of PCE, have been observed. The aquifer at the Site appears to exhibit a range of geochemical conditions that are generally aerobic and therefore not

conductive toward reductive dechlorination of PCE.

- There are two primary influences on the migration of PCE from land surface to ground water. The migration of PCE from land surface to ground water is likely the result of water containing dissolved PCE infiltrating through the unsaturated zone. PCE is also transported as vapor through the unsaturated zone. Once PCE enters the ground water, transportation in ground water is influenced by pumping of municipal water supply wells (millions of gallons of water from deep wells). Based on the depths of PCE detections, the location of detections at municipal water supply wells, and based on the history of land use activities that occurred within the area, releases of PCE most likely occurred at land surface two or more decades ago.



What Is The “Contaminant Of Concern” For This Site?

A contaminant of concern (COC) is defined as a chemical that exceeds initial screening level concentrations and warrants further investigation. More detailed study may reveal that a COC poses a carcinogenic risk of greater than 1 in 1,000,000 (1×10^{-6}) or a non-carcinogenic hazard (Hazard Index, HI) or greater than 1. Ground water contaminants that exceed MCLs become the COCs for the Site. COCs for a Site may

be selected because of their intrinsic toxicological properties, because they are present in large quantities, or because they are presently in, or, could potentially move into critical exposure pathways (e.g., drinking water supply). EPA, the JSP, and the NMED identified PCE as the primary contaminant of concern for the Site. Other volatile organic carbons (VOCs) including benzene, toluene, and methyl tertiary butyl ether (MTBE) have been detected within the plume boundaries. These VOCs will continue to be monitored and removed under any remedy that is selected for the Site. The NMED Petroleum Storage Tank Bureau is also actively addressing the other detected VOCs, because they were part of a separate release(s) that occurred in the same area. Now that some of the contaminants are part of a co-mingled plume at the GWP Site, the selected remedy will address these other contaminants as well.

PCE has been detected at concentrations ranging from 0.09 $\mu\text{g/L}$ to 53 $\mu\text{g/L}$ in the ground water. The City of Las Cruces ensures that the public water supply meets the requirements of the SDWA and complies with the PCE standard of 5 $\mu\text{g/L}$ through frequent sampling and compliance with the approved blending program. The blending program consists of mixing affected ground water with unaffected water at the above-ground reservoir located near Interstate 25. The water is blended at ratios that will maintain compliance, prior to its release to the public water supply.

PCE is a chlorinated solvent that is often associated with dry cleaners or metal degreasing activities. If PCE is released to soil, it will evaporate into the atmosphere, but at higher concentrations, it will leach into the ground water. Human exposure to PCE can occur through inhalation of contaminated air and through ingestion of contaminated drinking water. When concentrations in air are high, such as in closed, poorly ventilated areas, single exposures can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, or

death. Skin and eye irritation can result from direct contact with PCE. Repeated or extended skin exposure can cause chemical burns. Ingestion of PCE at high concentrations generally causes symptoms similar to those from inhalation, but could lead to more severe nausea and vomiting reactions. Prolonged exposure to PCE can damage the central nervous system, cardiovascular and reproductive systems. Results of animal studies, conducted with concentrations of PCE much higher than those that most people are exposed to, indicate PCE can cause liver and kidney damage and liver and kidney cancers, although the relevance to human populations is unclear. The International Agency for Research on Cancer (IARC) has determined that PCE is probably carcinogenic to humans.

Scope and Role

The EPA expects that the Site contamination will be addressed as one operable unit by the remedy selected in the Record of Decision (ROD). An operable unit is a discrete action that comprises an incremental step toward comprehensively addressing Site contamination. The ROD will be issued following EPA's evaluation of comments received on this Proposed Plan. The ROD will identify the response action, and how the PCE in ground water will be addressed through treatment. Through the use of treatment technologies, this response will permanently reduce the toxicity, mobility, and volume of PCE-contaminated ground water at the Site.

Summary of Site Risks

As part of the RI/FS, EPA performed a baseline human health risk assessment (HHRA) to determine the current and future risks of Site contaminants to human health and the environment. Potentially complete exposure pathways were determined to be shallow soil vapor (through vapor intrusion to residents and buildings) and ground water (through the water supply distribution system, or through private domestic wells).

The HHRA was developed based on shallow soil vapor data collected in November 2005 and on ground water data collected in January 2004 and December 2005. The risk assessment team identified adult/child residents, industrial workers, and adolescent recreational users as realistic current and future receptors in the vicinity of the GWP Site.

Human Health Risks

Details of risk calculations and final risk characterizations for each receptor group listed above can be found in the HHRA (RI/FS November 2006) for the Site. The HHRA concluded that current and future exposures to indoor air concentrations from vapor intrusion are within EPA's target risk range.

To protect human health, EPA has set the acceptable risk range for carcinogens at Superfund Sites from 1 in 10,000 to 1 in 1,000,000 (expressed as 1×10^{-4} to 1×10^{-6}). A risk of 1 in 10,000 (1×10^{-4}) represents the upper bound of the acceptable risk range. This means that one person out of ten thousand people could be expected to develop cancer as a result of a lifetime exposure to the Site contaminants. EPA typically uses the 1×10^{-6} risk level for establishing preliminary remediation goals for contaminants where goals are not set to ARARs (e.g., an MCL). This means that a cumulative risk level of 1×10^{-6} is used as the starting point (or initial "protectiveness" goal) for determining the most appropriate risk level that alternatives should be designed to attain. Factors related to exposure, uncertainty and technical limitations may justify modification of initial cleanup levels that are based on the 1×10^{-6} risk level.

The risk from the statistical analysis performed for soil vapor data indicates that inhalation of PCE from the Site does not exceed the acceptable risk range. EPA's risk analysis also indicates that non-cancer impacts from inhalation of PCE from the Site are not expected.

EPA's analysis of the ground water data indicates that a significant plume of PCE contamination exists at the Site. Concentrations of PCE are present in the plume at levels greater than the MCL, a chemical-specific regulatory standard. These PCE concentrations represent an unacceptable risk to human health that warrants a remedial action.

Remedial Action Objectives

Remedial Action Objectives (RAOs) provide a general description of what a Superfund cleanup should accomplish. The EPA proposes the following RAOs for the Site:

Prevent human exposure to contaminated ground water above the MCL (5 µg/L) for PCE.

Maintain capture of the PCE-contaminated ground water plume above the MCL (5 µg/L) for PCE.

Restore ground water to its expected beneficial use as a drinking water supply with PCE concentrations no greater than the MCL (5 µg/L).

Summary of Remedial Alternatives

EPA has developed remedial alternatives to address the PCE contamination at the Site. EPA developed the alternatives in cooperation with the JSP, and NMED, based in part, on the results of the ground water fate and transport model developed for the Site. The alternatives are Site-specific and call for containment of the affected ground water and/or removal and treatment of the affected ground water.

Common Remedial Alternative Components:

Except for Alternative 1 (No Action), each alternative provides hydraulic plume containment and reduction of the plume through extraction and/or treatment. Each alternative provides reduction and containment within varying degrees, but all provide limitation of control for plume expansion beyond its currently known extent.

Except for Alternative 1, each alternative provides for Long Term Monitoring and Assessment. Long term monitoring will allow for mid-course adjustments to the engineering controls and will serve as a means for measuring progress toward meeting the remediation goals.

Alternatives 3, 4, and 5 provide active treatment of ground water prior to distribution into the public water supply system. Alternative 2 relies on blending to maintain compliance with the MCLs prior to distribution. Monitoring data is used to confirm blended water meets the MCL after delivery into the municipal drinking water distribution system.

Long-term monitoring of contaminant concentrations and water levels will allow progress toward meeting remediation goals to be measured and evaluated.

Institutional Controls (ICs) are expected to become a common element in the selected remedy. ICs are non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use. EPA proposes an IC providing for a moratorium on the installation of private wells during the period of restoration within the Site boundaries. EPA also proposes that a communication mechanism be developed to notify local, federal, and state authorities when a release to ground water occurs that may impede restoration of the Site ground water.

Alternative 1: No Action

The No Action alternative constitutes the absence of any remedial actions (including interim actions). No Action is considered as a baseline for comparison to all other potential remedial actions, as required by the NCP.

Estimated Capital cost: 0
Estimated Present Worth, Annual Operation and Maintenance (O&M): 0
Estimated Total Present Worth: 0

Alternative 2: Ground Water Extraction with Blending

This alternative utilizes the existing municipal water supply wells to provide hydraulic containment of ground water with concentrations of PCE greater than the MCL, and uses the minimum allowable pumping rates. Extracted ground water with concentrations higher than the PCE MCL is blended with unaffected water at the above-ground reservoir located on I-25 before delivery into the City of Las Cruces drinking water distribution system.

Estimated Capital cost: \$1,122,723.
Estimated Annual O&M (Year 1): \$552,472.
(Year 2-5): \$ 464,797.
(Year 6-completion): \$ 260,906.
Estimated Total Present Worth: \$10,152,542.

Alternative 3: Ground Water Extraction with Treatment

This alternative utilizes the existing municipal water supply wells to provide hydraulic containment of ground water with concentrations of PCE greater than the PCE MCL. Plume reduction would be accomplished by pumping ground water at rates higher than needed to simply maintain hydraulic containment. The higher pumping rates will be at levels that will reduce the time needed for remediation while

preventing the plume from expanding. This alternative also provides for treatment of extracted ground water utilizing either granular activated carbon (GAC), chemical/ultraviolet (UV) oxidation (chemical/UV oxidation), or air stripping of VOCs to remove PCE from the ground water. Under this alternative, extracted ground water would be conveyed to a new central treatment facility, where the ground water would be treated to meet the MCL standard prior to delivery into the municipal drinking water distribution system. The estimated capital cost of Alternative 3 includes the estimate for building a central treatment facility and associated underground piping (see Table 1).

Estimated Capital Cost (w/ Air Stripper): \$3,946,036.
Estimated Present Worth, Annual O&M: (Year 1): \$821,029.
(Year 2-5): \$638,635.
(Year 6-completion): \$536,818.
Estimated Total Present Worth: \$16,627,776.

Estimated Capital Cost (w/ Granular Activated Carbon, or GAC): \$4,504,573.
Estimated Present Worth, Annual O&M: (Year 1): \$764,672.
(Year 2-5): \$571,708.
(Year 6-completion): \$460,019.
Estimated Total Present Worth: \$15,633,464.

Estimated Capital Cost (w/ chemical/UV oxidation): \$5,211,897.
Estimated Present Worth, Annual O&M: (Year 1): \$986,991.
(Year 2-5): \$649,457.
(Year 6-completion): \$547,640.
Estimated Total Present Worth: \$18,407,955.

Alternative 4: Enhanced Ground Water Extraction with Treatment

This alternative is similar to Alternative 3. Alternative 4 provides hydraulic containment and plume reduction of ground water with concentrations higher than the allowable MCL limit for PCE. This alternative also provides a higher level of efficiency for capture by targeting extraction in the areas of highest PCE concentrations and serves to reduce the remediation time frame. Ground water will be extracted and treated to meet the MCL prior to delivery to the City of Las Cruces drinking water distribution system. This alternative will use two existing municipal supply wells (for example, CLC Well Nos. 18 and 27) and one new extraction well to obtain the desired plume capture and efficiency. The technologies for treating affected, pumped ground water are the same as Alternative 3; either GAC, chemical/UV oxidation, or air stripping (see Table 1).

Estimated Capital Cost (w/ Air Stripper):
\$5,151,978.
Estimated Present Worth, Annual O&M:
(Year 1): \$821,029
(Year 2-5): \$638,635.
(Year 6-completion): \$510,090.
Estimated Total Present Worth:
\$13,780,213.

Estimated Capital Cost (w/ GAC):
\$5,710,514.
Estimated Present Worth, Annual O&M:
(Year 1): \$764,672.
(Year 2-5): \$571,708.
(Year 6-completion): \$433,291.
Estimated Total Present Worth:
\$13,323,493.

Estimated Capital Cost (w/Chemical/UV Oxidation): \$6,340,304.
Estimated Present Worth, Annual O&M:
(Year 1): \$986,991.
(Year 2-5): \$649,457.
(Year 6-completion): \$520,912.

Estimated Total Present Worth:
\$15,407,101.

Alternative 5: In-Well Stripping in Higher Concentration Areas of the Ground Water Plume

This alternative achieves hydraulic containment of ground water, and treats ground water in-situ at areas with concentration of PCE above MCL in the aquifer. Twelve new treatment wells would be installed to provide air stripping of ground water in the aquifer. A new extraction well would also be installed to provide hydraulic containment of the plume during the in-situ treatment. Ground water from the new extraction well would be treated at the well-head using GAC before delivery to the City of Las Cruces drinking water distribution system.

Estimated Capital Cost: \$18,403,797.
Estimated Present Worth, Annual O&M:
(Year 1): \$1,051,260.
(Year 2-5): \$679,255.
(Year 6-completion): \$577,438.
Estimated Total Present Worth:
\$31,882,979.

Evaluation Of Alternatives

The EPA uses nine criteria to evaluate remedial alternatives for the cleanup of a release. Alternatives are evaluated individually and compared to each other using these criteria, in order to select a remedy for the Site.

These nine criteria are categorized into three groups: threshold, balancing, and modifying.

The threshold criteria are overall protection of human health and the environment and compliance with Applicable, Relevant and Appropriate Requirements (ARARs).

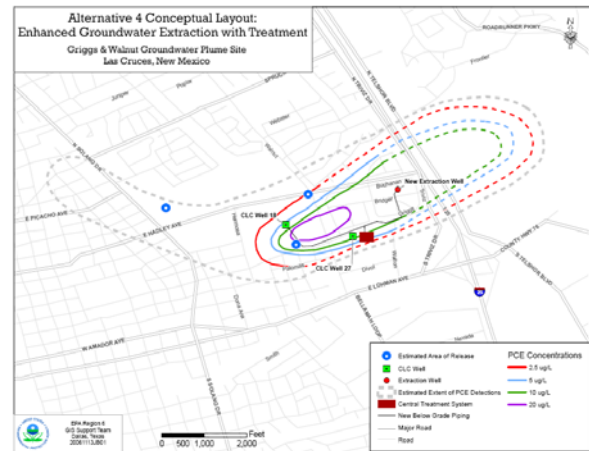
The threshold criteria must be met in order for an alternative to be eligible for selection. The balancing criteria are used to weigh major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost.

The modifying criteria are state acceptance and community acceptance, which are evaluated once the public comment period for the Proposed Plan is complete.

Based on the information and the analysis presented in the FS, EPA has identified the following Preferred Alternative.

Alternative 4: Enhanced Ground Water Extraction with Treatment Preferred Option: Air-Stripping

The EPA could modify its position regarding Site remediation based upon its assessment of state acceptance and community acceptance (the final two criteria). EPA's remedy selection decision will be described in the ROD after comments are received. Comments received will be addressed in a document called a "Responsiveness Summary."



Evaluation Criteria for Superfund Remedial Alternatives

Overall Protectiveness of Human Health and the Environment: determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Compliance with ARARs: evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the Site, or whether a waiver is justified.

Long-term Effectiveness and Permanence: considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment: evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-term Effectiveness: considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability: considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Costs: includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to – 30 percent.

State/Support Agency Acceptance: considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

Community Acceptance: considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Comparative Analysis of Remedial Alternatives: Overall Protection of Human Health and the Environment

Except for the No-Action Alternatives, all of the alternatives provided overall protection to human health and the environment. Each provides hydraulic containment and reduction of PCE concentrations in the aquifer to varying degrees but over different periods.

All four alternatives require monitoring to confirm hydraulic containment and to confirm PCE concentrations are below the MCL prior to distribution to the community. Alternative 2 requires more frequent monitoring to ensure the blending ratio is appropriate for meeting MCLs. Alternatives 3, 4, and 5 remove elevated concentrations of PCE from the ground water through treatment prior to distribution and thus, are more reliable in providing clean water for distribution.

All three alternatives (Alternatives 3, 4, and 5) treat the affected media (ground water) and thus, meet the NCP expectation that treatment will be used wherever practicable. The treatment methods described for Alternatives 3, 4, and 5 remove or destroy contaminant mass. Alternative 2 does not treat the extracted ground water and so, under Alternative 2, the statutory preference for treatment is not met for the extracted ground water.

All four alternatives meet RAOs thereby reducing risk to human health and the environment. All four alternatives will remove contaminants from the ground water, and will restore the aquifer to its beneficial use. The RAOs will be met in the shortest amount of time through Alternative 4 (14 years). Using the JSP Ground Water-Flow and Solute-Transport Model, it is estimated that elevated levels of PCE will persist for about 23 years for Alternative 2; 21 years for Alternative 3; 14 years for 4; and 20 years for Alternative 5.

Alternative 2 relies on above-ground (ex-situ) blending which does not constitute treatment. The contaminant remains in the water and is diluted. Alternatives 3, and 4, rely on ex-situ treatment but will (depending on which technology is selected) either transfer the contaminants from ground water to another medium (e.g., air) where it can be safely disposed, or destroy the contaminant (e.g., chemical/UV oxidation). Alternative 5 relies on a combination of in-well treatment using air stripping and above-ground (ex-situ) treatment using GAC, both of which transfer the contaminants from ground water to another medium where it will be safely disposed, recycled, or destroyed.

Under all of the action alternatives, long-term monitoring of trends in PCE concentrations in the aquifer is required to confirm hydraulic containment, plume reduction, and compliance with ARARs (e.g., MCL).

Maintaining a proper blending program as provided in Alternative 2 is less reliable than treatment Alternatives 3, 4, and 5 because of the potential for fluctuation in PCE concentrations. More frequent monitoring might be required for Alternative 2 than for the other three action alternatives to ensure the blending ratio is appropriate and concentrations are consistently maintained below the MCL prior to delivery into the municipal drinking water distribution system. Alternative 2 provides a low risk to workers from exposure to affected ground water or from the blending process during active remedial action and O&M. Alternatives 3, 4, also provide a low risk to workers from affected ground water or the treatment process during active remedial action and O&M.

Compliance with ARARs

Except for the No-Action Alternative, the remaining four alternatives are expected to meet ARARs. Alternatives 2, 3, 4, and 5 provide drinking water that meets the MCL. They also would restore the aquifer to its beneficial use as a drinking water supply (see above for projected time frames, based on modeling results).

Alternatives 2, 3, 4, and 5 require monitoring to ensure the MCL is met prior to distribution to the drinking water supply. Alternative 2, however, could require more frequent monitoring than the other alternatives to ensure MCLs are met prior to delivery into the drinking water distribution system.

Long-Term Effectiveness and Permanence

Alternatives 2, 3, 4, and 5 provide long-term effectiveness and are expected to remove contaminants from the ground water, meet the RAOs, and restore the aquifer to its beneficial use (within the JSP model-predicted time frame identified above). For the No-Action Alternative, contaminants would remain in the aquifer above MCLs for an indefinite period and are expected to

expand beyond the current plume extent. The length of time that it will take for contaminants to be removed under Alternatives 2, 3, 4, and 5 varies. These four alternatives minimize the potential for plume expansion by pumping to achieve hydraulic containment. Alternative 4 provides the shortest remediation timeframe. Alternative 2 would provide the longest remediation timeframe, and the least reliability in terms of meeting MCLs in drinking water (through blending). With blending, while it is an acceptable interim measure, the NCP preference for treatment to remove contaminants in the contaminated ground water is not met.

Reduction of Toxicity, Mobility and Volume (TMV) Of Contaminants through Treatment

Alternatives 1 and 2 provide no reduction in TMV through treatment. Alternatives 3, 4, and 5 all provide reduction of TMV through treatment.

Short-Term Effectiveness

Minimal to low risks to workers, the community, and the environment in the short-term are expected from Alternatives 2, 3, 4, and 5.

Alternative 2 provides a low risk to the community as long as blending is maintained to ensure that PCE concentrations remain below the MCL and adequate controls are kept in place to prevent exceedances.

There is a potential for failure for each of these alternatives including but not limited to mechanical failure of equipment, control logic failures and for incorrect blending ratios for Alternative 2. The potential for failure is slightly higher for Alternative 2.

Alternative 2, 3, 4, and 5 also present low risk to workers and to the environment from

affected ground water during production and O&M. Alternatives 3, 4, and 5, which provide active treatment would also provide low risk to workers during construction of in-situ and ex-situ treatment facilities. The use of a non-destructive treatment technology (i.e., air stripping or GAC) transfers contaminants to other media, posing a short-term risk to human health and the environment by the production of air emissions or by production of a waste that requires proper handling and disposal. The chemicals used for certain treatment units (i.e., air stripper with pretreatment and chemical/UV oxidation) could provide a risk to workers if not properly handled and disposed. Meeting ARAR requirements for controlling emissions as well as following proper waste handling should reduce this risk. Also, training requirements for workers reduces the potential for short-term risks to workers.

Alternatives 2, 3, 4, and 5 each require the installation of additional wells for performing the ground water monitoring, and could potentially present a low risk to workers during installation. Safety training for workers minimizes short-term risks to workers.

Implementability

The No-Action alternative requires no implementation, Alternative 2 is easy to implement because most of the infrastructure is already in place. Alternatives 3, 4, and 5 require implementing ground water extraction technologies that are commonly used at remediation sites; they are proven technologies that are generally easy to implement and maintain. Alternative 5 requires additional mechanical equipment and infrastructure which increases operation and maintenance efforts.

Of the three treatment options considered under Alternative 3 and 4: (1) the air stripper might require pretreatment to minimize scaling (preliminary evaluations indicate the potential for scaling is

borderline); (2) GAC treatment requires periodic carbon replacement and disposal; and (3) chemical/UV oxidation requires a continuous source of chemicals. Alternative 2 requires no pre-treatment prior to blending. Under Alternatives 3, 4, and 5 the need for pre-treatment should be evaluated during design to avoid scaling within the wells if the air stripping option is selected. Costs could increase significantly should pre-treatment be required.

No modifications to existing wells are required for Alternatives 2 and 3 other than the potential need for additional piping between CLC Well Nos. 18 and 27, and O&M.

Alternative 4 will require some modifications to the pumping wells and the addition of a new extraction well. This increases the technical difficulty of implementing this alternative. Alternative 5 also requires installation of in-situ treatment wells and an extraction well for purposes of plume containment, increasing the technical difficulty of implementing this alternative.

Cost

The estimated present worth cost of Alternative 4 is less than Alternative 3 and 5, but more than Alternative 2; Alternative 2, however; does not provide as effective removal of PCE mass from the aquifer, which is a statutory preference for the Site. Air stripping is slightly higher in cost than GAC, but less than chemical/UV oxidation. Alternative 5 is the most expensive alternative to operate but is comparable in effectiveness to Alternative 4. See also Table 1.

State and Local Government Acceptance

The JSP and the NMED support the preferred alternative identified below. EPA will make a final decision on the remedy after all comments are received.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the Site.

Summary of The Preferred Alternative

The preferred Alternative for addressing ground water contamination at the Griggs and Walnut Ground Water Plume Site is Alternative 4 (Enhanced Ground Water Extraction with Treatment) with the preferred treatment option being the use of air stripping PCE from the affected ground water. There is no soil vapor treatment component to any of the remedies because the soil vapor concentrations are within acceptable health risk range levels for human exposure. The preference of air stripping over granular activated carbon or chemical/UV oxidation is based on an independent study conducted by the City of Las Cruces to evaluate treatment of both PCE and uranium. In this JSP Report, ("Uranium and PCE Treatment Phase 1 Evaluation of Treatment Technologies") the CLC indicates that air stripping for PCE combined with Ion Exchange for treatment for uranium may be the most cost-effective approach.

Community Participation

EPA will make a final remedy selection after the comment period closes and after all comments are evaluated. Responses to comments will be provided in the Responsiveness Summary of the ROD, along with the remedy selected for the Site.

Table 1
 Comparative Analysis of Remedial Alternatives
Griggs and Walnut Ground Water Plume
Las Cruces, New Mexico

Remedial Alternative	Alternative 1 - No Action	Alternative 2 - Ground Water Extraction with Blending	Alternative 3 - Ground Water Extraction with Treatment	Alternative 4 - Enhanced Ground Water Extraction with Treatment	Alternative 5 - In-Well Stripping in Higher Concentration Areas of the Ground Water Plume
THRESHOLD CRITERIA¹					
Overall protection of human health and the environment¹	NO – No action would be performed and RAOs would not be met. Elevated levels of contaminants exist above the MCLs and will continue to threaten human health and the environment through migration and possible increases in contaminant detections in municipal supply wells.	YES – Hydraulic containment and reduction in contaminant concentrations in the aquifer by pumping and blending ground water will meet RAOs, thereby reducing risk to human health and the environment.	YES – Hydraulic containment and reduction in contaminant concentrations in the aquifer by pumping and active treatment will meet RAOs, thereby reducing risk to human health and the environment.	YES – Hydraulic containment and reduction in contaminant concentrations in the aquifer by pumping higher-concentration zones and active treatment will meet RAOs, thereby reducing risk to human health and the environment.	YES – Hydraulic containment and reduction in contaminant concentrations in the aquifer by active treatment will meet RAOs, thereby reducing risk to human health and the environment.
		Removal of contaminants from the ground water restores the aquifer to its beneficial use. The JSP ground water fate and transport model predicts elevated levels of PCE will persist for about 23 years.	Removal of contaminants from the ground water restores the aquifer to its beneficial use. The JSP ground water fate and transport model predicts elevated levels of PCE will persist for about 21 years.	Removal of contaminants from the ground water restores the aquifer to its beneficial use. The JSP ground water fate and transport model predicts elevated levels of PCE will persist for about 14 years.	Removal of contaminants from the ground water restores the aquifer to its beneficial use. Based on JSP ground water fate and transport modeling of other alternatives, it is anticipated with this alternative that elevated levels of PCE will persist for about 20 years.
		Provides protection of human health through blending of contaminated ground water to below MCLs with clean water prior to distribution into the public drinking water supply. Note: blending can be effective, but does not constitute “treatment”.	Provides protection of human health through treatment of contaminated ground water to below MCLs prior to distribution into the public drinking water supply.	Provides protection of human health through treatment of contaminated ground water to below MCLs prior to distribution into the public drinking water supply.	Provides protection of human health through treatment of contaminated ground water to below MCLs prior to distribution into the public drinking water supply.

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Griggs and Walnut Ground Water Plume
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Overall protection of human health and the environment, continued¹		This alternative relies on above-ground (ex-situ) blending which does not constitute treatment. The contaminant remains in the water and is simply diluted.	This alternative relies on above-ground (ex-situ) treatment, which will, depending on the technology chosen, either safely transfer the contaminants from ground water to another medium (e.g. air) or destroy the contaminants (e.g. chemical/UV oxidation).	This alternative relies on above-ground (ex-situ) treatment, which will, depending on the technology chosen, either safely transfer the contaminants from ground water to another medium (e.g. air) or destroy the contaminants (e.g. chemical/UV oxidation).	This alternative relies on a combination of in-well treatment using air stripping and above-ground (ex-situ) treatment using Granular Activated Carbon (GAC), both of which safely transfer the contaminants from ground water to another medium (e.g. air).
		Active long-term monitoring in the aquifer and the blending effluent is required to confirm hydraulic containment and compliance with ARARs (e.g. MCLs). Maintaining a proper blending program is less reliable than treatment alternatives due to the potential fluctuation in concentrations. More frequent monitoring may be required than for other alternatives to ensure blending ratio is appropriate and concentrations are consistently maintained below the MCL prior to distribution into the public drinking water supply.	Active long-term monitoring in the aquifer and in the treatment effluent is required to confirm hydraulic containment and compliance with ARARs (e.g. MCLs).	Active long-term monitoring in the aquifer and the treatment effluent is required to confirm hydraulic containment and compliance with ARARs (e.g. MCLs).	Active long-term monitoring in the aquifer and the treatment effluent is required to confirm hydraulic containment and compliance with ARARs (e.g. MCLs).
		This alternative involves low risk to workers from affected ground water or the	This alternative involves low risk to workers from affected ground water or the	This alternative involves low risk to workers from affected ground water or the	This alternative involves low risk to workers from affected ground water or the

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		blending process during active remedial action and O&M.	treatment process during active remedial action and O&M.	treatment process during active remedial action and O&M.	treatment process during active remedial action and O&M.
Compliance with ARARs¹	NO - Not compliant. No action would be performed, and drinking water would not meet MCLs.	YES – Provides drinking water that meets MCLs. Also, provides restoration of the aquifer to its beneficial use as a drinking water supply (within about 23 years as predicted by the JSP model). May require more frequent monitoring than other alternatives to ensure MCLs are met prior to distribution to the drinking water supply.	YES – Provides drinking water that meets MCLs. Also, provides restoration of the aquifer to its beneficial use as a drinking water supply (within about 21 years as predicted by the JSP model). Requires monitoring to ensure MCLs are met prior to distribution to the drinking water supply.	YES – Provides drinking water that meets MCLs. Also, provides restoration of the aquifer to its beneficial use as a drinking water supply (within about 21 years as predicted by the JSP model). Requires monitoring to ensure MCLs are met prior to distribution to the drinking water supply.	YES – Provides drinking water that meets MCLs. Also, provides restoration of the aquifer to its beneficial use as a drinking water supply (within about 20 years as estimated based on the JSP modeling of other alternatives). Requires monitoring to ensure MCLs are met prior to distribution to the drinking water supply.
BALANCING CRITERIA					
Long-term effectiveness and permanence	No action would be performed. Contaminants would remain in the aquifer above MCLs for an indefinite period (predicted by the JSP model to be longer than 30 years).	Removal of contaminants from the ground water will meet RAOs and restore the aquifer to its beneficial use (within the JSP model-predicted time frame of about 23 years).	Removal of contaminants from the ground water will meet RAOs and restore the aquifer to its beneficial use (within the JSP model-predicted time frame of about 21 years).	Removal of contaminants from the ground water will meet RAOs and restore the aquifer to its beneficial use (within the JSP model-predicted time frame of about 14 years).	Removal of contaminants from the ground water will meet RAOs and restore the aquifer to its beneficial use (within about 20 years, as estimated based on the JSP modeling for other alternatives).
	The JSP ground water fate and transport model predicts future plume expansion, with impacts to well GWMW11 and CLC Well No. 26.	The potential for plume expansion is minimized through the use of hydraulic containment.	The potential for plume expansion is minimized through the use of hydraulic containment.	The potential for plume expansion is minimized through the use of hydraulic containment.	The potential for plume expansion is minimized through the use of hydraulic containment.

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Long-term effectiveness and permanence, continued		Pumping rates set at the minimum long-term average pumping rate needed to maintain hydraulic containment.	Higher pumping rates than used in Alternative 2 provide higher likelihood of success in achieving and maintaining hydraulic containment and restoring the aquifer.	Targeted pumping provides higher likelihood of success in restoring the aquifer in a shorter period compared to Alternatives 2 and 3.	Targeted in-situ treatment provides higher likelihood of success in restoring the aquifer compared to Alternatives 2 and 3.
Reduction of toxicity, mobility, or volume (TMV) through treatment	No action would be performed and no overall reduction of TMV through treatment would occur.	No overall reduction of TMV in the contaminated ground water through treatment would occur (blending does not constitute treatment).	Provides overall reduction of TMV in the contaminated ground water through treatment.	Provides overall reduction of TMV in the contaminated ground water through treatment.	Provides overall reduction of TMV in the contaminated ground water through treatment.
Short-term effectiveness	No action would be performed, and drinking water would not meet MCLs.	Low risks to workers, the community, and the environment in the short-term are expected. Low risk to the community associated with the use of the blended ground water for drinking water as long as pumping rates to control blending to below the MCL are maintained and adequate controls are in place to warn of system failure. There is the potential for failures in the blending process, including but not limited to, mechanical failure of equipment, control logic failures, or incorrect blending ratio.	Minimal to low risks to workers, the community, and the environment in the short-term are expected. Minimal risk to the community associated with the use of treated ground water for drinking as long as adequate controls are in place to warn of system failure. There is minimal potential for failure in the treatment process, including but not limited to, mechanical failure of equipment or control logic failures.	Minimal to low risks to workers, the community, and the environment in the short-term are expected. Minimal risk to the community associated with the use of treated ground water for drinking as long as adequate controls are in place to warn of system failure. There is minimal potential for failure in the treatment process, including but not limited to, mechanical failure of equipment or control logic failures.	Minimal to low risks to workers, the community, and the environment in the short-term are expected. Minimal risk to the community associated with the use of treated ground water for drinking as long as adequate controls are in place to warn of system failure. There is minimal potential for failure in the treatment process, including but not limited to, mechanical failure of equipment or control logic failures.

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Short-term effectiveness, continued		<p>Low risk to workers and to the environment from affected ground water are anticipated during production and O&M.</p>	<p>Low risk to workers during construction and maintenance of the ex-situ treatment unit. The use of a non-destructive treatment technology (i.e., air stripping or GAC) transfers the contaminants to another medium, posing a short-term risk to human health and the environment by the production of air emissions or a waste that requires proper handling and disposal. The chemicals used for certain treatment units (i.e., air stripper with pretreatment and chemical/UV oxidation) provide a risk to workers if not properly handled and disposed. Meeting ARARs for emissions and waste handling and OSHA-training for workers minimizes short-term risks to workers.</p>	<p>Low risk to workers during construction and maintenance of the ex-situ treatment unit. The use of a non-destructive treatment technology (i.e., air stripping or GAC) transfers the contaminants to another medium, posing a short-term risk to human health and the environment by the production of air emissions or a waste that requires proper handling and disposal. The chemicals used for certain treatment units (i.e., air stripper with pretreatment and chemical/UV oxidation) provide a risk to workers if not properly handled and disposed. Meeting ARARs for emissions and waste handling and OSHA-training for workers minimizes short-term risks to workers.</p>	<p>Low risk to workers during construction and maintenance of the in-well and ex-situ treatment units. The use of a non-destructive treatment technology (i.e., air stripping or GAC) transfers the contaminants to another medium, posing a short-term risk to human health and the environment by the production of air emissions or a waste that requires proper handling and disposal. The chemicals used for certain treatment units (i.e. air stripper with pretreatment) provide a risk to workers if not properly handled and disposed. Meeting ARARs for emissions and waste handling and OSHA-training for workers minimizes short-term risks to workers.</p>
		<p>This alternative requires installation of additional wells (for ground water monitoring) that could pose a low risk to workers during installation. OSHA-training for workers minimizes short-term risks to workers.</p>	<p>This alternative requires installation of additional wells (for ground water monitoring) that could pose a low risk to workers during installation. OSHA-training for workers minimizes short-term risks to workers.</p>	<p>This alternative requires installation of additional wells (for ground water extraction and monitoring) that could pose a low risk to workers during installation. OSHA-training for workers minimizes short-term risks to workers</p>	<p>This alternative requires installation of additional wells (for ground water treatment, extraction, and monitoring) that could pose a low risk to workers during installation. OSHA-training for workers minimizes short-term risks to workers.</p>

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Las Cruces, New Mexico

Remedial Alternative	Alternative 1 - No Action	Alternative 2 - Ground Water Extraction with Blending	Alternative 3 - Ground Water Extraction with Treatment	Alternative 4 - Enhanced Ground Water Extraction with Treatment	Alternative 5 - In-Well Stripping in Higher Concentration Areas of the Ground Water Plume
Implementability	No action to implement.	Easy to implement because the majority of the initial infrastructure is already in place.	The ground water extraction technologies considered under this alternative are commonly used, and are generally easy to install and maintain.	The ground water extraction technologies considered under this alternative are commonly used, and are generally easy to install and maintain.	The ground water extraction technologies considered under this alternative for hydraulic containment are commonly used and are generally easy to install and maintain.
		If the availability of sufficient clean water for blending decreases with increasing concentrations in the extracted water, significant changes to infrastructure or the addition of another treatment technology could become necessary over time. May require more frequent monitoring than other alternatives to ensure MCLs are met prior to distribution to the drinking water supply.	Of the three treatment options considered under this alternative: (1) the air stripper may require pretreatment for scaling (preliminary evaluations indicate the potential for scaling is borderline); (2) GAC treatment requires periodic carbon replacement and disposal; and (3) chemical/UV oxidation requires a continuous source of chemicals.	Of the three treatment options considered under this alternative: (1) the air stripper may require pretreatment for scaling (preliminary evaluations indicate the potential for scaling is borderline); (2) GAC treatment requires periodic carbon replacement and disposal; and (3) chemical/UV oxidation requires a continuous source of chemicals.	The in-well air stripping might result in scaling in wells, and some chemical addition may be required. Additional mechanical equipment and infrastructure associated with this alternative increases O&M costs over the other alternatives.
		Pretreatment not required.	The potential need for pretreatment to address scaling under air stripping option should be considered in more detail during the RD.	The potential need for pretreatment to address scaling under air stripping option should be considered in more detail during the RD.	The need for pretreatment to address scaling associated with in-well air stripping should be considered in more detail during the RD.
		No modifications to existing wells required, other than the addition of piping between CLC Well Nos. 18 and 27, and O&M.	No modifications to existing wells required, other than the addition of piping between CLC Well Nos. 18 and 27, and O&M.	Modifications to the pumping wells and the addition of new extraction wells somewhat increases the difficulty of this alternative.	Installation of in-situ treatment wells and the addition of an extraction well for containment somewhat increases the difficulty of this alternative.

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Costs (Present worth)	None – requires no additional expenditure.	\$10.2 MM	\$15.6 – \$18.4 MM Air stripping without pretreatment: \$16.6 MM ² GAC: \$15.6 MM Chemical/UV oxidation: \$18.4 MM	\$13.3 - \$15.4 MM Air stripping without pretreatment: \$13.8 MM ² GAC: \$13.3 MM Chemical/UV oxidation: \$15.4 MM	In-well air stripping and GAC for ground water extracted to maintain hydraulic containment: \$31.9 MM^{3,4}
-30% to +50% range:	None – requires no additional expenditure.	\$7.1 to 15.2 MM	\$10.9 to \$27.6 MM² Air stripping without pretreatment: \$11.6-\$24.9 MM ² GAC: \$10.9-23.5 MM Chemical/UV oxidation: \$12.9-27.6 MM	\$9.3 to \$23.1 MM² Air stripping without pretreatment: \$9.6-\$20.6 MM ² GAC: \$9.3-20.0 MM Chemical/UV oxidation: \$10.8-23.1 MM	\$22.3 to 47.8 MM^{3,4}

Notes:

- To be eligible for selection, an alternative must meet the two threshold criteria, or in the case of ARARs, must justify why a waiver is appropriate. For this reason, each alternative either meets the criterion (i.e., Yes) or does not meet the criterion (i.e., No).
- A preliminary evaluation indicates the potential for scaling is borderline under the ex-situ air stripping treatment option. The Ryznar Stability Index (RSI) calculated for CaCO₃ scaling potential at GWP is 6.1; RSI less than 6 indicates higher potential for scaling. The Langlier Index (LI) calculated for CaCO₃ scaling potential at GWP is 0.9; LI greater than 1 indicates higher potential for scaling. Because the assumptions used in making these calculations can greatly affect the result, a more detailed evaluation of scaling potential must be performed during the RD.
 Pretreatment for scaling under the ex-situ air stripping treatment option would increase the costs of Alternatives 3 and 4 by a net present worth value cost of about \$5 to \$6 MM for the entire period of operation. The cost estimate with acid pretreatment for Alternatives 3 and 4 is as follows:
 Alternative 3: Air stripping with acid pretreatment: \$22.9 MM; +50/-30% range: \$16.0-34.3 MM
 Alternative 4: Air stripping with acid pretreatment: \$18.4 MM; +50/-30% range: \$12.9-27.6 MM
- Costs for Alternative 5 are based on ex-situ treatment using GAC as a representative option for treatment of ground water extracted to maintain hydraulic containment. Other ex-situ treatment technologies such as air stripping or chemical/UV oxidation could also be used.
- Pretreatment for scaling may also be required for the in-well air stripping described under Alternative 5; vendor-supplied system costs include costs for pretreatment for the in-well air stripping. If the ex-situ treatment option is changed from GAC to air stripping, a more detailed evaluation of the potential for scaling and the need for pretreatment should be performed during the RD (see also Note 2).

Glossary

Applicable, Relevant and Appropriate Requirements (ARARs) – Generally, any Federal, State, or local requirements or regulations that would apply to a remedial action if it were not being conducted under CERCLA, or that while not strictly applicable, are relevant in the sense that they regulate similar situations or actions and are appropriate to be followed in implementing a particular remedial action.

Aquifer - An aquifer is an underground rock formation composed of such materials as sand, soil, or gravel that can store ground water and supply it to wells and springs.

Baseline Human Health Risk Assessment – A formal risk assessment conducted as part of the RI according to EPA-prescribed procedures. The need for remedial action at a Site is established in part on the results of the baseline risk assessment.

Chlorinated Solvents – An organic hydrocarbon in which chlorine atoms substitute for one or more hydrogen atoms in the compound's structure, for example, methylene chloride and 1,1,1-trichloromethane. Commonly used in aerosol spray containers, in highway paint, for grease removal in manufacturing, dry cleaning, and other operations. The substituted chlorine makes the compound less flammable than the non-substituted equivalent, but more toxic.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – Also known as Superfund. CERCLA is a federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. Under the program, U.S. EPA can either: 1. Pay for Site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work; or 2. Take legal action to force parties responsible for Site contamination to clean up the Site or pay back the federal government for the cost of the cleanup.

Confining Layer - A "confining layer" is a geological formation characterized by low permeability that inhibits the flow of water.

Contaminant - A contaminant is any physical, chemical, biological, or radiological substance or matter present in any media at concentrations that may pose a threat to human health or the environment.

Conceptual Site Model (CSM) - A CSM, a key element used in facilitating cleanup decisions during a site investigation, is a planning tool that organizes information that already is known about a site and identifies the additional information necessary to support decisions that will achieve the goals of the project. The project team then uses the CSM to direct field work that focuses on the information needed to remove significant unknowns from the model. The CSM serves several purposes - as a planning instrument; as a modeling and data interpretation tool; and as a means of communication among members of a project team, decision makers, stakeholders, and field personnel.

Dense Non-aqueous Phase Liquids (DNAPL) – A DNAPL is an organic substance that is relatively insoluble in water and denser than water. DNAPLs tend to sink vertically through sand and gravel aquifers to the underlying layer.

Detection Limit - The lowest concentration of a chemical that can be distinguished reliably from a zero concentration.

Dose - A measure of exposure. Examples include (1) the amount of a chemical ingested, (2) the amount of a chemical absorbed, and (3) the product of ambient exposure concentration and the duration of exposure.

Ex Situ - The term ex situ or "moved from its original place," means excavated or removed.

Hazard index – In the baseline risk assessment, the ratio of the dose calculated for a receptor divided by the reference dose. When the HI exceeds 1.0 (i.e., the expected dose exceeds EPA's reference dose), a health risk is assumed to exist.

Hazard quotient – The ratio of exposure to toxicity for non-cancer endpoints. The HQ is calculated by dividing the estimated daily intake of a chemical by the non-cancer reference dose for that chemical. When the HQ exceeds 1.0, a possible health risk is assumed to exist.

Hazardous Substance - CERCLA defines a hazardous substance as "(A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33, (B) any element, compound, mixture, solution or substance designated pursuant to section 9602 of this title, (C) any hazardous waste having the characteristics identified in under or listed pursuant to section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which the Solid Waste Disposal Act has been suspended by Act or Congress), (D) any toxic pollutant listed under section 1317(a) of Title 33, (E) any imminently hazardous chemical substance or mixture with respect to which the (EPA) Administrator has taken action pursuant to section 2606 of Title 15. The term does not (within the context of CERCLA) include petroleum, crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance (by CERCLA)...The term (hazardous substance) does not include natural gas, natural gas liquids, liquified natural gas, or synthetic natural gas usable for fuel (or mixtures of natural gas and such synthetic gas).

In Situ - The term in situ, "in its original place," or "on-site", means unexcavated and unmoved. In situ soil flushing and natural attenuation are examples of in situ treatment methods by which contaminated sites are treated without digging up or removing the contaminants.

Maximum Containment Levels (MCLs) – Set under the Safe Drinking Water Act, a contaminant level that may not be exceeded in a drinking water source.

Migration Pathway - A migration pathway is a potential path or route of contaminants from the source of contamination to contact with human populations or the environment. Migration pathways include air, surface water, ground water, and land surface. The existence and identification of all potential migration pathways must be considered during assessment and characterization of a waste site.

Monitored Natural Attenuation - The term monitored natural attenuation refers to the remedial approach that allows natural processes to reduce concentrations of contaminants to acceptable levels. Monitored natural attenuation involves physical, chemical, and biological processes that act to reduce the mass, toxicity, and mobility of subsurface contamination. Physical, chemical, and biological processes involved in monitored natural attenuation include biodegradation, chemical stabilization, dispersion, sorption, and volatilization.

Monitoring Well - A monitoring well is a well drilled at a specific location on or off a hazardous waste site at which ground water can be sampled at selected depths and studied to determine the direction of ground water flow and the types and quantities of contaminants present in the ground water.

National Contingency Plan (NCP) – The National Oil and Hazardous Substances Pollution Contingency Plan is composed of the federal regulations that guide the Superfund program.

National Priorities List (NPL) – EPA's list of the most serious uncontrolled or abandoned hazardous waste Sites identified for possible long-term remedial response where money from the Trust Fund may be used. The list is based, primarily, on the score a Site receives on the Hazard Ranking System (HRS). U.S. EPA is required to update the NPL at least once a year.

Plume - A plume is a visible or measurable emission or discharge of a contaminant from a given point of origin into any medium.

Preliminary Remediation Goals (PRGs) - The Initial clean-up goals developed early in the remedy selection process based on readily available information and that are modified to reflect results of the baseline risk assessment. They also are used during analysis of remedial alternatives in the remedial investigation/feasibility study (RI/FS).

Remedial Action Objectives (RAOs) – A Remedial Action Objective is a general description of what a given remedial action will accomplish. RAOs aimed at protecting human health and the environment should specify: (1) the contaminants of concern; (2) exposure routes and receptors; and, (3) an acceptable contaminant level or range of levels for each exposure medium (i.e., a PRG).

Release - A "release" is defined by CERCLA as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers and other closed receptacles containing any hazardous substance or pollutant or contaminant".

Toxic Substance - A toxic substance is a chemical or mixture that may present an unreasonable risk of injury to health or the environment. Toxic Substances Control Act (TSCA) TSCA was enacted in 1976 to test, regulate, and screen all chemicals produced or imported into the U.S. TSCA requires that any chemical that reaches the consumer marketplace be tested for possible toxic effects prior to commercial manufacture. Any existing chemical that poses health and environmental hazards is tracked and reported under TSCA.

Vadose Zone - The vadose zone is the area between the surface of the land and the surface of the water table in which the moisture content is less than the saturation point and the pressure is less than atmospheric. The openings (pore spaces) also typically contain air or other gases.

Vapor - Vapor is the gaseous phase of any substance that is liquid or solid at atmospheric temperatures and pressures. Steam is an example of a vapor.

Volatile Organic Compound (VOC) - A VOC is one of a group of carbon-containing compounds that evaporate readily at room temperature. Examples of VOCs include trichloroethane; and BTEX. These contaminants typically are generated from metal degreasing, printed circuit board cleaning, gasoline, and wood preserving processes.

Griggs & Walnut Groundwater Plume Site Locator Map

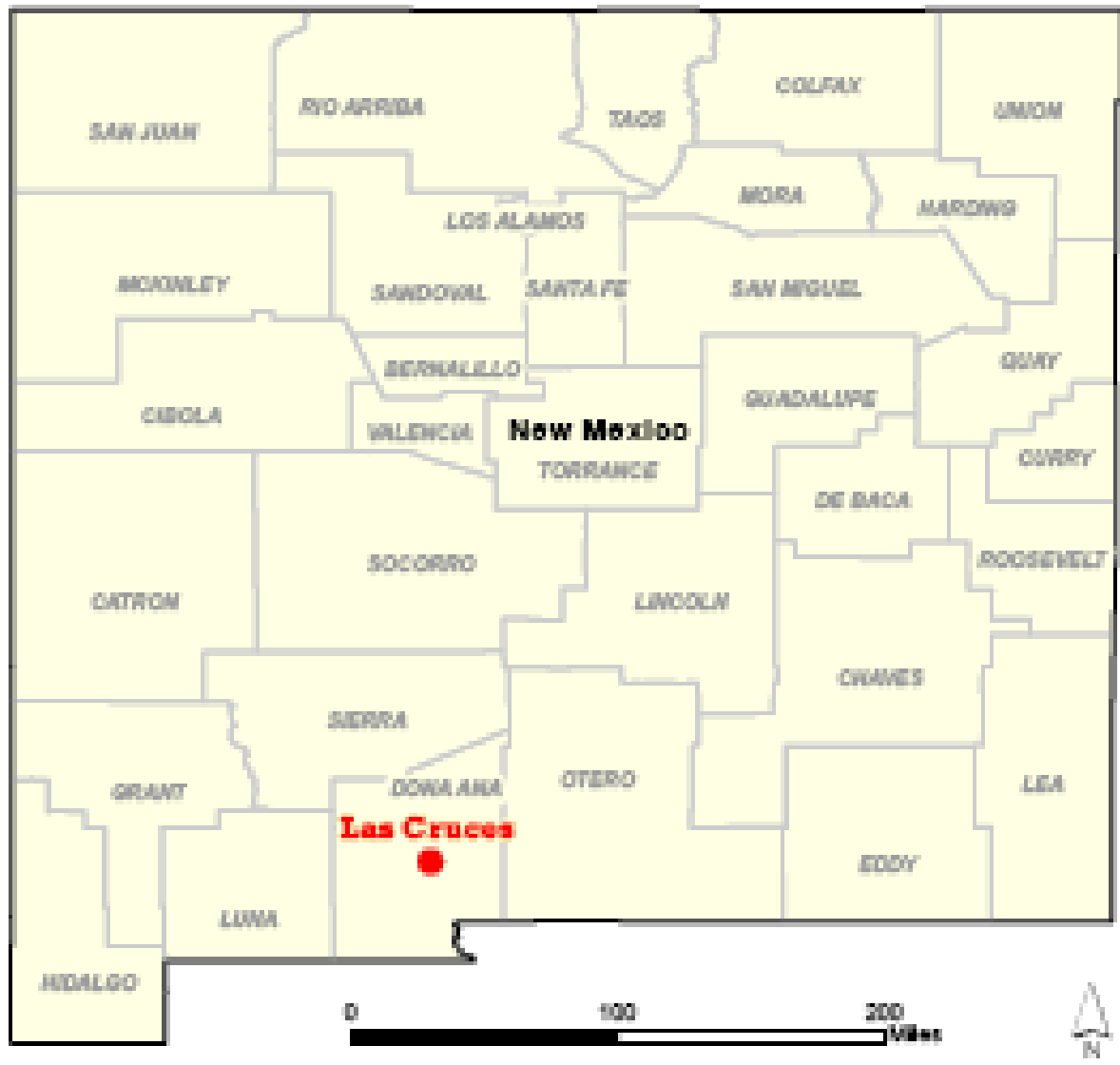
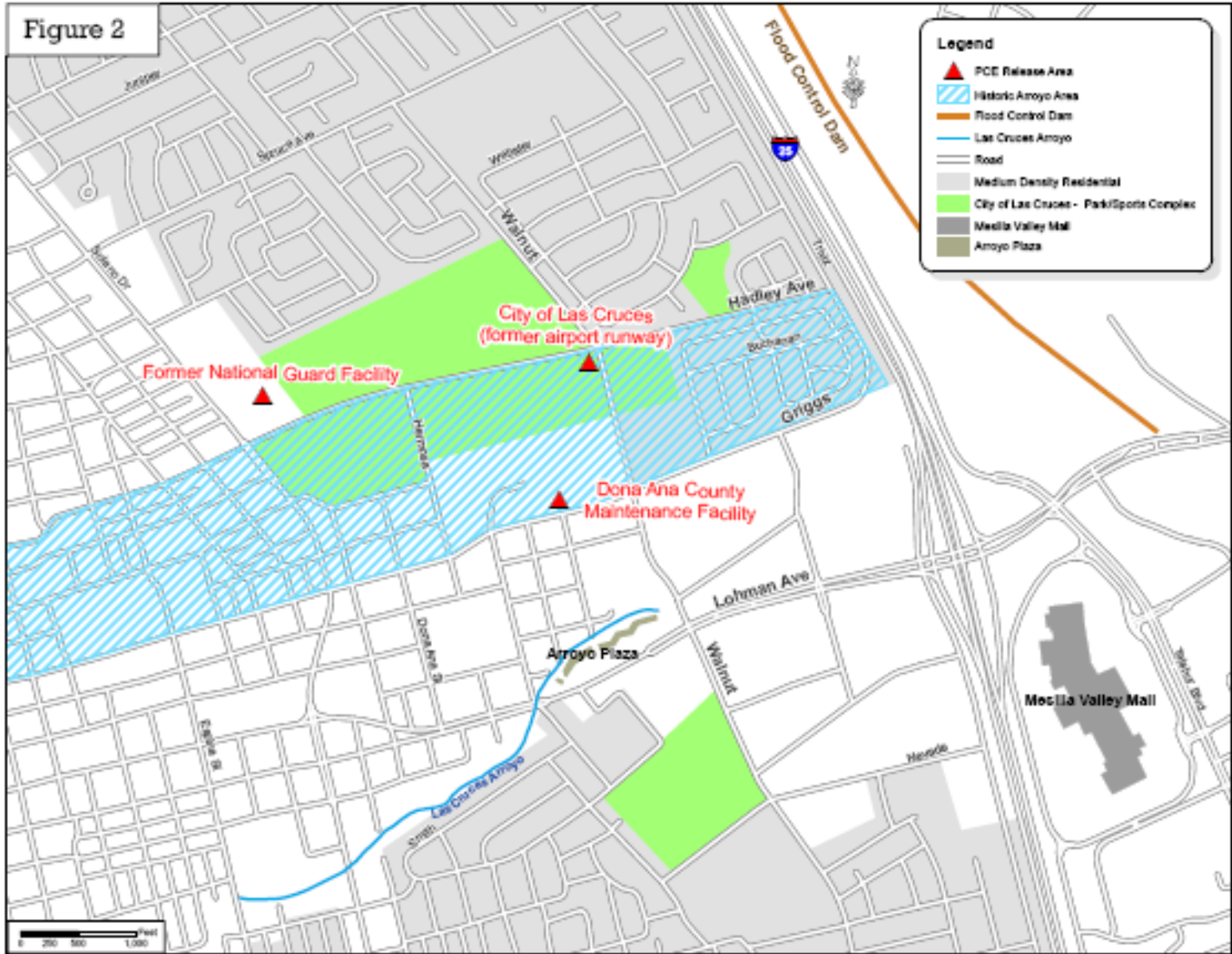


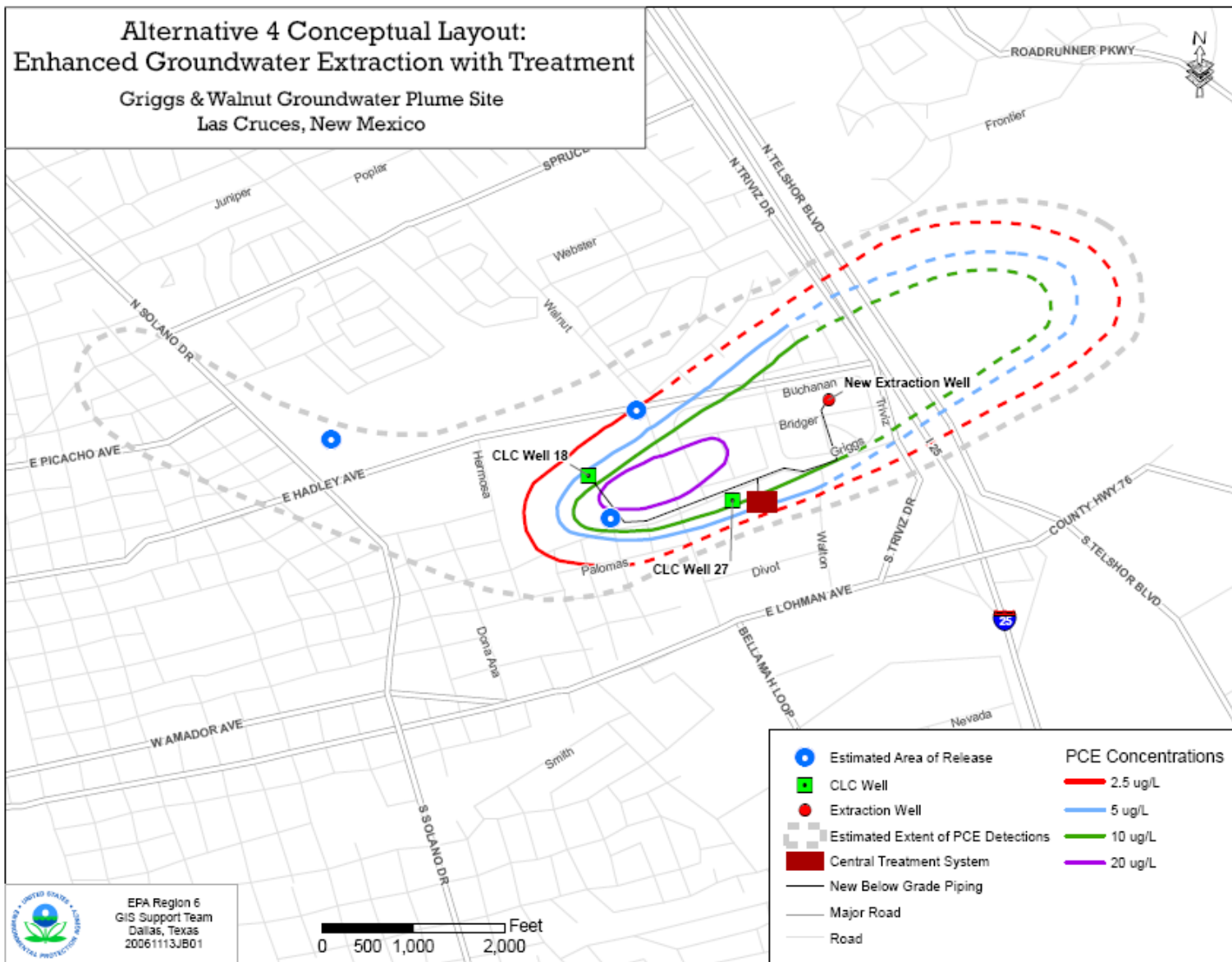
Figure 2







Preferred Alternative



Conceptual Model of PCE Release and Subsurface Contamination

Griggs and Walnut Ground Water Plume Site
Las Cruces, New Mexico

