FIRST FIVE-YEAR REVIEW REPORT FOR GRIGGS AND WALNUT GROUND WATER PLUME SUPERFUND SITE LAS CRUCES, DOÑA ANA COUNTY, NEW MEXICO

SEPTEMBER 2016

Prepared by

U.S. Environmental Protection Agency
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FIRST FIVE-YEAR REVIEW REPORT
GRIGGS AND WALNUT GROUND WATER PLUME SUPERFUND SITE
EPA ID#: NMD0002271286
DOÑA ANA COUNTY, NEW MEXICO

This memorandum documents the U.S. Environmental Protection Agency's (EPA's) performance, determinations and approval of the Griggs and Walnut Ground Water Plume Superfund site (Site) first Five-Year Review (FYR) under Section 121 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code Section 9621 (c), as provided in the attached First Five-Year Review Report.

Summary of the First Five-Year Review Report

The Site consists of a ground water plume contaminated with dissolved perchloroethylene (PCE). The dissolved PCE plume is approximately 1.8 miles long by 0.5 miles wide and located within the City of Las Cruces (CLC), New Mexico. PCE contamination is present in the ground water at depths ranging from more than 100 ft. to 650 ft. below ground surface. The PCE contamination impacted several CLC municipal water supply wells.
The Site was proposed to the NPL on January 11, 2001, to address contaminated ground water. Final listing was on June 14, 2001. EPA issued the Record of Decision (ROD) for the remedy on June 19, 2007, selecting enhanced ground water extraction (pumping) with treatment of extracted ground water to remove PCE. The ROD estimated a period of 14 years to clean up the Site ground water.

The remedy utilizes the water production capacity of two rehabilitated and modified municipal water supply wells and existing infrastructure to deliver treated ground water into the public water supply. The water treatment plant consists of two parallel stacked-tray air strippers. The remedy is supported by institutional controls for the temporary moratorium on new well permits within the area of ground water contamination and a long-term monitoring program. Construction of the remedy began in September 2011 and was completed in April 2012. The ground water extraction and treatment system has been operating since April 2012, with no major down-times.

A Site inspection was conducted on February 3, 2016 by EPA and NMED representatives. The remedial system was found to be operating efficiently and the water treatment plant was manned by well trained personnel. During the inspection, it was learned that the sampling protocol used for the multi-port monitoring wells did not follow the manufacturer's guidelines for well purging. A discussion with the manufacture indicated that this discrepancy could affect sample analytical results. To address this situation, as explained further below (*see* Issues and Recommendations, page ix), we recommend that steps be taken to ensure that the sampling protocols performed for the multi-port monitoring wells follow the manufacturer's recommended sampling guidelines.

In review of annual reports and the preparation of time-series plots of PCE concentrations versus time for the pumping wells, it was determined that the remedy is effective at extracting and treating contaminated ground water. Since 2012, over 430 million gallons of ground water have been extracted for treatment and over 40 pounds of PCE mass have been removed from the extracted water. As explained in the following paragraph, however, the degree to which the extraction system is capturing and reducing the extent of the PCE contaminated ground water plume is uncertain.

In review of the ground water maps provided with the annual reports, it appears that the remedy is partially effective at capturing the PCE plume and reducing PCE concentrations to below the MCL. Circular depressions of water levels (cones of depression) have formed in the area of the two pumping wells that provide hydraulic capture of a portion of the plume. Additionally, time-series plots of PCE concentrations versus time for monitoring wells show a general decreasing trend of PCE concentrations over time since the start of the remedial action with the exception of a few wells. However, some multi-port wells show considerable variability in PCE concentrations that may be a result of the questionable sampling procedures discussed above. There are also

insufficient water level measurements to adequately define the cones of depression in the PRP's mapping efforts, hence there is a level of uncertainty in the degree of capture achieved. PCE concentrations have also increased in some wells. Whether such increases indicate ineffective hydraulic capture is not known.

The lack of monitoring data for adequately assessing the effectiveness of the remedy on ground water is a direct result of the CLC and Doña Ana County having not performed such monitoring consistent with plans approved by EPA with regards to frequency of sampling and number of wells sampled.

A reassessment of the indoor air vapor intrusion pathway was performed using EPA's 2015 vapor intrusion guidance, the OSWER vapor intrusion screening level (VISL) calculator, and the updated VISL for PCE in indoor air. Based on these results it was determined that PCE concentrations in 44 out of 45 exterior soil gas samples collected as part of the RI in 2005 at seven residential properties present an excess lifetime carcinogenic risk of greater than 1×10^{-6}. It was also shown that PCE soil gas levels in a PCE release area (primary source area) also exceeded the 1×10^{-6} cancer risk level, with the highest concentrations more than 24 times the risk level. Based on the EPA's vapor intrusion guidance, an exceedance of the 1×10^{-6} risk warrants further investigation of the indoor air vapor intrusion pathway for both the residential area and the PCE release area. As explained below in the paragraph entitled *Human Exposure Status*, EPA intends to develop a plan to collect sub-slab and/or indoor data to see whether people are being exposed to PCE indoors.

To the extent that subsurface conditions in the vicinity of the PCE release area may pose a health threat via vapor intrusion under current or reasonably expected future conditions, additional ICs may be warranted beyond those comprising the selected remedy (which focuses on the ground water ingestion pathway and ensuing ground water cleanup, but not on vapor intrusion).

As part of this five-year review, the Government Performance and Results Act Measures have also been reviewed. The measures and their status are as follows:

Human Exposure Status: While human exposures at this Site with respect to the ground water exposure pathway have been under control since the start of the remedial action, EPA is reviewing this environmental indicator and working to determine whether, under current conditions, there are any actual human exposures to contaminants at the Site through the potential indoor air vapor intrusion pathway for residential land use. At this time, there are no data on residential indoor air quality or sub-slab soil gas to determine human exposure control status. EPA will prepare a work plan in the fall of 2016 to collect indoor air data at residential properties located near the intersection of North Walnut Street and East Hadley Avenue to determine if the indoor air vapor intrusion pathway is complete.

Ground Water Migration Status: Overall, there is insufficient data to determine ground water migration control status at the Site. An insufficient number of monitoring wells used in the long-term monitoring program prevents an adequate assessment of the progress being made in achieving hydraulic capture of the PCE plume and reduction of PCE concentrations to below the MCL for PCE.

Actions Needed

The following actions must be taken for the remedy to be protective over the long term:

- Assess the indoor air vapor intrusion pathway by collecting sub-slab soil gas samples and/or indoor air samples at residential properties and soil gas samples in PCE release area;
- Include additional monitoring wells in the long-term monitoring program to allow a better evaluation of the remedy progress for achieving the Remedial Action Objectives for hydraulic capture of the PCE plume and reduction of PCE levels to below the MCL; and
- Take steps to ensure that the sampling protocols performed for the multi-port monitoring wells follow the manufacturer's sampling guidelines.

Determination

I have determined that a protectiveness determination of the remedy at the Griggs and Walnut Ground Water Plume Superfund site cannot be made at this time until further information is obtained. This five-year review report specifies the actions that need to be taken to obtain the information required to complete the protectiveness determination and for the remedy to be protective in the long term.

Pam Phillips, Acting

Carl E. Edlund, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency Region 6

9/28/16

Date

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CONCURRENCES

FIRST FIVE-YEAR REVIEW
Griggs and Walnut Ground Water Plume Superfund Site
EPA ID# NMD0002271286

By: _____ Date: 8/22/2016
Mark Purcell, U.S. EPA
Remedial Project Manager

By: _____ Date: 9/2/16
Blake Atkins, U.S. EPA
Chief, Louisiana/New Mexico/Oklahoma Section

By: _____ Date: 9/7/16
John C. Meyer, U.S. EPA
Chief, Superfund Remedial Branch

By: _____ Date: 9/8/16
James Costello, U.S. EPA
Practice Group Leader, Office of Regional Counsel

By: _____ Date: 09/12/16
Mark Peycke, U.S. EPA
Chief, Superfund Branch, Office of Regional Counsel

By: _____ Date: 9/28/16
Pamela Phillips, U.S. EPA
Deputy Director, Superfund Division

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ISSUES/RECOMMENDATIONS

FIRST FIVE-YEAR REVIEW REPORT
GRIGGS AND WALNUT GROUND WATER PLUME SUPERFUND SITE
EPA ID#: NMD0002271286
DOÑA ANA COUNTY, NEW MEXICO

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: Other**			
	Issue: PCE concentrations detected in 44 out of 45 exterior soil gas samples collected at seven residential properties located near the intersection of North Walnut Street and East Hadley Avenue during the RI in 2005 exceeded EPA's excess lifetime cancer risk of 1 x 10^{-6} (*i.e.*, EPA's point of departure). PCE concentrations detected in eight exterior soil gas samples collected at the PCE release area across the street from this residential area in 2002 exceeded the 1 x 10^{-6} risk level by approximately an order of magnitude.			
	Recommendation: The vapor intrusion to indoor air pathway warrants further investigation for both the residential and PCE release areas of concern. The performance of sub-slab soil gas and/or indoor air sampling to assess potential vapor intrusion at residential properties is recommended. The performance of exterior soil gas sampling in the vicinity of the PCE release area is also recommended.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA		6/30/2017

Issues and Recommendations Identified in the Five-Year Review:	
OU(s):	**Issue Category: Monitoring**
	Issue: The Ground Water Monitoring Program has not been performed in accordance with the Remedial Action Sampling and Analysis Plan and Pre-Achievement O&M Plan approved by EPA. An inadequate number of ground water samples were collected and water level measurements taken to adequately assess the progress of the remedy in achieving hydraulic capture of the PCE plume and reducing PCE concentrations to below the MCL of 5 µg/L over the entire Site. Additionally, seven wells that are part of the monitoring well network are inaccessible (could not be located) or have collapsed and can no longer be used as monitoring wells.
	Recommendation: Include additional monitoring wells and increase the frequency of sampling for the Ground Water Monitoring Program as deemed necessary by EPA to adequately document the progress of the remedy in achieving the Remedial Action Objectives set forth in the Record of Decision.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	EPA	All future sampling events

Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: Monitoring**			
	Issue: Variance in the sampling protocol used to collect samples from multi-port monitoring wells may have resulted in a bias toward lower PCE concentrations in samples collected from these wells.			
	Recommendation: The following steps should be taken to ensure that the sampling protocol implemented for the multi-port monitoring wells follows the manufacturer's *"Sampling guidelines for Water FLUTe systems installed prior to May, 2009",* Revised April, 2010: 1. Verification of use of correct sampling protocol by field sampling personnel as provided by manufacturer's recommended guidelines and update Sampling and Analysis Plan to include the guidelines; 2. Consultation and training of field sampling personnel as needed by manufacturer to ensure sampling protocol is implemented correctly; 3. Implementation of sampling protocol in accordance with manufacturer's guidelines for all future sampling events; and 4. Documentation of sampling procedures performed by field sampling personnel in field log book for all sampling events and provision of a copy of the signed and dated log book notes for each sampling event to EPA as an attachment to the annual remedial action progress reports or other such annual reports prepared and submitted to EPA as part of O&M activities.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA	11/1/2016

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLC	City of Las Cruces
DACTD	Doña Ana County Transportation Department
DBS&A	JSP's (see below) consultant, Daniel B. Stephens and Associates
DWB	New Mexico Drinking Water Bureau
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
gpm	Gallons per minute
HRS	Hazard Ranking System
ICs	Institutional Controls
ICIAP	Institutional Control Implementation and Assurance Plan
JEM	Johnson and Ettinger Model
JSAI	John Shoemaker & Associates, Inc., environmental contractor for the JSP
JSP	Joint Superfund Project whereby Dona Ana County and City of Las Cruces have combined efforts to address ground water contamination at the Griggs and Walnut Ground Water Plume Superfund Site
LHZ	Lower Hydrogeologic Zone
MCLs	Maximum Contaminant Levels
NMED	New Mexico Environment Department
NCP	National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300
NPL	National Priorities List
O&M	Operation and Maintenance
OSE	New Mexico Office of the State Engineer
OSWER	Office of Solid Waste and Emergency Response
ppby	parts per billion by volume
PRP	Potentially Responsible Party
RA SAP	Remedial Action Sampling and Analysis Plan
RAO	Remedial Action Objectives
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
SDWIS	NMED (see above) Drinking Water Bureau Safe Drinking Water Information System
SOS	NMED Superfund Oversight Section
TBC	To be considered
UAO	Unilateral Administrative Order
UHZ	Upper Hydrogeologic Zone
UU/UE	Unlimited Use/Unrestricted Exposure
µg/L	Micrograms per liter
$\mu g/m^3$	Micrograms per cubic meter
VISL	Vapor Intrusion Screening Level

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, the FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the first FYR for the Griggs and Walnut Ground Water Plume Superfund Site (hereinafter the "Site"). The triggering action for this statutory review is the start of remedial action construction activities on September 2, 2011. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of a single operable unit to address a ground water plume contaminated with dissolved tetrachloroethene (also known as perchloroethylene or "PCE"), a volatile organic compound (VOC). The objective of the remedy is to reduce the concentrations of PCE in ground water to the Federal Safe Drinking Water Act (SDWA) maximum contaminant level (MCL), which is 5 micrograms per liter (µg/L).

The Site FYR was led by Mr. Mark Purcell, EPA Region 6, Remedial Project Manager (RPM) and Mr. Angelo Ortelli, New Mexico Environment Department (NMED) Superfund Oversight Section (SOS). Participants included the City of Las Cruces (CLC or City) Utilities Water Resources Administrator and Operations Manager, and the CLC Utilities Remedial Design/Remedial Action (RD/RA) consultant, as well as local residents and members of the community. The CLC Utilities Water Resources Administrator was notified of the initiation of the FYR. The review began on November 1, 2015.

Site Background

The Site is located in the City of Las Cruces, Doña Ana County, New Mexico (Appendix B, Figure 1). Based on estimates from the Remedial Investigation (RI) completed in 2005, the geographical extent of dissolved PCE contamination in the ground water is approximately 1.8 miles long by 0.5 miles wide, and is located generally between East Griggs Avenue and East Hadley Avenue, and extends east to beyond Interstate 25 (I-25), and west to beyond North Solano Avenue. Current land use at and near the Site is characterized by a broad mix of commercial, public recreational, light industrial, and residential land uses.

As early as 1993, PCE was detected in ground water at a depth of approximately 190 feet below ground surface (bgs), and affects the local municipal water supply to a depth of approximately 650 feet bgs. Four municipal water supply wells (CLC Wells 18, 19, 21, and 27) are affected by PCE contamination associated with the Site (Appendix B, Figure 1). Based on review of the New Mexico Office of the State Engineer (OSE) Water Rights Reporting System database (*i.e.*, well permit records) and the NMED Drinking Water Bureau (DWB) Safe Drinking Water Information System (SDWIS) database, a broad estimate of 106,000 people may be served by public water supply and private/domestic wells within a 4-mile radius of the Site.

Based on data collected during the RI, three sources of PCE contamination were identified at the Site. Based on the soil vapor survey results, elevated concentrations of PCE were found at the former location of the Crawford Municipal Airport, at the present location of the Doña Ana County Transportation Department (DACTD) maintenance facility, and near the former location of a National Guard Armory (Appendix B, Figure 2).

FIRST FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Griggs and Walnut Ground Water Plume Superfund Site		
EPA ID: NMD0002271286		
Region: 6	**State:** NM	**City/County:** Las Cruces/ Doña Ana County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Angelo Ortelli (NMED Project Manager)		
Author affiliation: New Mexico Environment Department (NMED) - Superfund Oversight Section		
Review period: 9/2/2011 - 9/2/2016		
Date of site inspection: 2/3/2016		
Type of review: Statutory		
Review number: 1		
Triggering action date: 9/2/2011		
Due date *(five years after triggering action date):* 9/2/2016		

II. RESPONSE ACTION SUMMARY

Most of the information summarized in this FYR was obtained from the RI and Feasibility Study (FS) reports, the Record of Decision (ROD), the Remedial Design (RD) report, and various Remedial Action (RA) completion reports for the remedy components. Appendix A is a reference list of the documents that were reviewed for the compilation of this report. Site maps (figures) are provided in Appendix B.

A Site chronology table is provided in Appendix C. The table highlights the significant events and dates that occurred at the Site regarding the CERCLA process from initial discovery to the present.

Basis for Taking Action

The Site affects the sole source drinking water aquifer and the public water supply for the CLC which must be protected and kept from further contamination. Four municipal water supply wells (CLC Wells 18, 19, 21, and 27) are affected by PCE contamination associated with the Site. Two of these impacted wells (CLC wells 19 and

21), along with CLC wells 20, 24, 26, and 38, have been taken off-line to prevent further spreading of the plume. The other two impacted wells (CLC wells 18 and 27) are being used as part of the EPA remedy selected in the ROD.

In conjunction with the RI, a Baseline Human Health Risk Assessment (BHHRA) was completed in 2006. The BHHRA estimated what human health risks the Site would have posed if no action were taken. It provides the basis for taking action at this Site and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BHHRA identified the contaminant of concern (COC) as PCE, assessed exposure and toxicity related to this COC, and characterized the human-health risk at the Site. The following subsections present data obtained through investigations conducted following placement of the Site on the National Priorities List (NPL) of Superfund sites to support the basis for taking remedial action at the Site.

Vapor Intrusion

The BHHRA included modeling of indoor vapor intrusion, using soil vapor samples collected near residences and recreational buildings. These data were used in an evaluation of whether PCE vapor from shallow soil underlying the residential or recreational properties presents an unacceptable risk to human health.

Seven residential properties located near the intersection of North Walnut Street and East Hadley Avenue were sampled for shallow soil vapor concentrations during the RI. PCE was detected at concentrations ranging from 34 parts per billion by volume (ppbv) to 644 ppbv. The PCE concentrations exceeded a 120 ppbv screening level in 34 of 45 soil vapor samples collected at 5- and 10-foot depths at the residential properties during the RI (Appendix B, Figure 3). TCE was detected in only three out of 32 locations sampled in the residential area. The maximum concentration of TCE detected in the residential area was 15 ppbv at a depth of 30 feet bgs.

Using the Johnson & Ettinger screening-level model (JEM) for the November 2005 data, the excess lifetime cancer risk associated with potential exposure to PCE in indoor air was estimated between 1×10^{-5} and 4×10^{-5}. The BHHRA concluded that due to the uncertainty inherent in the use of the JEM, the risk calculated using conservative exposure assumptions tends to overestimate the risk by an order of magnitude or more. Therefore the Site-specific risk values ranging from 1×10^{-5} to 4×10^{-5} were within the 1×10^{-4} to 1×10^{-6} cancer risk range established by EPA as protective of human health for the vapor intrusion exposure pathway and no further action to address vapor intrusion was required in the ROD.[1]

Ground Water Contamination

Based on the findings of the RI and BHHRA, the primary contaminant identified in ground water at the Site is PCE. PCE was detected in ground water at depths ranging from approximately 190 to 650 feet bgs and impacts were identified to the local municipal water supply wells (Appendix B, Figure 4). PCE degradation products (trichloroethene (TCE), cis-1,2 dichloroethene (DCE), and trans-1,2, DCE) have been detected within the PCE plume boundary but no remediation goal was established because their concentrations remain below their respective MCLs and because the aquifer conditions were evaluated and determined not to be conducive to natural attenuation of PCE. Other petroleum-related VOCs detected in the ground water within the footprint of the PCE plume are benzene, toluene, and methyl tertiary butyl ether (MTBE). Of these, only benzene has been detected in Site monitoring wells above its corresponding MCL (5 µg/L) in seven monitoring wells. Benzene has not been detected in any municipal supply wells.

Uranium has also been detected at concentrations exceeding its corresponding MCL in seven municipal supply wells (CLC Wells 10, 19, 20, 21, 24, 38 and 44). It was originally identified by the NMED-DWB in 2005 when the CLC wells were sampled to evaluate the drinking water system's compliance with the new MCL for uranium (30 µg/L). However, based on previous work by the U.S. Geological Survey (USGS) on ground water quality in

[1] *See* Section V (Technical Assessment) Question B, below, for a more complete explanation of cancer risk, and the uncertainty inherent in the Johnson-Ettinger screening-level model.

portions of New Mexico, it was determined that the elevated concentrations of uranium and other radionuclides in the area of the Site are naturally occurring. CERCLA does not address a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found. (*See* 42 U.S.C. § 9604(a)(3)(a)). Although CERCLA does not address these naturally elevated levels, the Safe Drinking Water Act (SDWA) requires treatment of the City's municipal water supply to safe levels (*i.e.*, MCLs). Therefore, meeting the MCLs after treatment provides protection to the users of the water supply. Additionally, it is noted that the seven municipal supply wells with elevated uranium levels are no longer used by the City as a source of drinking water.

Response Actions

The NMED-DWB conducted the initial regulatory response at the Site in August 1993. In consultation with EPA, the NMED-SOS conducted preliminary assessment (PA) and site inspection (SI) activities from May 1997 through September 2000. During these investigations, NMED-SOS installed ground water monitoring wells, collected soil samples during installation of the monitoring wells, and conducted soil vapor sampling at the DACTD maintenance facility. Using the PA/SI data, EPA prepared the Hazard Ranking System (HRS) scoring documentation for the Site in November 2000.

As a result of the PA/SI findings and the HRS score, EPA proposed the Site for placement on the NPL on January 11, 2001. Following the Site listing on June 14, 2001, EPA initiated the RI/FS, which was completed in November 2006.

The EPA signed a Settlement Agreement with the City and Doña Ana County (DAC or County) on April 20, 2005. This agreement addressed the completion of the RI/FS at the Site. The City and County formed the Joint Superfund Project (JSP) to facilitate their participation in the remedial process.

The EPA formed a Technical Work Group with the NMED and JSP to provide a forum for stakeholders to participate in the completion of the RI/FS and to provide input related to stakeholder needs. In addition to supporting and assisting field data collection efforts, the JSP modeled flow and transport of PCE in the ground water to refine the conceptual site model (Appendix B, Figure 5) and to support the evaluation of remedial alternatives in the FS.

The ROD was signed by EPA on June 19, 2007. The ROD documented the selected remedy for the Site as enhanced ground water extraction (pumping) with treatment of extracted ground water to remove PCE. The remediation goal for PCE selected in the ROD for ground water is presented in the following table on remediation goals.

Remediation Goals Selected in Record of Decision

Site Ground Water COC	National Primary Drinking Water Standards (Non-Zero MCLGs and MCLs) µg/L
PCE	5

The Remedial Action Objectives (RAOs) for ground water at the Site were established in accordance with the EPA guidance document entitled "*Presumptive Response Strategy and Ex Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites, Final Guidance*" (EPA 1996). The RAOs are provided as follows:

- 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 for PCE; and
- Restore ground water to its beneficial use as a drinking water supply with PCE concentrations no greater than the MCL.

According to the ROD, the major components of the selected remedy are:

- Water will be pumped from municipal supply wells (CLC Wells 18 and 27, or other wells, if it is determined during RD and implementation that the use of other wells is appropriate) and treated. The preferred water treatment technology is air stripping.

- Based on ground water modeling results, it is expected that within approximately five years one new extraction well will be necessary to continue treating and reducing the PCE concentrations to below the MCL of 5 µg/L. The new extraction well would likely replace CLC Well 18 after the first five years of operation because the fate and transport model predicts that over time, CLC Well 18 will draw more clean water than PCE affected water and consequently, it will remove contamination less efficiently.

- PCE plume containment will rely on hydraulic control, and on discontinuing pumping operations at CLC wells 19, 20, 21, 24, 26, and 38, during remediation. Hydraulic control, treatment of contaminated ground water, and plume reduction will be further evaluated and refined during RD to determine the appropriate measures for implementation.

- The remedy will be supported by institutional controls (ICs), a long-term monitoring program, and annual reviews and reporting. The RAO for restoring ground water to its beneficial use as a drinking water supply is expected to be reached in approximately 14 years.

On October 15, 2009, EPA issued a unilateral administrative order (UAO) to the City and County. The UAO required the City and County to perform a RD for the Site remedy selected in the ROD.

On February 14, 2011, EPA issued another UAO to the City and County, requiring the City and County to undertake the construction of the selected remedy as designed under the first UAO. This February 14, 2011, UAO was rescinded before its effective date, and a new UAO calling for the construction of the selected remedy was issued on May 11, 2011. The City and County completed construction of the ground water extraction and treatment system described in the ROD, under the UAO, in July 2012.

The City and County are presently operating the extraction and treatment system to remove PCE contamination from the ground water. The City and County have not, however, undertaken the extensive ground water monitoring well testing described in the ROD.

Status of Implementation

The RD was completed by the JSP's consultant, Daniel B. Stephens & Associates (DBS&A), and the treatment system was constructed by Highland Enterprises, Inc. Construction of the ground water extraction and treatment system began in September 2011 and was completed in April 2012, and ground water extraction and treatment have been ongoing since May 2012. The remedy utilizes the water production capacity of two rehabilitated/modified municipal supply wells (CLC Wells 18 and 27) and existing infrastructure to deliver treated ground water into the public water supply. The major components of the RD and RA construction are summarized below.

Ground Water Extraction System

Based on recommendations of the preliminary RD, CLC Wells 18 and 27 were modified, and aquifer testing was performed to ensure that these wells could sustain the necessary pumping rates. Upon rehabilitation (scrubbing, jetting, and redevelopment) and backfilling of the lower sections of these wells, each well could sustain pumping rates in excess of 200 gpm and were deemed suitable for use as ground water extraction wells.

During the RD, a maximum ground water treatment rate of 500 gpm was used to select submersible pumps for the extraction wells. Based on the "*Strategy for Remediation of PCE Contamination*" report that was prepared for the JSP during the RD, a pumping rate of 300 gpm (CLC Well 18 pumping at 200 gpm and CLC Well 27 pumping at 100 gpm) was predicted to be sufficient for plume capture. Assuming a pumping rate of 300 gpm and 80 percent pumping time (due to pump cycling and routine downtime), approximately126 million gallons of ground water would be extracted and treated annually.

Ground Water Treatment System

The ground water treatment system is fed by two CLC wells: CLC Well 18, which is located within a fenced treatment compound, and CLC Well 27, which is located approximately 1,500 feet southeast of the treatment compound. A pre-engineered steel building was constructed to house the ground water treatment system next to CLC Well 18. Two pipelines approximately 1,500-feet long and two 28,000-gallon holding/equalization tanks (extracted/raw water and treated/finished water) were installed as part of the treatment system. Backflow prevention between the holding tanks and extraction wells is achieved using check valves and air breaks.

The ground water treatment system consists of two parallel stacked-tray air strippers and transfer pumps that convey untreated/raw ground water to the two air strippers to remove VOCs to concentrations below the MCL. Chemical pretreatment is needed to address potential scaling and is achieved by injecting a polyphosphate anti-scalant compound in-line between the raw/untreated water equalization tank and the air strippers.

The treated water from the air strippers is pumped to a second 28,000-gallon equalization tank, and is disinfected and pumped through an 8-inch PVC discharge pipeline that ties into an existing 10-inch conveyance pipeline near CLC Well 27 for delivery to the 3 million-gallon capacity, Upper Griggs Reservoir (Appendix B, Figure 1).

Institutional Controls

An Institutional Control Implementation and Assurance Plan (ICIAP) was prepared by the JSP in November 2011, to describe the ICs that were implemented at the Site. The ICs implemented at the Site are administrative controls that minimize the potential for human exposure to contamination by limiting water resource use. The JSP worked with the NMED in requesting that the OSE institute a temporary moratorium on the permitting of new wells within an area defined by the PCE plume with an additional 500-foot buffer (Appendix B, Figure 6).

The OSE issued the well drilling moratorium on October 12, 2011, stating that no new wells or the transfer of water to existing wells (water injection) could occur within the designated boundaries of the PCE plume and 500-foot buffer. The moratorium specifically excludes wells installed for the purpose of remediation at the Site, and it remains in place to prevent human consumption of contaminated ground water until the RAOs are achieved.

Based on a review of the New Mexico Water Rights Reporting System (NMWRRS), no well permit applications have been filed with the OSE since the well drilling moratorium was issued on October 12, 2011.

IC Summary Table

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Ground water, engineered control Discontinued operation of CLC Wells 19, 20, 21, 24, 26, and 38, during remediation	Yes	Yes	PCE plume area and 500-foot buffer (Appendix B, Figure 6)	Supports hydraulic control and prevention of ground water plume expansion	
Ground water, IC	Yes	Yes	PCE plume area and 500-foot buffer (Appendix B, Figure 6	Well drilling moratorium to minimize the potential for human exposure to contamination by limiting water resource use	State Engineer Order, October 6, 2011
Ground water conditions or the remediation efforts may be affected if a contaminant release occurs at the Site	Yes	Yes	PCE plume area	Prevent the comingling of contaminants onsite	JSP has requested that other CLC departments, state agencies, and authorities provide notification should a contaminant release occur

Systems Operations/Operation & Maintenance

The *"Remedial Action Work Plan"* and associated documents as required by the RA-UAO Statement of Work were prepared by the JSP for submittal to EPA in August 2011. The *"Interim Remedial Action Report", "Pre-Achievement Operations and Maintenance Plan", and "Post-Achievement Operations and Maintenance Plan"* were prepared by the JSP for submittal to EPA on August 14, 2012. No revisions or modifications have been made to these plans during this first FYR period.

The ground water extraction and treatment system has been operating since April 2012, with no major down-times. Operation and maintenance (O&M) activities have been conducted in accordance with the pre-achievement O&M plan and have included the following tasks:

- Routine O&M of the extraction, conveyance, and treatment system equipment;
- Monthly sampling of CLC Well 18 and Well 27 for PCE concentrations; and

- Monthly sampling of untreated (raw) and treated (finished) water for PCE concentrations.

Routine O&M of the treatment system equipment is conducted by CLC-Utilities staff per the manufacturers' instructions for various system components, and includes the following:

- Routine maintenance of mechanical equipment, including pumps, compressors, blowers, and valves;
- Removal of residual buildup in wells, pumps, piping, and treatment equipment due to chemical scaling and biofouling; and
- Replacement of chemicals per manufacturers' specifications and system usage rates.

Routine O&M of the treatment system includes monthly monitoring of the extracted (raw) and treated (finished) water for VOCs and total metals. The monitored VOCs include TCE and the two dichloroethylene isomers (cis-1,2-DCE and trans-1,2-DCE). These data are used to calculate contaminant removal rates and efficiencies and to ensure that the treated water meets the MCLs prior to mixing into the City's drinking water system.
In order to ensure that air quality standards are not exceeded in the removal of VOCs during air stripping, air quality samples are also collected monthly from the treatment system.

TCE was the only PCE degradation product detected in ground water in 2015. TCE was detected in MW-SF10 at a concentration of 1.8 µg/L and in GWMW9 at concentrations of 1.2 and 1.8 µg/L from two ports. These concentrations are below the respective MCL of 5 µg/L for TCE.

Based on ground water monitoring and updated ground water modeling results (after the first year of operation), the JSP concluded that pumping CLC Well 18 at a rate of 170 gallons per minute (gpm) for 4 to 5 hours daily and allowing the well to recover would optimize PCE extraction rates. The JSP also proposed increasing the pumping rate of CLC Well 27, to see if doing so would optimize the PCE removal rate from that well. CLC Well 27 is currently operating 24-hours per day at approximately 160 gpm.

Ground Water Monitoring Program

The Ground Water Monitoring Program is being implemented by the JSP. Select monitoring wells and inactive CLC water supply wells have been sampled periodically since 2012 to evaluate the performance of the extraction system at achieving hydraulic capture of the PCE plume and reduction of PCE concentrations to below the MCL of 5 µg/L for PCE. These wells are identified in the RA Sampling and Analysis Plan (RA SAP) approved by EPA in 2011, with the exception of monitoring wells GWMW16-S and GWMW16-D which were installed in August, 2015, as part of the optimization effort. The same list of monitoring wells is included in the Pre-Achievement O&M Plan, which states that sampling shall be performed in accordance with the RA SAP. The RA SAP has been reviewed as part of the FYR to assess the degree to which the JSP has performed the monitoring that was required by EPA. The wells and number of samples currently included in the Ground Water Monitoring Program for the Site are listed in the table below, as well as the years in which each well was sampled and any change in the integrity of the well.

Ground Water Monitor Program
Monitoring Well Network

Well	No. of Samples[a]	Years Monitoring Performed since Remedy Start-up	Notes[b]
CLC 18	1	Pumping Well	
CLC 20	1	2012, 2015	
CLC 26	1	2012 – 2015	
CLC 27	1	Pumping Well	
CLC 57	1	2012 – 2015	
CLC Paz Park Well	1	2012 – 2015	
GWMW 01	7	2012 – 2015	
GWMW 03	4	2012 – 2015	
GWMW 08	5	2012 – 2015	
GWMW 09	7	2012 – 2015	
GWMW 10	7	2012 – 2015	
GWMW 11-S	1	2012 – 2015	
GWMW 11-I	1	2012 – 2015	No water levels measured in 2012, 2013
GWMW 11-D	1	2012 – 2015	No water levels measured in 2012, 2013
GWMD 15-S	1	2012 – 2015	No water level measured in 2012
GWMD 15-I	1	2012 – 2015	No water levels measured in 2012, 2013
GWMW 15-D	1	2012 – 2015	No water levels measured in 2012, 2013
GWMW 16-S	1	2015	Well installed in August, 2015
GWMW 16-D	1	2015	Well installed in August, 2015
MW-1	1	2012 – 2015	No water levels measured in 2012, 2013
MW-2	--	--	Blockage in well, no sample
MW-3	--	2012, 2013, 2014	Unable to locate, no sample
MW-4	--	2012, 2013, 2014	Blockage in well, no sample
MW-5	--	2012, 2013, 2014	Blockage in well, no sample
MW-6	--	--	Well collapsed, no sample
MW-SF1	--	2012	Blockage in well, no sample
MW-SF2	--	2012, 2013, 2014	Unable to locate, no sample
MW-SF3	--	--	Well collapsed, no sample
MW-SF4	--	--	Well plugged, no sample
MW-SF5	1	2012 – 2015	No water levels measured in 2012, 2013
MW-SF6	1	2012 – 2015	No water level measured in 2012
MW-SF9	1	2012 – 2015	No water level measured in 2012
MW-SF10	1	2012 – 2015	No water level measured in 2012

[a] A well with more than one sample reflects multiple sampling ports at that well.

[b] As reported in the JSP's 2015 annual report.

Since the start-up of the extraction and treatment system, the JSP has not performed the Ground Water Monitoring Program consistent with the RA SAP and Pre-Achievement O&M Plan approved by EPA. The JSP

was required to perform quarterly monitoring of the wells the first year and semi-annually after the first year (*see* Section 2.2.3 – Ground Water Sampling of the RA SAP). Ground water sampling was performed approximately once a year by the JSP since 2012. Also, water levels have not been measured on a consistent basis for each of the wells in the monitoring well network and several monitoring wells have not been accessible or have collapsed at some time since 2012 and could not be sampled.

III. PROGRESS SINCE THE LAST REVIEW

This is the first FYR for the Site. Therefore, this section does not include the protectiveness determinations and statements from the last five-year review or the recommendations from the last five-year review and the current status of those recommendations.

IV. FIVE-YEAR REVIEW PROCESS

This FYR has been conducted in accordance with EPA's Comprehensive Five-Year Review Guidance (June 2001), and the report has been prepared in accordance with EPA's updated guidance entitled "*Five-Year Review Recommended Template – OLEM 9200.0-89*", dated January 2016. The FYR was conducted by Mr. Mark Purcell, the EPA Region 6 - RPM, and Mr. Angelo Ortelli, the NMED-SOS Project Manager for the Site.

Community Notification, Involvement & Site Interviews

An initial public notice was posted on 12/18/2015 in the Las Cruces Sun-News and the Deming Headlight newspapers, entitled *"Public Notice - Griggs-Walnut Ground Water Plume Superfund Site, U.S. EPA Region 6 Initiates First Five-Year Review of Site Remedy, December 2015"*, stating that the "U.S. EPA, Region 6 and the New Mexico Environment Department are conducting the first five-year review of the remedy for the Griggs-Walnut Ground Water Plume Superfund Site, located in Las Cruces, Doña Ana County, New Mexico."

This First Five-Year Review Report is scheduled for completion in September 2016 and will be available to the public at http://www.epa.gov/superfund/griggs-walnut. The report will also be available at the information repository located at the Thomas Branigan Memorial Library, 200 E. Picacho Ave., in Las Cruces, New Mexico.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** The interview records are provided in Appendix D. All interviewees have granted their permission to use their names in the interview records. The results of these interviews are summarized below.

In general, the members of the community/residents that were interviewed had expressed satisfaction with the overall remediation progress and were comfortable with the protectiveness of the remedy to date. Some residents raised concerns about the stigma associated with the presence of a Superfund site in their neighborhood and the affects that may have on property values. Overall, the residents felt that outreach efforts made by the JSP and EPA have addressed the community's concerns about the remedial process, and they appreciate the fact that the remedy enables beneficial use of the treated water in the municipal water supply.

Some residents also raised concerns about PCE remaining in the vadose zone soil and how that has been addressed. A soil vapor survey was conducted as part of the RI/FS to identify potential PCE release areas. However, no soil removal actions were completed at that time as it was determined that the PCE soil contamination did not pose a threat. Based on changes to the EPA's vapor intrusion guidance (EPA 2015), it is recommended that additional soil gas sampling be performed at the PCE release area for reevaluation of such determination.

The community feels that remediation progress and public interaction on the project is fine overall. At this stage, annual meetings are thought to be sufficient. An open house forum (versus more formal public meetings) would be a better way to communicate news about remedial progress at the Site. Project news and updates provided with monthly CLC water bills are also a good way to communicate progress. A community newsletter would also be a good forum for posting notices about the Site.

Data Review

Based on estimates from the RI in 2005, the geographical extent of dissolved PCE contamination in the ground water is approximately 1.8 long by 0.5 miles wide, and is located generally between East Griggs Avenue and East Hadley Avenue, and extends east to beyond Interstate 25 (I-25), and west to beyond North Solano Avenue (Appendix B, Figure 4).

The Site is located within the Mesilla Basin (also known as Mesilla Bolson, a closed intermontane basin). The Rio Grande flood plain alluvium (Quaternary) and the Santa Fe Group alluvial fan deposits (Miocene to Middle Pleistocene age) comprise the two major aquifers in the Mesilla Basin, with the two aquifers forming a complex aquifer system.[2] Ground water occurs under unconfined conditions within the flood plain alluvium and under unconfined to semi-confined conditions within the Santa Fe Group. Ground water flow within the basin is generally to the southeast. The Site-related PCE contamination is present in the ground water at depths generally ranging from more than 100 ft. bgs to 650 ft. bgs. The ground surface elevation across the Site ranges from 3,980 feet to 4,090 feet above mean sea level (amsl).

There are two distinct hydrogeologic zones beneath the Site, referred to as the Upper Hydrogeologic Zone (UHZ) and Lower Hydrogeologic Zone (LHZ). The UHZ is composed of the lower portion of the Rio Grande alluvium and the upper portion of the Santa Fe Group. The LHZ is within the Santa Fe Group.

For modeling purposes, the JSP has divided the aquifer beneath the Site into five layers[3] (each 100-foot thick) with elevations (ft. amsl) as follows:

- Layer 1: shallow – water table (3,800 – 3,899 ft. amsl);
- Layer 2: intermediate (3,700 - 3,799 ft. amsl);
- Layer 3: deep - influenced by regional pumping (3,600 - 3,699 ft. amsl);
- Layer 4: deep – influenced by regional pumping (3,500 – 3,599 ft. amsl);
- Layer 5: below depth of pumping influence (3,400 – 3,499 ft. amsl).

Model Layer 1 represents the UHZ that is an unconfined aquifer consisting of sand and gravel. Model Layer 2 represents the upper portion of the LHZ that primarily consists of silt and clay beds. The low permeability beds (where present) limit hydraulic communication between the UHZ and LHZ. Model Layer 3 represents the lower portion of the Lower Hydrogeologic Zone consisting of sand and gravel.

Ground Water Gradients and Flow

John Shoemaker & Associates, Inc. (JSAI) prepared ground water elevation contour maps (Figures 7 through 11) for the UHZ and LHZ. These maps are presented in Appendix B of the "*2014-2015 System Operation and Remedial Action Progress"* report that was prepared by DBS&A for the CLC-Utilities office, dated April 8, 2016. The ground water elevation contour maps are based on water level data collected in November and December 2015. Water-level elevation contours indicate an eastward ground water flow direction across the Site, with lower

[2] Alluvium consists of unconsolidated clay, silt, sand, and gravel deposits.
[3] Because PCE has not been detected above the MCL of 5 µg/L in the deeper aquifer layers (Layer 4 and Layer 5), these layers are not discussed further in this FYR report.

water-level elevations surrounding the active municipal supply wells (CLC wells 32 and 35 and CLC wells 58 and 65), and ground water extraction/capture wells (CLC wells 18 and 27).

Based on JSAI's evaluation, the thickness and extent of the low-permeability silt and clay beds that divide Layer 1 from Layer 2 have influenced the lateral and vertical distribution of PCE in ground water. In the eastern part of the Site, there is a slight downward vertical gradient due to CLC Well 27 pumping where the UHZ and LHZ are hydraulically connected due to the absence of the clay layer which separates the zones to the west near CLC Well 18.

Ground Water Plume Maps and PCE Concentrations

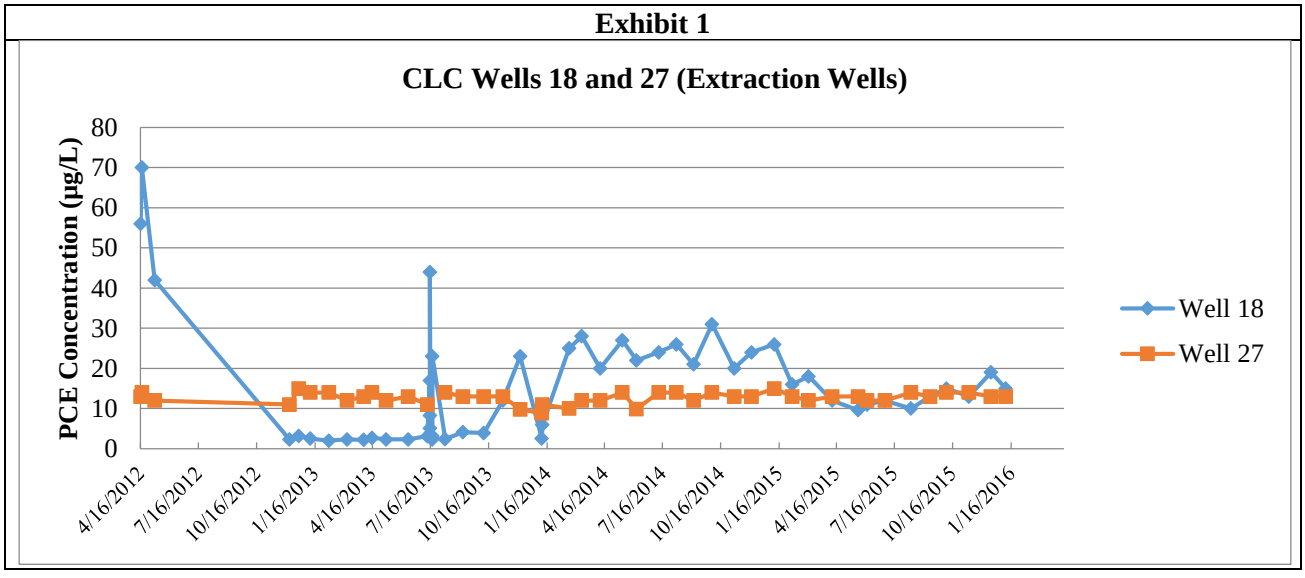
DBS&A prepared a composite (Layers 1, 2, and 3) PCE ground water plume map for 2012 (Figure 12). This map is presented in the "*2012-2013 System Operation and Remedial Action Progress"* report that was prepared for the CLC-Utilities office, dated October 15, 2013. DBS&A prepared a ground water plume map for PCE contamination in ground water in 2014 (Figure 13), which is presented in the "*2013-2014 System Operation and Remedial Action Progress"* report that was prepared for the CLC-Utilities office, dated December 1, 2014. The ground water plume maps, which depict where PCE levels exceed the MCL of 5 µg/L, indicate that the PCE ground water plume extent had not changed significantly between 2012 and 2014.

DBS&A recently prepared a ground water plume map for PCE contamination in ground water in 2015 (Figure 94), which is presented in the "*2014-2015 System Operation and Remedial Action Progress"* report. The ground water plume map depicts a larger PCE plume, compared to the 2012 and 2014 plumes, with an extension of the plume boundary eastward across I-25. The eastward extension reflects an increase in the PCE concentration at monitoring well GWMW-15I to 6.1 µg/L in the intermediate aquifer zone (Layer 2). PCE had been detected in the intermediate aquifer zone at GWMW-15I previously, but the concentrations were below the MCL of 5 µg/L and therefore, the extent of the plume had not been depicted east of I-25 for the 2012 and 2014 plume maps. It is noted that historical PCE concentrations measured in GWMW-15S east of I-25 were above the 5 µg/L level for the shallow aquifer zone (Layer 1), but have since decreased to below the MCL.

For the FYR, NMED-SOS developed iso-concentration contour maps for PCE contamination in the shallow aquifer (Layer 1) in December 2002 (Figure 105), May 2007 (Figure 11), and May 2012 (Figure 127), along with time-series plots for specific wells that depict the historical trends for PCE concentrations across the Site.

A time-series plot of PCE concentrations versus time was prepared for CLC Wells 18 and 27 (Exhibit 1).

Exhibit 1



PCE concentrations in CLC Well 18 were initially as high as 70 µg/L (when system operations began in April 2012), and rapidly decreased (ranging from approximately 2 to 3 µg/L) in December 2012 through July 2013.

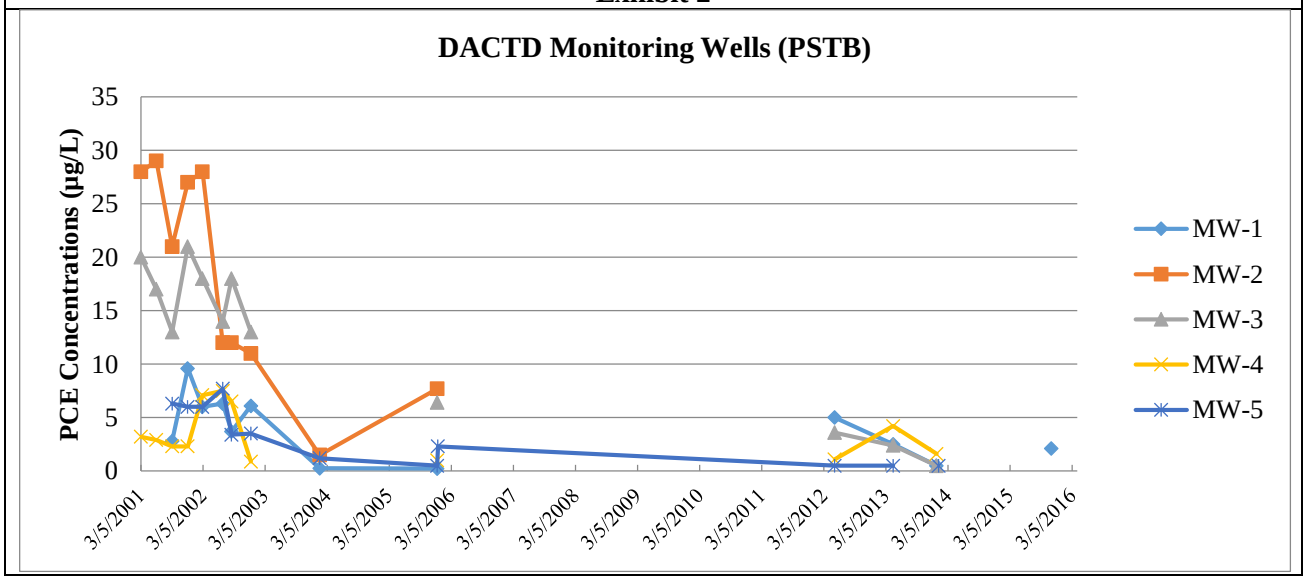
An assessment of the well hydraulics revealed that this well yields water from both the screened interval (315 to 516 ft. bgs) and the saturated gravel pack in the annulus above the well screen. Ground water with lower PCE concentrations in the deeper aquifer (Layer 3) had effectively diluted the higher concentrations of PCE that were initially extracted from the shallow aquifer (Layer 1).

Diagnostic pumping tests and pumping rate adjustments (ultimately reducing flow to 170 gpm and pumping only four hours daily) were made to this extraction well as part of the JSP's optimization strategy. This pumping strategy, employed since February 2014, has resulted in greater PCE concentrations (ranging from approximately 10 to 30 µg/L) and improved PCE extraction rates as compared to the overall volume of water treated.

PCE concentrations in CLC Well 27 have been consistent (ranging from approximately 9 µg/L to 15 µg/L) over time. An optimization test was conducted between November 2013 and January 2014, where the pumping rate was increased from 130 gpm to 170 gpm (by 20 gpm increments in 30-day intervals). PCE concentrations remained stable (between 9.8 µg/L and 13 µg/L), indicating that increasing the pumping rate increases the PCE mass removal with a greater volume of water being treated.

A time-series plot of PCE concentrations versus time was prepared for monitoring wells installed by the NMED Petroleum Storage Tank Bureau (PSTB) as part of the release response for petroleum contamination at the DACTD site (Exhibit 2).

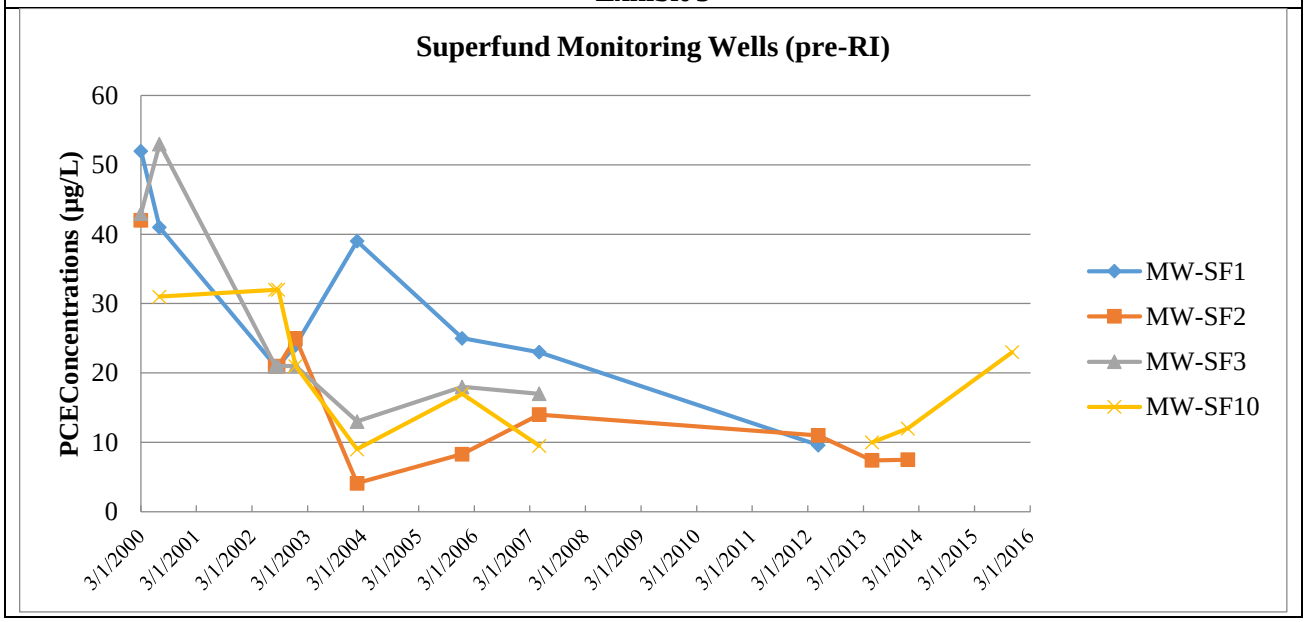
Exhibit 2



Decreasing PCE concentrations in the shallow aquifer (Layer 1) may be attributed to petroleum contaminant removal actions at the DACTD site and possibly the influence of pumping ground water from CLC Well 18 to maintain hydraulic control of the PCE plume from 2005 to 2008. PCE concentrations in these wells have remained below the MCL (5 µg/L) since the start of remedial system O&M in April 2012.

A time-series plot of PCE concentrations versus time was prepared for single-stage monitoring wells (located near CLC Well 18) installed in 2000 by the NMED-SOS to determine the extent of PCE contamination at the Site (Exhibit 3).

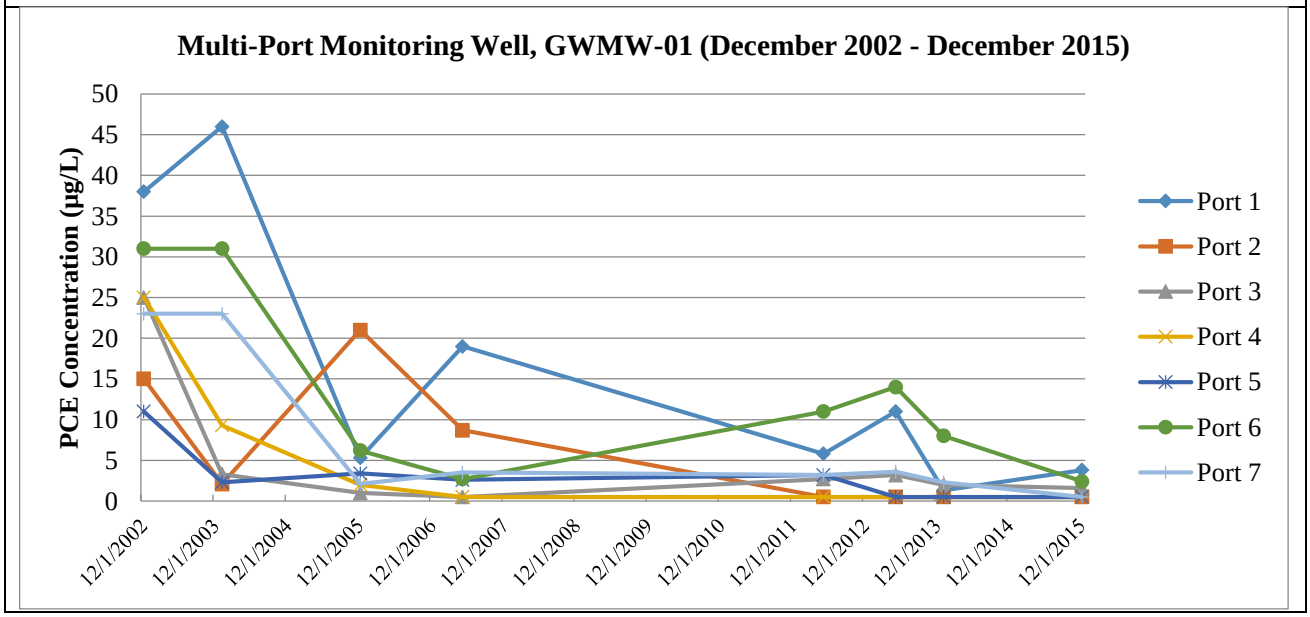
Exhibit 3



Decreasing PCE concentrations in the shallow aquifer (Layer 1) since March 2000 (when these wells were installed) are likely attributed to the influence of pumping ground water from CLC Well 18 to maintain hydraulic control of the PCE plume from 2005 through 2008. However, PCE concentrations have increased in monitoring well MW-SF10, which is located downgradient and outside of the radius of influence for the extraction well.

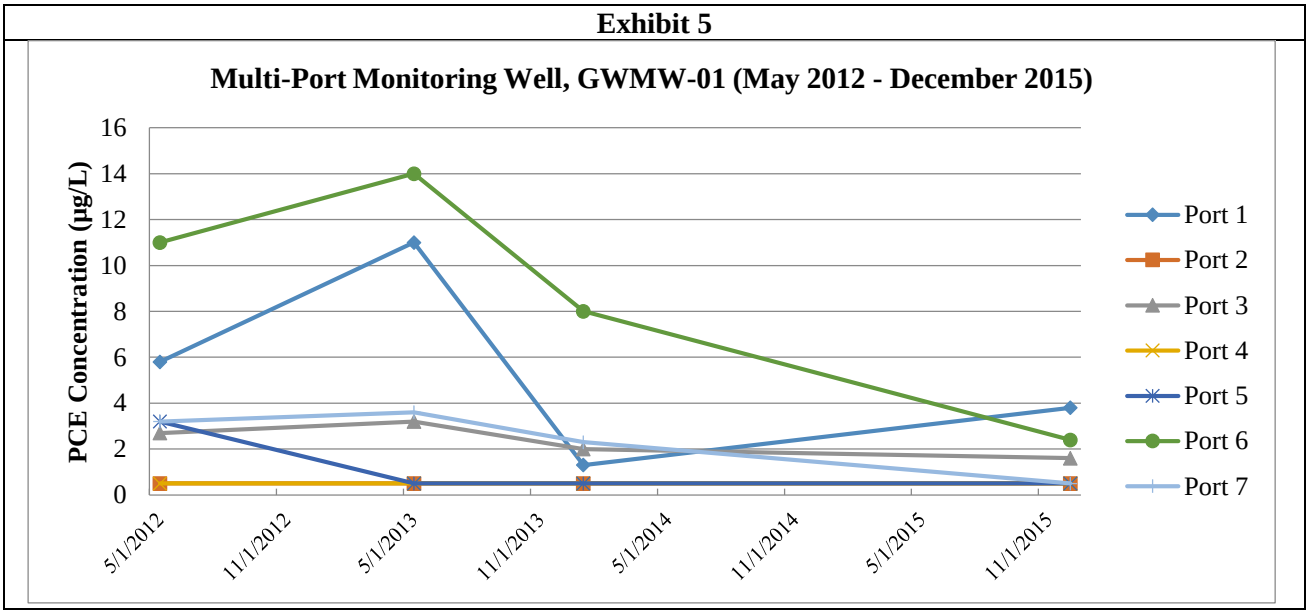
A time-series plot of PCE concentrations versus time was prepared for multi-port monitoring well GWMW-01 (located near CLC Well 18) installed by the EPA as part of the RI activities at the Site. Well GWMW-01 contains seven ports (Ports 1 through 7) from shallow to deep (Exhibit 4).

Exhibit 4



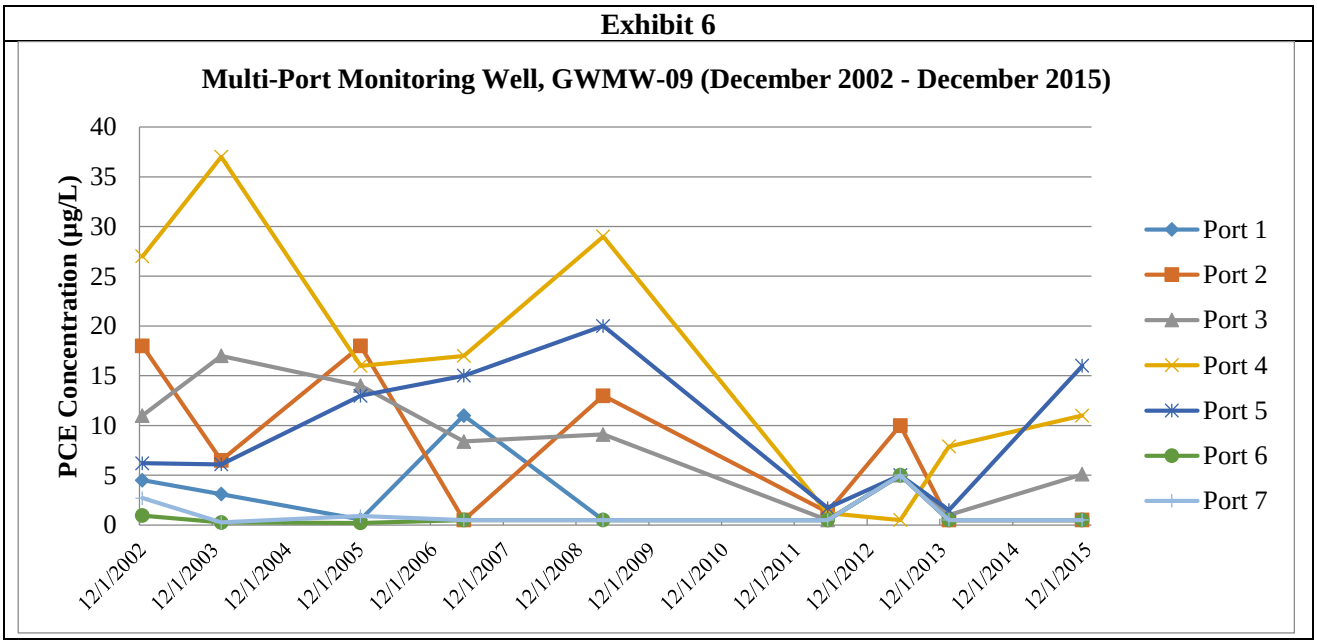
Decreasing PCE concentrations in the shallow, intermediate, and deep aquifers (Layers 1, 2, and 3) from 2002 through 2008 are likely attributed to the influence of pumping ground water from CLC Well 18 to maintain hydraulic control of the PCE plume from 2005 through 2008. Decreasing PCE concentrations from 2012 through 2015 are likely attributed to ground water extraction at CLC Well 18 (Figure 8 and 9) and improved PCE extraction rates associated with remedial system O&M since April 2012 (Exhibit 5).

Exhibit 5



A time-series plot of PCE concentrations versus time was prepared for multi-port monitoring well, GWMW-09 (located downgradient of CLC Wells 18 and 27) installed by the EPA as part of the RI activities at the Site (Exhibit 6).

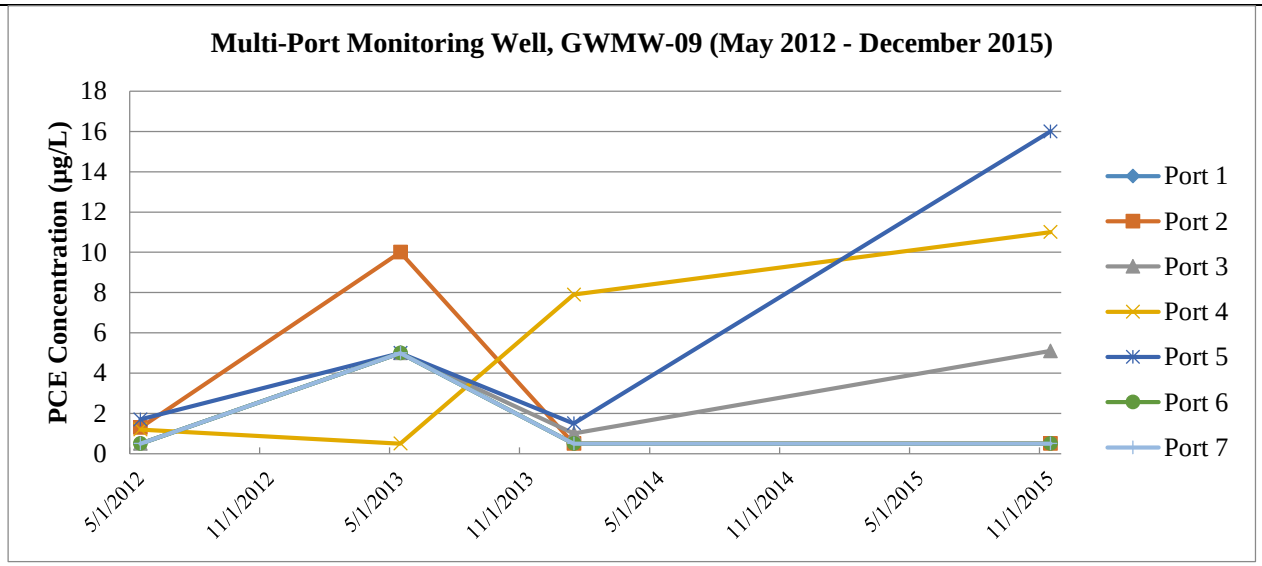
Exhibit 6



PCE concentrations in samples collected from Ports 1 through 5 at multi-port monitoring well GWMW-09 exhibit considerable variability and lack any clear trends. PCE concentrations in samples collected in 2012 and earlier, range from the detection limit (0.5 µg/L) to 37 µg/L.

PCE concentrations in samples collected after 2012 from multi-port monitoring well GWMW-09 also exhibit considerable variability, and range from the detection limit (0.5 µg/L) to 16 µg/L (Exhibit 7).

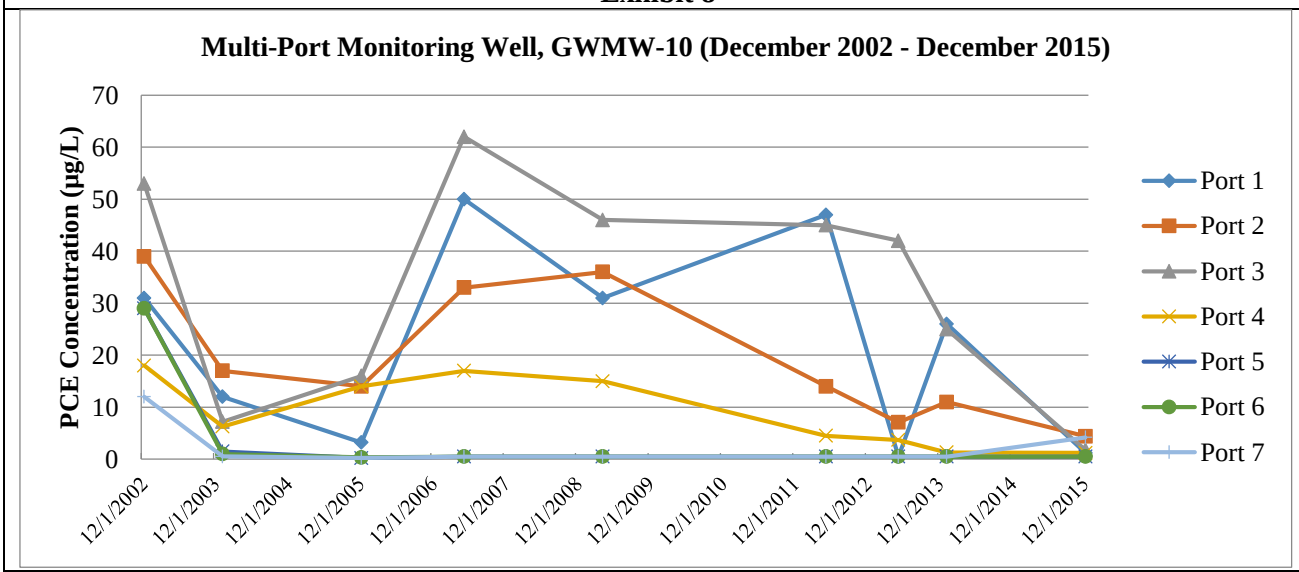
Exhibit 7



Variability in the PCE concentrations in samples collected from Ports 1 through 5 in monitoring well GWMW-09 may be attributed to the differences in the sampling protocol used versus the guidelines recommended by the multi-port well manufacturer, as discussed under the Site Inspection observations below.

A time-series plot of PCE concentrations versus time was prepared for multi-port monitoring well GWMW-10 (located downgradient of CLC Wells 18 and 27), installed by the EPA as part of the RI activities at the Site (Exhibit 8 and Exhibit 9).

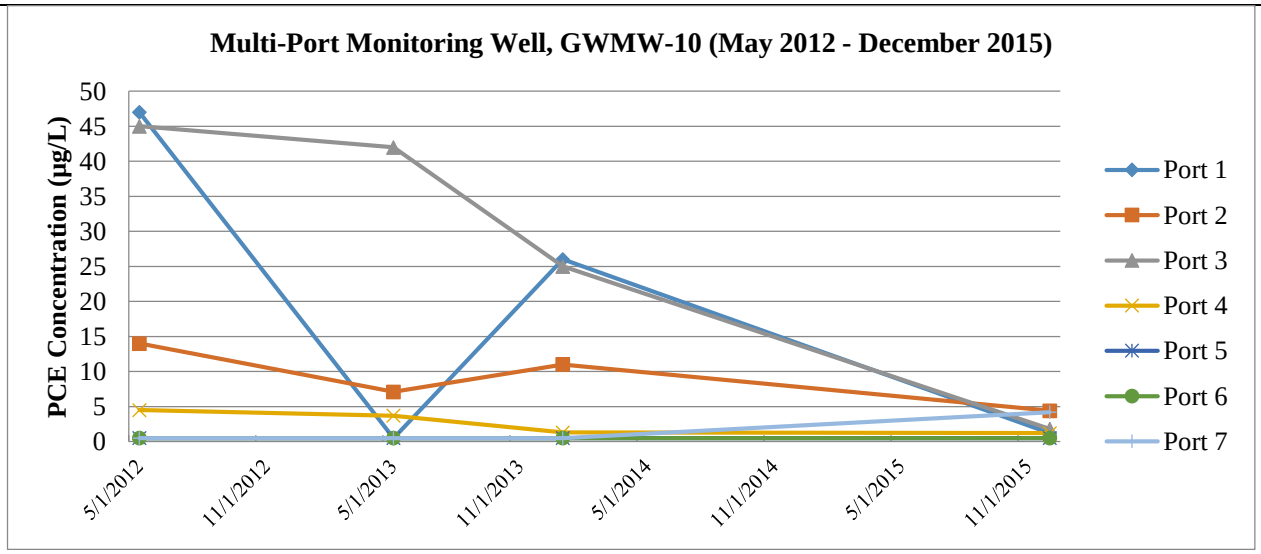
Exhibit 8



The significant increase in PCE concentrations in samples collected from multi-port monitoring well GWMW-10 since 2005 may be attributed to the absence of a confining layer separating the UHZ and LHZ, which allows for vertical downward ground water flow induced by pumping at CLC Well 27, as indicated by the interpreted radius of influence around this well, based on the 2015 water-level elevation data.

Similar variability in the PCE concentrations in samples collected from Port 1 in this monitoring well may be attributed to issues with the sampling process (as discussed for multi-port monitoring well GWMW-09 above), in particular for the samples collected in May 2013 and December 2015 (Exhibit 9).

Exhibit 9



Site Inspection

The inspection of the Site was conducted on 2/3/2016. In attendance were Mr. Mark Purcell, EPA Region 6, RPM, Mr. Angelo Ortelli, NMED-SOS, Project Manager, Ms. Adrienne Widmer, the CLC-Utilities Water Resources Administrator, and Mr. Pascual Rodriquez, the CLC-Utilities Operations Manager. A complete list of participants and their contact information is included with an inspection team roster/sign-in sheet attached to the Site inspection checklist, which is provided in Appendix E. Site photos are also included with Appendix E.

The purpose of the inspection was to assess the remediation system O&M as it relates to the protectiveness of the remedy. As far as the implementation of the remedy is concerned, no specific O&M issues were identified. The remedy is effective at extracting and treating contaminated ground water and functioning as designed. Routine O&M of mechanical equipment (including pumps, compressors, blowers, and valves) is conducted at a 6-month frequency, and demonstrates that the remediation system is properly maintained and is adequate for current protectiveness of the remedy.

Mr. Pascual Rodriquez, the CLC-Utilities Operations Manager, indicated that all CLC water supply wells will be monitored on the supervisory control and data acquisition (SCADA) remote monitoring system in the future; twelve wells are currently on-line. Any issues noted during sampling of single-stage monitoring wells and FLUTe multi-port wells are detailed in the Annual Monitoring Reports.

During the inspection, it was learned that the Flexible Liner Underground Technologies, Ltd. (FLUTe), multi-port wells were sampled (upon recharge) after a single-purge cycle. However, the manufacturer recommends that at

least 2-3 purge cycles be discarded before sampling (allowing for recharge after each purge cycle) before representative ground water samples are collected.

According to the *"Sampling guidelines for Water FLUTe systems installed prior to May, 2009",* the first flow of the sampling cycle (following 2-3 purge cycles and subsequent recharge) sweeps along droplets of water left in the tubing from the purge cycle (residual water) that is depleted of volatile components. Apparently, the first tube volume of the sample flow should be discarded as depleted in volatiles (the "discard volume"), and thereafter, representative samples can be collected from the sample tube outflow. The collection of samples depleted of volatile components would likely result in considerable variability and a bias toward lower PCE concentrations.

V. TECHNICAL ASSESSMENT

The purpose of the FYR is to determine whether the Site remedy was implemented as specified in the ROD and is protective of human health and the environment. The EPA guidance provides three questions that are used to organize and evaluate data and information and ensure that all relevant issues are considered when determining the protectiveness of a remedy. These questions are addressed below.

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The ROD documented the selected remedy for the Site as enhanced ground water extraction (pumping) with treatment of extracted ground water to remove PCE. The RAOs for ground water at the Site are intended to: 1) prevent human exposure to contaminated ground water above the MCL (5 µg/L) for PCE; 2) maintain capture of the PCE-contaminated ground water plume above the MCL for PCE; and 3) restore ground water to its beneficial use as a drinking water supply with PCE concentrations no greater than the MCL.

The remedy was implemented as specified in the ROD, and addresses the RAOs for ground water at the Site. Construction of the ground water extraction and treatment system began in September 2011 and the system was completed in April 2012. Ground water treatment has been ongoing since May 2012.

The ground water treatment system consists of two parallel stacked-tray air strippers that effectively reduce the PCE concentrations below the MCL. The remedy utilizes the water production capacity of two rehabilitated and modified municipal supply wells (CLC Wells 18 and 27) to maintain plume control and capture of PCE contamination. Ground water plume containment relies on hydraulic control and discontinued operation of CLC Wells 19, 20, 21, 24, 26, and 38 (inactive water supply wells located hydraulically down-gradient of CLC Wells 18 and 27) during remediation.

Remedial Action Performance for Extraction and Treatment of Contaminated Ground Water

The remedy is effective at extracting and treating PCE-contaminated ground water. The remedy is operating and functioning as designed for extraction and treatment. PCE removal rates were evaluated in the "*2012-2013 System Operation and Remedial Action Progress"* and "*2013-2014 System Operation and Remedial Action Progress"* reports that were prepared for the CLC-Utilities office.

According to the 2012-2013 annual report for the first year of O&M, the concentration of PCE entering the treatment system had declined by 87 percent, decreasing from 35 µg/L (in April 2012) to 4.40 µg/L (in May 2013). An assessment of the well hydraulics at CLC Well 18 revealed that it was extracting a significant amount of water with low PCE concentrations from the deeper aquifer (Layer 3) which had diluted the PCE concentrations of the untreated water entering the treatment system from both CLC Wells 18 and 27.

Over the first year of O&M, approximately 15 pounds of PCE mass were removed and 234 million gallons of water were treated.

Based on the JSP's remedial system evaluation and optimization efforts, the pumping rate at CLC Well 18 was adjusted to 170 gpm for 4 to 5 hours daily (allowing the well to recover overnight) and pumping CLC Well 27 continuously at approximately 160 gpm to maintain a consistent PCE removal rate.

According to the 2013-2014 annual report for the second year of O&M, the concentration of PCE entering the treatment system had increased from 6 µg/L (in August 2013) to 17 µg/L (in July 2014). The PCE concentration in water extracted from CLC Well 18 had increased significantly, while the PCE concentration in water extracted from CLC Well 27 remained relatively stable over the same period. Over the second year of O&M, approximately 10 pounds of PCE mass were removed and 107 million gallons of water were treated.

According to the 2014-2015 annual report for the third year of O&M, the concentration of PCE entering the treatment system ranged from 9.6 to 26 µg/L at CLC Well 18 and ranged from 12 to 14 µg/L at CLC Well 27. Over the third year of O&M, approximately 16 pounds of PCE mass were removed and 143 million gallons of water were treated.

Remedial Action Performance for Capture of PCE Plume and Restoration of Ground Water

The remedy is partially effective at capturing the PCE-contaminated ground water plume above the MCL of 5 µg/L based on mapping performed by the JSP's consultant JSAI. Ground water elevation contour maps (Appendix B, Figures 8, 9, 10 and 11) depict circular depressions of the water levels (*i.e.*, cones of depression) in the vicinity of the pumping wells CLC wells 18 and 27 for both the UHZ and LHZ. Figures 8 and 10 show the PCE plume in relationship to the water level contours for the UHZ and LHZ. Figures 9 and 11 show the UHZ and LHZ water level contours and the actual water level measurements for the wells that were used in the mapping effort. Hydraulic containment of the PCE plume is created within or near those cones of depression, with ground water flows toward the pumping wells (as depicted by the ground water flow direction arrows on the maps).[4]

For the UHZ, approximately half of the PCE plume is estimated to be within the cone of depression centered over CLC Well 18 and captured by the pumping well. The other half of the PCE plume is outside of this cone of depression and appears to flow to the east toward I-25. JSAI has indicated that this eastern portion of the PCE plume is actually being captured by pumping of CLC Well 27 as the UHZ and LHZ are hydraulically connected in this area of the Site (*see* section on Ground Water Gradients and Flow, above).

For the LHZ, JSAI has interpreted a much larger cone of depression centered on CLC Well 27, which is pumped continuously (Figures 10 and 11). The entire PCE plume in the LHZ is located within or near this cone of depression and appears to be hydraulically captured by pumping. However, it is noted that on Figure 11, the water level measured at GWMW16-D (approximately 3,842 ft. amsl) does not correlate to the water level contours drawn on the map, which suggests that the water level at GWMW16-D is approximately 3,832 ft. amsl. Honoring this value in the contouring effort for water elevations would change the map significantly. Yet, as stated above, this well has not been surveyed for top-of-casing elevation, and the 3,842 ft. amsl water level is only an estimate.

Overall, the effort made by JSP and its consultants to evaluate the degree of hydraulic capture of the PCE plume and reduction of PCE concentrations within the plume to below the MCL has not been adequate, as the JSP did not implement the Ground Water Monitoring Program consistent with the Pre-Achievement O&M Plan and RA

[4] Monitoring well GWMW16-S and GWMW16-D have yet to be surveyed for accurate elevations of the top of well casing. Therefore, the water elevations used for these wells are only approximations. Once these wells are surveyed, accurate water level elevations can be determined and incorporated into updated mapping efforts for assessing ground water flow directions and hydraulic capture.

SAP approved by EPA. The JSP did not perform quarterly ground water sampling the first year and semi-annual sampling thereafter. Hence, there were an inadequate number of ground water samples collected and water levels measured to sufficiently document the performance of the extraction system over the first few years of operation. The insufficient number of water level measurements used in the mapping effort for the UHZ and LHZ do not support the interpretation of hydraulic capture for the eastern portion of the PCE plume in the UHZ (through the pumping of CLC Well 27) as well as for the PCE plume in the LHZ. Another factor to consider are the recent increases in PCE concentrations at some wells. The PCE concentration at monitoring well GWMW-10, located near the eastern edge of the PCE plume, has increased to 23 µg/L in 2014 for the UHZ. This increase is depicted in the time series plot for GWMW-10 shown on NMED's maps of the UHZ (Layer 1) (Figures 15, 16, and 17). The PCE concentration at monitoring well GWMW15-I, located east of I-25, has slightly increased to 6.1 µg/L in 2015. Whether these increase are an indication of inadequate hydraulic capture in some areas of the Site and the movement of PCE-contaminated ground water away from the pumping wells is not known. Additional water level data and water quality data from more monitoring wells than those currently sampled by the JSP are warranted to assess the degree of plume capture and reduction in PCE concentrations at the Site.

The independent mapping performed by NMED of the PCE plume in the UHZ for 2002 (Figure 15), 2007 (Figure 16), and 2012 (Figure 17) as part of this FYR shows the extent of the PCE plume to have decreased over time.

System Operations/O&M

The ground water extraction and treatment system has been operated since April 2012, with no major down-times. More than 40 pounds of PCE have been removed from the extracted ground water and more than 430 million gallons of ground water have been extracted from the PCE plume since operational startup. PCE has not been detected in the treated ground water that has been returned to the public water supply distribution system at the Upper Griggs Reservoir. Operation and maintenance (O&M) activities have included the following tasks:

- Routine O&M of the extraction, conveyance, and treatment system equipment;
- Monthly sampling of CLC Well 18 and Well 27 for PCE concentrations;
- Monthly sampling of untreated (raw) and treated (finished) water for PCE concentrations; and
- Annual ground water monitoring across the Site.

As part of the JSP's optimization efforts, two additional monitoring wells (GWMW16-S and GWMW16-D) were installed in August 2015 to obtain additional data to define the plume extent and monitor remediation progress more effectively. Approximately $142,250 was expended in the third year of O&M (2014-2015) for the installation and development of these new monitoring wells.

Implementation of Institutional Controls and Other Measures

The ICs implemented at the Site are administrative controls that minimize the potential for human exposure to contamination by limiting water resource use. The OSE issued the well drilling moratorium on October 12, 2011, stating that no new wells or the transfer of water to existing wells (for injection) could occur within the designated boundaries of the PCE plume and 500-foot buffer. The moratorium specifically excludes wells installed for the purpose of remediation at the Site, and it remains in place to prevent human consumption of contaminated ground water until the RAOs are achieved.

The JSP also has agreed that it will communicate with other local departments, state agencies, and authorities, requesting that these departments, agencies, and authorities notify the JSP whenever a release occurs that may affect the Site ground water or the remediation efforts under the ROD. The JSP has agreed that it will notify these departments, agencies, and authorities when they become aware of such a release that could result in comingling of contaminants at the Site.

To the extent that subsurface conditions in the vicinity of the PCE release area located near the corner of North Walnut Street and East Hadley Avenue may pose a health threat via vapor intrusion under current or reasonably expected future conditions, additional ICs may be warranted beyond those comprising the selected remedy (which focuses on the ground water ingestion pathway and ensuing ground water cleanup, but not on vapor intrusion). *See* response to Question B, below. The updated EPA subsurface vapor intrusion guidance (EPA 2015) recommends establishing ICs in areas where subsurface contamination is not consistent with "unlimited use/unrestricted exposure." Where the vapor intrusion pathway may pose a health threat in the future, information devices, for example, can provide notice of subsurface contamination. In addition, the guidance states that "ICs may also be used to help inform the need for vapor intrusion mitigation for future construction where vapor-forming waste remains in place and may pose unacceptable human health risk due to vapor intrusion." (*See* Section 8.6 of EPA 2015 vapor intrusion guidance). EPA will collect additional soil gas samples in the PCE release area and evaluate based on the updated guidance to determine if ICs or other actions are needed to protect human health.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

The exposure assumptions and toxicity data have changed for inhalation parameters and assessment of the indoor air vapor intrusion pathway. The cleanup levels, and RAOs used at the time of the remedy selection for ground water continue to remain valid. There have been no significant changes in physical conditions at the Site that would affect the continued protectiveness of the remedy with respect to the ground water pathway.

Changes in Standards and To-Be-Considered Criteria

Remedial action (RA) at the Site is directed solely at cleaning up contaminated ground water. PCE is the COC that is the object of the Site cleanup. Federal and State of New Mexico (State) cleanup standards identified for PCE in ground water (*e.g.*, MCLs, New Mexico Water Quality Control Commission ground water standards) have not changed during the five-year period that is the subject of this document. Federal or State standards identified for COCs in ground water (*i.e.*, PCE) in the ROD have not changed during this first FYR period. There have not been any new ground water standards promulgated for PCE that impact the protectiveness of the remedy selected in the ROD. Conditions at the Site have not changed in a manner that would question the protectiveness of the ground water remedy.

There are currently no promulgated fixed numerical nationwide or State-wide cleanup standards for soil gas and indoor air. The EPA, under the National Contingency Plan (NCP), selects cleanup standards for soil gas and indoor air based on risk to human health and the circumstances at the Superfund site at issue. EPA developed vapor intrusion screening levels (VISLs) to help determine which sites warrant further assessment and possible cleanup. The VISLs were developed for human health protection. They are generally recommended, medium specific, risk-based screening level concentrations intended for use in identifying areas or buildings that may warrant further investigation of the vapor intrusion pathway. Generally, at properties where subsurface concentrations of vapor-forming chemicals (*e.g.*, ground water or "near source" soil gas concentrations) fall below VISLs, no further action or study is warranted, so long as the exposure assumptions match those taken into account by the calculations and the site fulfills the conditions and assumptions of the generic conceptual model underlying the screening levels. In similar fashion, the results of risk-based screening can help EPA identify areas, buildings, and/or chemicals that can be eliminated from further assessment. The generic conceptual model underlying these screening levels is described in Section 6.5 of EPA's updated vapor intrusion guidance (EPA 2015).

The EPA VISLs for PCE and TCE have changed since the draft subsurface vapor intrusion guidance was released in 2002. The 2002 guidance was used during the RI to assess the risk of soil gas migration to indoor air in the residential neighborhood located near the intersection of North Walnut Street and East Hadley Avenue. The

VISLs for PCE and TCE in indoor air were updated by EPA in May 2014. The previous VISLs were based on older (1980s) toxicity values. They have been updated with new toxicological studies and better modeling predictions of chemical exposure. Based on a comparison of the 2002 VISLs to the 2014 VISLs for indoor air (*i.e.*, 1 x 10^{-6} carcinogenic risk), the VISLs for PCE and TCE have increased. The VISL for PCE has increased from 0.81 micrograms per cubic meter (µg/m^3) to 11 µg/m^3; the VISL for TCE increased from 0.022 µg/m^3 to 0.48 µg/m^3.

According to EPA's vapor intrusion guidance (EPA 2015), when individual soil gas sampling results exceed the respective VISL for soil gas, it does not mean that vapor intrusion necessarily poses an unacceptable human health risk to building occupants. The reason that exceeding the VISLs for soil gas does not mean that there is an unacceptable risk to human health is that a very conservative assumption is used when developing the VISL to account for natural reduction or attenuation of contaminants in soil vapors that may migrate upward through the soil and enter into a building. To account for this natural attenuation process, EPA applies an attenuation factor to the calculation for soil gas VISLs.[5] EPA has developed generic vapor attenuation factors for sub-slap soil gas (0.03), near source exterior soil gas (for soil deeper than 5 ft. below the building foundation) (0.03), crawl space (1.0), and ground water (0.001). These attenuation factors are based on empirical attenuation factors collected by EPA for VOCs and residential buildings. *See* Table 6-1 of EPA's 2015 vapor intrusion guidance.

During the FYR for the Site, the PCE concentrations in exterior soil gas samples collected at the seven residential properties (Figure 3) during the RI (discussed in Section II under "*Vapor Intrusion - Basis for Taking Action*") were reviewed using EPA's Vapor Intrusion Assessment, VISL calculator and the updated risk-based VISL of 11 µg/m^3 for PCE in indoor air. The 11 µg/m^3 corresponds to a 1 x 10^{-6} excess lifetime cancer risk. The calculator was used to determine a target exterior soil gas concentration for PCE that would equate to the indoor air VISL (11 µg/m^3), taking into account natural attenuation. The generic attenuation factor of 0.03 recommended in EPA's 2015 vapor intrusion guidance for near source exterior soil gas was used in the calculation. The targeted PCE concentration of 360 µg/m^3 (53 ppbv) was derived with the calculator and represents the exterior soil gas VISL that equates to a 1 x 10^{-6} excess lifetime cancer risk. The 360 µg/m^3 (53 ppbv) was then compared to the actual exterior soil gas data collected at the residential properties in 2005 as well as the soil gas data collected at the PCE release area (primary source area), which is located across North Walnut Street from the residential properties. This primary source are is a land area bounded by North Walnut Street on the east, East Griggs Avenue on the south, North Hermosa Street on the west and the recreational fields on the north (*see* Appendix B, Figure 3).

This comparison showed that PCE levels in 44 out of 45 exterior soil gas samples collected (at 5- and 10-foot depths) at the residential properties exceeded the PCE soil gas VISL (360 µg/m^3; 53 ppbv) for the 1 x 10^{-6} carcinogenic risk (*i.e.*, EPA's point of departure). TCE also was detected in the residential area at a maximum concentration of 81 µg/m^3 at a 30-foot depth, which equals a carcinogenic risk of 5.1 x 10^{-6}.

Similarly, PCE levels in all eight of the exterior soil gas samples collected at the PCE release area exceeded the VISL (360 µg/m^3; 53 ppbv) for the 1 x 10^{-6} cancer risk. The maximum detected PCE concentration in soil gas in the PCE release area (8,800 µg/m^3) exceeds this screening level (360 µg/m^3) by approximately 24 times.

Based on these review findings, the performance of sub-slab soil gas sampling and/or indoor air sampling to assess potential vapor intrusion at the residential area located near the intersection of North Walnut Street and East Hadley Avenue is recommended. It is also recommended that soil gas sampling be performed at the PCE release area located near the same intersection to evaluate potential vapor intrusion. In short, very conservative soil vapor modeling based on outdoor samples and based on new EPA policy established in 2015 shows that there is a possibility of indoor air contamination. To determine whether or not an indoor air health risk exists, sub-slab (*i.e.*, sub-foundation) sampling and/or indoor air samples are recommended by this FYR.

[5] Attenuation factor is defined as the ratio of indoor air concentration to subsurface concentration (for example: sub-slab soil gas, near source exterior soil gas or ground water). It is used as a measure of the decrease in concentration (dilution) that can occur when vapors enter into a building from the subsurface and mix with indoor air.

Changes in Toxicity and Other Contaminant Characteristics

The toxicological information for the COCs (*i.e.*, PCE) in air has changed. Since the ROD was issued, EPA's Office of Research and Development has published a new toxicological assessment for PCE in EPA's Integrated Risk Information System (IRIS), which has resulted in a lower inhalation unit risk for PCE (indicating airborne PCE is less toxic than was formerly believed).

Toxicological information for the PCE in ground water on which the MCLs were established has not changed since the original risk assessment was performed.

Changes in Risk Assessment Methods

As part of the RI, EPA undertook the BHHRA for the Site. The methodologies used to develop the BHHRA have not changed. The indoor air VISLs for PCE and TCE have changed since the BHHRA was performed. These changes are discussed under "*Changes in Standards and To-Be-Considered Criteria"* above.

Changes in Exposure Assumptions

The Remedial Action (RA) selected in the ROD for the Site does not address potential vapor intrusion to residential indoor spaces on the Site because the PCE detected in soil vapor samples collected at seven residential properties during the Remedial Investigation (RI)[6] were in such low concentrations, it was determined not to pose a significant health risk[7] based on the findings of EPA's BHHRA. Indoor air samples were not collected at these residences during the RI even though PCE levels in soil vapor exterior to the buildings had exceeded EPA's VISLs. At the time of the RI, the science and technology associated with evaluating and addressing risk from vapor intrusion was evolving, especially for vapor intrusion sourcing from subsurface soil or contaminated ground water. Moreover, EPA's 2002 guidance for evaluating the indoor air vapor intrusion pathway was only draft (EPA 2002).

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[6] The Remedial Investigation (RI) is a process undertaken by EPA to determine the nature and extent of the problem presented by the release of hazardous substances at a Superfund site listed on the NPL, like the Site. The RI emphasizes data collection and site characterization, and is generally performed concurrently and in an interactive fashion with the Feasibility Study (FS). The RI includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for remedial action and to support the evaluation of remedial alternatives. The FS is undertaken by EPA to develop and evaluate options for remedial action. The FS emphasizes data analysis and is generally performed concurrently and in an interactive fashion with the RI, using data gathered during the RI. The RI data are used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives. *See* 40 CFR § 300.5.

[7] 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 1,000,000 (1×10^{-6}) means that one person out of one million people could be expected to develop cancer as a result of a lifetime exposure to the site contaminants. Where the aggregate risk from COCs based on existing applicable or relevant and appropriate requirements (ARARs) (*see* 40 CFR § 300.5) exceeds 1×10^{-4}, or where remediation goals are not determined by ARARs, EPA uses the 1×10^{-6} as a point of departure for establishing preliminary remediation goals. This means that an accumulative 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. Under the NCP, site cleanup should generally achieve a level of risk within the 10^{-4} to 10^{-6} carcinogenic risk range based on the reasonable maximum exposure for an individual. The cleanup levels to be specified include exposures from all potential pathways, and through all media (*e.g.*, soil, ground water, surface water, sediment, air, structures and biota). The upper boundary of the risk range for carcinogens in the NCP is not a discrete line at 1×10^{-4}, although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions.

The exposure assumptions for modeling indoor air vapor intrusion have changed somewhat since the performance of the BHHRA and issuance of the ROD. The BHHRA relied upon the use of a one-dimensional, steady-state analytical model, which was published by Johnson and Ettinger in 1991 (JEM). Today, however, EPA has a greater recognition about the complexity of vapor intrusion processes and the limitations of mathematical models of vapor intrusion, which is reflected in the updated vapor intrusion guidance (EPA 2015). Very few buildings have been studied in detail to provide information for validation of any vapor intrusion model, including the JEM. The ROD suggested that because the JEM is "based on a number of simplifying assumptions" (*e.g.*, steady-state conditions, no biodegradation), the JEM tends "to overestimate the risk by an order of magnitude or more." Although the JEM is a steady-state model and does not account for biodegradation, it does not follow that the modeling predictions of indoor air concentrations will necessarily and always be conservative on these basis alone. In light of these uncertainties, a reassessment of the indoor air vapor intrusion pathway may be warranted. Moreover, the updated vapor intrusion guidance recommends further evaluation of the indoor air pathway where contaminant levels in soil vapors exceed the EPA's VISL corresponding to a 1×10^{-6} carcinogenic risk (EPA 2015).

Changes in Exposure Pathways

The BHHRA estimated what human health risks the Site would have posed if no action was taken. It provided the basis for taking action at this Site and identified the COCs and exposure pathways that needed to be addressed by the remedial action. Since exposure pathways are dependent on current or future land uses at a site, the BHRRA assesses current and potential future land uses at NPL sites. There have been no changes in land use at the Site, which is expected to remain zoned as commercial, public recreational, light industrial, and residential land uses. Further, no additional drinking water supply wells have been installed at the Site. Exposure pathways have not changed since the ROD was signed by EPA on June 19, 2007.

The BHHRA considered the indoor air vapor intrusion exposure pathway but did not identify it as a pathway that needed to be addressed by remedial action because it was shown not to present a health threat based on the JEM. Based on a review of the 2005 exterior soil gas data at the residential area using the updated vapor intrusion guidance (EPA 2015) and the updated VISL for PCE, this FYR is recommending that the indoor air vapor intrusion pathway be further evaluated at the Site.

Expected Progress toward Meeting RAOs

The remedy is proving to be effective in removing PCE mass from the ground water aquifers through the extraction and treatment of contaminated ground water. By removing the PCE mass, it can be assumed that some progress has been made in achieving the RAO for restoring the aquifers to its beneficial use as a drinking water supply with PCE concentrations no greater than the MCL. However, it cannot be determined whether the remedy is achieving such restoration over the entire Site as concentrations of PCE have increased in some wells. It also cannot be determined whether the remedy is achieving another of the RAOs for hydraulic capture of the PCE plume. An insufficient number of monitoring wells are used to measure ground water levels and collect ground water samples to allow adequate documentation of hydraulic capture of the plume and reduction of PCE levels to below the MCL throughout the entire Site. Moreover, as discussed in the *"Data Review"* and *"Site Inspection"* sections above, variance in the sampling protocol used to collect samples from down-gradient multi-port monitoring wells GWMW-09 and GWMW-10 may have resulted in a bias toward lower PCE concentrations in samples collected from these wells, and may lead to underestimating the extent of the PCE-contaminated ground water plume and the time needed to achieve the RAOs.

The RAOs set forth in the ROD do not address potential risk from indoor air vapor intrusion for residential land use and reasonably anticipated future residential land use.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

As discussed in the response to Question B above, soil gas data collected in a residential area during the RI (see Figure 3) were reviewed using the updated vapor intrusion guidance (EPA2015) and the VISL Calculator, Version 3.5.1 (May 2016 VISLs). Based on this review, the vapor intrusion to indoor air pathway for residential structures warrants further investigation. Therefore, the performance of sub-slab soil gas sampling and/or indoor air sampling is recommended to assess potential vapor intrusion at the residential area located near the intersection of North Walnut Street and East Hadley Avenue. Additionally, the performance of soil gas sampling is recommended to assess potential vapor intrusion at the PCE release area located near the same intersection.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: Other**			
	Issue: PCE concentrations detected in 44 out of 45 exterior soil gas samples collected at seven residential properties located near the intersection of North Walnut Street and East Hadley Avenue during the RI in 2005 exceeded EPA's excess lifetime cancer risk of 1 x 10^{-6} (*i.e.*, EPA's point of departure). PCE concentrations detected in eight exterior soil gas samples collected at the PCE release area across the street from this residential area in 2002 exceeded the 1 x 10^{-6} risk level by approximately an order of magnitude.			
	Recommendation: The vapor intrusion to indoor air pathway warrants further investigation for both the residential and PCE release areas of concern. The performance of sub-slab soil gas and/or indoor air sampling to assess potential vapor intrusion at residential properties is recommended. The performance of exterior soil gas sampling in the vicinity of the PCE release area is also recommended.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA		6/30/2017

Issues and Recommendations Identified in the Five-Year Review:	
OU(s):	**Issue Category: Monitoring**
	Issue: The Ground Water Monitoring Program has not been performed in accordance with the Remedial Action Sampling and Analysis Plan and Pre-Achievement O&M Plan approved by EPA. An inadequate number of ground water samples were collected and water level measurements taken to adequately assess the progress of the remedy in achieving hydraulic capture of the PCE plume and reducing PCE concentrations to below the MCL of 5 µg/L over the entire Site. Additionally, seven wells that are part of the monitoring well network are inaccessible (could not be located) or have collapsed and can no longer be used as monitoring wells.

	Recommendation: Include additional monitoring wells and increase the frequency of sampling for the Ground Water Monitoring Program as deemed necessary by EPA to adequately document the progress of the remedy in achieving the Remedial Action Objectives set forth in the Record of Decision.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	All future sampling events

Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: Monitoring**			
	Issue: Variance in the sampling protocol used to collect samples from multi-port monitoring wells may have resulted in a bias toward lower PCE concentrations in samples collected from these wells.			
	Recommendation: The following steps should be taken to ensure that the sampling protocol implemented for the multi-port monitoring wells follows the manufacturer's *"Sampling guidelines for Water FLUTe systems installed prior to May, 2009",* Revised April, 2010: 1. Verification of use of correct sampling protocol by field sampling personnel as provided by manufacturer's recommended guidelines and update Sampling and Analysis Plan to include the guidelines; 2. Consultation and training of field sampling personnel as needed by manufacturer to ensure sampling protocol is implemented correctly; 3. Implementation of sampling protocol in accordance with manufacturer's guidelines for all future sampling events; and 4. Documentation of sampling procedures performed by field sampling personnel in field log book for all sampling events and provision of a copy of signed and dated log book notes for each sampling event to EPA as an attachment to annual remedial action progress reports or other such annual reports prepared and submitted to EPA as part of O&M activities.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA	11/1/2016

Other Findings

No other technical issues, nor the implementation of the remedy, were noted during the FYR.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement	
Protectiveness Determination: Protectiveness Deferred	*Planned Addendum Completion Date:* Not Applicable
Protectiveness Statement: A site-wide protectiveness determination of the remedy at the Griggs and Walnut Ground Water Plume Superfund site cannot be made at this time until further information is obtained. Further information will be obtained by performing sampling to assess the potential indoor air vapor intrusion pathway for existing residential land use and other potential future land uses at a primary source area. It is expected that these actions will take approximately 12-15 months to complete, at which time a protectiveness statement will be made. For the ground water exposure pathway, there is currently no known human exposure. An institutional control is in place that restricts permitting of new ground water wells over the area of the contaminant plume while remediation is ongoing. The institutional control limits exposure to contaminated ground water. Follow-up actions are needed to achieve long-term protectiveness because the current long-term monitoring program and evaluation of remedial progress related to capture of the PCE plume and restoration of the ground water are inadequate. They are also needed to achieve long-term protectiveness because additional institutional controls may be necessary to address the indoor air vapor intrusion pathway under current or reasonably anticipated future land uses.	

VIII. NEXT REVIEW

The next five-year review report for the Griggs and Walnut Ground Water Plume Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Griggs and Walnut Ground Water Plume Superfund Site
Documents & Information Reviewed

Agency for Toxic Substances & Disease Registry (ATSDR), 2005. *"Public Health Assessment for Griggs & Walnut Ground Water Plume (a/k/a Griggs & Walnut Groundwater Site)"*, Las Cruces, Dona Ana County, New Mexico. EPA Facility ID: NM0002271286. Prepared by the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Superfund and Program Assessment Branch, Atlanta, Georgia. February 25, 2005.

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DBS&A, 2012a. *"Interim Remedial Action Report"*, Griggs-Walnut Ground Water Plume Site. Prepared for the Joint Superfund Project, Las Cruces, New Mexico. August 12, 2012.

DBS&A, 2012b. *"Pre-Achievement Operations and Maintenance Plan"*, Griggs-Walnut Ground Water Plume Site. Prepared for the Joint Superfund Project, Las Cruces, New Mexico. August 12, 2012.

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DBS&A, 2013. *"2012-2013 System Operation and Remedial Action Progress"* Report, Griggs-Walnut Ground Water Plume Superfund Site. Prepared for the Las Cruces-Utilities, Las Cruces, New Mexico. October 15, 2013.

DBS&A, 2014. *"2013-2014 System Operation and Remedial Action Progress"* Report, Griggs-Walnut Ground Water Plume Superfund Site. Prepared for the Las Cruces-Utilities, Las Cruces, New Mexico. December 1, 2014.

DBS&A, 2016. *"2014-2015 System Operation and Remedial Action Progress"* Report, Griggs-Walnut Ground Water Plume Superfund Site. Prepared for the Las Cruces-Utilities, Las Cruces, New Mexico. April 8, 2016.

John Shoemaker & Associates, Inc. (JSAI), 2009a. *"Analysis of water-level data from the Griggs and Walnut PCE plume monitoring network, Las Cruces, New Mexico"*. Technical Memorandum to Dan Santantonio, Project Manager, Griggs and Walnut Joint Superfund Project, Las Cruces, New Mexico. March 3, 2009.

JSAI, 2009b. *"Updates to the Groundwater Model and Recommendations for using City of Las Cruces Wells 18 and 27 to capture and contain the Griggs and Walnut Plume"*. Technical Memorandum to Dan Santantonio, Project Manager, Griggs and Walnut Joint Superfund Project, Las Cruces, New Mexico. November 5, 2009.

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U. S. EPA Region 6, 2005. *"Settlement Agreement for Funding of EPA's Remedial Investigation/ Feasibility Study"*, and Letter from EPA to the City of Las Cruces and Doña Ana County regarding the *"Involvement of the City of Las Cruces and Doña Ana County in the RI/FS Process"*. April 20, 2005.

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U. S. EPA Region 6, 2006b. *"Feasibility Study Report"*, Griggs and Walnut Ground Water Superfund Site, Las Cruces, New Mexico. November 2006.

U. S. EPA Region 6, Superfund Division, 2007. *"Record of Decision",* Griggs and Walnut Ground Water Superfund Site, Las Cruces, New Mexico. June 2007.

U. S. EPA Region 6, 2012. *"Preliminary Close-Out Report"*, Griggs and Walnut Ground Water Superfund Site, Las Cruces, New Mexico. May 21, 2012.

U. S. EPA Region 6, 2015. *"OSWER Technical Guide For Assessing And Mitigating The Vapor Intrusion Pathway From Subsurface Vapor Sources To Indoor Air"*, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response (OSWER) Publication 9200.2-154. June 2015.

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APPENDIX B – SITE MAPS

Figure 1 – Site Location Map

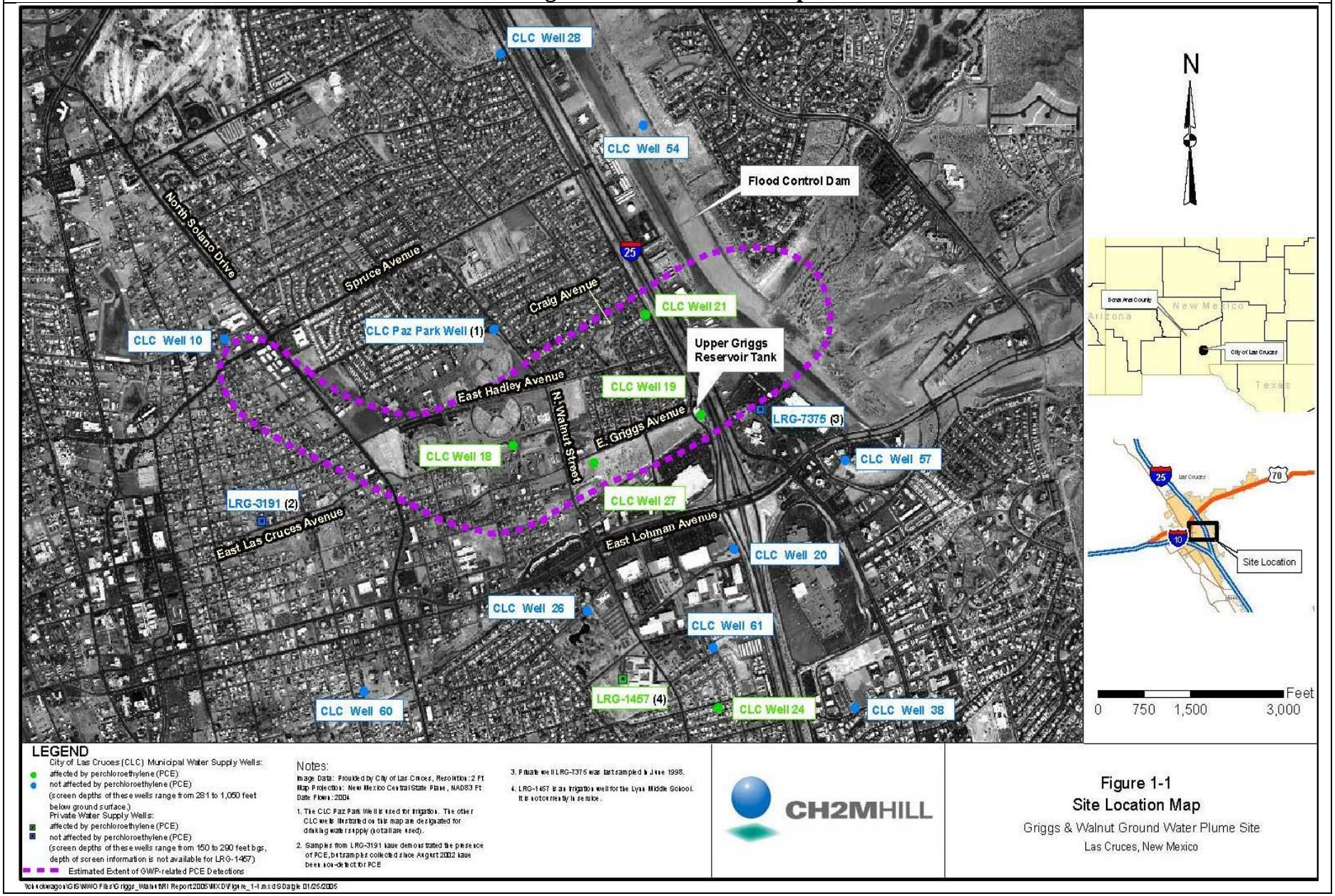


Figure 2 – PCE Release Areas

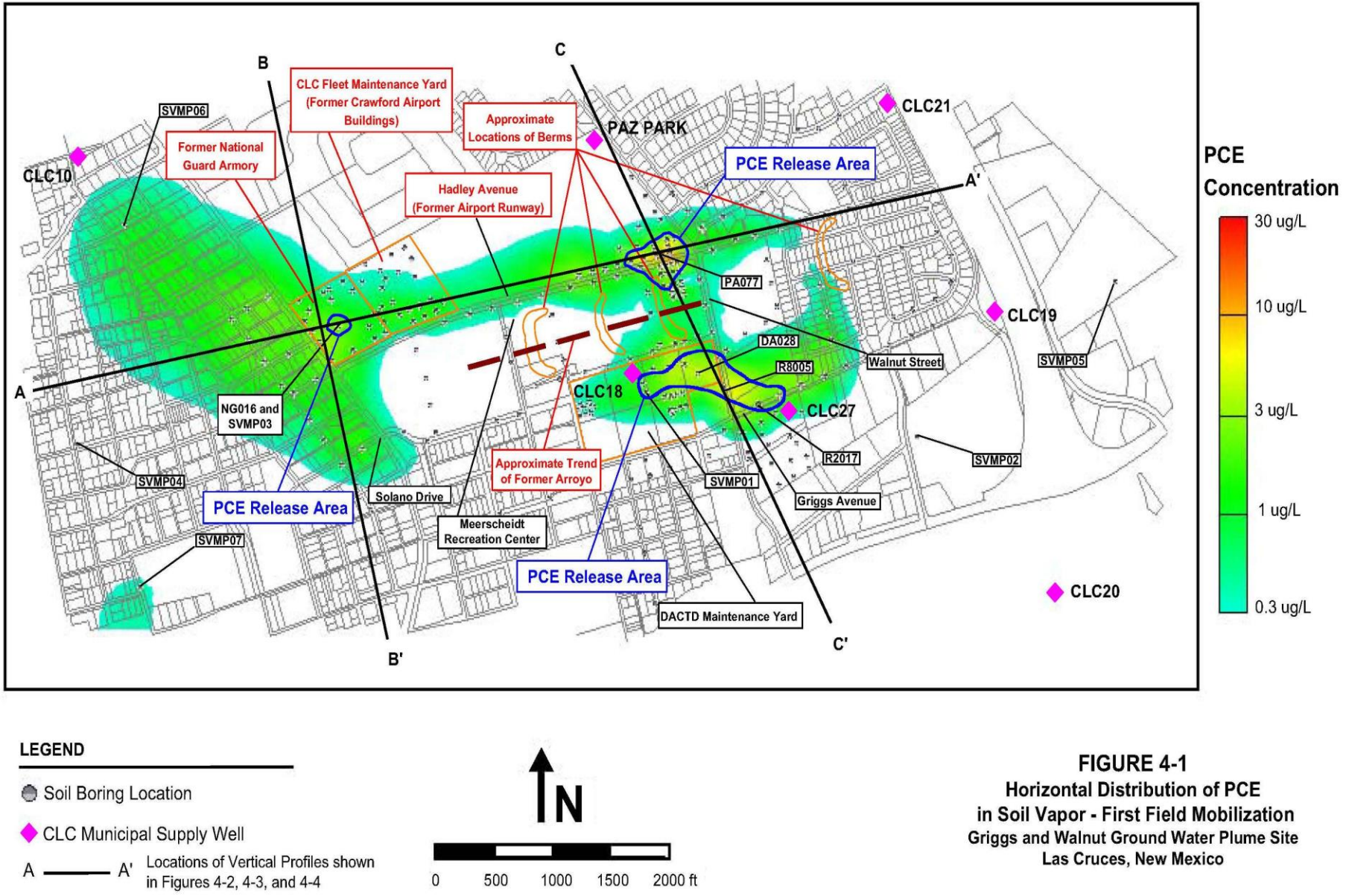


FIGURE 4-1
Horizontal Distribution of PCE in Soil Vapor - First Field Mobilization
Griggs and Walnut Ground Water Plume Site
Las Cruces, New Mexico

Figure 3 – PCE Shallow Soil Vapor Concentrations in the Residential Area

Figure 4 – PCE Groundwater Plume Area (December 2005)

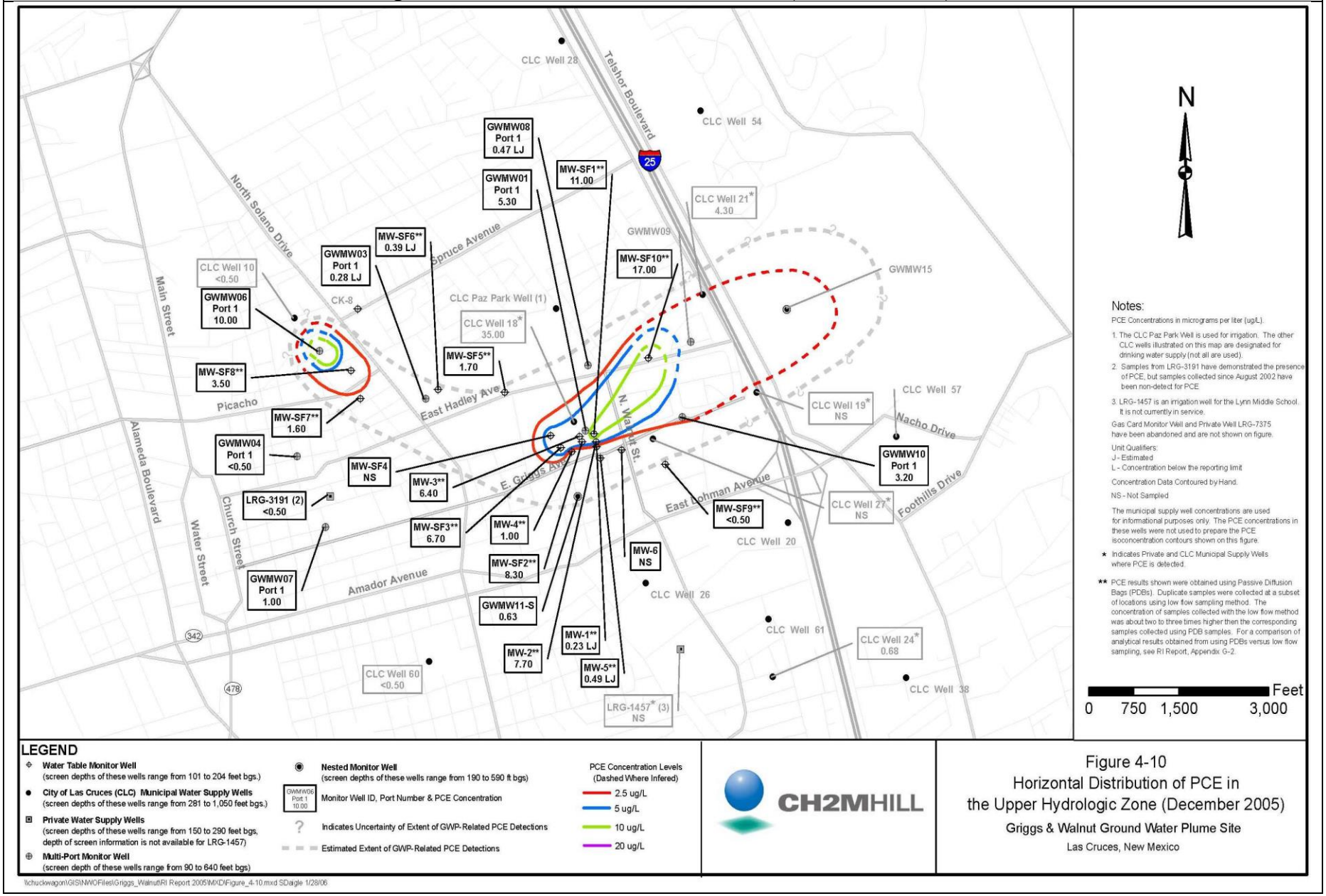


Figure 5 – Conceptual Site Model

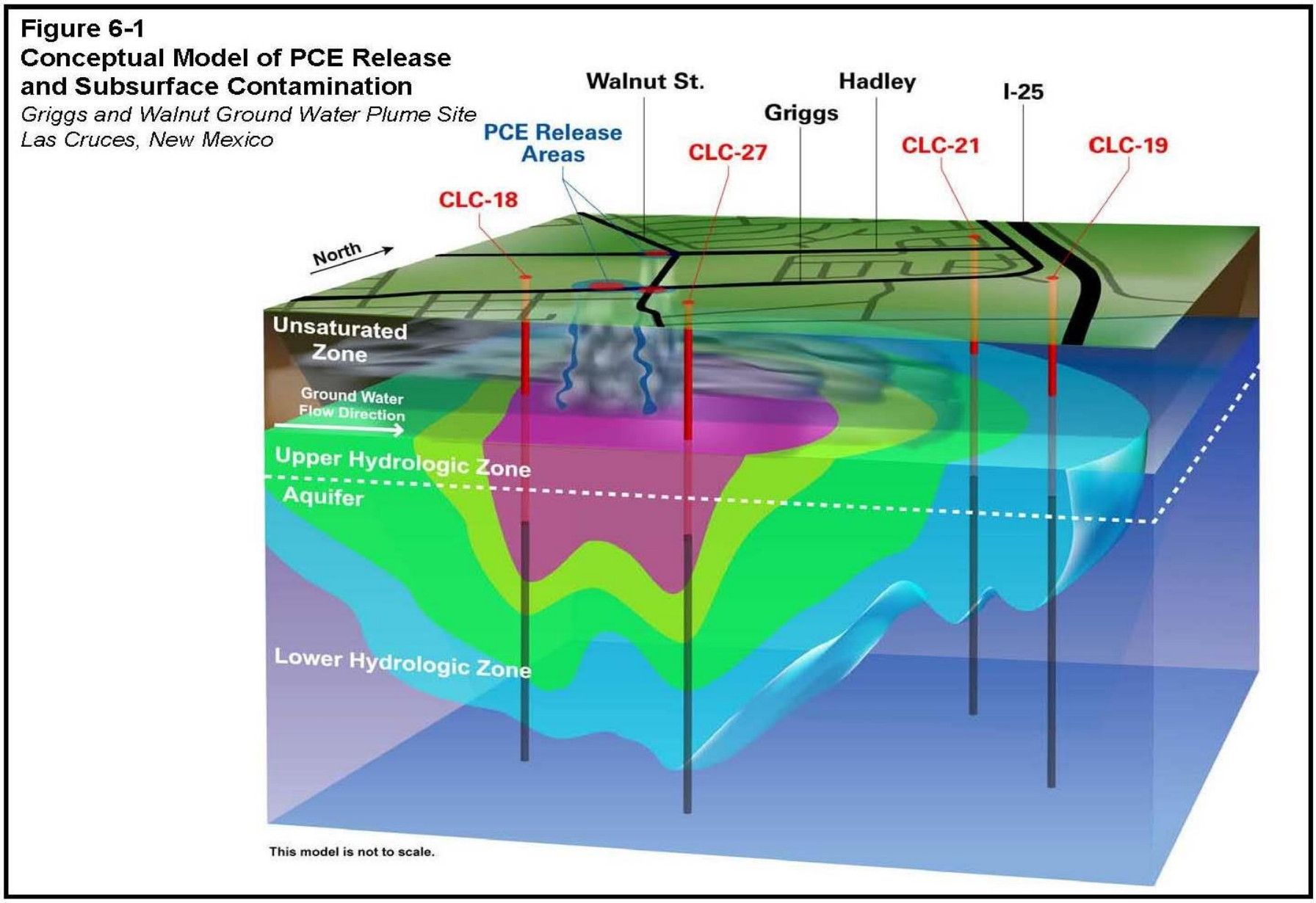
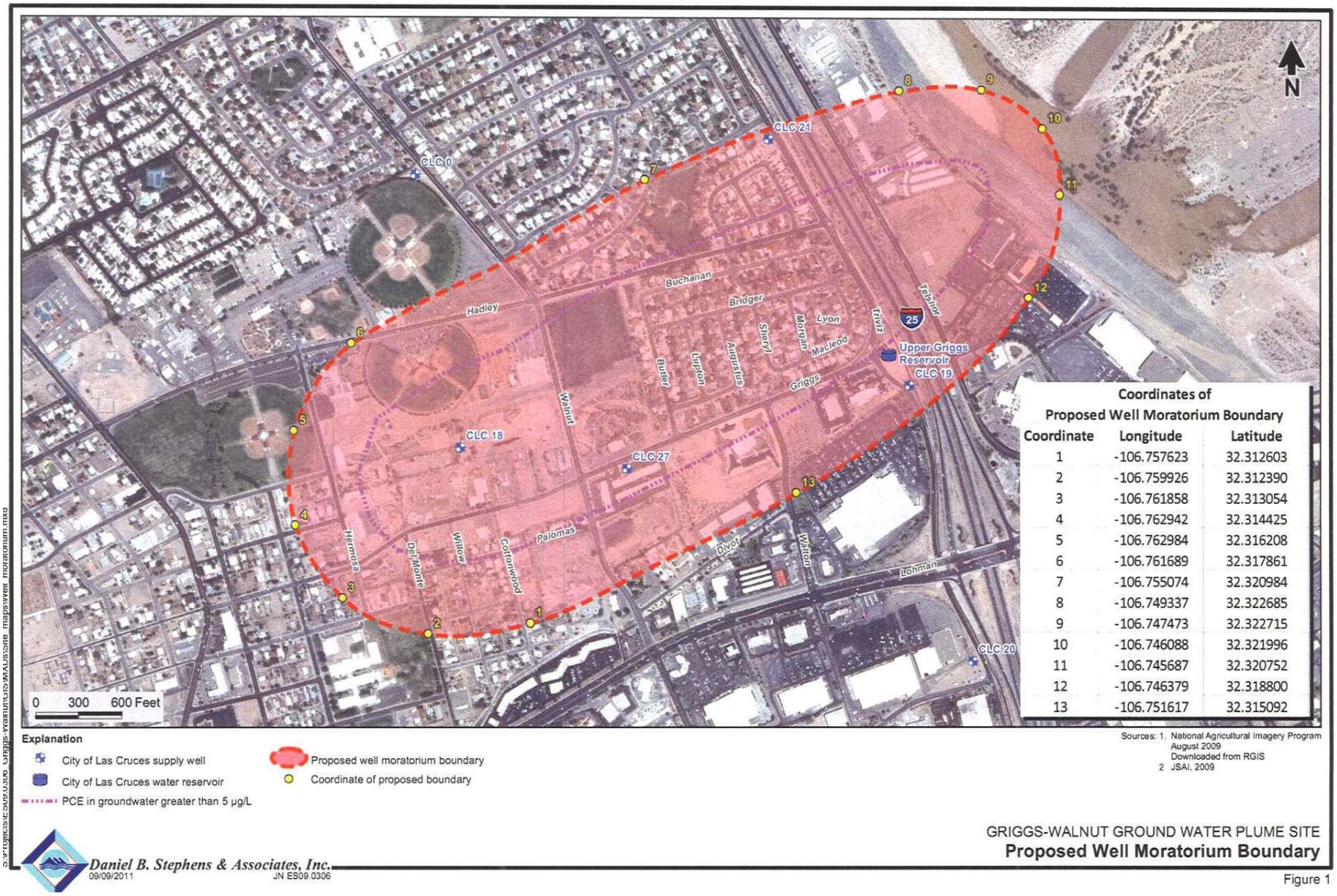


Figure 6 – Institutional Controls



Coordinates of Proposed Well Moratorium Boundary

Coordinate	Longitude	Latitude
1	-106.757623	32.312603
2	-106.759926	32.312390
3	-106.761858	32.313054
4	-106.762942	32.314425
5	-106.762984	32.316208
6	-106.761689	32.317861
7	-106.755074	32.320984
8	-106.749337	32.322685
9	-106.747473	32.322715
10	-106.746088	32.321996
11	-106.745687	32.320752
12	-106.746379	32.318800
13	-106.751617	32.315092

Figure 7 – Ground Water Elevation Contours for City of Las Cruces Area, December 2015 (JSAI, 2016)

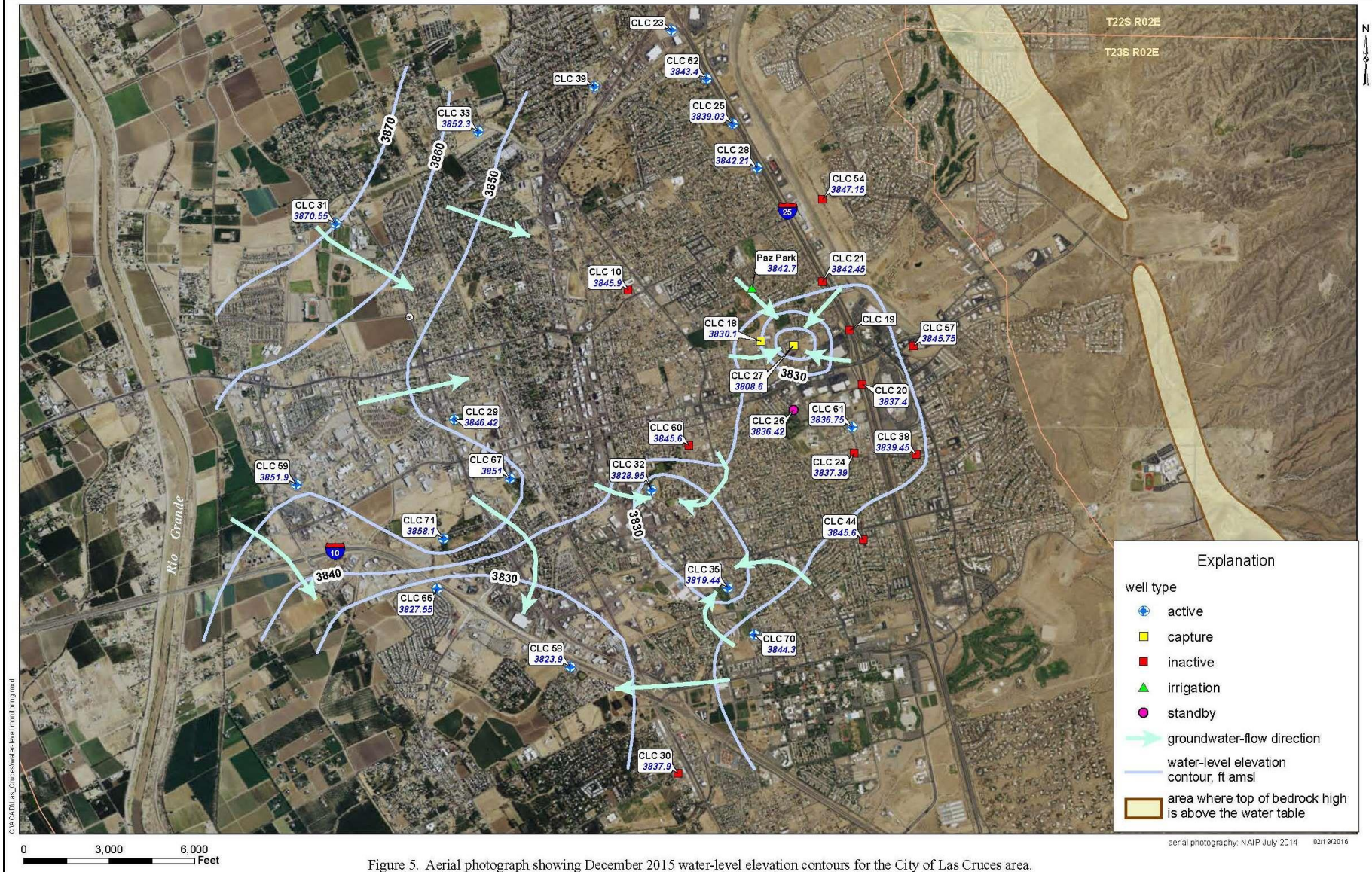


Figure 5. Aerial photograph showing December 2015 water-level elevation contours for the City of Las Cruces area.

JOHN SHOMAKER & ASSOCIATES, INC.

Figure 8 – Ground Water Elevation Contours for the Upper Hydrogeologic Zone and PCE Plume November 2015 (JSAI, 2016)

Figure 8. Aerial photograph showing November 2015 PCE concentrations and groundwater-elevation contours for the Upper Hydrogeologic Zone, Griggs and Walnut site, City of Las Cruces, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.

Figure 9 – Ground Water Elevation Contours for the Upper Hydrogeologic Zone November 2015 (JSAI, 2016)

Figure 6. Aerial photograph showing November 2015 water-level elevation contours for the Upper Hydrogeologic Zone, Griggs and Walnut site, City of Las Cruces, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.

Figure 10 – Ground Water Elevation Contours for the Lower Hydrogeologic Zone and PCE Plume November 2015 (JSAI, 2016)

Figure 9. Aerial photograph showing November 2015 PCE concentrations and groundwater-elevation contours for the Lower Hydrogeologic Zone, Griggs and Walnut site, City of Las Cruces, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.

Figure 11 – Ground Water Elevation Contours for the Lower Hydrogeologic Zone November 2015 (JSAI, 2016)

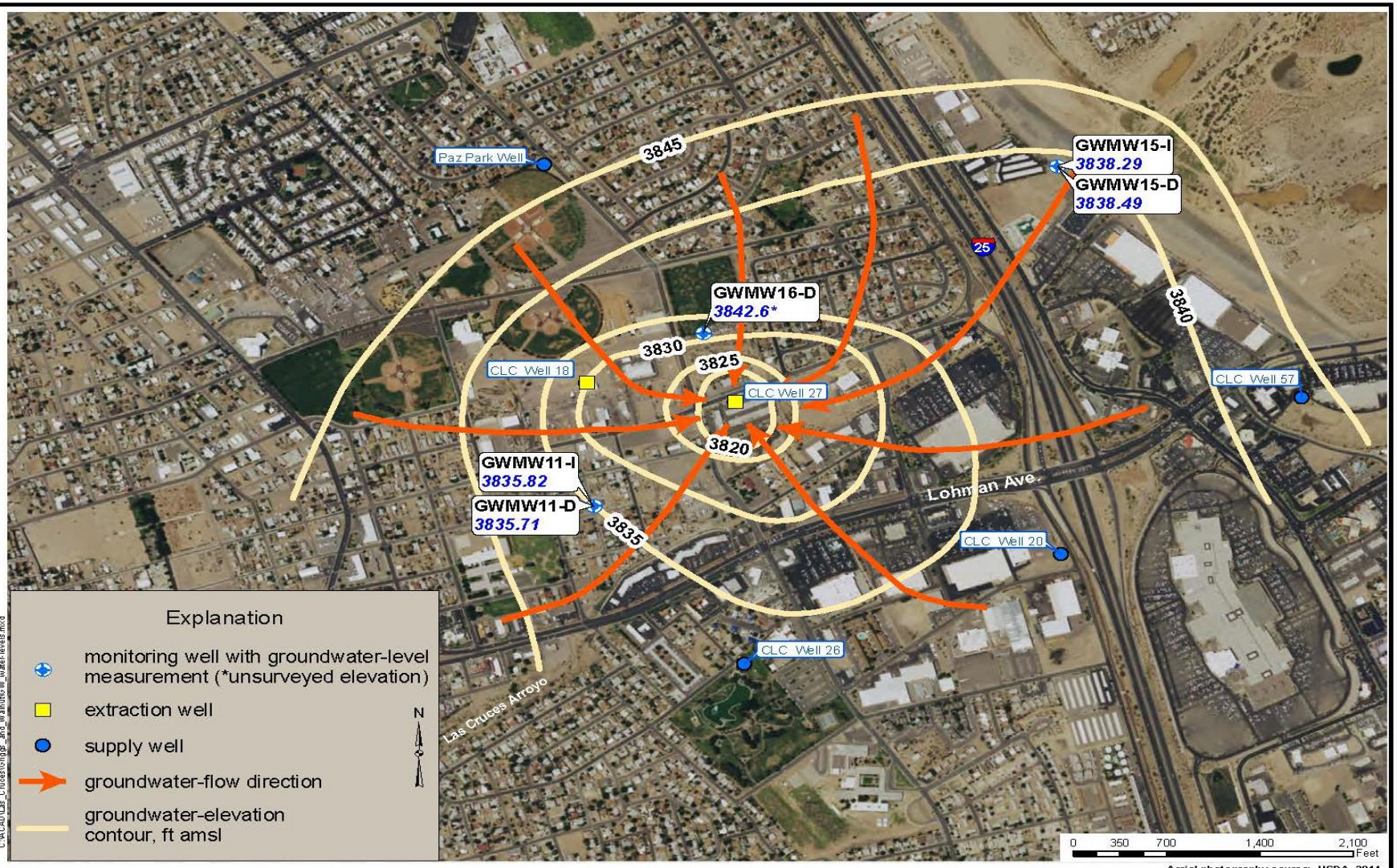


Figure 7. Aerial photograph showing November 2015 water-level elevation contours for the Lower Hydrogeologic Zone, Griggs and Walnut site, City of Las Cruces, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.

Figure 12 – Composite PCE Contaminant Plume Overlays, Aquifer Layers 1, 2, and 3, 2012 (DBS&A, 2013)

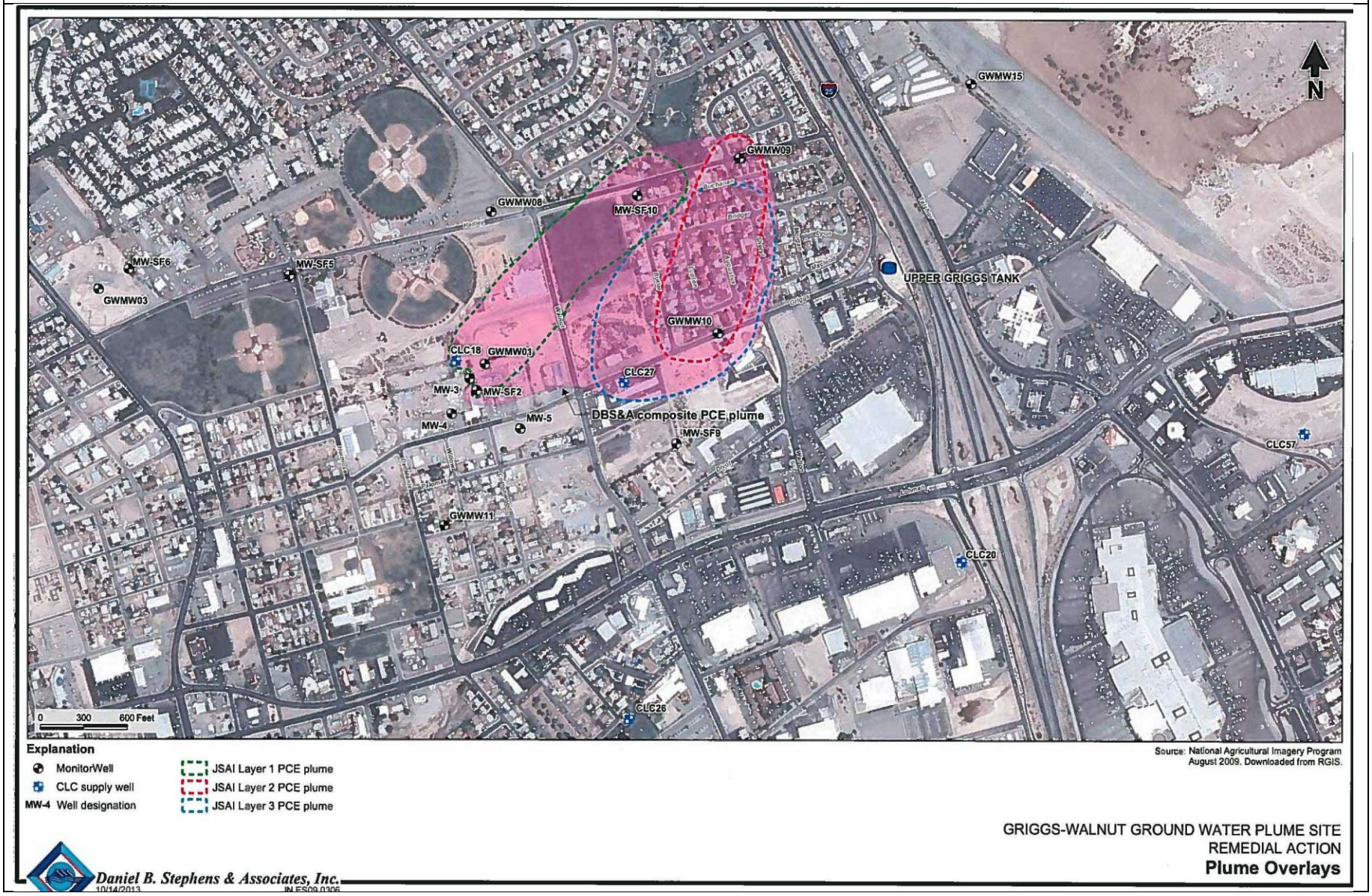


Figure 13 - PCE Contamination in Groundwater, 2014, (DBS&A, 2014)

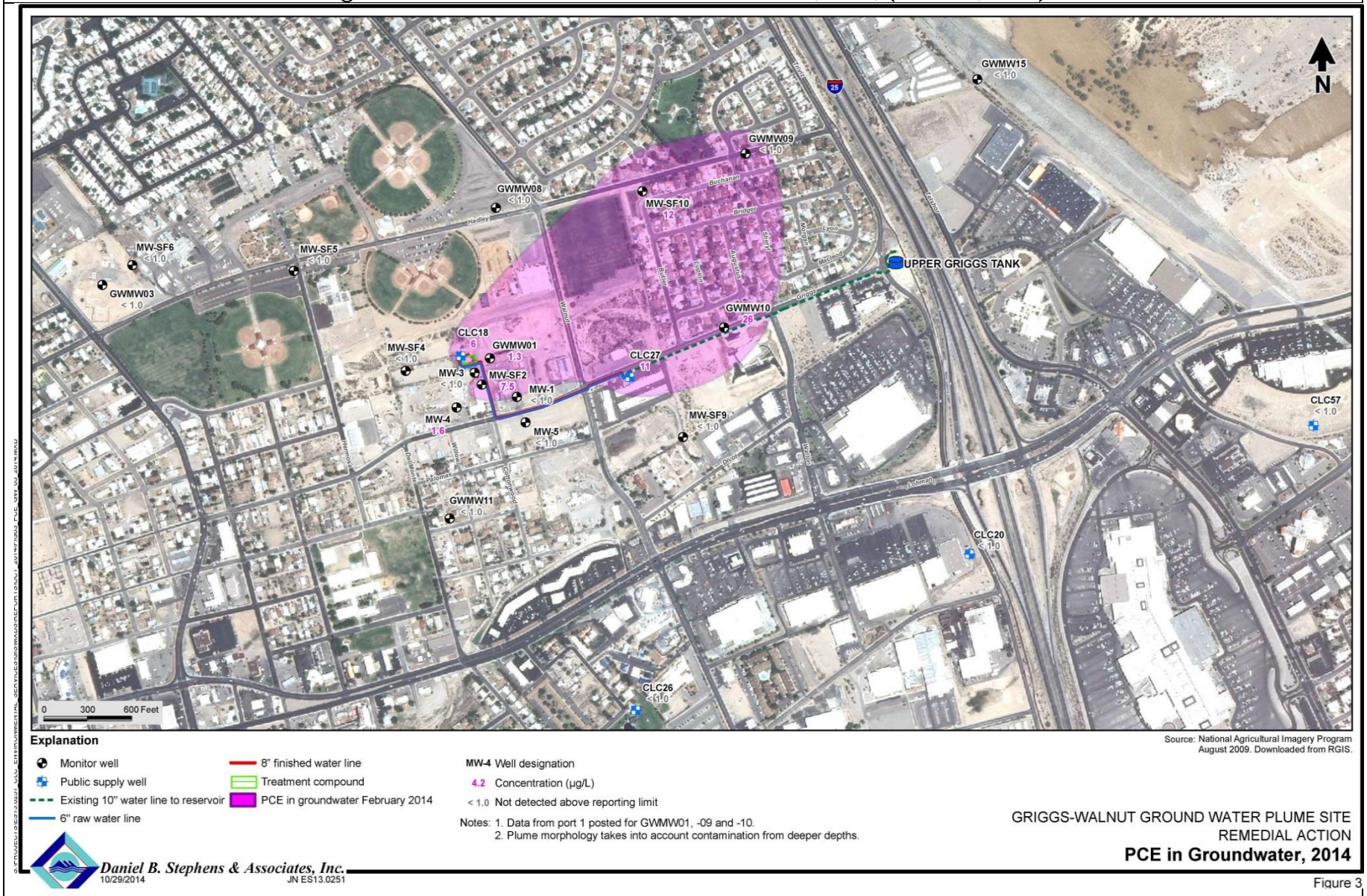
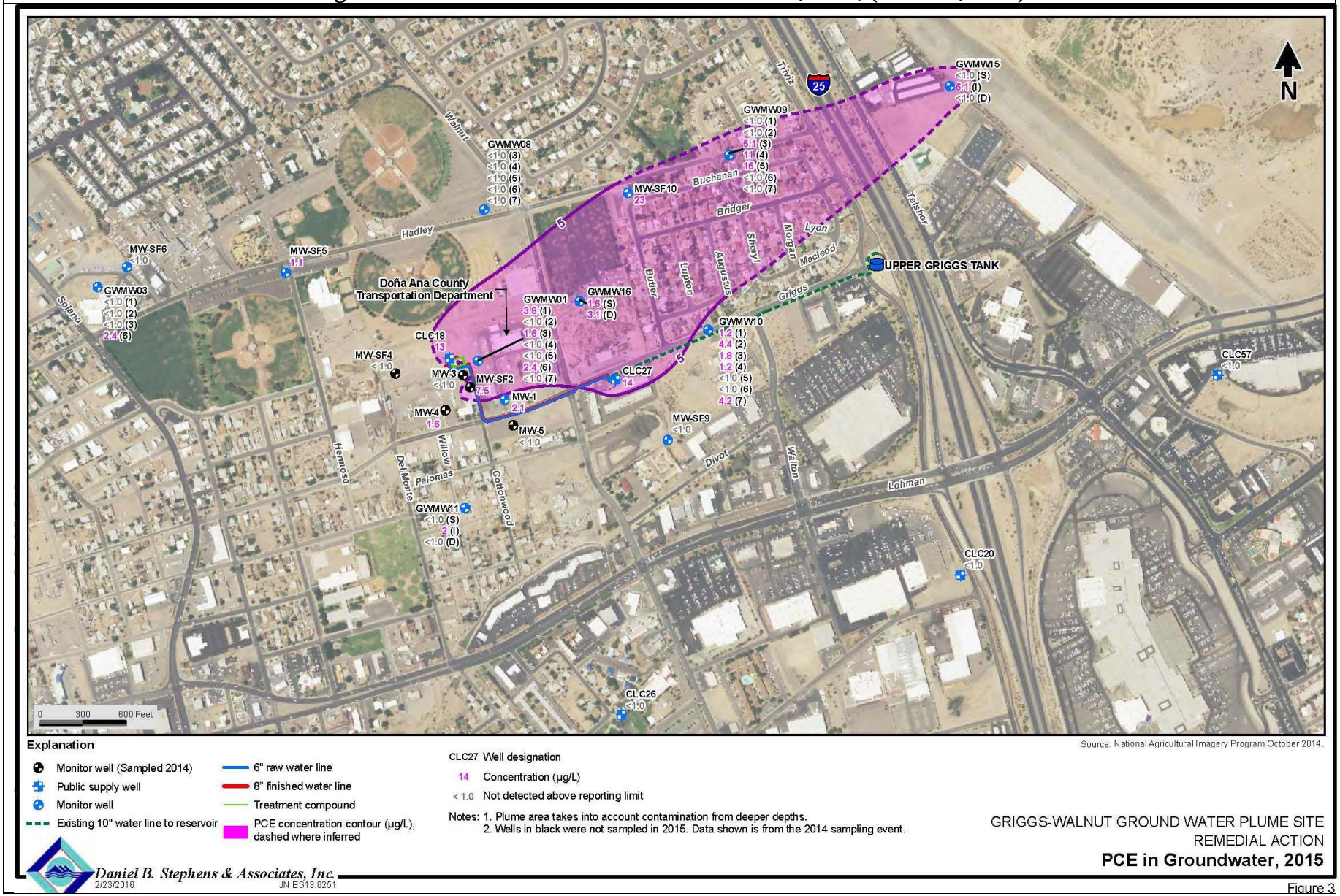


Figure 94 - PCE Contamination in Groundwater, 2015, (DBS&A, 2016)



Source: National Agricultural Imagery Program October 2014.

Explanation

- Monitor well (Sampled 2014)
- Public supply well
- Monitor well
- Existing 10" water line to reservoir
- 6" raw water line
- 8" finished water line
- Treatment compound
- PCE concentration contour (µg/L), dashed where inferred

CLC27 Well designation
14 Concentration (µg/L)
< 1.0 Not detected above reporting limit

Notes: 1. Plume area takes into account contamination from deeper depths.
2. Wells in black were not sampled in 2015. Data shown is from the 2014 sampling event.

GRIGGS-WALNUT GROUND WATER PLUME SITE
REMEDIAL ACTION
PCE in Groundwater, 2015

Daniel B. Stephens & Associates, Inc.
2/23/2016 JN ES13.0251

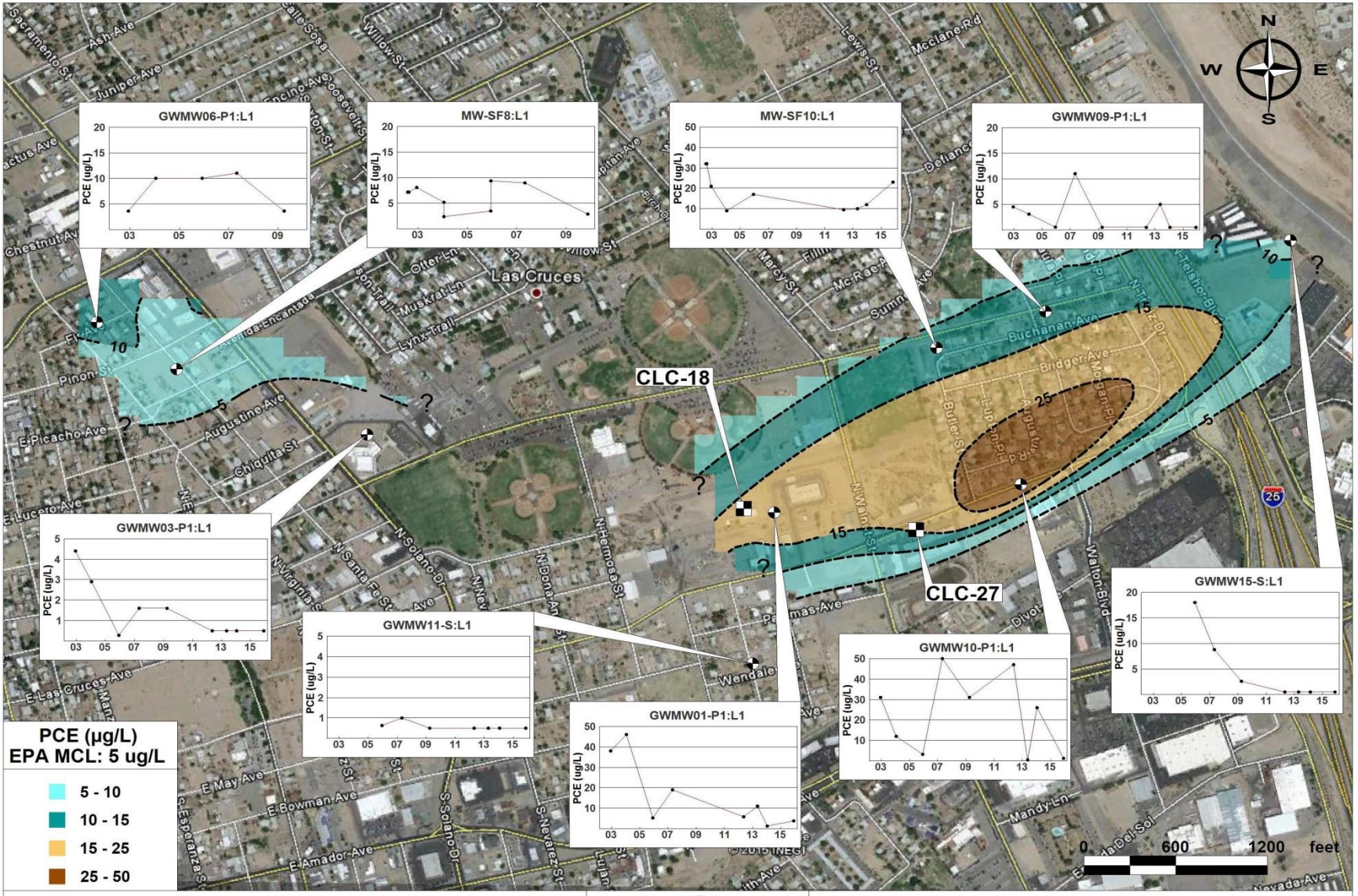
Figure 3

Figure 105 - PCE Contamination in Aquifer Layer 1, December 2002

PCE Isoconcentration Contour Map (December 2002)
and Time Series Plots (2002-2016)
Shallow Aquifer (Layer 1)

New Mexico Environment Department
Griggs & Walnut Plume Superfund Site
Las Cruces, Dona Ana County, New Mexico

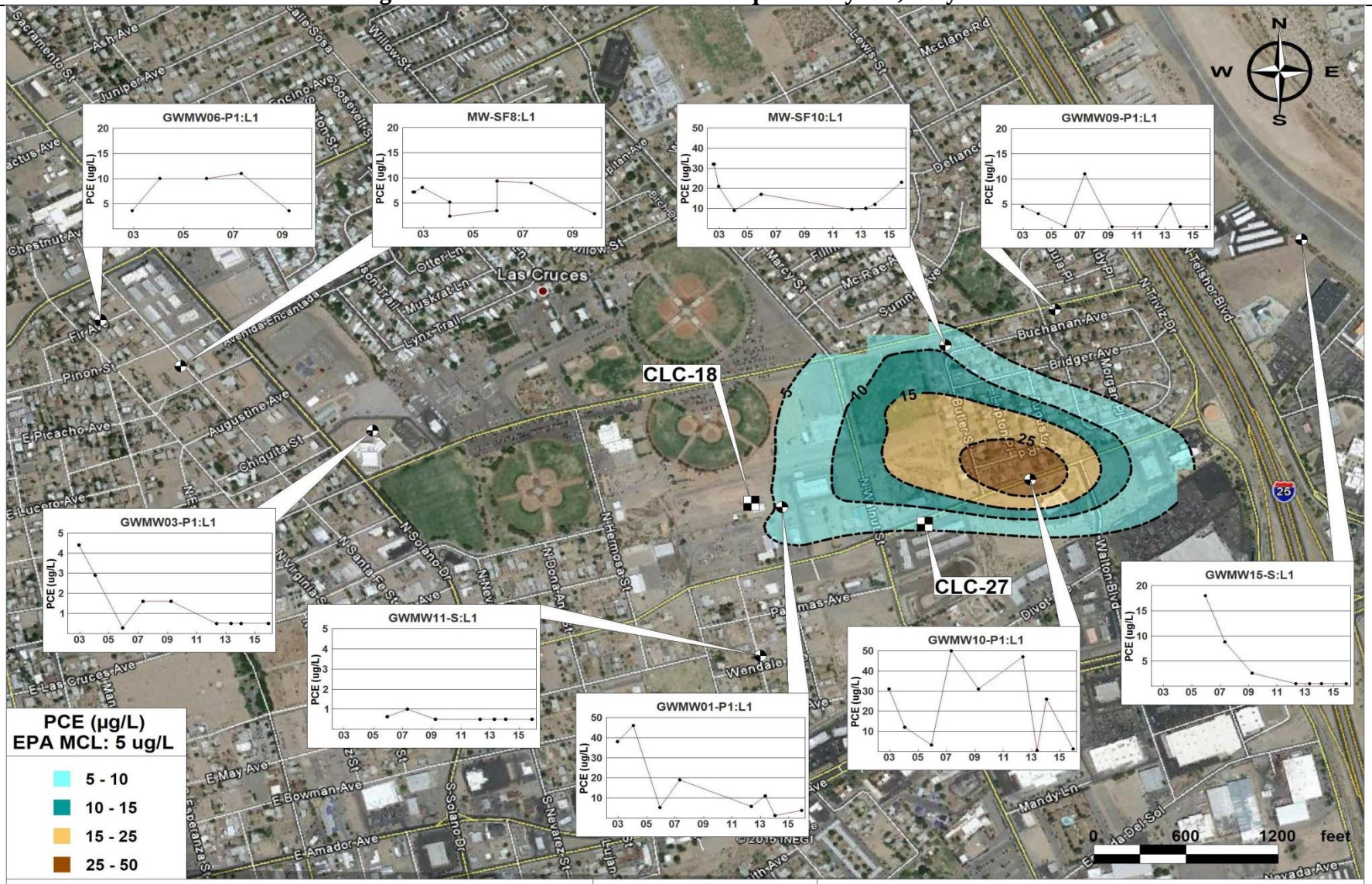
Figure 116 - PCE Contamination in Aquifer Layer 1, May 2007



PCE Isoconcentration Contour Map (May 2007)
and Time Series Plots (2002-2016)
Shallow Aquifer (Layer 1)

New Mexico Environment Department
Griggs & Walnut Plume Superfund Site
Las Cruces, Dona Ana County, New Mexico

Figure 12 - PCE Contamination in Aquifer Layer 1, May 2012



PCE Isoconcentration Contour Map (May 2012)
and Time Series Plots (2002-2016)
Shallow Aquifer (Layer 1)

New Mexico Environment Department
Griggs & Walnut Plume Superfund Site
Las Cruces, Dona Ana County, New Mexico

APPENDIX C – SITE CHRONOLOGY

Site Chronology

Date	Event
August 8, 1993	PCE was detected in CLC Well 21 and CLC Well 27 in samples collected by the NMED Drinking Water Bureau (DWB), the first sampling event performed under the Safe Drinking Water Act (SDWA) requirements which added PCE to the list of drinking water contaminants.
January 10, 1995	PCE was detected in CLC Well 18 in a sample collected by the NMED-DWB. This was the first detection of PCE in this well. The concentration of PCE was 32.0 µg/L.
September 26, 1996	CLC Well 18 was removed by the CLC from the municipal drinking water distribution system (mechanical difficulties were reported).
May – October 1997	The NMED Superfund Oversight Section (SOS) performed a Preliminary Assessment for the GWP site, and completed a PA Report in October 30, 1997. The PA report stated that PCE detected in groundwater at CLC Well 18 represented a risk to human health and the environment.
February 6, 1998	NMED-SOS performed a Focused Site Inspection (SI) for the Site, and prepared an SI work plan, dated February 6, 1998.
July 1999	NMED-SOS conducted a soil vapor survey at the DACTD maintenance facility as part of the Focused SI for the Site.
June 2000	NMED-SOS installed 10 monitoring wells in the vicinity of the GWP to determine the extent of contamination and to identify potential sources of contamination associated with the Site.
November 2000	EPA prepared the Hazard Ranking System (HRS) Scoring documentation for the Site under CERCLA.
January 11, 2001	The Site was proposed for inclusion on the Superfund National Priorities List (NPL).
June 14, 2001	The Site listing on the NPL was finalized.
September 2001	CLC Well 27 was removed from the drinking water supply distribution system due to increases in the PCE concentration (4.9 µg/L at that time).
April 29, 2002	EPA initiated the first mobilization to conduct field work for the GWP Remedial Investigation (RI) under CERCLA.
June 2002	CLC began pumping CLC Wells 18 and 27 to provide some measure of plume control with the goal of preventing further migration of PCE toward CLC Wells 19 and 21.
July 2002 – September 24, 2002	CLC submitted a blending plan to the NMED DWB for CLC Well 21 in July 2002. The blending plan was designed to maintain PCE concentrations in drinking water from the Upper Griggs Reservoir below drinking water standards. The NMED-DWB approved the final blending plan on September 24, 2002.
February 2003	Field work for the first mobilization of the RI was completed. Field activities included the collection of over 600 soil vapor samples, installation of 7 deep SVMPs, installation of 8 multi-port ground water monitoring wells, and collection of over 200 groundwater samples from new and existing monitoring wells.
October 2003	The NMED-DWB begins quarterly sampling of PCE-affected CLC drinking water supply wells.

Date	Event
November 2003	EPA issued the report entitled "*Identification of PCE Release Areas in the Vicinity of the Griggs and Walnut Ground Water Plume"* documenting the results of the first field mobilization.
April 2005	A settlement agreement between the EPA, CLC, and Doña Ana County (DAC) was signed. A Technical Activities Work Group was formed between the EPA, CLC, DAC, and NMED to provide a forum for stakeholder input into the RI/FS process for the Site.
July 21, 2005	The Technical Activities Work Group finalized the scope for the RI/FS at the Site.
October 17, 2005 – December 27, 2005	Field activities were conducted for the second mobilization of the RI. Field activities included the installation of two additional monitoring wells, installation of one additional deep SVMP, additional shallow subsurface soil vapor sampling to support the BHHRA, and groundwater sampling of new and existing monitoring wells.
August 2006	The "*Ground Water Flow and Transport Model*" for the GWP was completed and integrated into the Feasibility Study (FS) for the Site.
November 21, 2006	The "*Remedial Investigation Report*" and "*Feasibility Study Report*" were completed and released.
December 7, 2006	Public Meeting on the Proposed Plan for the Site. Public comment period on the Proposed Plan extended from December 4, 2006 through January 5, 2007.
June 18, 2007	The Record of Decision (ROD) was authorized on June 18, 2007, and outlined EPA's selected remediation strategy to address groundwater contamination at the Site.
October 14, 2009	EPA issued a Unilateral Administrative Order (UAO) for the Remedial Design (RD) to the Joint Superfund Project (JSP).
March 10, 2010	The "*Remedial Design Work Plan for Remediation of PCE Contamination*" was prepared by the JSP for submittal to the EPA.
July 7, 2010	The "*Preliminary Engineering Report for Remediation of PCE Contamination*" was prepared by the JSP for submittal to the NMED Construction Programs Bureau.
July 12, 2010	The *"Geotechnical Engineering Report"* was prepared for the JSP, and integrated into the RD for the Site.
October 5, 2010	The "*Strategy for Remediation of PCE Contamination*" report was prepared for the JSP, and integrated into the RD for the Site.
January 7, 2011	The *"Results of Back plugging and Testing Wells No. 18 and No. 27"* report was prepared for the JSP, and integrated into the RD for the Site.
March 3, 2011	The *"Sampling and Analysis Plan"* was prepared for the JSP, and integrated into the RD for the Site.
April 7, 2011	The *"Permitting Requirements and Compliance Plan"* was prepared for the JSP, and integrated into the RD for the Site.
May 17, 2011	EPA issued a Unilateral Administrative Order (UAO) and Statement of Work (SOW) for the Remedial Action (RA) to the JSP.
May 24, 2011	The *"Final Remedial Design Report"* was prepared for the JSP and released.
August 25, 2011	The "*Remedial Action Work Plan"* and associated documents required by the RA UAO-SOW were prepared by the JSP for submittal to the EPA.
September 2, 2011	Start of RA construction activities.
November 28, 2011	The "*Institutional Control Implementation and Assurance Plan"* and associated *"Appendix A: NMOSE Well Permitting Moratorium"* were prepared by the JSP for submittal to the EPA.

Date	Event
April 16, 2012	RA construction was completed, pre-final inspection was conducted, and shakedown operations began to evaluate the operational capacity of the remedial system.
April to May 2012	Baseline groundwater monitoring was conducted for pre-achievement operation & maintenance (O&M).
May 21, 2012	The *"Preliminary Close-out Report"* for the RA construction was signed by the EPA.
June 20, 2012	The EPA certified the remedy to be operational and functional.
August 14, 2012	The "*Interim Remedial Action Report", "Pre-Achievement Operations and Maintenance Plan"* and *"Post-Achievement Operations and Maintenance Plan"* as required by the RA UAO-SOW were prepared by the JSP for submittal to the EPA.
October 15, 2013	The "*2012-2013 System Operation and Remedial Action Progress"* report was prepared for the CLC Utilities Administrator and submitted to the EPA.
December 1, 2014	The "*2013-2014 System Operation and Remedial Action Progress"* report was prepared for the CLC Utilities Water Resources Administrator and submitted to the EPA.
April 8, 2016	The "*2014-2015 System Operation and Remedial Action Progress"* report was prepared for the CLC Utilities Water Resources Administrator and submitted to the EPA.
November 2011 – pending	EPA, DOJ, NMED, and JSP made revisions to the Consent Decree (CD) and Statement of Work (SOW) for the Remedial Design/Remedial Action (RD/RA) at the Site.

APPENDIX D – INTERVIEW RECORDS

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site	**EPA ID #: NMD0002271286**	
Subject: First Five-Year Review	**Time:**	**Date:**
Type: Visit **Location of Visit: Treatment Facility – Conference Room**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**
Name: Mr. Angelo Ortelli	**Title: Project Manager**	**Organization: NMED**

Individual Contacted:

Name: **Ms. Adrienne Widmer, P.E.**	**Title:** **Administrator**	**Organization:** **City of Las Cruces-Utilities**

Telephone No: (575) 528-3514 **Fax No:** **E-Mail Address: awidmer@las-cruces.org**	**Street Address:** 680 N. Motel Blvd Las Cruces, NM 88007

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)
The JSP has been successful in providing an air stripper system that is effectively removing PCE from the groundwater. The public appears to be pleased with the success when we have yearly open houses.

Question 2: Is the remedy functioning as expected? How well is the remedy performing?
The remedy is functioning as expected and is removing 100% of PCE.

Question 3: What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
Monitoring data showed that a modification to the operation of Well 18 was required. The operation of Well 18 was modified and since that time, the monitoring data shows that the amount of PCE that is being treated is consistent. Based on the annual report prepared by our Consultant, the plume size is decreasing.

Question 4: Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Yes, O&M personnel are on site daily and the remediation system is monitored 24 hours a day via a Supervisory Control And Data Acquisition (SCADA) program. Staff reviews the operation of the system on a daily basis and completes any maintenance that is required or scheduled.

Question 5: Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
There have been no significant changes beyond the change of the pumping regime for Well 18 which increased the effectiveness of the remedy by pulling PCE above the MCL for Well 18 instead of below the MCL.

Question 6: Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

The rate of replacement on the air stripper gaskets and some valves are more often than originally anticipated.

Question 7: Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The optimization of Well 18 to pump for 4 hours a day has improved the efficiency of the system but has lowered the revenue generated that helps pay for the operation and maintenance.

Question 8: Do you have any comments, suggestions, or recommendations regarding the project?

None at this time.

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site	**EPA ID #: NMD0002271286**	
Subject: First Five-Year Review	**Time:**	**Date:**
Type: Visit **Location of Visit: Treatment Facility - Conference Room**		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** **Remedial Project Manager**	**Organization:** **EPA Region 6**
Name: Mr. Angelo Ortelli	**Title: Project Manager**	**Organization: NMED**

Individual Contacted:

Name: **Mr. Pascual Rodriguez**	**Title:** **Facility Operator**	**Organization:** **City of Las Cruces-Utilities**

Telephone No: 528-3580 **Fax No:** **E-Mail Address: prodriguez@las-cruces.org**	**Street Address:** 680 N. Motel Blvd Las Cruces, NM 88007

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)
My overall impression of the project is that the facility is a success. Treated groundwater incorporated into WSS NM3511707 from CLC Production Wells 27 and 18 have consistently been in compliance for the removal of Tetrachloroethylene (PCE). The plan and layout of the facility is easy to understand and trace the entire process from beginning to end.

Question 2: Is the remedy functioning as expected? How well is the remedy performing?
Yes, the remedy is functioning as expected, final treatment to groundwater has produced non-detect concentrations of PCE since process was instituted in April 2012. The remedy is performing satisfactory because when sampled as processed water the sampling level show that the water is non-detectable or zero.

Question 3: What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
Monitoring from sampled raw water show levels of PCE when sampling at pump start up for CLC Production Wells 27 and 18. Contaminant trends and monitoring data is handled by a consultant.

Question 4: Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Yes, there is a continuous on-site OM presence. The facility is visited and monitored on a daily basis. Every 6 months, staff shuts down the facility to perform the semi-annual preventative maintenance. During the semi-annual preventative maintenance, staff checks the gallons per minute; inspect the raw water tank and pumps; inspect the blowers and strippers; calibrate the flow meter; inspect the finished product pumps; lube all pumps; inspect and calibrate the chlorine analyzer; replace air filters on the blowers; inspect inlet anti-scalant pumps; inspect sodium hypo-chlorine pumps; and inspect and calibrate the conductivity meter.

Question 5: Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
CLC Production Well 18 has been modified to run 4 hours a day to maximize the capture of PCE as recommended by John Shomaker and Associates, Inc.

Question 6: Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

Staff has had to replace the 2" check valves that are on top of the transfer pumps. These check valves wear out and are in need of replacement 3 times a year.

Question 7: Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Frequency of startup and shut down of CLC Production Wells 27 and 18 have been modified to increase PCE concentrations for treatment as recommended by the consultant.

Question 8: Do you have any comments, suggestions, or recommendations regarding the project?

None

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site		**EPA ID #: NMD0002271286**
Subject: First Five-Year Review	**Time: 0830**	**Date: 2/11/16**
Type: Email Correspondence **Location of Visit: NA**		
Contact Made By:		
Name: Mr. Mark Purcell	**Title: Remedial Project Manager**	**Organization: EPA Region 6**
Name: Mr. Angelo Ortelli	**Title: Project Manager**	**Organization: NMED**
Individual Contacted:		
Name: Ms. Kelly Isaacson	**Title: Staff Engineer**	**Organization: Daniel B. Stephens & Assoc.**
Telephone No: 505-822-9400 **Fax No: 505-822-8877** **E-Mail Address: kisaacson@dbstephens.com**		**Street Address: 6020 Academy NE Suite 100 Albuquerque, NM 87108**

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

The treatment system is operating as designed and the system is being well monitored and maintained. From 2012 to 2014, groundwater concentrations have been generally decreasing. The City's efforts to engage and inform the public have helped make this project successful.

Question 2: Is the remedy functioning as expected? How well is the remedy performing?

The remedy is functioning as expected. Finished water concentrations are consistently below detection limits. The remedy is performing well, mass removal rates have improved each year.

Question 3: What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

Since the optimization completed on CLC 18, the raw water concentrations from both extraction wells have been relatively steady (approximately a 20 ug/L variation over the course of the year). The PCE concentration data from groundwater monitoring show that the plume footprint is steady or decreasing since the remediation system has been online.

Question 4: Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Key operational parameters of the treatment system are tied into the City's SCADA system, which allows the City to monitor operation continuously. In addition, City staff is onsite several times a week to inspect the system, ensure process chemicals are being replenished as needed, monitor the disinfection system, and perform routine maintenance. The City staff has been very proactive about maintenance of pumps and the air strippers, resulting in very high operational time (only two days last year where the system was not running, both for scheduled maintenance).

Question 5: Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

There have been no major changes to the O&M requirements or maintenance schedules in the last five years. There have been no changes to the sampling routines of the process in the last five years. There have been minor changes in the groundwater monitoring due to development in the area that has paved over some monitoring wells and some monitoring wells becoming inaccessible. The loss of these wells does not affect the protectiveness or effectiveness of the remedy.

Question 6: Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

There was one O&M difficulty in the first year: the gaskets on the trays of the air strippers started to degrade about nine months into operation. They were replaced by the manufacturer under warranty. There have been no unexpected O&M difficulties or costs since the gasket replacement. All costs have been routine chemical and maintenance costs.

Question 7: Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

In 2013, a successful revised pumping strategy to target contaminated water near Well 18 and minimize extraction of clean water was implemented. The mass removal per gallon of water treated has continued to increase each year since the revised pumping strategy was implemented.

Question 8: Do you have any comments, suggestions, or recommendations regarding the project?

The system is operating as designed and is well maintained. We have no suggestions or recommendations at this time.

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site		**EPA ID #:** NMD0002271286
Subject: First Five-Year Review	**Time:** 5-6pm	**Date:** 2/3/2016
Type: Visit **Location of Visit:** Lobby of the Hampton Inn @ I-25		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6
Name: Mr. Angelo Ortelli	**Title:** Project Manager	**Organization:** NMED

Individual Contacted:

Name: Mr. Leo Clear Jr.	**Title:** Property Owner/Resident	**Organization:**

Telephone No: (575) 524-9615 **Fax No:** **E-Mail Address:** jrclear@gmail.com	**Street Address:** 450 Butler Street Las Cruces, NM 88001

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

It's an impressive remediation project.
A clear explanation of the remediation endgame has been accomplished.

Question 2: What effects have the site operations had on the surrounding community?

The fact that this is a Superfund Site, has raised some questions:

Why in my neighborhood?
How does this affect my neighborhood?

There was some trepidation to begin with. Outreach efforts have helped to alleviate this trepidation.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Construction activities affected traffic flow around the Griggs & Walnut intersection for a while, but beyond that - nothing specific.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None.

Question 5: Do you feel well informed about the Site's activities and progress?

At this point – yes. I've certainly learned much about the Site activities during the interview tonight.

I've been using the DAC – Griggs & Walnut Superfund webpage for information.

A community newsletter would also be a good forum for posting notices about Site.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Offer refreshments at the open houses.

Communication twice a year would be good (i.e. fact sheets, etc.).

Please include me on EPA's mailing list.

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site		**EPA ID #:** NMD0002271286
Subject: First Five-Year Review	**Time:** 10-11am	**Date:** 2/4/2016
Type: Visit **Location of Visit:** Lobby of the Hampton Inn @ I-25		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6
Name: Mr. Angelo Ortelli	**Title:** Project Manager	**Organization:** NMED

Individual Contacted:

Name: Mr. Gilbert Perez	**Title:** Property Owner/Resident	**Organization:**

Telephone No: (575) 524-3091 **Fax No:** **E-Mail Address:** gilma1005@zianet.com	**Street Address:** 185 N. Virginia Street Las Cruces, NM 88001

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

I'm satisfied with overall engineering approach for the project, and the length of time needed for remediation under a pump and treat remedy.

Question 2: What effects have the site operations had on the surrounding community?

There are no complaints from our community.

Although, I have some concerns about the aesthetics of my tap water:

There appears to be some rust/iron discoloration in the water. Also, the water has had an odd taste recently.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

No complaints or specific concerns.

The CLC and EPA were good about addressing community concerns during the RI process.

These parties have been very forthright.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None.

I trust emergency responders to handle any issues, as needed.

Question 5: Do you feel well informed about the Site's activities and progress?

Yes. The CLC has done a good job of informing the community. The CLC provides relevant information with the monthly water bills.

EPA also provided effective communication with the community during the RI activities.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Why wasn't contamination released/observed in an undeveloped lot south of the Griggs Avenue (near the Griggs-Walnut intersection) cleaned-up? I observed the City dumping waste there.

Soil vapor surveying was conducted (as part of the RI activities) around this area, but no soil removal actions were completed.

Please include me on EPA's mailing list.

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site	**EPA ID #:** NMD0002271286	
Subject: First Five-Year Review	**Time:** 11 am – 12 am	Date: 2/4/2016
Type: Visit Location of Visit: Lobby of the Hampton Inn @ I-25		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6
Name: Mr. Angelo Ortelli	**Title:** Project Manager	**Organization:** NMED:

Individual Contacted:

Name: Mr. Fernando Cadena	**Title:** Property Owner/Resident	**Organization:**

Telephone No: (575) 521-1426 **Fax No:** **E-Mail Address:** fcadena01@hotmail.com	**Street Address:** 2875 Long Bow Drive Las Cruces, NM 88011

Summary of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

Fantastic job overall. Although, I have a few questions:

Who's paying for the project and remediation efforts?

Answer: *The City of Las Cruces (CLC) and Doña Ana County paid for a portion of the Remedial Investigation and Feasibility Study (RI/FS). EPA contracted and paid for the rest of the RI/FS through the Record of Decision (ROD). Since the ROD, the CLC has contracted and paid for the Remedial Design, Remedial Action construction and the Operation and Maintenance (O&M).*

Why isn't the untreated/extracted water from CLC Wells 18 and 27 simply used for irrigation at the parks (i.e., as opposed to the expense of treatment)?

Answer: *As mentioned by the CLC in past public meetings, the beneficial use of the treatment water in the municipal supply system provides valuable revenue to the CLC Utilities.*

Question 2: What effects have the site operations had on the surrounding community?

Psychologically – none. It makes sense that the treated water is being used beneficially.

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

In the beginning of the project, there were some concerns, but not now.

The community is confident with the water quality reports provided by the CLC-Utilities office.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None.

Question 5: Do you feel well informed about the Site's activities and progress?

Yes. Since the remediation system has been working well – we're good.

I'm comfortable with the remediation progress and performance of the remedy to date.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

I'm concerned about PCE in the vadose zone. Are you going to clean up the vadose zone (soil gas) contamination? The pumping wells will likely remove this contamination near the wells, but what about over by the former National Guard Armory? We cannot expect to clean up the vadose zone contamination there with this remedy.

Answer: *Soil vapor surveying was conducted under the RI/FS to identify potential PCE release areas. However, no soil removal actions were completed. This First Five-Year Review Report recommends sampling exterior soil gas in the PCE release area as well as sub-slab (below foundation) soil gas and/or indoor air in residences located at the intersection of North Walnut Street and East Hadley Avenue to assess the potential indoor air vapor intrusion pathway.*

I'm also concerned about the existing asbestos-cement pipelines that are shown on a Project Facilities map (from the JSP's Preliminary Engineering Report) as part of the water conveyance infrastructure between the water treatment system and the Upper Griggs Reservoir near I-25. The orthophosphate anti-scaling additive used in the pre-treatment process may cause chemical alteration/chelating effects in the water that could potentially affect the inner-lining of the asbestos-cement water conveyance pipeline.

Has this ever been evaluated? Are we analyzing for asbestos in the finished water? Also, acidic water may leach asbestos from the pipeline if we do not have typical scaling of the inner wall of the pipe. Is the pH adjusted at the water treatment plant? What is the pH of the finished water?

Answer: *With regards to the asbestos concern in the water conveyance pipeline, the final RD specifies the use of new PVC conveyance pipelines between the extraction wells and the treatment system, but does not describe the composition of the existing pipelines to the reservoir. The CLC-Utilities office would need to address this concern. EPA has notified Ms. Adrienne Widmer, Administrator, CLC-Utilities, of your concern regarding the asbestos pipeline.*

INTERVIEW RECORD

Site Name: Griggs & Walnut Ground Water Plume Superfund Site		**EPA ID #:** NMD0002271286
Subject: First Five-Year Review	**Time:** 1-2pm	**Date:** 2/4/2016
Type: Visit **Location of Visit:** Lobby of the Hampton Inn @ I-25		

Contact Made By:

Name: Mr. Mark Purcell	**Title:** Remedial Project Manager	**Organization:** EPA Region 6
Name: Mr. Angelo Ortelli	**Title:** Project Manager	**Organization:** NMED

Individual Contacted:

Name: Ms. Hui-Chun Johnson and Mr. David Johnson	**Title:** Property Owners/Residents	**Organization:**

Telephone No: (575) 524-4622 **Fax No:** **E-Mail Address:** nmsunnyliving@gmail.com	**Street Address:** P.O. Box 1162 Mesilla, NM 88046

Summary Of Conversation

Question 1: What is your overall impression of the project? (general sentiment)

Overall, good job. The remediation system seems to be working well.

There's just not enough publicity on positive progress and successful outcomes.

Question 2: What effects have the site operations had on the surrounding community?

The fact that this is a Superfund Site has raised some concerns over impacts to property values (i.e. stigma associated with Superfund sites, etc.).

Question 3: Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

None.

Question 4: Are you aware of any complaints, incidents or activities at the Site such as vandalism, trespassing, or emergency response from local authorities? If so, please provide details.

None.

Question 5: Do you feel well informed about the Site's activities and progress?

At this stage, annual meetings are sufficient.

Any project news and updates on monthly water bills are a good way to communicate progress.

We've attended open houses on the project in the past. An open house forum (versus more formal public meetings) seems to be a better way to communicate news about remedial progress at the Site. The opportunity to have one-on-one discussions with EPA at least once a year is good.

Question 6: Do you have any comments, questions, or recommendations regarding the Site's management or operation?

Good job done by all parties. Good progress and public interaction on the project overall.

Please include us on EPA's mailing list. The news will be shared with other realtors in the area.

APPENDIX E – SITE INSPECTION CHECKLIST

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: Griggs & Walnut Ground Water Plume Superfund Site	**Date of inspection:** February 3, 2016
Location and Region: Las Cruces, New Mexico EPA Region 6	**EPA ID:** NMD0002271286
Agency, office, or company leading the five-year review: New Mexico Environment Department (NMED)	**Weather/temperature:** Clear, sunny, temperature 45-50° F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ■ Institutional controls
- ■ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ■ Inspection team roster attached ■ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Adrienne Widmer, P.E. (Name) Administrator (Title) 2/3/2016 (Date)
   Interviewed: ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ■ Report attached
   _____
   _____

2. **O&M staff** Pascual Rodriquez (Name) Operations Manager (Title) 2/3/2016 (Date)
   Interviewed: ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ■ Report attached
   _____
   _____

3. **RD/RA consultant** Kelly Isaacson, P.E. (Name) Design Engineer (Title) _____ (Date)
   Interviewed: ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ■ Report attached
   _____
   _____

4. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____
Name Title Date Phone no.
Problems, suggestions; ☐ Report attached
_____
_____

Agency _____
Contact _____ _____ _____
Name Title Date Phone no.
Problems, suggestions; ☐ Report attached
_____
_____

Agency _____
Contact _____ _____ _____
Name Title Date Phone no.
Problems, suggestions; ☐ Report attached
_____
_____

Agency _____
Contact _____ _____ _____
Name Title Date Phone no.
Problems, suggestions; ☐ Report attached
_____
_____

5. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ■ O&M manual — ☐ Readily available — ■ Up to date — ☐ N/A
   - ■ As-built drawings — ☐ Readily available — ■ Up to date — ☐ N/A
   - ■ Maintenance logs — ☐ Readily available — ■ Up to date — ☐ N/A

   Remarks: O&M Documents are available in the treatment building meeting room.

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: SHASP was not available onsite during the inspection, but is available at the CLC Utilities office; a copy of the SHASP should be kept onsite at all times.

3. **O&M and OSHA Training Records** ■ Readily available ☐ Up to date ☐ N/A

   Remarks: OSHA training records accompany the SHASP which was not available onsite during the inspection, but is available at the CLC Utilities office.

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks_____

7. **Groundwater Monitoring Records** ☐ Readily available ■ Up to date ☐ N/A

   Remarks: Ground water monitoring data are available at the JSP's FTP database portal

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks_____

9. **Discharge Compliance Records**
   - ■ Air — ☐ Readily available — ■ Up to date — ☐ N/A
   - ■ Water (effluent) — ☐ Readily available — ■ Up to date — ☐ N/A

   Remarks: CLC staff sample untreated and treated water, and air emissions on a monthly basis.

10. **Daily Access/Security Logs** ☐ Readily available ■ Up to date ☐ N/A

    Remarks: Access at the treatment building is tracked via sign-in sheets and logbook entries.

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
■ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
■ Other: CLC staff manage and conduct all O&M and ground water sampling activities.

2. **O&M Cost Records**

☐ Readily available ■ Up to date
■ Funding mechanism/agreement in place: Consent Decree (near-final)
Original O&M cost estimate: _____

Total annual cost by year for review period if available

From	9/2/2011 Date	To	6/30/2012 Date	$1,803,861 Total cost (RA Const. Bid – 7/5/2011)	☐ Breakdown attached
From	7/1/2012 Date	To	6/30/2013 Date	$92,738 Total cost	■ Breakdown attached
From	7/1/2013 Date	To	6/30/2014 Date	$126,256 Total cost	■ Breakdown attached
From	7/1/2014 Date	To	6/30/2015 Date	$174,305 Total cost	■ Breakdown attached
From	7/1/2015 Date	To	1/30/2016 Date	$105,778 Total cost	■ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons:
RA construction activities were conducted from 9/2/2011 through 4/16/2012. Approximately $ 142,250 was expended for installation and development of two new single-stage monitoring wells (GWMW-16S and GWMW-16D) in August 2015.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ■ N/A

Remarks: Intruder alarms at the front door of the treatment building are SCADA monitored.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ■ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ■ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): Site inspections
Frequency: Annual
Responsible party/agency: Joint Superfund Project (JSP)

Contact: Adrienne Widmer, P.E. (Name) Administrator (Title) 2/3/2016 (Date)

Reporting is up-to-date ☐Yes ☐ No ■ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ■ N/A

Specific requirements in deed or decision documents have been met ■Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ■ No ☐ N/A
Other problems or suggestions: ☐ Report attached

_____

_____

2. **Adequacy** ■ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: NMOSE – State Engineer Order – Well drilling moratorium in-place.

_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident

Remarks_____

_____

2. **Land use changes on site** ■ N/A

Remarks_____

_____

3. **Land use changes off site** ■ N/A

Remarks_____

_____

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A

Remarks_____

_____

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☐ Applicable ■ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ■ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ■ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
■ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks: CLC Well 18 pumps at approximately 170 gpm (4 hrs./day)
and CLC Well 27 pumps at approximately 160 gpm (24 hrs./day)

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
■ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ■ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: A spare set of air stripper trays are available to rotate into either air stripper during routine 6-month maintenance intervals.

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ■ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks: _____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

C. Treatment System ■ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
■ Air stripping ☐ Carbon adsorbers
■ Filters: Air filters are inspected every 6 months and replaced as needed.
■ Additive (*e.g.*, chelation agent, flocculent): anti-scaling orthophosphate
☐ Others_____
☐ Good condition ☐ Needs Maintenance
■ Sampling ports properly marked and functional
■ Sampling/maintenance log displayed and up to date
■ Equipment properly identified
■ Quantity of groundwater treated annually: 110 million gallons/year (approx.)
☐ Quantity of surface water treated annually_____
Remarks_____
_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks: SCADA controls all system parameters
_____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance

Remarks: Quarterly inspections (10/2015, 1/2016, 4/2016, and 8/2016)

4. **Discharge Structure and Appurtenances**

☐ N/A ■ Good condition ☐ Needs Maintenance

Remarks: Upper Griggs Reservoir – 3 million-gallon storage capacity

5. **Treatment Building(s)**

☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair

■ Chemicals and equipment properly stored

Remarks: Secondary containment in-place for chlorine (disinfectant) and orthophosphate (anti-scalant – MCT-4120); MSDS available for chemicals stored on-site.

6. **Monitoring Wells** (pump and treatment remedy)

■ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ■ Needs Maintenance ☐ N/A

Remarks: Monitoring wells have been sampled annually since the start of operations of the remedial system. However, the wells should be sampled semi-annually as required by the EPA-approved Sampling and Analysis Plan. It is also noted that for the first year of operation, the wells were to be sampled quarterly. Several wells within the monitoring well network have collapsed or have been lost and, therefore, cannot be sampled.

D. Monitoring Data

1. Monitoring Data

☐ Is routinely submitted on time ☐ Is of acceptable quality

Remarks: In accordance with the EPA-approved Remedial Action Sampling and Analysis Plan, ground water sampling was to be performed quarterly for the first year of operation of the remedy and semi-annually thereafter, with reports submitted after sampling. This required frequency of monitoring was not performed.

Most of the ground water monitoring data are of acceptable quality. However, the purging and sampling procedures conducted at the multi-port monitoring wells have not followed the manufacturer's guidelines. This may affect the analytical results.

2. **Monitoring data suggests:**
☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

Remarks: It is not known whether the ground water plume is effectively contained because there has been an inadequate amount of ground water chemistry and water level data collected to verify the City of Las Cruces assessment of hydraulic capture by the pumping wells.

Contaminant concentrations have declined in some monitoring wells. However, certain monitoring wells have shown an increase in the concentrations since the start of the remedial system. The concentration of PCE entering the treatment system from the extraction wells (CLC Well 18 and CLC Well 20 had declined from 35 µg/L to 4.4 µg/L from 2012 – 2014. However, an assessment of the well hydraulics at CLC Well 18 indicated that it was extracting a significant amount of water with low PCE concentrations from the deeper portion of the aquifer, which had diluted the PCE concentrations of the untreated water entering the treatment system. An adjustment of the pumping rate at Well 18 resulted in the PCE concentration increasing significantly at that well.

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A

Remarks_____
_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The extraction and treatment component of the remedy appears to be effective and functioning as designed. More than 40 pounds of PCE have been removed from the extracted ground water and over 430 million gallons of ground water have been extracted from the PCE plume since operational startup.

However, it is not known whether the PCE ground water plume is effectively contained or if the reduction of PCE concentrations to below the cleanup standard within the plume is progressing as intended. An insufficient amount of ground water data has been collected to adequately assess the degree of hydraulic containment of the plume and PCE levels have increased in some wells since the start-up of the remedy.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Routine O&M of mechanical equipment (including pumps, compressors, blowers, and valves) is conducted at a 6-month frequency, and demonstrates that the water treatment system is properly maintained and is adequate for reducing PCE levels to below the federal drinking water standard. Therefore, the treated water that is returned to the municipal water supply distribution system at the Upper Griggs Reservoir meets drinking water standards.

The performance of the Ground Water Monitoring Program, as part of O&M, has not been adequate. As discussed above, the frequency of ground water monitoring and reporting was not consistent with the requirements of the EPA-approved Remedial Action Sampling and Analysis Plan. Additionally, several monitoring wells have collapsed or been lost and, therefore, cannot be sampled. The adequate implementation of this monitoring program is necessary to assess the long-term protectiveness of the remedy.

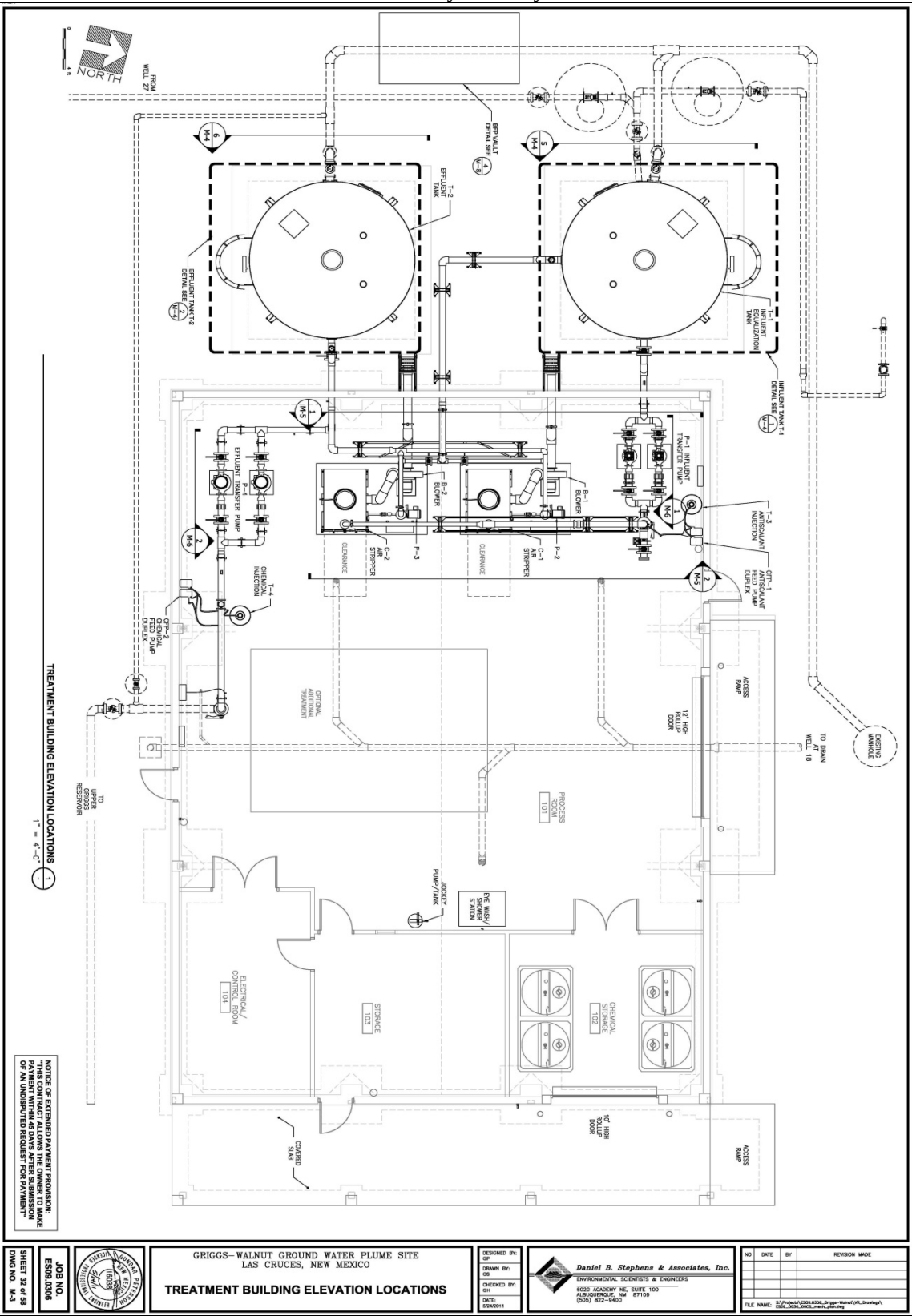
C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No early indicators of potential remedy problems were identified for the water treatment system or the two ground water extraction wells (CLC wells 18 and 27). The ground water maps provided by the JSP which depict the degree of hydraulic capture of the PCE plume show that the plume in the Upper Hydrogeologic Zone is partially outside of the cone of capture (cone of depression) at CLC Well 18. The JSP have reported that the portion of this plume is actually being captured at CLC Well 27, along with the entire plume in the Lower Hydrogeologic Zone. However, the maps provided by the JSP do not support such interpretation due to a lack of data. Additionally, PCE concentrations have increased in some wells since the start of the remedial system.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. All CLC wells will be monitored on the SCADA system in the future; twelve wells are currently on-line. Any issues noted during sampling of single-stage monitoring wells and FLUTe multi-port wells are detailed in the Annual Monitoring Reports. Ground water sampling is being conducted under an SOP adopted from the RI; however, the FLUTe multi-port wells were sampled after a single-purge cycle. The FLUTe manufacturer recommends at least 2-3 purge cycles for representative groundwater sampling. _____

GRIGGS AND WALNUT GROUNDWATER PLUME NPL SITE
1ST FIVE-YEAR REVIEW
FEBUARY 3, 2016 SITE INSPECTION

SIGN-IN SHEET

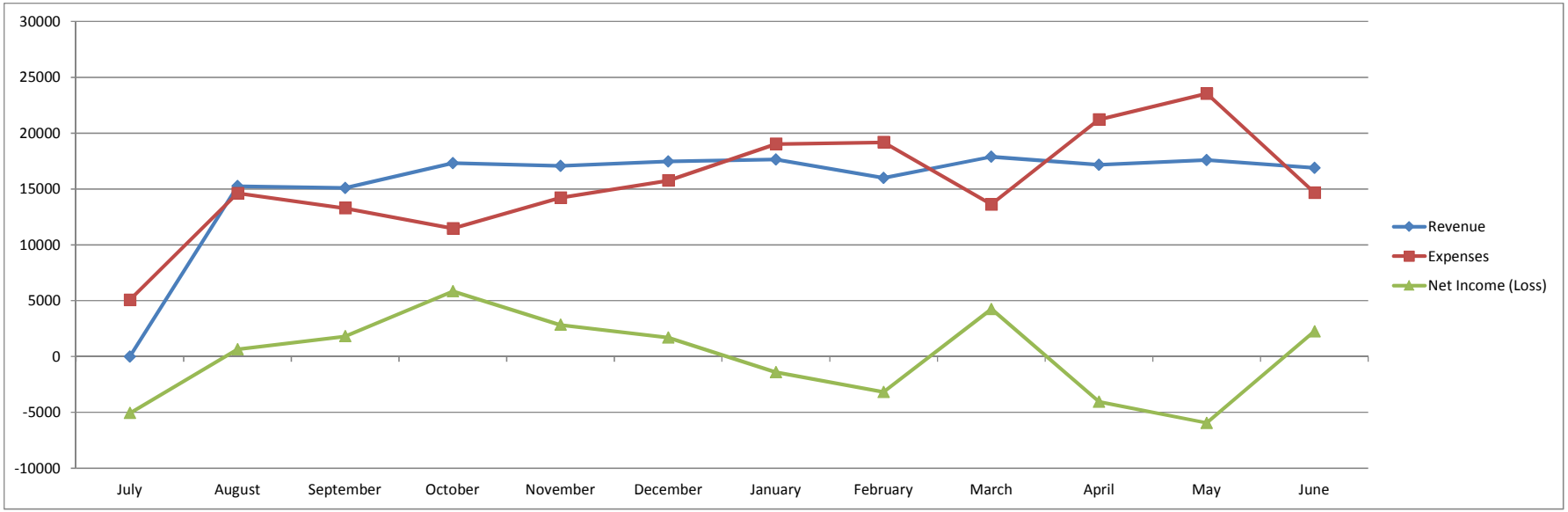
	NAME / DEPARTMENT	CONTACT INFO
1.	Adrienne Widmer / Las Cruces Utilities	awidmer@las-cruces.org 575-528-3514
2.	Carol Clark / Las Cruces Utilities	cclarke@las-cruces.org 528-3548
3.	~~DAVE MEDRANO BAC LCCOM (NOT PARTICIPATING/OBSERVING ONLY)~~	575 525 5523
4.	JORGE A. GARCIA, LCU	jogarcia@las-cruces.org (575) 528-3572
5.	Joshua Rosenblatt, LCO	jrosenblatt@las-cruces.org 575-528-3704
6.	Pascual Rodriguez, LCU	prodriguez@las-cruces.org 575-528-3580
7.	Angelo Ortelli, NMED	angelo.ortelli@state.nm.us 505/827-2866
8.	PAUL GAMBOA, CLU	pgamboa@las-cruces.org (575) 202 8033
9.	~~JACOB CABRALES~~ CLU	JCabrales@las-cruces.org (573) 635-1259
10.	Balduino Sepulveda CLU	bsepulveda@las-cruces.org 575-805-9602
11.	Robin Zielinski LCSUN-News	rzielinski@lcsun-news.com
12.	Laura Montoya CLC/RES/WQL	lamontoya@lascruces.org
13.	Luis Guerra Utilities-RES/TS-WQL	lguerra@las-cruces.org

Treatment System Layout



Griggs Walnut Plume
Fiscal Year 2013
YTD June 30, 2013

	July	August	September	October	November	December	January	February	March	April	May	June
REVENUES	$ -	$ 15,257.16	$ 15,092.36	$ 17,314.18	$ 17,067.41	$ 17,463.32	$ 17,636.03	$ 16,004.44	$ 17,879.22	$ 17,166.44	$ 17,601.17	$ 16,901.19
EXPENSES	$ 5,063.58	$ 14,617.85	$ 13,282.50	$ 11,475.50	$ 14,229.74	$ 15,755.43	$ 19,029.02	$ 19,181.20	$ 13,621.29	$ 21,212.32	$ 23,541.82	$ 14,658.87
NET INCOME (LOSS)	$ (5,063.58)	$ 639.31	$ 1,809.86	$ 5,838.68	$ 2,837.68	$ 1,707.89	$ (1,392.99)	$ (3,176.76)	$ 4,257.93	$ (4,045.88)	$ (5,940.65)	$ 2,242.32



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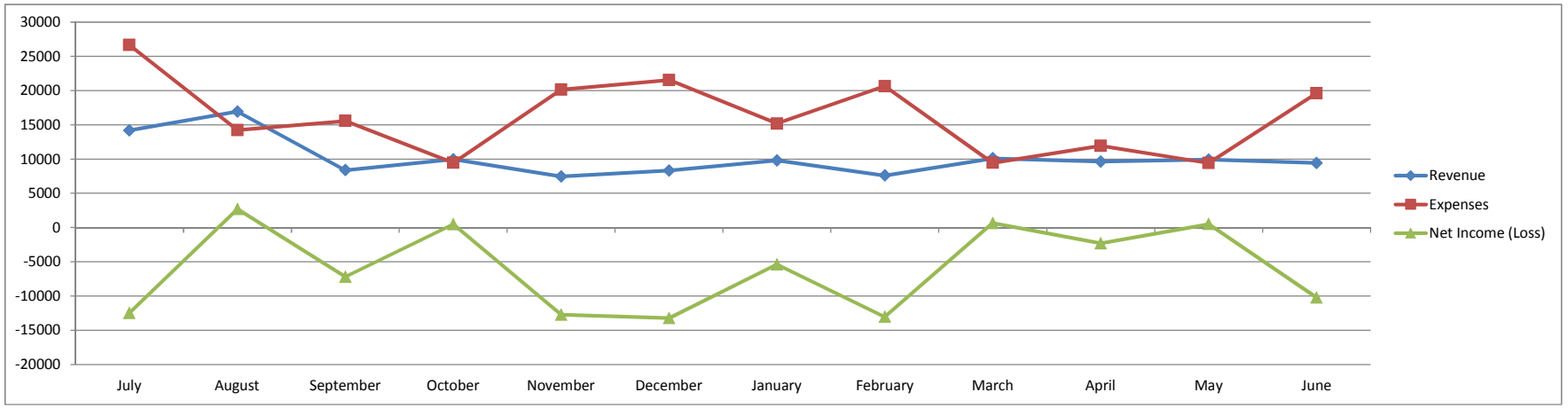
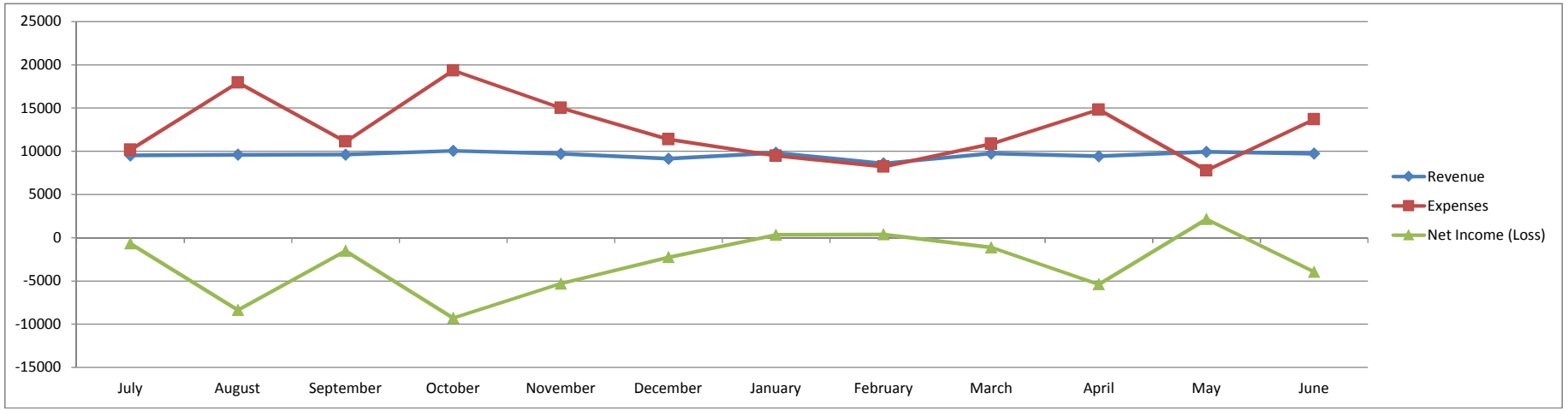
Griggs Walnut Plume
Fiscal Year 2014
YTD June 30, 2014

	July	August	September	October	November	December	January	February	March	April	May	June
REVENUES	$ 14,215.66	$ 16,947.82	$ 8,401.47	$ 9,979.30	$ 7,464.42	$ 8,349.11	$ 9,822.12	$ 7,621.65	$ 10,122.13	$ 9,657.94	$ 9,953.00	$ 9,443.64
EXPENSES	$ 26,662.29	$ 14,236.48	$ 15,579.97	$ 9,467.48	$ 20,152.53	$ 21,566.20	$ 15,178.58	$ 20,636.13	$ 9,464.60	$ 11,932.33	$ 9,428.53	$ 19,631.64
NET INCOME (LOSS)	$ (12,446.63)	$ 2,711.34	$ (7,178.50)	$ 511.82	$ (12,688.11)	$ (13,217.09)	$ (5,356.46)	$ (13,014.48)	$ 657.53	$ (2,274.39)	$ 524.47	$ (10,188.00)



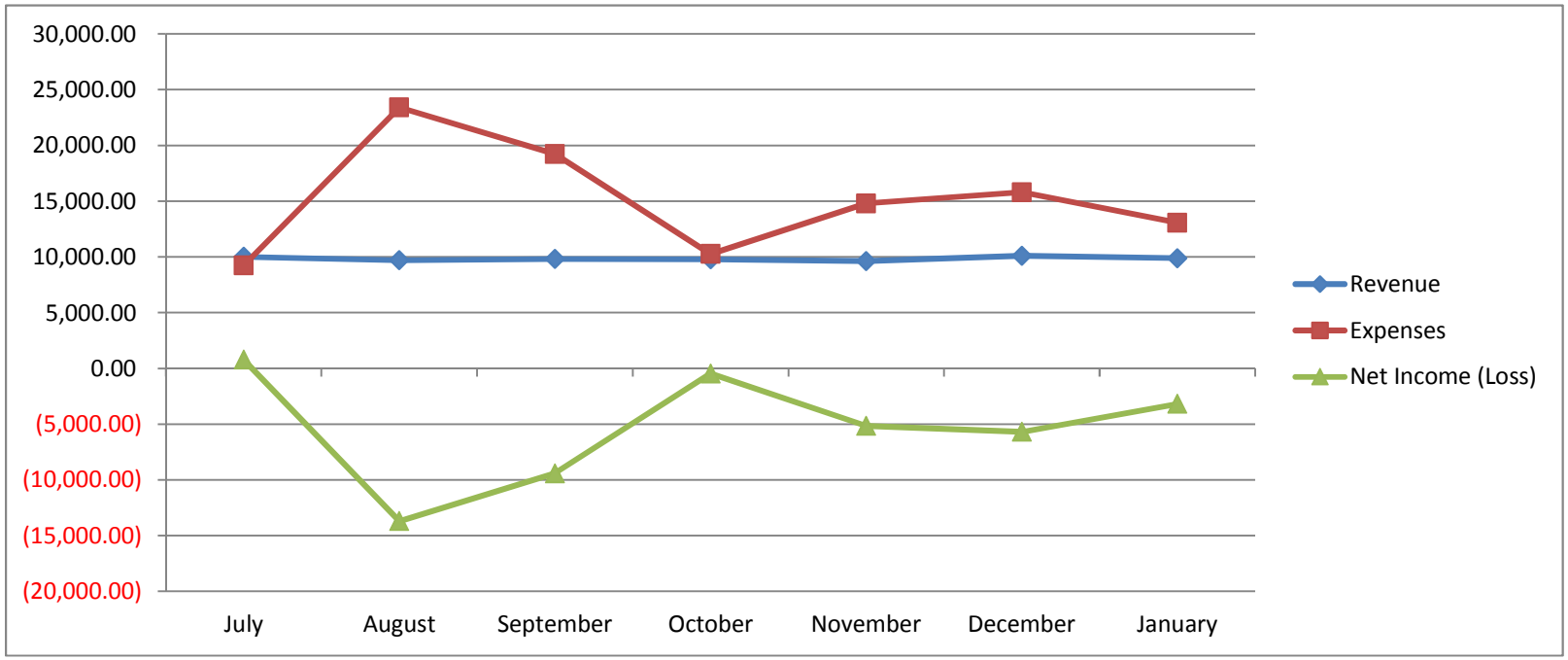
Griggs Walnut Plume
Fiscal Year 2015
YTD June 30, 2015

	July	August	September	October	November	December	January	February	March	April	May	June
REVENUES	$ 9,516.51	$ 9,601.67	$ 9,617.41	$ 10,065.26	$ 9,710.90	$ 9,138.04	$ 9,826.70	$ 8,607.93	$ 9,749.41	$ 9,440.12	$ 9,940.75	$ 9,737.08
EXPENSES	$ 10,179.00	$ 17,961.88	$ 11,132.31	$ 19,356.06	$ 15,025.54	$ 11,391.71	$ 9,491.39	$ 8,229.50	$ 10,878.43	$ 14,830.44	$ 7,785.07	$ 13,689.88
NET INCOME (LOSS)	$ (662.49)	$ (8,360.21)	$ (1,514.90)	$ (9,290.80)	$ (5,314.64)	$ (2,253.67)	$ 335.31	$ 378.43	$ (1,129.02)	$ (5,390.32)	$ 2,155.68	$ (3,952.80)



Griggs Walnut Plume
Fiscal Year 2016
YTD January 31, 2016

	July	August	September	October	November	December	January
REVENUES	$ 10,009.55	$ 9,692.88	$ 9,809.89	$ 9,790.49	$ 9,615.18	$ 10,089.89	$ 9,886.68
EXPENSES	$ 9,236.40	$ 23,402.87	$ 19,229.75	$ 10,255.45	$ 14,791.76	$ 15,794.47	$ 13,067.00
NET INCOME (LOSS)	$ 773.15	$ (13,709.99)	$ (9,419.86)	$ (464.96)	$ (5,176.58)	$ (5,704.58)	$ (3,180.32)



Griggs & Walnut Superfund Site, First FYR - Site Inspection Photographs

Mr. Mark Purcell (EPA-RPM), Ms. Adrienne Widmer (CLC-Utilities Administrator), and CLC-Utilities Facility Operators, discuss the remedial system operations in the main room next to the two parallel stacked-tray air strippers (South view).

Close-up view of a QED Environmental Systems single stacked-tray air stripper and control panel, with water transfer pump and air blower that forces air through the stacked trays of untreated/raw water in the air stripper to remove VOCs (West view).

Griggs & Walnut Superfund Site, First FYR - Site Inspection Photographs

Water treatment facility process control panel inside the treatment system control room (East view).

Close-up view of the water treatment facility process control panel and operator interface terminal (South view).

Griggs & Walnut Superfund Site, First FYR - Site Inspection Photographs

LCD monitors at the operator interface terminal indicate the water levels in the two 28,000-gallon equalization tanks (extracted/raw water and treated/finished water) (South view).

Mr. Mark Purcell (EPA-RPM), Ms. Adrienne Widmer (CLC-Utilities Administrator), and CLC-Utilities Facility Operators, discuss the remedial system operations next to the two 28,000-gallon equalization tanks on the west side of the treatment system building (South view).

Griggs & Walnut Superfund Site, First FYR - Site Inspection Photographs

CLC Well 27 and well house enclosure located west of Walnut Street on the south side of East Griggs Avenue (East view).

Close-up view of the water discharge flow meter at CLC Well 27 indicating an extraction rate of approximately 162 gallons per minute (West view).