Five-Year Review Report

First Five-Year Review Report

For

Modesto Groundwater Contamination Superfund Site

Modesto, California

September 2008

PREPARED BY:

United States Environmental Protection Agency
Region 9
San Francisco, California

Approved by: Kathleen Salyer **Date:** 9/30/08

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
EPA	Environmental Protection Agency
ft	feet/foot
FYR	five-year review
GAC	granular activated carbon
gpm	gallons per minute
GWT	groundwater extraction and treatment
HHRA	Human Health Risk Assessment
IC	institutional control
IROD	Interim Record of Decision
MCL	maximum contaminant level
MRL	minimal risk level
MWH	Montgomery Watson Harza
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PCE	tetrachloroethylene
ppbv	parts per billion by volume
RAO	remedial action objective
RSL	regional screening level
ROD	Record of Decision
SI	site investigation
SVE	soil vapor extraction
TBC	to be considered
µg/L	micrograms per liter
USACE	United States Army Corps of Engineers
VI	vapor intrusion
VOC	volatile organic compound

Executive Summary

The U.S. Environmental Protection Agency, Region 9 has conducted the first five-year review (FYR) of the Modesto Groundwater Contamination Superfund Site (the "Modesto Site" or the "Site") in the City of Modesto, Stanislaus County, California. The purpose of this review is to determine whether the interim remedial actions implemented at the Site are operating as intended and are protective of human health and the environment. The triggering action for this review was the initiation of field activities associated with the interim soil and groundwater remedial actions in 2000.

An interim remedy for the site was selected in 1997 and included soil vapor extraction and groundwater extraction and treatment for containment of the source area, primarily tetrachloroethylene (PCE), from contaminated soil and groundwater. A final remedy has not been selected for the Site. The final remedy will address the groundwater dissolved-phase plume, the soil contamination, and soil vapor intrusion.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Interim Record of Decision (IROD). However, the remedy is not protective of human heath due to recent information about vapor intrusion of PCE into two businesses near the source area. With respect to groundwater, EPA finds that the operating groundwater remedy is protective of human health and the environment in the short term. While the downgradient edge of the plume has not been fully characterized or contained, there are no known complete receptor pathways (i.e., no drinking water wells within or downgradient of the plume).

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Modesto Groundwater Contamination Superfund Site

EPA ID *(from WasteLAN)*: CERCLIS ID #: CAD981997752

Region: 9	**State: CA**	**City/County: Modesto/Stanislaus**

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete

Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:**

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Holly Hadlock

Author title: Remedial Project Manager	**Author affiliation:** USEPA Region 9

Review period: November 2007 to September 2008

Date(s) of site inspection: February 27-28, 2008

Type of review: ☒ **Statutory** ☐ **Policy:**
☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☒ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering action:
☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____
☐ Construction Completion ☐ Previous Five-Year Review Report
☒ Other (specify) Actual interim RA onsite construction start

Triggering action date *(from WasteLAN)*: March 2000

Due date *(five years after triggering action date)*: March 2005

* OU refers to operable unit

Five-Year Review Summary Form, cont'd.

Issues:

#1 Vapor Intrusion: Recent indoor air concentrations of PCE within two businesses, at and nearby the PCE source area, exceeded EPA's risk range for long-term industrial exposure.

#2 High soil/soil vapor PCE: Asymptotically low SVE mass extraction rates by the treatment system, coupled with discovery of high soil/soil vapor PCE concentrations next to and under Halford's Cleaners building indicate that the current configuration of the SVE system is not optimal.

#3 Migration prevention: Although the objective for the IROD was source control, the IROD also expected that one groundwater extraction well would achieve the required capture zone to prevent the migration of the dissolved plume. Analysis of the extraction system indicates that the current extraction well, although pumping at the rate called for in the IROD, is not capable of the dissolved plume control. The extent of the dissolved plume is still under investigation.

Recommendations and Follow-up Actions:

#1 & #2: Install the new vapor extraction wells recommended in the SVE Optimization Report and continue the indoor air sampling program after the new SVE system is in place. The two new vapor extraction wells are expected to reduce exposure to vapor infiltrating through the slab floor and reduce remaining vadose zone contaminant mass. If necessary, take additional actions to address indoor air through ventilation or other mechanisms.

#3: Complete the dissolved plume investigation, evaluate the need for expansion of the interim remedy, and select final remedy for the site.

Protectiveness Statement(s):

The interim remedy at the Modesto Groundwater Superfund Site is not protective of human health and the environment due to the vapor intrusion of PCE into two businesses near the source. The operating groundwater portion of the remedy is protective of human health and the environment in the short term because there are currently no known complete receptor pathways (i.e., no drinking water wells within or downgradient of the plume). In order to be protective in the long-term, a final remedy for the Site must be selected to address the dissolved phase plume.

Other Comments:

No other comments

Modesto Groundwater Contamination Superfund Site
Modesto, Stanislaus County, California
First Five-Year Review Report

I. Introduction

This is the first five-year review (FYR) report of remedial actions for the Modesto Groundwater Contamination Superfund Site located in Modesto, Stanislaus County, California. Interim remedial actions implemented in 2000 based on the Interim Record of Decision (IROD) of 1997 were the triggering action for this review.

The purpose of an FYR report is to determine whether the remedy at a Superfund site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in the FYR reports. In addition, FYR reports identify issues found during the review and identify recommendations to address those issues.

The United States Environmental Protection Agency (EPA) is preparing this FYR report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c) states:

> *If the President Selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such a review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

The purpose and focus of FYRs are further defined in EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P (EPA, 2001).

EPA Region 9 has conducted a review of the interim remedial actions implemented at the Modesto Groundwater Contamination Superfund Site ("the "Modesto Site" or "the Site"), located at 941 McHenry Avenue between West Fairmont and Griswold Avenues in Modesto, California. This review was conducted by the U.S. Army Corps of Engineers (USACE), on behalf of EPA, between November 2007 and September 2008. The Seattle District USACE project delivery team (PDT) prepared this FYR through an Interagency Agreement between EPA Headquarters and USACE.

EPA guidance states that FYRs are to be conducted within five years of the start of an implemented remedy. This statutory review is required because the interim remedial actions for soil and groundwater were post-Superfund Amendments Reauthorization Act actions that left hazardous substances on site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

The following table details the major milestones or notable events for the Modesto Site:

Table 1 – Chronology of Site Events

Event	Date
Modesto Municipal Well 11 found to be contaminated with PCE > State maximum contaminant level (MCL) level of 5 micrograms per liter (µg/L) and shut off	Sep 1984
Numerous investigations of soil, groundwater, and sanitary sewer line sludge between Municipal Well 11 and Halford's Cleaners (1,000 feet to the southeast), culminating in RWQCB soil gas study confirming Halford's Cleaners as Municipal Well 11 PCE source	Apr 1985 – Apr 1990
Modesto Site placed on National Priorities List	Mar 1989
EPA issues order to PRP for treatment of contaminated soil	Sep 1990
Removal Action by Halford's Cleaners consisting of limited soil vapor extraction (SVE) system; EPA later deemed this system inadequate and replaced it with larger system	Feb 1991
Granular activated carbon system installed by the City to treat PCE at well head; Municipal Well 11 turned back on	May-Jun 1991
Remedial Investigation conducted in 3 phases at Site by EPA	1991-Dec 1996
Municipal Well 11 permanently deactivated due to presence of naturally occurring uranium >MCL	Oct 1995
Feasibility Study completed	Mar 1997
Proposed Plan released to public	Jul 1997
Baseline Human Health Risk Assessment completed	Jul 1997

Event	Date
Interim Record of Decision specifying soil vapor extraction and groundwater extraction, with air stripping and/or carbon adsorption as methods for treatment	Sep 1997
Soil Vapor Extraction (SVE) and Treatment system installed	May 2000
Groundwater Extraction and Treatment (GWT) system installed	Jun 2000
SVE and GWT systems shake-down period complete; operation begins full-time	early 2001
Interim (SVE and GWT) Remedial Action Report completed	Apr 2001
Quarterly groundwater and soil vapor monitoring, and SVE and GWT system operation and monitoring conducted	Jul 2001-current
Remediation System Evaluation Report completed	December 2001
After many operational difficulties (i.e., inferred screen failure, well siltation, pump failure), GWT extraction well EW-1 permanently shut off	Nov 2004
Current SVE system PCE removal reached asymptotically low level (0.2 lbs/day)	Jan 2005
GWT replacement extraction well EW-1R installation complete and operational	Jun 2006
Supplemental Site Investigation	Jan 2007
SVE system optimization and enhancement recommendations report	Oct 2007

III. Background

The City of Modesto is located approximately 80 miles southeast of Sacramento, California in Stanislaus County. The Modesto Site is located approximately 1.5 miles north of downtown on McHenry Avenue between West Fairmont Avenue and Griswold Avenue in the vicinity of Halford's Cleaners (941 McHenry), a commercial dry cleaning business (Figure 1). The site encompasses both the source area and the area affected by the dissolved-phase contaminant plume as discussed later in this section.

Physical Characteristics

Site topography is flat and ground surface elevation is about 90 feet above mean sea level. The Site and its immediate surroundings are within an older and highly developed portion of Modesto. Nearly all the land surface above the contaminant source area is paved or covered by buildings.

Sediments beneath the Site are composed of San Joaquin River channel and floodplain deposits, and alluvial fan deposits from the Sierra Nevada Mountains which define the northeastern boundary of the San Joaquin Valley. These sediments generally consist of

interbedded sands, silts, sand-silt mixtures, and clays; these beds are usually less than ten feet thick (EPA, IROD, 1997).

Land and Resource Use

McHenry Avenue is a busy thoroughfare with a range of commercial businesses, including two motels and a senior assisted living facility between the 800-900 blocks. The areas on either side of McHenry are residential. This entire portion of Modesto is on public water supply; there are no known active private or commercial wells for consumptive groundwater use.

History of Contamination

Contamination at the Site was originally discovered in 1984 during routine sampling of Modesto municipal water supply wells. PCE associated with the Modesto Site was first detected in Municipal Well 11 (Well 11), at the corner of Magnolia and Mensinger Avenues (Figure 1, inset). Analytical results indicated a PCE concentration of 16.7 micrograms per liter (µg/L) in Well 11 water, exceeding the Federal and State maximum contaminant level (MCL) for drinking water of 5 µg/L. PCE is an industrial solvent commonly used in dry cleaning and subsequent investigations determined the PCE at Well 11 originated from Halford's Cleaners, located approximately 1,100 feet southeast of Well 11.

Initial Response

To protect the public drinking water supply, Well 11 was taken out of service by the City in 1984 as soon as PCE above the MCL of 5 µg/L was detected in the well. In 1987 PCE and other volatile organic compounds (VOCs) were not detected in groundwater samples so Well 11 was reactivated. In February 1989 Well 11 was again taken out of service after PCE again exceeded the MCL. The well remained out of service until the City installed a wellhead granular activated carbon (GAC) treatment system in May 1991. The GAC system effectively reduced the PCE concentration to below the MCL prior to the water entering the public supply system. Municipal Well 11 was returned to service in June 1991 and operated until October 1995, when the City indefinitely deactivated it because naturally occurring uranium was detected above its MCL of 20 Pico Curies per liter (MWH Americas, Inc., 2007). The uranium in some Central Valley California soils is naturally occurring and is believed to be derived from alluvial deposition of eroded uranium-containing Sierra Nevada igneous rocks.

The Modesto Site was placed on EPA's National Priorities List (NPL) on March 31, 1989. In December 1989, EPA collected soil and soil vapor samples in the vicinity of Halford's Cleaners to further characterize site contamination.

IV. Remedial Actions

Remedy Selection

In September 1997 EPA issued an interim ROD instead of a final ROD due to uncertainties over whether the groundwater cleanup standards could be met throughout the plume. The interim remedial actions selected in the IROD were soil vapor extraction (SVE) and treatment, and groundwater extraction and treatment (GWT) for removal and treatment of chlorinated VOCs, primarily PCE, from affected media.

Remedial Action Objectives

The overall objective of the interim remedial action, as stated in the IROD, is "to eliminate and contain the highest contaminant levels at the source (source control) and to prevent potential exposure of human or environmental receptors to PCE or other organic compounds (e.g., toluene) released to the soil and groundwater."

The IROD listed the following remedial action objectives (RAOs):

1) Eliminate and contain the highest contaminant levels at the source (source control),
2) Prevent exposure to contaminated groundwater, above acceptable risk levels, to protect human health and the environment,
3) Minimize the impact of interim cleanup measures to the community,
4) Collect data to determine if Federal and State requirements can be met throughout the aquifer, and
5) Delineate more clearly the downgradient edges of the plume and prevent its further migration.

In addition, the IROD stated that the "operation of the extraction well will draw groundwater in the most contaminated, source-area portions of the plume to the well, thus inhibiting downgradient migration of those source area contaminants."

The IROD further explained that the final RAOs for the aquifer will be determined in the final ROD, which would be written after the interim remedy is in place and the extent of the downgradient plume is determined.

Remedy Implementation

Installation of the SVE and GWT systems were completed on May 16 and June 12, 2000, respectively. The SVE and GWT systems operated intermittently between May and October 2000 due to technical operating issues that required frequent operator attention. MWH Americas, Inc. (MWH) has since been contracted by the USACE Sacramento District office to operate, maintain, monitor, and report on the progress of the remedial systems. The SVE system has run on a continual basis since late 2000, except for minor periods of maintenance or testing. The GWT system ran from late 2000 to November 2004 with only minor downtime due to maintenance. The GWT system was not operational between November 2004 and June 2006 because the

original extraction well was inoperable due to mechanical problems and well integrity issues. A new well was constructed and the GWT system has again run with minimal downtime due to periodic maintenance since June 2006.

The GWT system uses an air stripper and a granular activated carbon filter to capture the VOCs and an ion exchange unit with resin to capture the uranium. The SVE system uses a granular activated carbon filter to capture the VOCs.

In 1997 EPA installed six additional monitoring wells to delineate the vertical and horizontal extent of the dissolved plume (MW-10 through MW-15). These wells are screened, in general, between 69 and 100 feet. Quarterly sampling of these wells started in 1998. In 2007, EPA continued its investigation of the extent of the dissolved plume by drilling 14 borings, collecting grab groundwater samples at various depths and performing a CPT scan further downgradient from the source area. Based on the findings of this investigation, EPA will install additional downgradient monitoring wells by the end of 2008.

System Operations, Maintenance, and Monitoring

Table 2 shows the O&M costs for both the groundwater and SVE treatment systems. These costs include routine monitoring and operational costs, discharge permit fees, system performance monitoring, and contractor management and reporting costs. Also included are extraction well replacement evaluation and installation costs. Costs from 2002-2003 were highest due to work conducted pursuant to a Remediation System Evaluation conducted jointly by EPA and USACE. Costs were lower from 2005 to 2006 as a result of the extraction well being shut off. Costs also dropped after sample analysis shifted from private labs to the EPA Region 9 Lab.

Table 2 - Annual System Operation and Maintenance Costs

O&M Period	Total SVE & Groundwater Cost	Average Monthly Cost
Oct '00 - Sep '01	$509,100	$42,425
Oct '01 - Sep '02	$626,900	$52,242
Oct '02 - Sep '03	$709,000	$59,083
Oct '03 - Sep '04	$637,900	$53,158
Oct '04 - Sep '05	$518,100	$43,175
Oct '05 - Sep '06	$301,659	$25,138

V. Progress Since the Last Five-Year Review

This is the first five-year review for the Site.

VI. Five-Year Review Process

Administrative Components

The team lead for the Modesto Site FYR was Holly Hadlock, the EPA Remedial Project Manager (RPM), Region 9. Cynthia Wetmore, Superfund Technical Support, and Laurie Williams, Office of Regional Counsel assisted with the review. Sheri Moore, Jefferey Powers, and Marlowe Laubach with the USACE, Seattle District, assisted with the review. By November 2007, the review team had been formed, and had established the review schedule and its major components including:

- Document Collection and Review
- Data Assessment/Analysis
- Site Inspection
- Interviews and Community Notification and Involvement
- Five-Year Review Report Development and Review

Community Notification and Involvement

A public notice was published in the Modesto newspaper, *Modesto Bee,* on July 30, 2008 and in two Spanish-language newspapers, *Mundo Hispano* and *Vida En El Valle,* July 28, 2008 and July 30, 2008, respectively. The notices informed the public of EPA's intent to conduct a five-year review of the Site and identified where the results of the review would be available.

In addition, the USACE Seattle District developed a mailing list of residences and businesses potentially affected by the Site. After the FYR report is released, EPA will produce and distribute a fact sheet describing the Site, the report, and its findings.

Document Review

The review team reviewed reports and a data compilation summary pertinent to this FYR. The types of documents reviewed included investigation and feasibility study reports, decision documents, risk assessments, remedial action reports, operation, maintenance and monitoring data reports, replacement extraction well data, raw analytical data, the SVE optimization report, informational fact sheets, and other supporting materials. Attachment 1 is a complete list of documents reviewed during this FYR.

Data Review and Evaluation

In order to evaluate if the groundwater and soil interim remedies are operating as intended, all groundwater and soil vapor data available from 2000 to 2007 were reviewed. Additionally, GWT and SVE system operational and performance data were reviewed and evaluated for the same time period.

Groundwater Hydraulic Data

When Modesto Municipal Supply Well 11 was in operation, the hydraulic gradient direction was to the northwest, toward the well. The radius of influence exerted by Well 11 extended to the Modesto Site. Since October 1995, Well 11 has been out of service due to natural levels of uranium above drinking water limits. Since that time, the hydraulic gradient direction has nearly reversed, and is now toward the south/southeast. The current gradient direction is approximately 150 degrees out of phase with that of the Well 11-influenced direction. Note that other Modesto municipal wells currently operating in the vicinity of the Site continue to affect the Site's hydraulic gradient; therefore the Site's natural gradient uninfluenced by municipal wells cannot be determined.

Currently there are 11 municipal wells within a one-mile radius of the Site (City of Modesto Well Map, June 2008). Two of the 11 wells have no contaminants, five have contamination below drinking water standards, and four wells are currently out of service due to various contaminants. (Municipal Well 11 has been abandoned and is no longer part of the City's monitoring network, so is not included in the well count). The primary contaminants in these wells are radionuclides. The two closest downgradient municipal wells (based on the current gradient direction) do not have detectable levels of PCE.

The last potentiometric map constructed by the remedial contractor and reviewed for this evaluation was for May 2006 (See Attachment 2, Figure 1). The horizontal groundwater gradient at that time was 0.0018 ft/ft to the south-southeast. The gradient appears to be consistent with previously measured gradient conditions. Slight mounding of groundwater is observed near the operating SVE well.

Influence of Precipitation on Groundwater

Modesto precipitation data was compared against well-water elevation data to evaluate seasonal trends in aquifer recharge. Modesto experiences a Mediterranean-type climate, with dry summers and somewhat wet winters. Yearly precipitation averages 12.39 inches; 85 percent of which falls in the six months of October to March. Precipitation overall since 2000 has been near average, with the years 2002, 2003 and 2004 slightly below average, and 2000, 2001, 2005 and 2006 slightly above average. The first eight months of 2007 experienced below average precipitation (see Attachment 2, Figure 5 for yearly Modesto precipitation data). It is evident there is a direct relationship between precipitation and aquifer recharge as determined by groundwater elevations measured in the Site monitoring wells. There exists about a five-month lag between the month of maximum precipitation (Dec) and the month of maximum groundwater elevation (May). Water elevations were lower in 2003 and 2004 during the below-average precipitation years compared to the

above-average years of 2005 and 2006. Additionally, extraction of groundwater by Modesto municipal wells still in operation near the Site, presumably extracting larger quantities in summer, likely affects local water elevations to some degree.

Groundwater Analytical Data

Analytical groundwater data were reviewed for all on-site wells from which data were collected during the period of review. The wells for which data were evaluated are: monitoring wells MW-1 through MW-15 for the entire review period, extraction well EW-1 until its closure in November 2004, and replacement extraction well EW-1R since it became operational in Aug 2006. The groundwater analytical data were divided into two parts, that of the source area and that of the dissolved-phase PCE plume. This distinction is made to separately address the RAOs concerning source control and the larger-scale, dissolved-phase groundwater contaminant plume. See Table 3 for a summary of Site groundwater monitoring and extraction wells.

Source Area: The source area is defined as the area of highest soil and soil gas PCE concentrations behind Halford's Cleaners and west-southwest of the back of the cleaners prior to soil vapor extraction implementation. This combined source area is roughly defined in Figure 2. It includes soil contaminated from Halford's operations and soil contaminated from Halford's lateral sewer line connection.

PCE trends at source area wells MW-3, MW-5, MW-8, EW-1 up to November 2004, and EW-1R since August 2006, all decreased over the entire period of review (see Attachment 2, Figure 2). During the time when no groundwater extraction occurred, PCE at well MW-3 showed a statistically significant increasing trend (at the 90 percent confidence interval using Mann-Kendall non-parametric test for trend) while PCE at MW-5 and MW-8 declined slightly. This information suggests that the source area continued to contribute dissolved-phase PCE to groundwater. Since well EW-1R began operation, however, all source well PCE concentrations have dropped indicating adequate groundwater control within the source area.

Dissolved-Phase Plume: Although the interim remedy was designed for source control, data was collected from wells in the dissolved plume. Overall, PCE was present above 5 µg/L at seven of 12 wells not considered source area wells. These seven wells are: MW-2, MW-4, MW-6, MW-10, MW-12, MW-13, and MW-14 (Figure 2). From 2000 to 2007, PCE concentrations have been gradually increasing downgradient of the source area, in some instances even after EW-1R began operation. Although nearly two years without groundwater extraction likely caused increases in downgradient PCE concentrations, this suggests the wells monitoring the downgradient dissolved-phase plume outside of the source area are beyond the zone of capture for EW-1R. Not surprisingly, the wells with the lowest PCE concentrations are located either hydraulically upgradient (to the north of the source area), or just downgradient of the source but beneath an aquitard that has impeded groundwater flow from the upper aquifer (MW-9).

Of the wells monitoring the dissolved-phase plume, currently MW-4 has the highest PCE concentration at 2,200 µg/l. MW-4 is approximately 250 feet downgradient from the source

area. PCE at well MW-4 appeared to be stable or slightly decreasing while EW-1 was in operation. Since pumping stopped at EW-1, MW-4 concentrations have increased, from 800 µg/L to 2,000 µg/L, even after start up of EW-1R in Aug 2006. From 2001 to 2005 PCE concentrations at MW-10 increased from 91 µg/L to 910 µg/L; since then they have decreased to 300 µg/L. These changes in concentration at MW-4 and MW-10 indicate that the dissolved-phase contaminant plume is being transported by groundwater downgradient from the source and is not being completely captured by EW-1R. However, EW-1R is currently operating as intended and the IROD is continuing to be implemented, with the on-going groundwater investigation underway.

For other downgradient and partially downgradient wells, trends are slightly downward at MW-6 and slightly upward at MW-12, MW-13, and MW-14. However, none of these trends are statistically significant at the 90 percent confidence interval and no definitive conclusions may be drawn from them.

PCE concentrations at upgradient wells MW-1, MW-2, MW-7, MW-11, and MW-15 are much lower than at other wells, averaging 7.4 µg/L (Figure 2). The trends generally have been slightly decreasing at these locations although they are not statistically significant.

Grab groundwater samples collected in 2007 indicate that the distribution of PCE contamination in groundwater is not well defined south of the Site along the groundwater gradient. The furthermost groundwater grab sample, collected approximately 600 feet downgradient of MW-10, contained PCE at levels slightly above MCLs in the shallow groundwater but at 150 µg/L in the deepest grab sample (121 feet depth).

The only deep monitoring well is MW-9, which is partially isolated from the shallow PCE source by an aquitard. The vertical distance between the top of the MW-9 well screen and the base of the EW-1R well screen (the interval in which the aquitard is located) is 36 feet (this distance was 49 feet between MW-9 and EW-1). MW-9 is located within close lateral proximity to former extraction well EW-1 but is located about 100 feet upgradient of the current extraction well, EW-1R. Interestingly, PCE at MW-9 increased throughout the time when EW-1 was in operation but has shown a statistically significant decrease since operation of EW-1 ceased and operation of EW-1R began. The cause of the rise in deep PCE as monitored by MW-9 up to 2004 is uncertain; however, since then EW-1R has appeared to mitigate the downward migration of PCE beneath the aquitard.

Table 3 – Groundwater Well Summary

Well ID	Screened Water-Bearing Zone	Area of Plume Monitored	Elevation Top of Casing (ft msl)	Screen Interval (ft bgs)	Latest PCE Result (µg/L, 11/2007)
MW-1	Upper	Upgradient	91.61	91-101	2.5
MW-2	Upper	Upgradient	90.88	86-96	9.2
MW-3	Upper	Source	91.49	84-94	280
MW-4	Upper	Downgradient	91.13	78-88	2,300
MW-5	Upper	Source	90.74	60-90	190

Well ID	Screened Water-Bearing Zone	Area of Plume Monitored	Elevation Top of Casing (ft msl)	Screen Interval (ft bgs)	Latest PCE Result (µg/L, 11/2007)
MW-6	Upper	Downgradient	89.72	60-90	8.5
MW-7	Upper	Upgradient	91.24	60-90	<0.5
MW-8	Upper	Source	91.44	60-90	23
MW-9	Lower	Unit below source	91.20	144-154	6.5
MW-10	Upper	Downgradient	90.48	60-89	330
MW-11	Upper	Upgradient	89.91	70-90	2.2
MW-12	Upper	Downgradient	91.15	87-97	33
MW-13	Upper	Downgradient	89.27	77-97	7.8
MW-14	Upper	Side-gradient	89.79	70-90	1.7
MW-15	Upper	Upgradient	91.76	80-100	0.5
EW-1*	Upper	--	89.54	65-95	--
EW-1R	Upper	Source	90.65	59-109	310

* Indicates well is no longer in service.

Groundwater Extraction and Treatment System Operational Data

EW-1 was shut down due to mechanical problems and well integrity issues in November 2004. A replacement well, EW-1R, was installed in June 2006 and has been operating since August 2006. Like EW-1 prior to mechanical and integrity issues, EW-1R operates at 50 gallons per minute (gpm), which is the capacity of the treatment system. The groundwater extraction and treatment system had extracted about 66 million gallons of groundwater and had removed 291 pounds of PCE from startup through November 2004 utilizing former extraction well EW-1. Through September 2007, the treatment system (now using EW-1R) has extracted a total of 87 million gallons and has removed a total of 358 pounds of PCE. The bulk of the mass removal occurred during the first two years of groundwater extraction and treatment system operation. In early 2001, after the system was constructed and the shakedown period completed, no exceedances of PCE or uranium were measured in the effluent. The effluent limit for PCE is 0.5 µg/L and for uranium is 20 Pico Curies per liter.

During periods of groundwater extraction, plan-view potentiometric contouring indicates a radius of influence from the extraction well on the order of 500 feet. The radius of influence is the area where the GWT system has an effect on groundwater. Groundwater near the edge of the radius of influence is not being drawn toward the GWT system but is either static or is moving slower than groundwater outside of the radius of influence. Therefore, wells further downgradient from EW-1R but still within the 500-foot radius of influence do not consistently show decreasing trends. As discussed previously, however, well data from within the source area do demonstrate groundwater control within this critical area.

The full extent of the dissolved-phase plume is not defined and the GWT system as currently configured does not address the entire plume. Currently, there are no Site wells to define the outer, downgradient limits of the plume to levels that meet the 5 µg/L regulatory limit. MW-10, the most southern well along the center line of the plume, is approximately 600 ft from the source area and has PCE at greater than 100 µg/L. MW-13 is the most southwesterly well, about 1,100 ft from the source area, and has PCE concentrations ranging from 7 to 28 µg/L. The IROD identified downgradient dissolved-phase plume delineation and prevention of its further migration as a remedial objective; this RAO has not been fully achieved to date. However, additional monitor wells will be installed in 2008.

Soil and Soil Vapor Analytical Data

Source Area: Horizontal contaminant transport in vadose zone soil is very limited, as evidenced by the limited extent of soil contamination. Soil vapor is present above both the source area and the dissolved-phase contaminant plume.

EPA contractors conducted a vadose zone supplemental site investigation (SI) in 2007, which led to the SVE system recommendations in the Optimization Report. According to the 2007 supplemental SI, as documented in the SVE Optimization Report (MWH, 2007), significant contaminant mass remains in the vadose zone near the northwest corner of Halford's Cleaners. There appears to be a significant residual source of PCE in the subsurface at location P1 (Figure 2). The highest soil concentration was 19 mg/kg at 5.5 feet below ground surface (bgs). The highest soil vapor concentrations were 41,837 ppbv at 10 feet bgs and 21,996 ppbv at 20 feet bgs. According to the SVE Optimization Report, the current estimated PCE mass in vadose zone soils is 1,800 pounds, although large uncertainty is acknowledged due to the lack of characterization directly beneath Halford's Cleaners. It is probable that soil directly underneath the building is contaminated with PCE.

Because of the findings in the 2007 Supplemental SI, EPA conducted a vapor intrusion testing program in six businesses located on the western side of the 900 block of McHenry Avenue in February 2008. The Site SVE system was temporarily shut off at the time of testing to allow subsurface soil gas conditions to equilibrate. The purpose of the testing was to determine whether PCE that persists in the vadose zone and groundwater from the historic release at Halford's Cleaners was entering indoor air at the businesses. The testing included collection of 24-hour indoor and outdoor air samples as well as sub-slab soil gas grab samples and several miscellaneous grab samples. Samples were tested for PCE and several related VOCs. The VOC detections were compared to risk based on screening levels for air at commercial/industrial sites; in the case of PCE the screening levels correspond to EPA's protective risk range (1 in one million to 100 in one million excess lifetime cancer risk). In four of the businesses, levels of PCE were within EPA's risk range. Two businesses that are located in one building, Halford's Cleaners and the Parts House, had indoor air samples exceeding EPA's risk range and the ATSDR minimal risk level (MRL) of 200 ppbv for acute exposure. Halford's Cleaners' indoor air concentrations averaged 990 ppbv. Although Halford's is an operating drycleaner using PCE in its operation, and therefore regulated by higher OSHA limits, it appears that some of the PCE is attributable to vapor intrusion. (A sub-slab sample collected concurrently was 20,000 ppbv).

The Parts House shares a common foundation and a non-structural partition wall with Halford's Cleaners. The Parts House had an indoor air average concentration of 450 ppbv.

EPA repaired some of the observable vapor intrusion pathways in the slab floor at Halford's Cleaners (there were two open pipes connecting the subsurface to inside the building). EPA also restarted the vapor extraction system and advised the tenants at the building to increase the ventilation. Subsequently in May 2008, EPA re-collected indoor air samples within the two affected businesses. The concentrations dropped significantly but still exceeded EPA's risk range for long-term industrial exposure. The average 24-hour indoor air concentrations from the re-sampling were 97 ppbv in Halford's and 110 ppbv in The Parts House. These concentrations are below ATSDR's Acute MRL but still exceed the ATSDR Chronic MRL (40 ppbv) that is protective for exposure of one year and longer.

Soil Vapor Extraction and Treatment System Operational Data

Since the shakedown period ended shortly after construction, the SVE system has operated with an overall up time of 83 percent. The total cumulative VOC mass removed by the SVE system from start-up through June 2006 is estimated to be 3,406 pounds. This amount is significantly more than the total mass removed via the groundwater treatment system by a ratio of more than 11 to 1.

As with the groundwater system, the majority of the mass was removed by the SVE system within the first few years. This is clearly indicated on Figure 8 of Attachment 2. The first year accounted for 60 percent of the total removed mass; the last year of available data showed less than one percent removed. This trend of diminishing removal rates indicates that the current system has removed nearly all of the PCE in soil within the radius of influence of vapor extraction well SVE-1. The radius of influence for the shallower soil (0 – 25' bgs) is 100 feet; the radius for the deeper soil (25 – 40' bgs) is 85 feet. The remaining PCE is entrained within the lowest-permeability stratigraphic layers and is released slowly, primarily by diffusive processes. The trend also supports the recommendation made by the remedial contractor to install new SVE wells in the area immediately adjacent to Halford's Cleaners.

The SVE Optimization Report, a product of the supplemental SI, evaluated SVE operational data along with other remedial technologies and concluded SVE remains the most effective treatment technology for removing PCE mass from the unsaturated zone (i.e., addressing soil and soil vapor) at the Site. The principal recommendation for enhancing the current system was abandonment of the current SVE well and replacement with two extraction wells located closer to the current soil/soil vapor PCE mass, and associated performance testing of the wells. Plans are in place to implement this recommendation in the near future.

Site Inspection

EPA and USACE conducted a site visit and inspection on February 27-28, 2008, to gather information about the Site's status. The review team visually inspected and documented the conditions of the Site, the treatment systems, and the surrounding area. For additional details regarding the site inspection and findings, including

photographs of select features and a roster of attendees, see the Site Inspection Trip Report (Attachment 4) and Site Inspection Checklist (Attachment 5).

Observations during the site inspection indicate the SVE and GWT systems appear to be in good working order, although the SVE system was shut down at the time of the site visit due to the indoor air-sampling event in the businesses along McHenry Avenue. Aboveground components of the systems were secured within trailers behind locked chain-link fencing. Signage on the fencing warns unauthorized personnel against trespassing and states that the components within the fencing are part of the *Modesto Groundwater Superfund Site*. The subsurface components of the remedies (i.e., vapor/groundwater extraction and monitoring wells) were installed in locked flush-mounted vaults.

As part of the site visit, USACE personnel viewed the Administrative Record on file at the Stanislaus County Free Library in downtown Modesto. This library is the designated local repository for the Site's Administrative Record.

Interviews

Mr. Richard Pitra, Western Region Field Services Manager for MWH, was interviewed during the course of the site inspection. Mr. Pitra provided valuable information concerning all aspects of the SVE and GWT systems in place and associated monitoring. Information from the interview is included in the Site Inspection Checklist (Attachment 5).

Holly Hadlock met with the following City of Modesto officials: Jim Niskanen, Interim City Manager; Nick Pinhey, Public Works Director; Allen Lagarbo, Water Superintendent; and John Rivera, Regulatory Compliance Supervisor. The purpose of the meeting was to inform them of the five-year review and to find out if the City had any issues or concerns regarding the Site. Details of the meeting are included in a May 19, 2008, memo to the file (Attachment 6).

VII. Technical Assessment

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

A.1 Remedial Action Performance and Monitoring Results:

The SVE system was put in place to eliminate and contain the highest contaminant levels in soil and soil vapor at the source areas. This system has addressed the source from the lateral to sewer line connection. However, high levels of soil/soil vapor contamination remain just to the west and beneath Halford's Cleaners as determined by recent sampling and analysis. EPA plans to reconfigure the SVE system by installing two new SVE wells positioned closer to Halford's Cleaners in order to remediate this portion of the source area. The following conclusions may be made regarding the SVE interim remedy:

- The SVE system has made significant progress in removing PCE mass from subsurface soil in the unsaturated zone.
- Recent and historic soil and soil gas investigations summarized in the 2007 SVE Optimization Report indicate that significant levels of PCE in these media still remain beneath and immediately adjacent to Halford's Cleaners. Continued active SVE remedial action is appropriate for this Site.
- Despite its documented success, the SVE system as it is currently configured has been run to a point of diminished returns based on an asymptotically low mass removal rate and must be reconfigured to remain effective in the future. Current data summarized in the 2007 SVE Optimization Report indicate high PCE concentrations in soil and soil vapor still exist beneath Halford's Cleaners, which are not being captured. Plans are in place to enhance PCE mass removal from the unsaturated zone with the addition of two new SVE wells.

The GWT system was also constructed to eliminate and contain the highest contaminant levels in groundwater at the source area. Based on Site date, this interim RAO has been largely achieved. An additional intention of the GWT system was to aid in prevention of exposure to contaminated groundwater above acceptable risk levels in order to protect human health and the environment. A third intention of the system and associated monitoring was to determine if Federal and State requirements could be met throughout the affected portion of the aquifer. The final RAO was to delineate more clearly the downgradient edges of the plume and prevent its further migration. Conclusions concerning these intentions of the groundwater interim remedy are as follows:

- The GWT system appears to maintain hydraulic control of the saturated zone beneath the source area as long as extraction is near the designed rate of 50 gpm, and continues to reduce overall PCE mass in groundwater.
- Exposure to contaminated groundwater above acceptable risk levels has been prevented through EPA's implementation of the combined interim SVE/GWT remedies, and has also been assisted by the City of Modesto's termination of groundwater extraction at Municipal Well 11. Additionally, there are no known production wells extracting groundwater from within the currently defined footprint of the PCE source area or dissolved-phase plume.
- PCE in groundwater continues to be measured in excess of the MCL in most of the downgradient, dissolved-phase plume monitoring wells. GWT system operational and groundwater analytical data indicate EW-1R is not adequate to control the dissolved-phase plume. The purpose of the GWT system, however, was only to reduce or contain the highest levels beneath the source; although the IROD assumed that it might prevent migration of the plume until a final remedy was selected. Additional plume characterization is being done; we are delineating the plume and will address capture in the final ROD.

A.2 System Operations and Maintenance

Recent operational performance data from both the SVE and GWT systems indicate they have been operating as designed and are meeting all applicable discharge requirements. Routine maintenance of both systems is conducted by the remedial action contractor (MWH), and no out-of-the-ordinary maintenance concerns are noted.

A.3 Costs of System Operations, Maintenance, and Monitoring

Project costs are not excessive. The installation of replacement well EW-1R and associated testing and incorporation into the GWT system, along with additional SVE system testing, additional soil and groundwater investigations, and vapor sampling, all of which are either directly or indirectly related to the treatment systems, have added to the O&M cost.

A.4 Opportunities for Optimization

There are no known current opportunities to optimize the existing GWT system. Both the GWT extraction well and the aboveground treatment train are operating at or near the 50 gpm capacity of the system. EW-1R is positioned to extract the highest concentration of dissolved-phase PCE in groundwater within and immediately downgradient of the source area. EPA will revisit whether there are opportunities to optimize the GWT system after characterization of the downgradient plume is complete.

After a thorough evaluation of the SVE system, EPA has determined that SVE remains the most efficient means of removing PCE mass from the subsurface vadose zone (MWH, 2007). There are several opportunities to optimize the current SVE system as presented in Table 6-1 of the SVE Optimization Report (MWH, 2007). These include:

- Shutting off the existing vapor extraction well and installing two new wells.
- Installing corresponding vapor monitoring points better positioned to remove/monitor the remaining soil/soil vapor mass.
- Testing of these new wells.
- Cycling the extraction system on and off to improve removal efficiency.
- Eliminating vapor treatment prior to discharge if it is not necessary to meet regulatory requirements.
- Reducing monitoring frequency once the mass extraction rate at the new wells has significantly decreased.

A.5 Indicators of Potential Remedy Problems

Other than the two previously mentioned issues, i.e., the need to reconfigure the subsurface vapor collection and the need to determine the downgradient extent of the PCE groundwater plume, there are no other indicators of potential remedy problems.

A.6 Implementation of Institutional Controls and Other Measures:

Institutional controls (ICs) are non-engineered instruments that minimize potential for human exposure to contaminants, incompatible limit land use, and/or protect the integrity of the remedy, although sometimes engineered access restrictions such as fencing, barriers, etc. are considered ICs. ICs were not called for in the IROD except for signage and fencing access restrictions around the designated treatment area, both of which are in place. No non-engineered instruments pertaining to the Modesto Site have been recorded, although there are checks in place to prevent new residential wells from being installed within Modesto city limits served by the public water system (personal communication/See Attachment 5, Damin, 2008). At this time no formal ICs need to be considered for implementation. If, after installation of new SVE wells, indoor vapor contaminant concentrations resulting from the Site continue to present an unacceptable risk to building occupants, the complete results and follow-on evaluation of the indoor air sampling program (based on both winter and summer sampling rounds) may lead to the establishment of project ICs to mitigate these concerns. The IROD states that the need for additional ICs will be evaluated in the final remedy.

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

B.1 Changes in Exposure Pathways:

The exposure assumptions, specifically the concentration of PCE in indoor air, were incorporated into the 1994 and 1997 Human Health Risk Assessments (HHRAs) through data obtained from a soil-to-soil vapor partitioning model (Farmers Model). Therefore, indoor air concentrations were a function of the highest soil concentrations detected as of 1995 (for the updated HHRA). Recent indoor, outdoor, and sub-slab VI data suggest the value estimated using the Farmers Model in the risk calculations may have been low.

An ecological risk assessment was done prior to the IROD and EPA determined that there were no unacceptable ecological risks because there were no exposure pathways. There have been no changes in exposure pathways since EPA issued the IROD so there are still no actual or potential pathways to ecological receptors from the contaminants at the Site.

B.2 Changes in Toxicity and Other Contaminant Characteristics:

Subsequent to the original risk assessment and IROD, EPA initiated a re-assessment of PCE toxicity; this assessment is currently underway with completion and formal adoption of any new toxicity values anticipated in 2010. In the interim, Superfund is using a PCE toxicity value developed by Cal/EPA because it meets the criteria outlined in Superfund's policy on provisional peer-reviewed toxicity values. The Cal/EPA toxicity value is reflected in the new Regional Screening Level (RSL) table. The RSL table was developed using the latest toxicity values, default exposure assumptions, and physical

and chemical properties and is consistent with the OSWER chemical toxicity hierarchy. For PCE, the RSL table has the tap water screening level of 0.11 µg/L. This corresponds to an increased cancer risk of one in one million. The upper range of EPA's risk range (one in ten thousand excess lifetime cancers) would be 11 µg/L. The State MCL for PCE remains 5 µg/L, which is within EPA's risk range.

B.3 Changes in Risk Assessment Methods:

There are no known changes in risk assessment methodology since the 1997 HHRA.

B.4 Changes in Standards and Requirements to be Considered (TBCs):

There are no known changes in standards and TBCs. Applicable or relevant and appropriate requirements (ARARs) were reviewed pertaining to chemical contaminant-specific and action-specific ARARs. No changes to the existing ARARs affecting the protectiveness of the interim remedy were identified. Attachment 3 has further details regarding the review of ARARs.

B.5 Expected Progress Towards Meeting RAOs:

Progress is being made for the following RAOs: remediation of source area vadose zone soils and soil vapor, and delineation of the dissolved plume.

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

Because of the findings in the 2007 Supplemental Site Investigation, EPA conducted a vapor intrusion-testing program in six businesses located on McHenry Ave. Results from this testing program show the indoor air at two businesses on top of, or just adjacent to, the source contains levels of PCE exceeding EPA's risk range for long-term industrial exposure. Subsurface samples below this building's slab had PCE levels in the 20,000 ppbv range, indicating a potential for vapor intrusion. EPA is working to address this exposure in the two businesses.

No other information has come to light that could call into question the protectiveness of the instituted interim remedies. Although the downgradient extent of the plume is not known, exposure is unlikely, as the closest downgradient municipal drinking water wells do not have PCE.

Technical Assessment Summary

According to the data reviewed and the site inspection, the interim remedy is not functioning as intended in the IROD. The recent discovery of elevated PCE vapor concentrations in commercial buildings along the western side of the 900 block of McHenry Avenue (near the source area at 941 McHenry) raises concerns about whether the current interim soil/soil vapor interim remedy is protective.

VIII. Issues

Table 4 – Issues of the 2008 Five-Year Review

Issue	Affects Protectiveness? (Y or N)	
	Current	Future
1. Vapor Intrusion. Recent indoor air concentrations of PCE within two businesses at and nearby the PCE source area exceeded EPA's risk range for long-term industrial exposure.	Y	Y
2. High soil/soil vapor PCE. Asymptotically low SVE mass extraction rates by the treatment system, coupled with discovery of high soil/soil vapor PCE concentrations next to and under Halford's Cleaners building.	Y	Y
3. Although the objective for the IROD was source control, the IROD also expected that one groundwater extraction well would achieve the required capture zone to prevent the migration of the dissolved plume. Analysis of the extraction system indicates that the current extraction well, although pumping at the rate designed for, is not capable of dissolved plume control. Extent of the dissolved plume is still under investigation. We are delineating the extent now and will evaluate capture under the final ROD.	N	Y

Notes:
"Y" indicates that protectiveness may be affected, but further investigation is necessary to determine to what extent (if any).

IX. Recommendations and Follow-up Actions

Table 5 – Recommended Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Planned Completion Date
1. Vapor Intrusion Air Pathway	Plans are underway to reconfigure the SVE system by adding two new vapor extraction wells better positioned to reduce vapor infiltrating through the slab floors.	EPA	EPA	Fall 2008

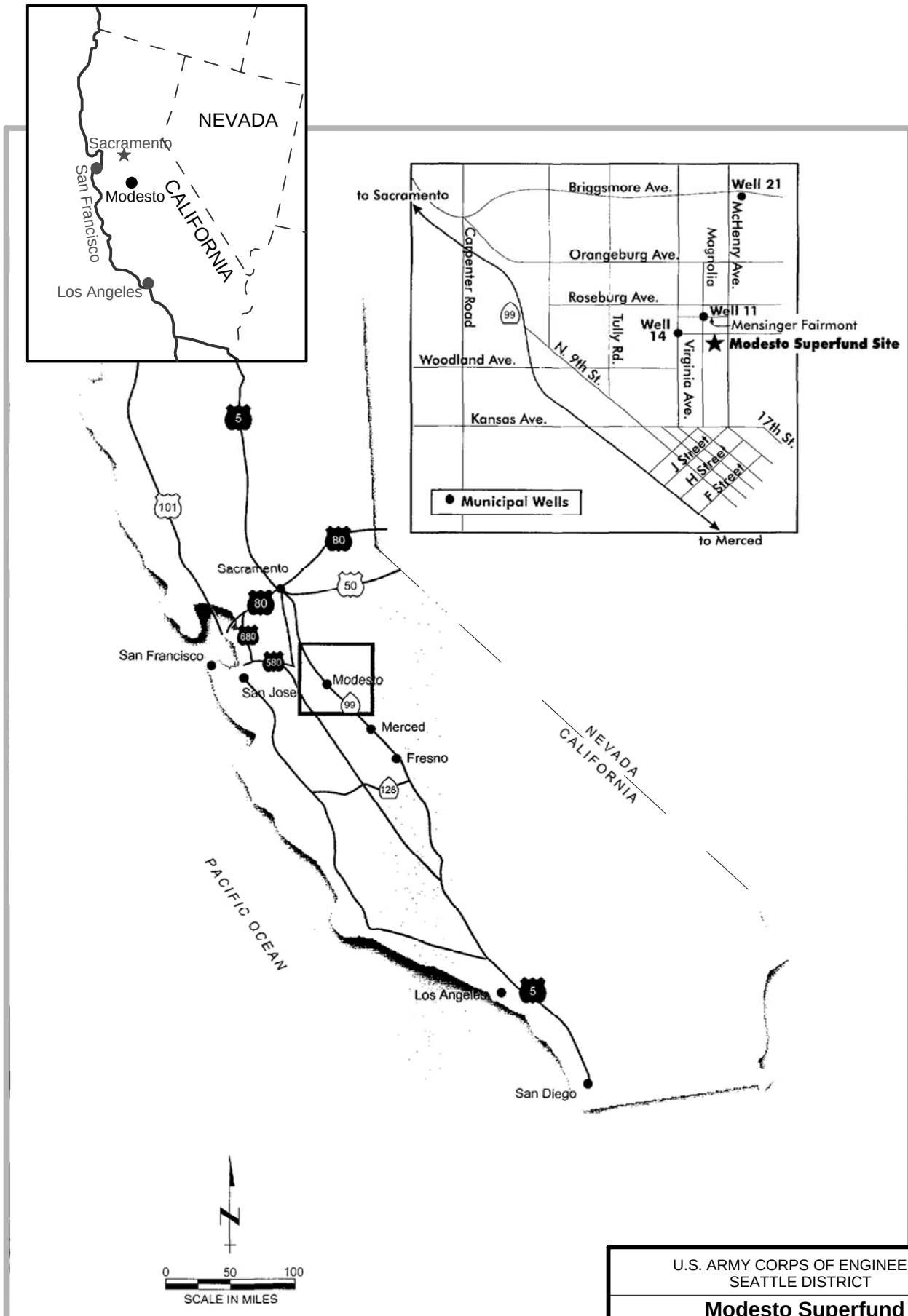
Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Planned Completion Date
2. High soil/soil vapor PCE	Plans are underway to reconfigure the SVE system by adding two new vapor extraction wells better positioned to capture remaining vadose zone contaminant mass.	EPA	EPA	Fall 2008
3. Dissolved Plume not defined or controlled.	Complete the dissolved plume investigation, evaluate the need for expansion of the interim remedy, and select final remedy for the site.	EPA	EPA	Fall 2011

X. Protectiveness Statement

The interim remedy at the Modesto Groundwater Superfund Site is not protective of human health and the environment due to the vapor intrusion of PCE into two businesses near the source. The operating groundwater portion of the remedy is protective of human health and the environment in the short term because there are currently no known complete receptor pathways (i.e., no drinking water wells within or downgradient of the plume). In order to be protective in the long-term, a final remedy for the Site must be selected to address the dissolved phase plume.

XI. Next Review

The next five-year review for the Modesto Site is required by September 2013, five years from the date of this review.



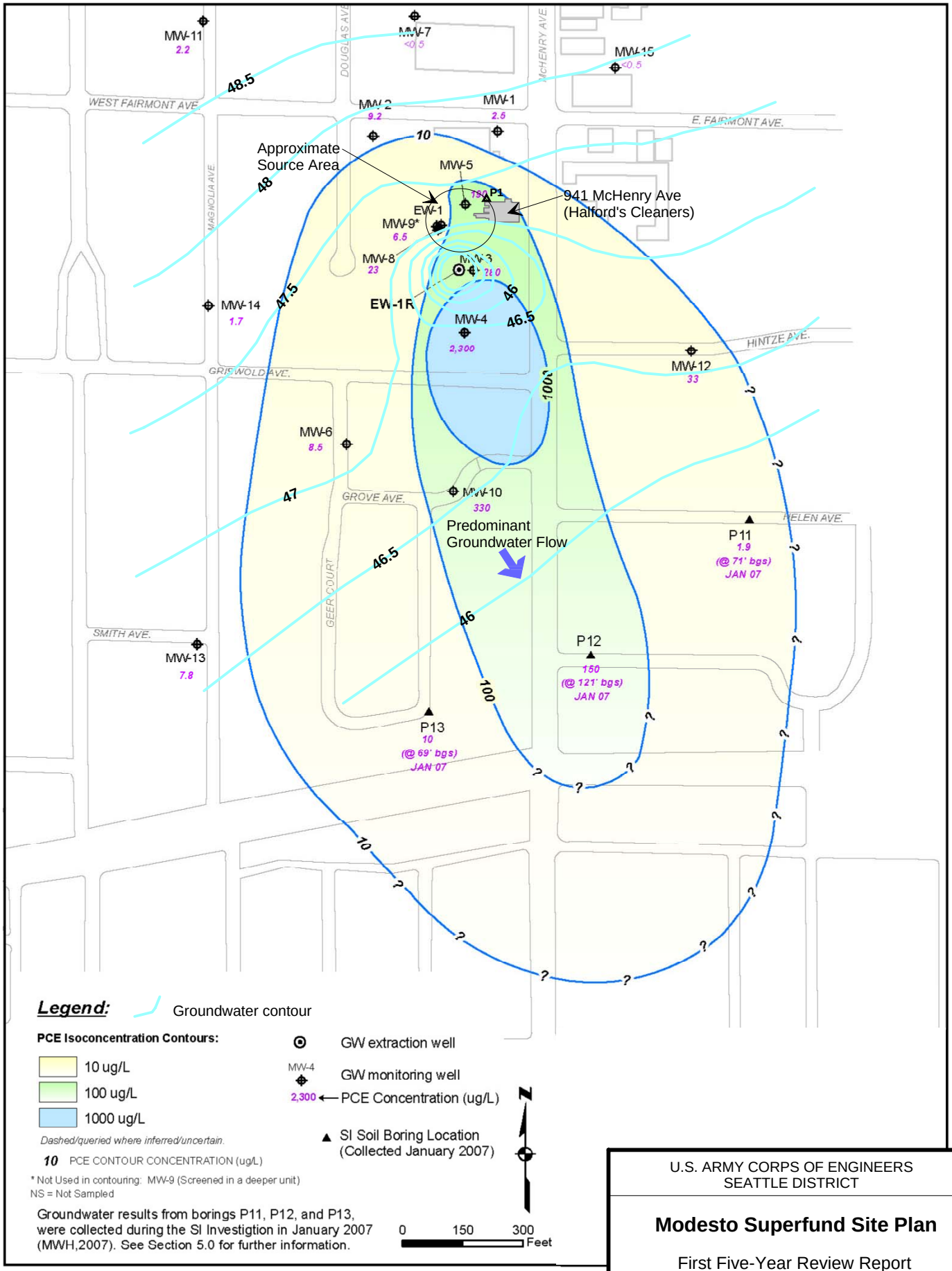
Drawing based on Figure 1-1, SVE Optimization Rpt (MWH, 2007)

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

Modesto Superfund Site Location Map

First Five-Year Review Report

Modesto	**Figure 1**	California



Drawing based on Figs 4-2 & 4-3, 4th Qtr Monitoring Rpt (MWH, 2008)

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SEATTLE DISTRICT

Modesto Superfund Site Plan

First Five-Year Review Report

Modesto	**Figure 2**	California

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MEMORANDUM FOR RECORD

SUBJECT: Technical Data Review, Modesto Groundwater Contamination Superfund Site, First Five Year Review

PREPARED BY: Jefferey Powers, L.G., Seattle District, U.S. Army Corps of Engineers

DATE: 10 April 2008

Introduction and Purpose

Seattle District, U.S. Army Corps of Engineers is assisting the U.S. Environmental Protection Agency (USEPA), Region 9, with the completion of statutorily required Five-Year Reviews (FYRs). FYRs are required under the Comprehensive Environmental Resource Compensation and Liability Act (CERCLA) to determine the protectiveness of the implemented remedy. One step in the evaluation of protectiveness is a review of the technical project data. For the Modesto Groundwater Contamination Site (henceforth referred to in this memo as the Modesto Site or simply "the Site") the data review encompasses groundwater, soil, and soil vapor data, as well as groundwater extraction and treatment system and soil vapor extraction and treatment system operational data. This memorandum documents the technical data review and evaluation for the first FYR for the Modesto Site. The FYR has a completion date of 30 Sep 2008.

An interim, rather than final, Record of Decision (IROD) was developed in 1997 for the Site because of uncertainties over whether any available remedial approach was capable of achieving groundwater cleanup standards throughout the dissolved-phase plume, and the necessity of further delineating the downgradient edges of the plume (USEPA IROD, 1997). Hence the interim remedial action objectives (RAOs), as stated in the IROD, were:

- Eliminate and contain the highest contaminant levels at the source (source control),
- Prevent exposure to contaminated groundwater, above acceptable risk levels, to protect human health and the environment,
- Minimize the impact of interim cleanup measures to the community,
- Collect data to determine if Federal and State requirements can be met throughout the aquifer, and
- To delineate more clearly the downgradient edges of the plume and to prevent its further migration.

This memorandum addresses the interim RAOs dealing with Site subsurface data collected to date, including those of the first, second and fourth bulleted items above. Note that the interim remedial actions were intended as a source control/containment measure to prevent unacceptable health risks to human and ecological receptors in the short term, and were not designed to clean up the Site to levels allowing for unlimited use/unrestricted exposure. The data was reviewed in this context. This memorandum also assesses operational data associated with the interim remedial systems to ensure they are operating as intended.

Time Period of Data

The period of review is 2000 through 2007. The Interim Record of Decision (IROD) required a FYR to be conducted five years after the remedial action commences. The remedy was completed and in operation starting in 2000. Because no prior FYR has been conducted at this site, the data review period for this FYR begins in 2000. The end date for data review is through the 25th Quarter (Aug 2007) site sampling event. This end date was selected to include sufficient operation of the replacement extraction well of the groundwater treatment system (GTS) and to allow for a clear startup time for the next FYR as Sep 2007.

Background

Tetrachloroethylene (PCE) was discovered in Modesto Municipal Well 11 (Well 11) in 1985. The discovery of PCE in Well 11 led to source investigations and remediation at Halford's Cleaners, a dry cleaning business

about 1,100 feet southeast of Well 11. Halford's Cleaners was identified as the source of the PCE contamination. Investigations revealed the underground piping at or near the private-to-public sanitary sewer connection approximately 75 to 100 feet west of the back of the Halford's building, along with a leaking dry cleaning machine at the northwest corner of the building (i.e. together referred to as the source area), had released PCE to soil for many years. Uranium is also present in the site soil and groundwater, but is not considered a Site contaminant of concern (COC) since it is naturally occurring.

The media of concern for the site have been soil, soil vapor, and groundwater. Vadose zone soil and associated pore space within the immediate area of the source area are contaminated with PCE. Until recently, indoor air had not been considered a medium of concern due to initial risk calculations showing acceptable excess cancer risks and hazard indices. New soil analytical data collected in 2007, coupled with EPA's recent focus on the vapor intrusion pathway, has led to a new indoor air evaluation at the Site. Indoor air sampling was being conducted during the time of the Feb 2008 FYR site visit due to the high levels of PCE in soil immediately adjacent to Halford's Cleaners.

Due to downward migration in soil, PCE has formed a dissolved-phase plume in groundwater beneath the site. Although the extents of the plume have yet to be adequately defined, the plume is at least 1,500 feet in length, 1,500 feet in width, and extends at least 154 feet below ground surface based on recent monitoring data. Because the City of Modesto has many municipal water supply wells in all directions from the Site (including Well 11 discussed previously), the potential for PCE to reach operating municipal wells is considered a potential future protectiveness threat. Protection of municipal wells from impacted Site groundwater is expected to be a final ROD objective.

The current remedy, as stated in the IROD, includes groundwater extraction and treatment (GWT) and soil vapor extraction and treatment (SVE). The SVE system addresses source control for soil and soil vapor while the GWT system addresses source control and to some extent reduction of the dissolved-phase component.

Data Utilized

All available groundwater monitoring data associated with the Site from the period of review were examined and evaluated. The following list is a compilation of all project-related documents reviewed in support of the data assessment:

- Modesto Site IROD (USEPA, Sep 1997)
- Modesto Site Interim Remedial Action Report (Ecology & Environment, Apr 2001)
- Modesto Superfund Site Quarterly Operations and Monitoring Report (MWH, May 2003)
- Modesto Superfund Site Quarterly Operations and Monitoring Report (MWH, May 2005)
- Modesto Superfund Site Quarterly Operations and Monitoring Report (MWH, Aug 2006)
- USEPA Region 9 Laboratory Report for 22nd Quarter Sampling (Nov 2006)
- USEPA Region 9 Laboratory Report for 23rd Quarter Sampling (Feb 2007)
- SVE System Optimization and Enhancement Methods, Modesto Superfund Site (MWH, Oct 2007)
- Modesto Superfund Site Quarterly Operations and Monitoring Report (MWH, Feb 2008)

Chemicals Selected for Analysis

PCE is the site COC due to its widespread presence in soil, soil gas, and groundwater. Other contaminants, trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE), and chloroform, have also been reported. These chemicals were either not detected above their method detection limit or infrequently detected at concentrations below regulatory limits in site samples.

All analytical data were reviewed; however, only PCE was found to exceed the current cleanup standard for site groundwater. PCE has been present in site monitoring wells above the Federal Safe Drinking Water Act Maximum Contaminant Level (MCL) throughout the period of review. The MCL for PCE is 5 µg/L (or parts per billion [ppb]). PCE is also the principal COC in site soils and soil vapor. Uranium data were also reviewed, but only for compliance with treated discharge standards.

Groundwater

Groundwater Hydraulic Data

When Modesto Municipal Supply Well 11 was in operation, the site hydraulic gradient direction was to the northwest, toward the well. The radius of influence exerted by Well 11 extended to the Modesto Site. Since Oct 1995, Well 11 has been out of service due to natural levels of uranium above drinking water limits. Since that time, the hydraulic gradient direction has nearly reversed, and is now toward the south/southeast. The current gradient direction is approximately 150 degrees out of phase with that of the Well 11-influenced direction. Note that other Modesto municipal wells currently operating in the vicinity of the Site continue to affect the Site's hydraulic gradient, and the Site's natural gradient uninfluenced by municipal wells has not been determined. Figure 1 shows the locations of Modesto Site wells and the groundwater flow gradient uninfluenced by Site groundwater extraction (but still influenced by nearby Modesto municipal wells). Figures from previous site reports, including the Phase 1 RI report (Ecology and Environment, Inc. 1993), depict as many as 26 Modesto municipal wells within a one mile radius of the Site.

The last potentiometric map constructed by the remedial contractor and reviewed for this evaluation was for May 2006. The horizontal groundwater gradient at that time was 0.0018 ft/ft to the south-southeast. The gradient appears to be consistent with previously measured gradient conditions. Slight mounding of groundwater near operating soil vapor extraction well SVE-1 was observed due to the negative pressure exerted on the water table.

It is important to note when looking at the map of monitoring wells that well MW-9, despite its close lateral proximity to the source area, is screened in a permeable unit beneath an aquitard. Its elevation data are not included in shallow groundwater evaluations other than noting that vertical hydraulic gradients measured between MW-9 and nearby shallow-screened wells are negligible except for when active groundwater extraction is occurring.

Influence of Precipitation

Modesto precipitation data was compared against well-water elevation data to evaluate for the presence of seasonal trends in aquifer recharge. Modesto experiences a Mediterranean-type climate, with dry summers and relatively wet winters. Yearly precipitation averages 12.39 inches; 85% of which falls in the six months of Oct to Mar. Precipitation overall since 2000 has been near average, with the years 2002, 2003 and 2004 slightly below average, and 2000, 2001, 2005 and 2006 slightly above average. The first eight months of 2007 experienced below average precipitation. See Figure 5 for yearly Modesto precipitation data. It is evident there is a direct relationship between precipitation and aquifer recharge as determined by groundwater elevations measured in the site monitoring wells. Figure 6 shows there to be about a five month lag between the month of maximum precipitation (Dec) and the month of maximum groundwater elevation (May). Water elevations are lower in 2003 and 2004 during the below-average precipitation years compared to the above-average years of 2005 and 2006. While only five of the 15 monitoring well hydrographs are displayed on Figure 6, the remaining wells showed similar cyclical patterns. Additionally, extraction of groundwater by Modesto municipal wells still in operation near the site, and presumably extracting larger quantities in summer, likely affects local water elevations to some degree.

Analytical Data

Analytical groundwater data were reviewed for all on-site wells from which data were collected during the period of review. The wells for which data were evaluated are: monitoring wells MW-1 through MW-15 for the entire review period, extraction well EW-1 until its closure in Nov 2004, and replacement extraction well EW-1R since it became operational in Aug 2006. The groundwater analytical data were divided into two parts, that of the source area and that of the dissolved-phase PCE plume. This distinction is made to separately address the RAOs concerning source control and the larger-scale, dissolved-phase groundwater contaminant plume.

Source Area

The source area is defined as the area of highest soil and soil gas PCE concentrations behind Halford's Cleaners (leaking dry cleaning machine source) and west-southwest of the back of the cleaners (private-to-

public sanitary sewer connection) prior to soil vapor extraction implementation. This combined source area is loosely bounded in plan-view by about a 100-foot buffer around a line connecting monitoring wells MW-5 and MW-8 (Figure 1).

PCE trends at the source area wells MW-3, MW-5, MW-8, EW-1 up to Nov 2004, and EW-1R since Aug 2006, all decreased over the entire period of review (Figure 2). During the time when no groundwater extraction occurred, PCE at well MW-3 showed a statistically significant increasing trend (at the 90 percent confidence interval) while PCE at MW-5 and MW-8 declined slightly. This information suggests that the source area continued to contribute dissolved-phase PCE to groundwater which was temporarily not being captured and was instead transported downgradient toward MW-3. Since well EW-1R began operation, however, all source well PCE concentrations have dropped indicating adequate groundwater control within the source area.

Dissolved-Phase Plume

Overall, PCE was present above 5 µg/L at seven of 12 wells not considered source area wells. These seven wells are: MW-2, MW-4, MW-6, MW-10, and MW-12 through MW-14. From 2000 to 2007, PCE concentrations have been gradually increasing downgradient of the source area, even after EW-1R began operation. This suggests the wells monitoring the downgradient dissolved-phase plume outside of the source area are beyond the zone of capture for EW-1R. Not surprisingly, the wells with the lowest PCE concentrations are located either to the north of the source area in what is now considered hydraulically upgradient, or just downgradient of the source but beneath an aquitard.

Of the wells monitoring the dissolved-phase plume, MW-4 has the highest PCE concentration at 2,300 µg/l. MW-4 is approximately 250 feet downgradient from the source area. PCE at well MW-4 appeared to be stable or slightly decreasing while EW-1 was in operation. Since pumping stopped at EW-1, MW-4 concentration has increased (Figure 3), even after start up of EW-1R in Aug 2006. PCE concentrations at MW-10 have been increasing over the review period (although at a slower rate since operation of EW-1R). These increases at MW-4 and MW-10 indicate that the dissolved-phase contaminant plume is moving with groundwater downgradient from the source and is not being completely captured by EW-1R. It should be emphasized, however, that EW-1R is currently operating as intended and that complete plume capture was not an objective of the selected interim groundwater remedy, although it was implied as an interim remedial action objective based on the IROD.

For other downgradient and partially downgradient wells, trends are slightly downward at MW-6 and slightly upward at MW-12, MW-13, and MW-14. However, none of these trends are statistically significant at the 90 percent confidence interval and no definitive conclusions may be drawn from them.

PCE concentrations at upgradient wells MW-1, MW-2, MW-7, MW-11, and MW-15 are much lower than at other wells (Figure 4). The trends generally have been slightly decreasing at these locations although they are not statistically significant.

The screened interval of MW-9 is partially isolated from the shallow PCE source by an aquitard. The vertical distance between the top of the MW-9 well screen and the base of the EW-1R well screen (the interval in which the aquitard is located) is 36 feet (this distance was 49 feet between MW-9 and EW-1). MW-9 is located within close lateral proximity to former extraction well EW-1 but is located about 100 feet upgradient of the current extraction well, EW-1R. Interestingly, PCE at MW-9 increased throughout the time when EW-1 was in operation but has shown a statistically significant decrease since operation of EW-1 ceased, including the time EW-1R has been in operation (Figure 4). The cause of the rise in deep PCE as monitored by MW-9 up to 2004 is uncertain; however, since then EW-1R has appeared to mitigate the downward migration of PCE beneath the aquitard.

Groundwater Extraction and Treatment System Operational Data

EW-1 was shut down due to mechanical problems and well integrity issues in Nov 2004. These included the inferred failure of the well screen due to well siltation and pump motor failure. A replacement well, EW-1R, was installed in Jun 2006 and has been operating since Aug 2006. Like EW-1 prior to mechanical and integrity issues, EW-1R operates at 50 gpm, which is the capacity of the treatment system. The groundwater extraction

and treatment system had extracted about 66 million gallons of groundwater and had removed 291 pounds of PCE from startup through Nov 2004 utilizing former extraction well EW-1. Through Sep 2007, the treatment system (now using EW-1R) has extracted a total of 87 million gallons and has removed a total of 358 pounds of PCE. The bulk of the mass removal occurred during the first two years of groundwater extraction and treatment system operation. After the system was constructed and the shake-down period completed by early 2001, no exceedances of PCE and uranium (which due to its natural occurrence is not a site COC) were measured in the effluent. The groundwater treatment system PCE mass removal and operational flow rates are shown in Figure 7.

During periods of groundwater extraction at a constant rate near the treatment system capacity of 50 gpm, plan-view potentiometric contouring indicates a radius of influence from the extraction well on the order of 500 feet. This radius of influence does not mean that all groundwater within 500 feet downgradient of the extraction well is captured for treatment because existing wells within 500 feet of EW-1R do not consistently show decreasing trends. As discussed previously, however, well data from within the source area do demonstrate groundwater control within this critical area.

The full extent of the dissolved-phase plume is not defined and the GWT system as currently configured, and based on current operational data, does not address the entire plume. Currently, there are no site wells to define the outer, downgradient limits of the plume to levels that meet the 5 µg/l regulatory limit. MW-10 is the most southern well along the center line of the plume, is approximately 600 ft from the source area, and has PCE at greater than 100 µg/L. MW-13 is the most southern well and about 1,100 ft from the source area and has PCE concentrations greater than 5 µg/L. The IROD identified downgradient dissolved-phase plume delineation as a remedial objective; this RAO has not been fully achieved to date.

Soil and Soil Vapor
Analytical Data

Source Area

Because horizontal contaminant transport in soil is very limited, the soil contamination extent and corresponding discussion is limited to the source area. Soil vapor is present above both the source area and the dissolved-phase contaminant plume. According to the 2007 Supplemental Site Investigation, as documented in the SVE Optimization Report (MWH 2007), significant contaminant mass remains in the vadose zone near the northwest corner of the Halford's Cleaners building. There appears to be a significant residual source of PCE in the subsurface near direct push boring location P1, which possibly extends underneath the building. The highest soil concentration was 19 mg/kg at 5.5 feet bgs. The highest soil vapor concentrations were 41,837 ppbv at 10 feet below ground surface (bgs) and 21,996 ppbv at 20 feet bgs. According to the SVE Optimization Report, the current estimated PCE mass in vadose zone soils is 1,800 pounds, although large uncertainty is acknowledged due to the lack of characterization directly beneath the Halford's Cleaners building.

Dissolved-Phase Plume

Soil vapor can originate from volatilization of PCE in soil or groundwater, including from the downgradient dissolved-phase plume. Volatilization of PCE from the dissolved-phase plume outside the source area has yet to be fully evaluated, although PCE vapors above the downgradient dissolved plume are expected to be less compared to that above the source area due to the lower concentrations and deeper depth of the contaminant. A vapor intrusion sampling and analysis program has been initiated for the Modesto Site. Evaluation of the Feb 2008 indoor air sampling from within businesses along the western side of McHenry Avenue south of the source area should address this concern. The winter sampling round was conducted in Feb 2008 while the summer round is anticipated for the Aug 2008 time frame.

PCE vapor intrusion recently has been discovered to be a concern for this Site. EPA conducted a vapor intrusion (VI) testing program within six commercial buildings along the western side of the 900 block of McHenry Avenue in late-Feb 2008. These six buildings encompass upgradient, source, and downgradient Site locations. The Site SVE system was shut off at the time of testing but the building's

HVAC systems were operating using normal business practices. The purpose of the testing was to determine whether PCE that persists in the vadose zone and groundwater from the historic release at Halford's Cleaners was entering the businesses. The testing included collection of 24-hour indoor and outdoor as well as sub-slab soil gas grab samples, and several miscellaneous grab samples. Samples were tested for PCE and several related volatile organic compounds. Radon was used as a tracer compound to see if PCE, along with radon, had migrated from sub-slab vadose soils to indoor air. Preliminary, unvalidated data suggests indoor PCE concentrations at least partially attributable to subsurface Site contamination were elevated under these conditions, particularly within two buildings closest to the source area. Indoor PCE levels consistently and rapidly decreased with distance downgradient from the source area, however, from a qualitative point of view, the results indicated an actual VI pathway exists at every building tested.

Soil Vapor Extraction and Treatment System Operational Data

Since the shake-down period ended shortly after construction, the SVE system has operated with an overall up time of 83 percent. The total cumulative volatile organic carbon (VOC) mass removed by the SVE system since start up through Jun 2006 is estimated to be 3,406 pounds. This amount is significantly more than the total mass removed via the groundwater treatment system (based on PCE being the predominant VOC) by a ratio of more than 11 to 1.

As with the groundwater system, the majority of the mass removed by the SVE system was in the first few years. The first year accounted for 60 percent of the total removed mass; the last year of available data showed less than one percent removed. This trend of diminishing removal rates indicates that the current system has removed nearly all the PCE in soil within the radius of influence of well SVE-1. The remaining PCE is entrained within the lowest-permeability stratigraphic layers. The trend also supports the recommendation made by the remedial contractor to install new SVE well or wells to extract soil vapors in the area immediately adjacent to or underneath the Halford's Cleaners building. Figure 8 shows the current SVE system operational data, including mass removal rates and system up-time.

A vadose zone Supplemental Site Investigation (SSI) was conducted in 2007 which led to the SVE system recommendations in the Optimization Report. This effort included more detailed Site lithologic characterization using a Cone Penetrometer Testing rig, soil and soil vapor sampling, SVE system rebound testing, an update to the conceptual site model, and evaluating further data gaps. The SVE Optimization Report, a product of the SSI, evaluated Modesto SVE operational data along with other remedial technologies and concluded SVE remains the most effective treatment technology for removing PCE mass from the unsaturated zone (i.e., addressing soil and soil vapor) at the Modesto Site. The reasons given were that SVE is one of the best technologies for dealing with highly heterogeneous sites such as Modesto, and the Site is located in an urban area not amenable to many other technologies. The principal recommendation for enhancing the current system was abandonment of the current SVE well and replacement with two extraction wells located closer to the current soil/soil vapor PCE mass, and associated performance testing of the wells. Plans are in place to implement this recommendation in the near future.

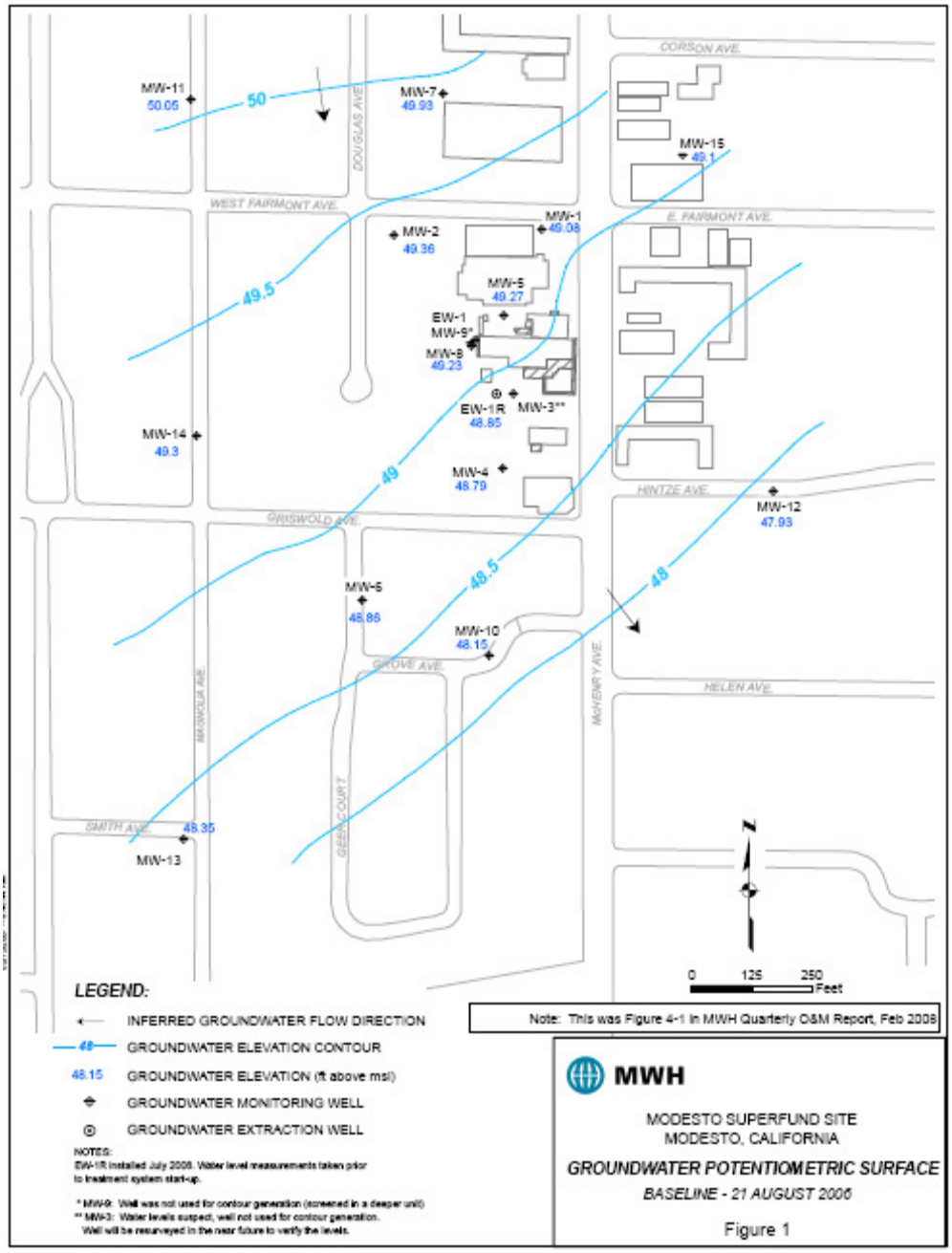
Analysis and Conclusions

Based on the data review and with the interim remedial action objectives and GWT and SVE system operational goals in mind, the following conclusions will be used to determine the remedy's protectiveness and success of operation.

- The highest levels of contamination have been contained and removed at the source area. The SVE system has made significant progress in removing PCE mass from subsurface soil in the unsaturated zone. The GWT system appears to maintain hydraulic control of the saturated zone beneath the source area as long as extraction is near the designed rate of 50 gpm, and continues to reduce overall PCE mass in groundwater. It is noted, however, that one flow rate measured at EW-1R was about 10 gpm and considerable variation has been observed (between about 10 and 65 gpm).
- Exposure to contaminated groundwater above acceptable risk levels has been prevented through EPA's implementation of the combined interim SVE/GWT remedies, and has also been assisted by the

City of Modesto's termination of groundwater extraction at Municipal Well 11. Additionally, there are no known private wells extracting groundwater from within the currently-defined footprint of the PCE plume.

- Insufficient aquifer data has been collected with respect to plume extent (both horizontally and vertically) to evaluate if Federal and State requirements can ultimately be met, and if so, how. This will be a focus of future Site efforts.
- At the site, the predominant south to southeastern groundwater gradient direction is consistent throughout the year as long as Well 11 remains off. Still, this direction should not be considered a "natural" groundwater flow direction because Site groundwater gradients are influenced by multiple nearby, active municipal wells. The observed pattern of seasonal cyclical groundwater elevation changes do not significantly affect the radius of influence of the extraction well when it is in operation.
- PCE in groundwater continues to be measured in excess of the MCL in most of the downgradient, dissolved-phase plume monitoring wells. GWT system operational and groundwater analytical data indicate EW-1R is not adequate to control the dissolved-phase plume. The purpose of the GWT system, however, was only to reduce or contain the highest levels beneath the source and was never intended to capture the entire dissolved-phase plume. Additional plume characterization is warranted in order to select the most appropriate final remedy for groundwater.
- Recent and historic soil and soil gas investigations summarized in the 2007 SVE Optimization Report indicate that significant levels of PCE in these media exist beneath and immediately adjacent to the Halford's Cleaners building. Continued active remedial action is appropriate for this site.
- Despite its documented success, the SVE system as it is currently configured has been run to a point of diminished returns based on asymptotically low mass removal rate and must be reconfigured to remain effective in the future. Current data summarized in the 2007 SVE Optimization Report suggests high PCE concentrations in soil and soil vapor still exist beneath the Halford's Cleaners building which are not being captured. Plans are in place to enhance PCE mass removal from the unsaturated zone with the replacement of the current extraction well with two new wells.
- Evidence suggests both SVE and GWT systems are currently meeting all applicable discharge requirements with respect to VOCs, including PCE, and uranium.


MW-11
50.05
50
MW-7
49.93
CORSON AVE.
MW-15
49.1
DOUGLAS AVE.
WEST FAIRMONT AVE.
E. FAIRMONT AVE.
MW-1
49.08
MW-2
49.36
MW-5
49.27
49.5
EW-1
MW-9*
MW-8
49.23
EW-1R
48.85
MW-3**
MW-14
49.3
49
MW-4
48.79
HINTZE AVE.
MW-12
47.93
GRISWOLD AVE.
48.5
48
MW-6
48.86
MW-10
48.15
GROVE AVE.
MONEMY AVE.
HELEN AVE.
MAGNOLIA AVE.
GEER COURT
SMITH AVE.
48.35
MW-13
N
0 125 250
Feet
LEGEND:
INFERRED GROUNDWATER FLOW DIRECTION
48 GROUNDWATER ELEVATION CONTOUR
48.15 GROUNDWATER ELEVATION (ft above msl)
GROUNDWATER MONITORING WELL
GROUNDWATER EXTRACTION WELL
NOTES:
EW-1R installed July 2006. Water level measurements taken prior to treatment system start-up.
* MW-9: Well was not used for contour generation (screened in a deeper unit)
** MW-3: Water levels suspect, well not used for contour generation. Well will be resurveyed in the near future to verify the levels.
Note: This was Figure 4-1 in MWH Quarterly O&M Report, Feb 2008
MWH
MODESTO SUPERFUND SITE
MODESTO, CALIFORNIA
GROUNDWATER POTENTIOMETRIC SURFACE
BASELINE - 21 AUGUST 2006
Figure 1

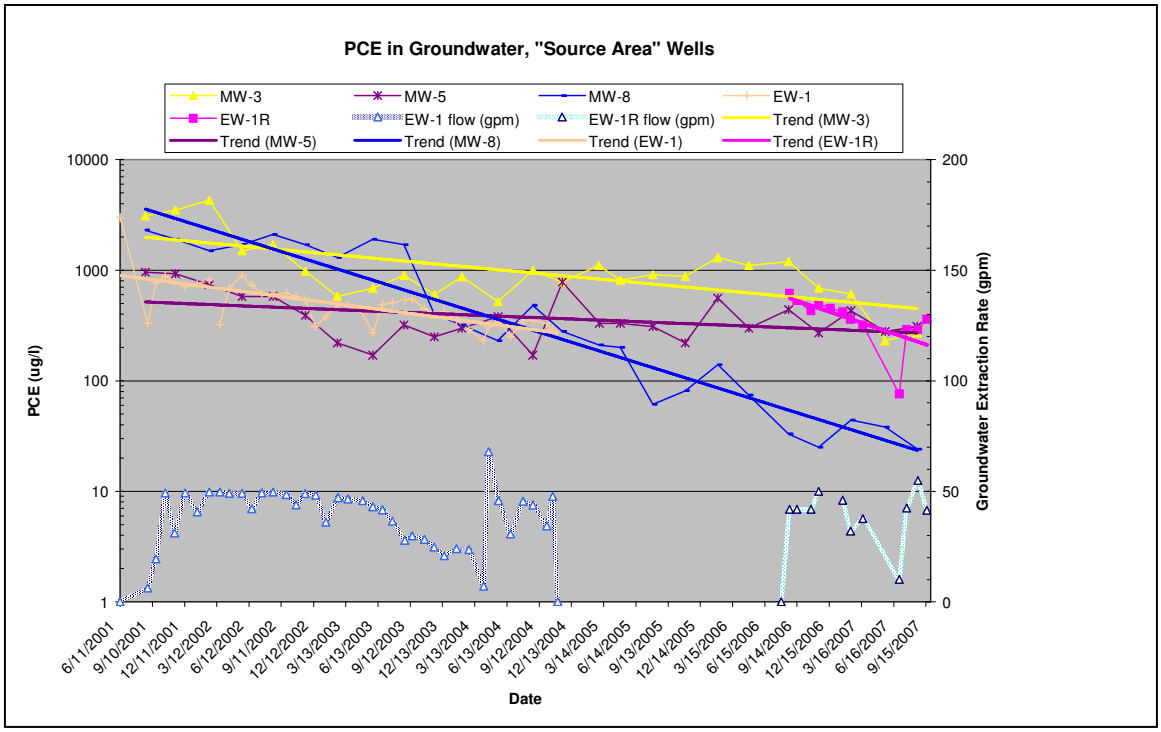


Figure 2. Historical PCE concentrations and trends in source area monitoring wells.

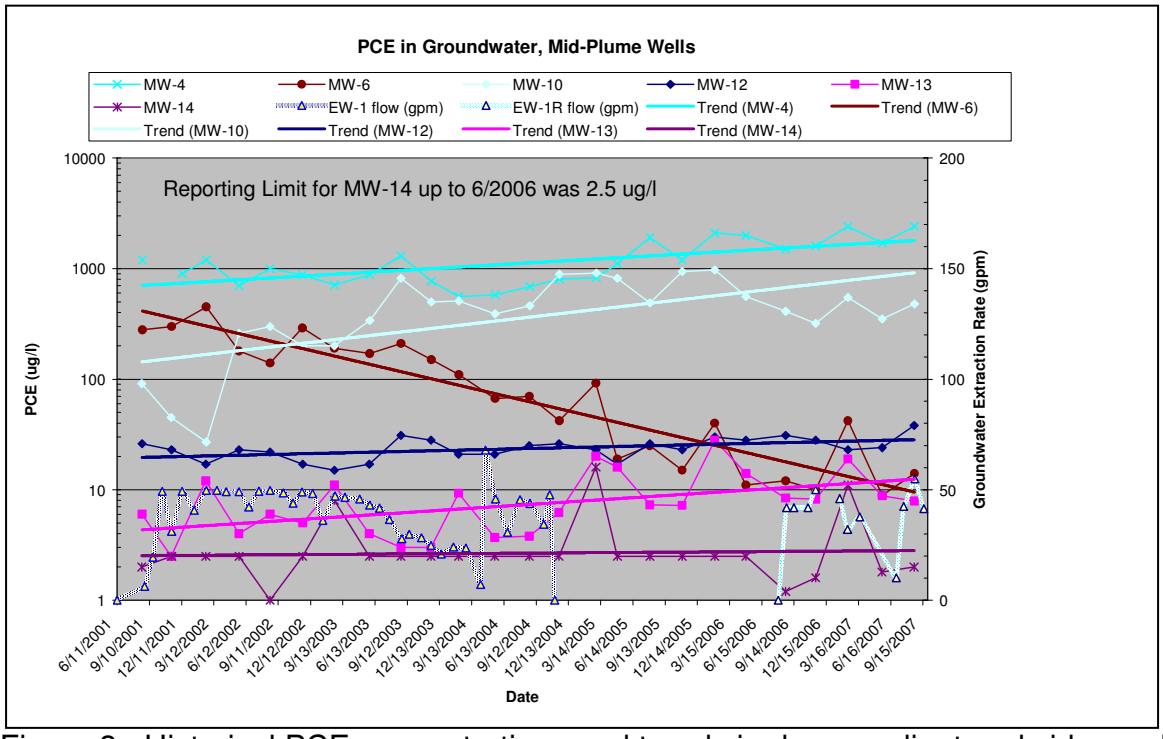


Figure 3. Historical PCE concentrations and trends in downgradient and side-gradient monitoring wells.

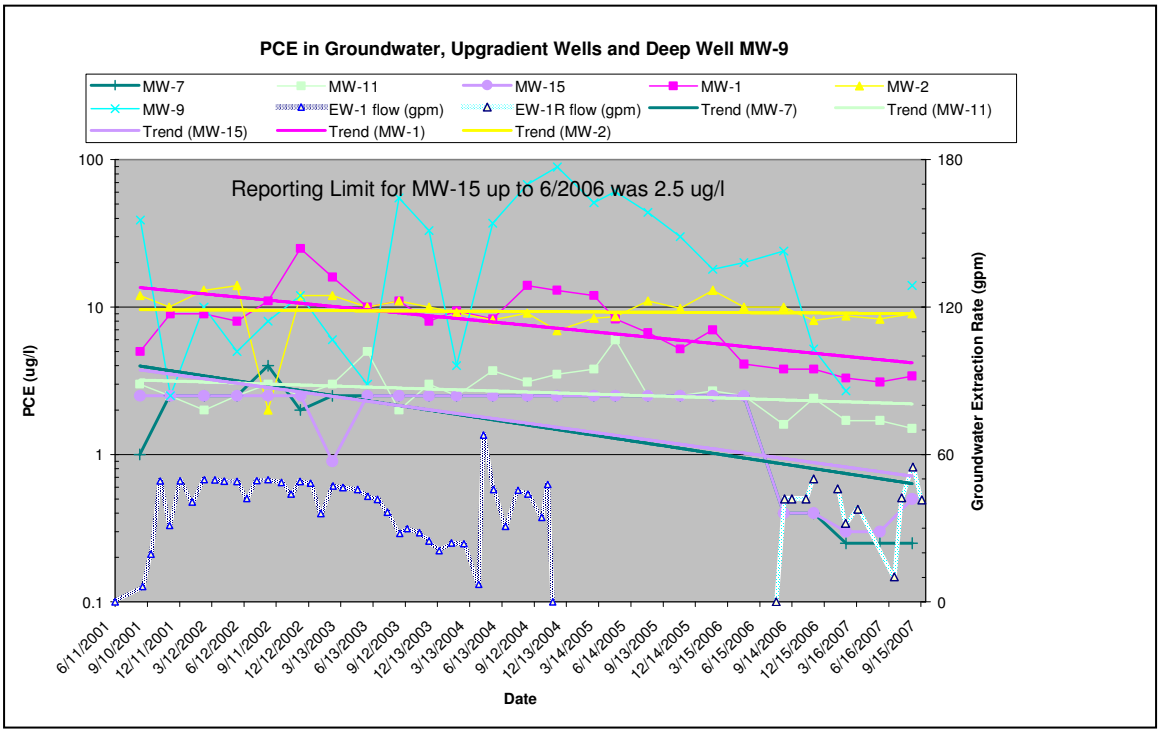


Figure 4. Historical PCE concentrations and trends in upgradient monitoring wells.

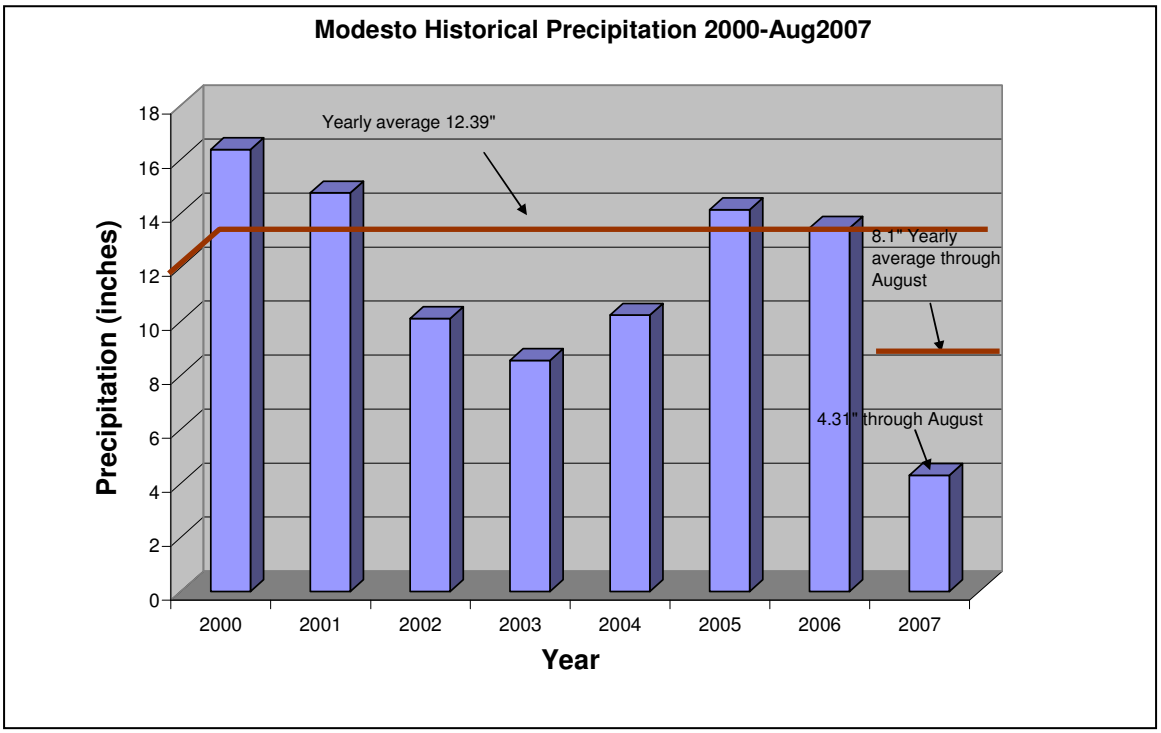


Figure 5. Historical annual precipitation for the Modesto Cooperative Weather Station compared to yearly average.

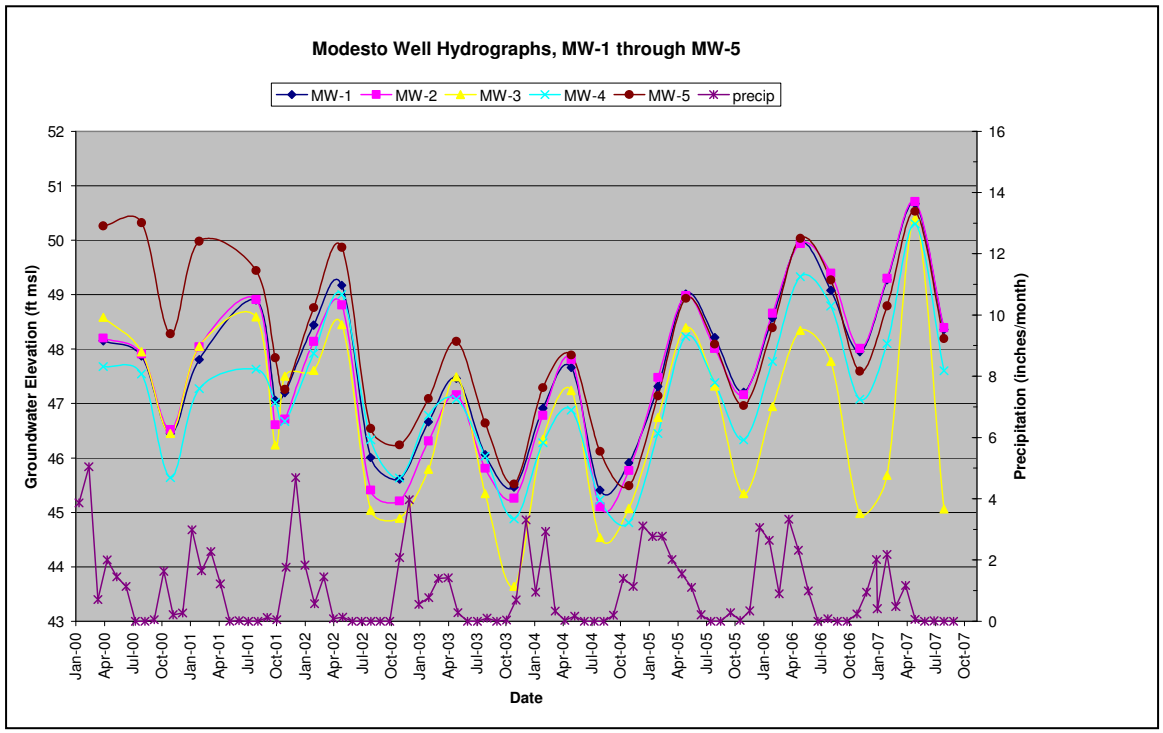


Figure 6. Select monitoring well hydrographs and monthly precipitation data.

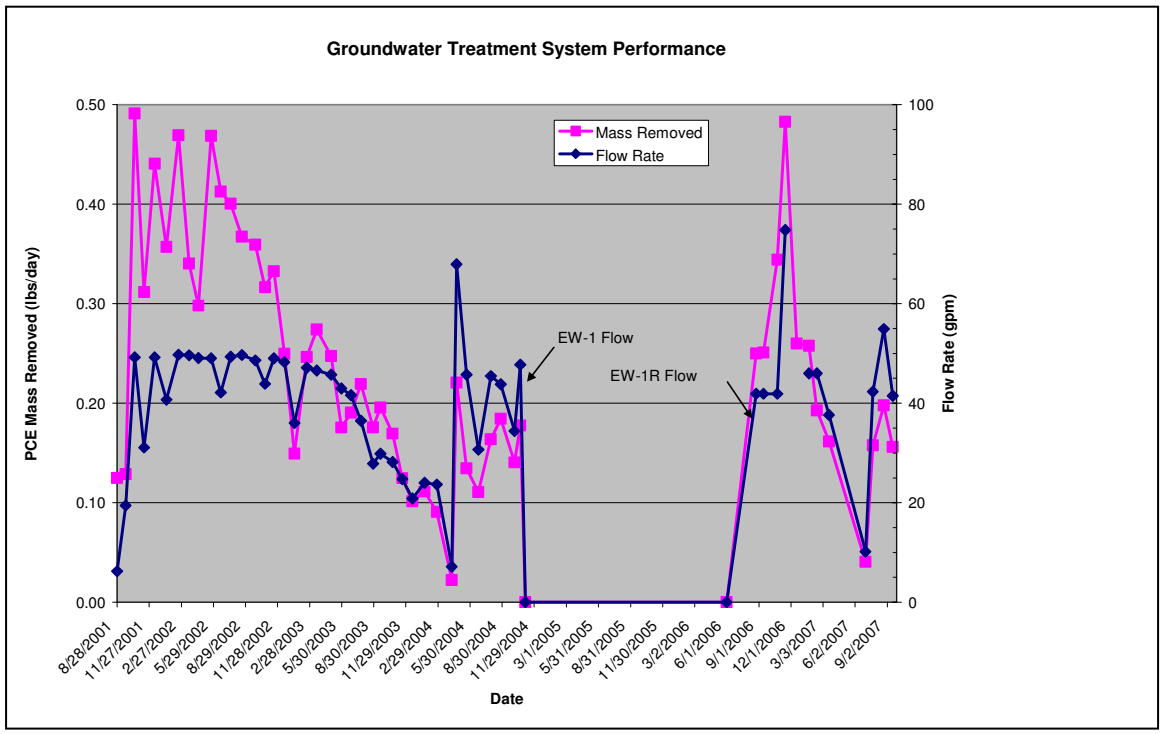


Figure 7. GWT system historical PCE mass extraction rate and operational data.

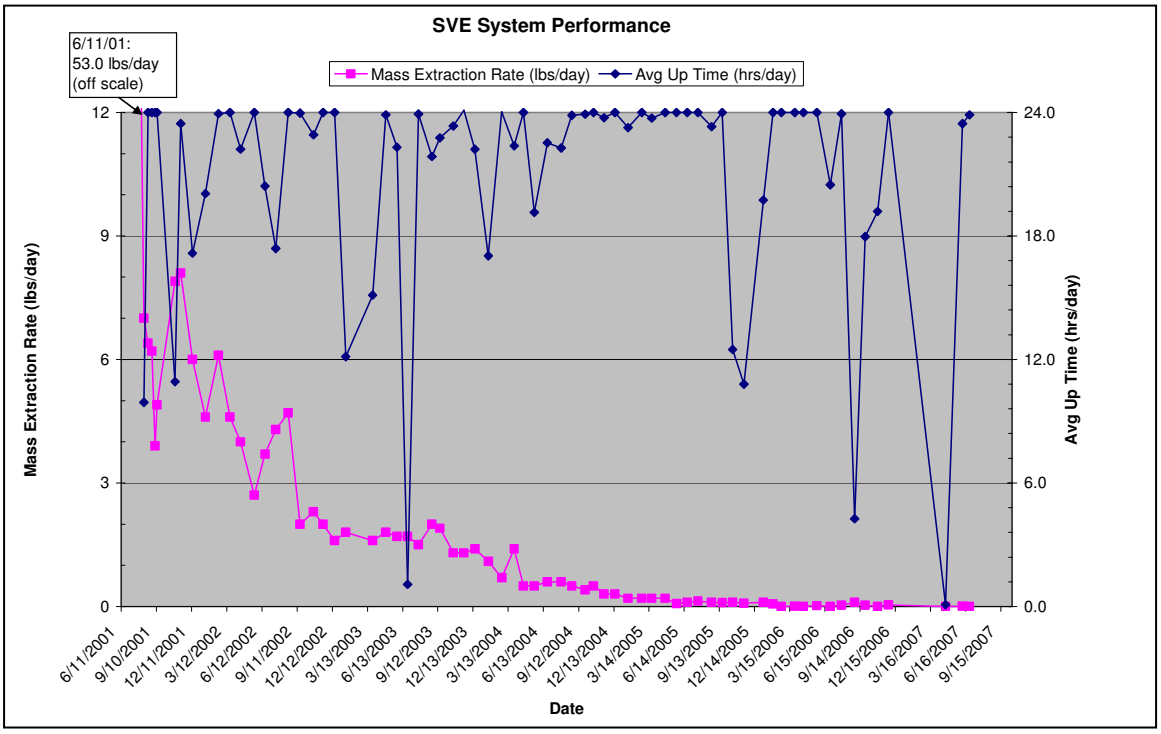


Figure 8. SVE system historical PCE mass extraction rate and operational data.

ARARs Review Summary, Modesto Site

Medium	Source/ARAR	Applicable or Relevant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
Chemical-Specific ARARs					
Groundwater	Porter-Cologne Water Quality Control Act, Cal. Water Code §13000, 13140, 13240/ State Water Resources Control Board Resolution No. 88-63, "Sources of Drinking Water Policy"	Applicable	Specifies that, with certain exceptions, all ground- and surface waters are considered suitable or potentially suitable for municipal or domestic water supply	Groundwater at the Site is a potential source of drinking water	This is still applicable. Groundwater is still a potential source of drinking water.
Groundwater	Safe Drinking Water Act, 40 USC §300f, et seql; Cal. Safe Drinking Water Act, Cal Health & Safety Code §4010/ National Primary Drinking Water Regs., 40 CFR Part 141, §141.61 (PCE MCL); Title 22 CCR, §64444, Table 64444-A (toluene MCL)	Potentially Applicable	Requirements applicable to public water systems. Establish "maximum contaminant levels" (MCLs), the maximum permissible level of a contaminant in water which is delivered to users of a public water system. MCLs are health-based standards.	Since this is an interim remedy, Federal and State MCLs are not ARARs for groundwater cleanup for this interim action because such a determination is outside the scope of this interim/source remedy. Groundwater cleanup standards will be determined in the final remedial action for the Site.	This is still potentially applicable. A final remedial action has not been determined or implemented for the Site.
All	22 CCR §66261.24(B)	Applicable	Establishes methods for determining hazardous waste classifications and sets characteristic of toxicity level for PCE	For determining waste classifications	This is still applicable. The treatment systems currently in place produce some hazardous waste.
Spent carbon	RCRA, Subtitle C, 42 USC §6921, et seq.; Hazardous Waste Control Act, Cal. Health & Safety Code §25100,	Applicable	Requires generators to determine whether waste is subject to land disposal restrictions	Requirement to determine whether carbon filtration units from treatment of vapors are subject to	This is still applicable. The treatment systems currently uses carbon filter units.

Medium	Source/ARAR	Applicable or Relevant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
	et seq./ 22 CCR, Division 4.5, Chapter 18, §66268.7(a)			land disposal restrictions is applicable	
Action-Specific ARARs (SVE and GWT system usage)					
Air	Clean Air Act, 42 USC §7401, et seq./ California State Implementation Plan (SIP)	Relevant and Appropriate	The SIP describes how the State air quality programs will be implemented to meet compliance with the CAA standards, including ambient air standards	Remedial actions should comply with relevant substantive requirements of the SIP	This is still relevant and appropriate. Remedial actions are still occurring.
Air	Clean Air Act, 42 USC §7401, et seq./ San Joaquin Valley Unified Air Pollution Control District, Rule 2201	Applicable	Stationary sources rule requires application of best available control technology to new or modified emissions unit if unit would increase emissions more than 2 pounds per day	For controlling air emissions from soil vapor and groundwater treatment units, applicable depending on quantity and types of air emissions	This is still applicable. The vapor treatment system will be optimized and potentially modified.
Air	Clean Air Act, 42 USC §7401, et seq./ San Joaquin Valley Unified Air Pollution Control District, Rule 4101	Applicable	Visible emission limits prohibit emission of more than 3 minutes/hour of certain types of visible emissions	For controlling air emissions from soil vapor and groundwater treatment units	This is still applicable. The soil vapor and groundwater treatment units are still operational.
Air	Clean Air Act, 42 USC §7401, et seq./ San Joaquin Valley Unified Air Pollution Control District, Rule 4102	Applicable	Prohibits discharge of air contaminants that will be a nuisance or will endanger the public	For controlling air emissions from soil vapor and groundwater treatment units	This is still applicable. The soil vapor and groundwater treatment units are still operational.
Air	Clean Air Act, 42 USC §7401, et seq./ San Joaquin Valley Unified Air Pollution Control	Applicable	Particulate matter emission standard prohibits emission of dust, fumes or total	For controlling air emissions from soil vapor and groundwater treatment units	This is still applicable. The soil vapor and groundwater treatment units are still operational.

Medium	Source/ARAR	Applicable or Relevant and Appropriate	Requirement Synopsis	Initial Comment on Application	Current ARAR Evaluation
	District, Rule 4201		suspended particulate matter greater than 0.1 grain per cubic foot of gas at dry standard conditions. Prescribes certain EPA analytical methods		
Air	RCRA, 42 USC §6901, et seq./ Air Emissions Standards for Process Vents, 40 CFR Part 264, Subpart AA	Applicable	Air emissions standards for process vents associated with air stripping operations managing hazardous wastes with organic concentrations of at least 10 ppmw	Potentially applicable to air strippers used in groundwater remediation, depending on concentrations of extracted groundwater	This is still potentially applicable. Air stripping is the primary component of the groundwater treatment system. Groundwater concentrations potentially may translate to vapor concentrations of at least 10 ppmw.
Air	EPA Guidance/ OSWER Directive No. 9355.0-28	Applicable	Guidance on the control of air emissions from air strippers for groundwater treatment at Superfund sites, limiting emissions to 15 pounds per day	For the air stripper to be used in the groundwater treatment remedy	This is still applicable. The groundwater treatment with an air stripping component is still operating.

TRIP REPORT
MODESTO GROUNDWATER SUPERFUND SITE, MODESTO, CA
(EPA ID: CAD981997752)

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1. INTRODUCTION:

a. Dates of Visit: 27-28 Feb 2008

b. Location: Modesto, Stanislaus County, California

c. Purpose: A site visit was conducted to provide information about the site's status and to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the first Five-Year Review Report.

d. Travelers:

Sheri Moore	USACE Seattle District	(206) 764-3467
Jefferey Powers	USACE Seattle District	(206) 764-6586

e. Contacts:

Holly Hadlock	USEPA Region 9 Remedial Project Manager (RPM)	(415) 972-3171
Rich Pitra	MWH Constructors	(916) 418-8241

2. SITE VISIT SUMMARY:

Sheri Moore and Jefferey Powers ("USACE team") arrived in Sacramento, California on the afternoon of 27 Feb 2008 and drove to Modesto, approximately 70 miles south, in preparation for the site visit and site inspection. On 27 Feb the USACE team inspected the residential areas surrounding the site along the northern, western, and southern perimeters. The team also reviewed the Administrative Record on file at the local repository, the Stanislaus County Free Library in Modesto.

On 28 Feb the USACE team inspected the residential area to the east of the site prior to the formal site inspection. At approximately 1015 hrs, the USACE team met with the other participants of the FYR site inspection (See paragraph 1e.) in the parking lot behind Halford's Cleaners (941 McHenry Ave., between Griswold Ave. and Fairmont Ave., See Photo 1). The weather was sunny with a slight breeze, and a temperature of about 70^{o}F. After introductions were made, Mr. Pitra and Ms. Hadlock provided a brief site history to the USACE team. Mr. Pitra led a tour of the groundwater treatment system, soil vapor extraction treatment system, and opened up the vaults to extraction well EW-1R and monitoring well MW-8. After all the issues pertinent to the site and the site inspection checklist were discussed (See Section 3, DISCUSSION, for details), the site inspection concluded at approximately 1215 hrs. The USACE team then returned to Sacramento on the afternoon of 28 Feb for a return flight to Seattle.

3. DISCUSSION:

The trip was made to complete the formal site inspection and associated Site Inspection Checklist, an important component of the Five Year Review. Furthermore, the site visit was helpful in providing the USACE technical team the opportunity to become more familiar with the site, the remedial actions being implemented, and the relationship between the site and the surrounding properties.

The Modesto Groundwater Superfund Site (MGSS) is a USEPA-led CERCLA site in which a five-year review is being conducted, with technical assistance provided by the Seattle District USACE. The physical remedies that have occurred on site dating back to 1991 include the installation and operation of a small-scale soil vapor extraction (SVE) system, groundwater extraction and treatment system (GWTS), a second, more robust SVE system, and replacement of the groundwater extraction well. The site has historically impacted Modesto Municipal Supply Well 11, located approximately 1,100 feet northwest of the site. This well has been out of service since 1995 due to high levels of naturally occurring uranium unrelated to the MGSS.

The critical site remedial components are protected by various access restrictions. The treatment components for the GWTS are inside a locked treatment trailer located inside a locked, aluminum chain link fence with woven privacy slats (Photo 2). The SVE treatment components are also inside their own locked treatment trailer (except the vapor-phase GAC vessel located immediately outside the trailer). All SVE components are within the same fence as the GWTS. The groundwater extraction well is located inside a large flush-mounted vault, and monitoring wells are located inside small flush-mounted vaults secured by two to three bolts. Because the PCE plume footprint extends across the property of several businesses, there is no fence which encompasses the entire MGSS. Signage was in place on the fence surrounding the GWTS and SVE systems which stated *"U.S. EPA Modesto Groundwater Superfund Site"* (Photo 3) and *"No Trespassing"* (Photo 2). Although Mr. Pitra indicated passers-by occasionally throw trash over the security fence, trespassing and vandalism are not recurring issues of concern for the site.

The GWTS appeared to be in good working order and was operating at the maximum designed capacity of 50 gpm at the time of the site visit (Photos 4, 5, 6). Mr. Pitra indicated readings are collected weekly from the GWTS and samples are collected monthly. Alarms are in place to automatically shut down the systems should a critical system failure occur. The SVE system appeared to be in working order, although the system was not in operation because an indoor air sampling program was being conducted at the time of the site visit which required ambient soil vapor pressures (Photo 7). Emergency shutdown procedures and current points of contact were prominently posted on the inside walls of the trailers (Photo 8).

Four site-related documents were located inside the SVE trailer, including: 1) GWTS and SVE System O&M Manual, 2) Project Safety Plan and Emergency Response Plan for OPM, SI, GW Installation, and SVE Construction (2006), 3) Modesto Superfund Site Final SAP (May 2001), and 4) Modesto Superfund Site SVE and GW System Sampling Plan (Photo 8). Mr. Pitra indicated the MWH personnel conducting system measurements or sampling carried the other pertinent site documents in their vehicle with them down from Sacramento. Copies of all

remedial action-related plans, reports, and other documentation are maintained in the Sacramento MWH office as well as the USEPA Region 9 office.

The flush-mounted covers to several wells were located within the parking lot to the west and southwest of Halford's Cleaners. Mr. Pitra opened the aluminum vault covering extraction well EW-1R (Photo 9). This well appeared to be in good condition and the submersible pump was active at the time of the site visit. Mr. Pitra then unbolted and removed the flush-mount well cover from monitoring well MW-8 (Photo 10). The well head contained a locked, expandable well cap (Photo 11). The rubber gasket was missing from the flush-mount cover, thereby allowing rainwater to enter the space inside the flush-mount (but not inside the well casing itself). Not all wells were located during the site visit.

A former Elks Lodge, now a catering business, is located immediately to the north and northwest of Halford's Cleaners. Several other businesses, including two auto repair facilities, an auto parts shop, and a real estate office are located to the south of Halford's. A large parking lot, mainly owned by the catering business, exists to the immediate west of Halford's (Photo 12). Generally commercial enterprises (retail outlets, motels, etc.) exist within a half-block buffer along both sides of McHenry Avenue to the north and south of the site. Beyond this corridor, single-family homes - and to much lesser extent apartments - surround the site in all directions. Municipal Well 12 (currently out of service) was located during the site visit within John Muir Park approximately 2,000 feet east-southeast of Halford's Cleaners (Photo 13).

At the time of the site visit, an indoor air sampling program was being conducted by a sub-contractor of MWH. This was the first of two indoor sampling events, corresponding to the late-winter ambient conditions. All buildings on the west side of the McHenry Avenue block that includes Halford's Cleaners were reportedly being sampled.

The local Administrative Record for the Modesto Groundwater Superfund Site was reviewed during the site visit. The local repository for the Administrative Record file is the Stanislaus County Free Library located on I Street in Modesto. When asked for the Modesto Groundwater Superfund Site Administrative Record, library personnel obtained the records from downstairs (inaccessible to the public) and brought them up to the main floor of the library for the USACE team to review. The record contained many documents dating back to 1986; however, there were no updates to the Administrative Record since Oct 1997.

The USACE Seattle District will incorporate the information obtained from the site visit into the first Five-Year Review Report, and will also assist the USEPA Region 9 in documentation of the site visit to be incorporated into the Site Inspection Checklist.

Jefferey Powers, L.G.
Hydrogeologist
CENWS-EC-TB-GE

Photo 1. Rear of Halford's Cleaners building.

Photo 2. Security fence surrounding treatment systems.

Photo 3. Superfund sign on security fence.

Photo 4. Equalization tank inside GWTS unit.

Photo 5. Air stripper inside GWTS unit.

Photo 6. Control panels in GWTS unit.

Photo 7. GAC treatment inside SVE unit.

Photo 8. Project documentation inside SVE unit.

Photo 9. Extraction well EW-1R.

Photo 10. Monitoring well MW-8.

Photo 11. MW-8, inside flush mount cover.

Photo 12. Parking lot west of site.

Photo 13. Municipal Well 12 (not in operation).

Site Inspection Team Roster

Modesto Groundwater Superfund Site
First Five-Year Review
Site Inspection – Feb 28, 2008

Name	Title	Affiliation	Phone No.
Holly Hadlock	Remedial Project Manager	USEPA, Region 9	(415) 972-3171
Rich Pitra	Manager – Field Services Western Region	MWH Constructors	(916) 418-8241
Sheri Moore	Environmental Engineer	US Army Corps of Engineers, Seattle District	(206) 764-3467
Jefferey Powers	Geologist	US Army Corps of Engineers, Seattle District	(206) 764-6586

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Modesto Groundwater Superfund Site	**Date of inspection:** February 28, 2008
Location and Region: Modesto, Stanislaus County, CA; USEPA Region 9	**EPA ID:** CAD981997752
Agency, office, or company leading the five-year review: USEPA Region 9	**Weather/temperature:** Sunny, light breeze, 70-deg F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Soil vapor extraction and treatment system (SVE)
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached
   _____
   _____

2. **O&M staff** Rich Pitra MWH, Field Services Manager, Western Region 28 Feb 2008
   Name Title Date
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached
   _____
   _____

3. **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
_____
_____

4. **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 Documentation mainly housed off site at remedial contractor's office in Sacramento; pertinent specific documents are brought to site during O&M activities.

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

   Remarks_____

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

   Remarks Annual HAZWOPER 8-hr refresher and safety update documentation

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 Effluent discharge permitted through 2009 despite Superfund permits not needed if substantive requirements being met.

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_____

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_____

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

    Remarks Weekly, not daily access. Logs not formally maintained on site.

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 Agency
☐ Other Remedial contractor (MWH) performs O&M, funded by USEPA.

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: Remedial contractor costs not yet reviewed for draft Site Inspection Checklist; will obtain, review, and add pertinent information for final checklist.

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks Fence is in good condition. Gate is kept closed and locked.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks Signs on fence indicating “Modesto Groundwater Superfund Site” and “No Trespassing.”
Security fencing and locked gates; locked treatment units; locked wells.

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)
_____
Frequency
_____
Responsible party/agency
_____
Contact _____ _____ _____ _____
Name Title Date Phone no.

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
Only current IC is prohibition against installing wells for any purpose except remedial treatment and groundwater monitoring. Based on personal communication with Nicole Damin (Stanislaus County Department of Environmental Resources), SCDER refers Modesto well permit requests to the City of Modesto, which currently denies requests if the location falls within city limits served by their public water supply system (as does the entire Site).
_____

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks IC to prevent water supply well drilling are in place and adequate; it is not known at this time if additional ICs are required pending results of indoor air sampling.
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks Occasional trash thrown over security fence into GWTS/SVE trailer area.
_____

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

A. Landfill Surface

B. Benches ☐ Applicable ☐N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

D. Cover Penetrations ☐ Applicable ☐ N/A

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐N/A

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

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 Extraction well EW-R1 operating at 50 gpm at time of site inspection.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks No apparent problems.

3. **Spare Parts and Equipment**
   ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks Common spare consumables on site and readily available; other parts must be ordered if originals fail.

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
   ☒ Additive (*e.g.*, chelation agent, flocculent) To prevent scale buildup
   ☒ Others Two resin canisters (lead and lag) to remove naturally occurring uranium.
   ☒ 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 Up to 26.28 million gallons (at 50 gpm with continuous operation).
   ☐ Quantity of surface water treated annually N/A
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks Not all wells were located during site inspection.
   _____

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. 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 N/A

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.

SOIL VAPOR EXTRACTION

At the time of the site inspection, the SVE system was not in operation because ambient soil vapor pressures were required for the indoor air sampling being conducted in nearby buildings along McHenry Ave. The inspection team looked inside the secured (locked) SVE trailer, which contained the condensate unit and GAC unit along with ancillary piping and electrical controls. The treatment equipment and the inside of the trailer appeared clean and in good working order. A window air conditioning unit was installed in the trailer and was in operation (set to 70-deg F). The trailer also contained pertinent emergency shut down procedures and points of contact posted prominently on the inside trailer wall. The trailer contained four site documents: 1) GWTS and SVE System O&M Manual, 2) Project Safety Plan and Emergency Response Plan, 3) Final SAP (May 2001), and 4) SVE and GW System Sampling Plan.

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 groundwater extraction and treatment system is designed to remove groundwater from the shallow aquifer contaminated with PCE, treat the water using an air stripper with off gas sent through granular activated carbon. Treatment system influent is also treated with resin canisters to remove naturally occurring uranium to levels acceptable for acceptance by the POTW. The goal is to effectively capture the PCE plume in order to prevent it from advancing farther downgradient from the site with groundwater. The GWTS is working properly; however, the maximum designed capacity of 50 gpm may not be sufficient to adequately control the PCE plume. System optimization is planned.

The soil vapor extraction and treatment system is designed to remove PCE from unsaturated soil (via soil vapor when a vacuum is applied to the vadose zone) and treat the air through granular activated carbon adsorbtion. Though not currently operating at the time of the site visit, the SVE system appears to be in good working order. Prior to shut down, the SVE data suggested the majority of PCE has been removed from the current SVE well, and that a new well or wells may be needed in areas still experiencing high soil and soil vapor PCE concentrations in order for the SVE system to be most effective. System optimization is in progress.

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.

Operation and maintenance appears sufficient at this time.

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.

Costs have not been evaluated for the draft checklist; however the GWT and SVE systems appear to be (or in the case of the temporarily shut down SVE system “appear to have been”) operating as designed. Both systems likely need to be upgraded to accomplish long term objectives of adequate removal of PCE in soil and groundwater.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Complete PCE plume characterization is required before full optimization evaluation can be performed. Likely optimization scenarios are to reconfigure the subsurface vapor extraction system and potentially add more treatment capacity to the GTW system if the entirety of the dissolved PCE plume remains uncaptured. _____ _____ _____

Attachment 6

Interview with City Officials

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105-3901

May 19, 2008

MEMORANDUM

FROM: Holly Hadlock, Remedial Project Manager

TO: The File

SUBJECT: Modesto Groundwater Five-Year Review Interview with City Officials

On May 15, 2008, I met with the following City of Modesto officials: Jim Niskanen, Interim City Manager; Nick Pinhey, Public Works Director; Allen Lagarbo, Water Superintendent; and John Rivera, Regulatory Compliance Supervisor. The purpose of the meeting was to inform them of the five-year review, to brief them about the Superfund site, and find out if the City has any issues or concerns regarding the site.

I inquired about municipal wells in the area that might have an influence on the groundwater flow near Halford's. Several municipal wells now have wellhead treatment for PCE; none have treatment for uranium but they might in the future. Mr. Legarbo said he would send me information about wells in the central Modesto area, including well locations, depths, pumping rates, and other pertinent information.

I was asked where the treated groundwater goes and informed them that it goes into their sewer system. We discussed better uses for this water, such as watering landscaping in downtown Modesto, and agreed to look into this further. Mr. Niskanen said they would not want to use city trucks and equipment to get the water if there is not a public right of way adjacent to the treatment trailer at the back of the Lyon/Tonda property.

In response to my informing them of high levels of PCE in Halford's and The Parts House, Mr. Niskanen expressed concern about employees working in an unhealthy environment. I told him we would re-sample the two businesses and take steps, both short term and long term, to reduce PCE levels in the buildings. He also requested a copy of the EPA fact sheet before it is sent to the public in order to be prepared for any calls that might come in.