THIRD FIVE-YEAR REVIEW REPORT FOR BOUNTIFUL/WOODS CROSS 5TH S. PCE PLUME SUPERFUND SITE DAVIS COUNTY, UTAH

Prepared by

Division of Environmental Response and Remediation

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LIST OF ABBREVIATIONS AND ACRONYMS

AF	Attenuation Factor
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BCI	Bountiful Cleaners Incorporated
bgs	Below Ground Surface
CAH	Chlorinated Aliphatic Hydrocarbon
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
DCE	Dichloroethylene
DERR	Division of Environmental Response and Remediation
EAB	Enhanced Anaerobic Bioremediation
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
GAC	Granular Activated Carbon
GWTS	Groundwater Treatment System
Hatchco	W.S. Hatch Company
HQ	Hazard Quotient
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
LTMP	Long-term Monitoring Plan
LTRA	Long-term Response Action
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
mg/kg	Milligrams per Kilogram
µg/m^3	Micrograms per Cubic MeterMNA Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&F	Operational and Functional
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SDSD	South Davis Sewer District
SDWA	Safe Drinking Water Act
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
UDEQ	Utah Department of Environmental Quality
UPDES	Utah Pollutant Discharge Elimination System
UU/UE	Unlimited Use and Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

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

The Division of Environmental Response and Remediation (DERR) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)) and considering United States Environmental Protection Agency (EPA) policy.

This is the third FYR for the Bountiful/Woods Cross 5th S. PCE Plume Superfund site (Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OUs). OU1 addresses the groundwater and soil remedies at the former W.S. Hatch Company (Hatchco) property. OU2 addresses the groundwater and soil remedies for the Bountiful Cleaners Incorporated (BCI) property and the former David Early property. This FYR addresses both OUs.

DERR Project Manager Michael Storck led the FYR. Participants included EPA Remedial Project Manager (RPM), Angela Zachman, EPA Community Involvement Coordinator (CIC) Meg Broughton and Utah Department of Environmental Quality (UDEQ) Environmental Planning Consultant Dave Allison. The review began on 1/19/2023. Documents used to prepare this FYR are summarized in Appendix A (Reference List). Appendix B provides a detailed Site chronology.

The EPA has determined in the Five-Year Review that the cleanup at the Bountiful/Woods Cross 5th S. PCE Plume Superfund Site is currently protective of human health and the environment. With the exception of one domestic well, groundwater beneath the site is not used for drinking water purposes and the installation of new groundwater wells is restricted by the Groundwater Management Plan for the Bountiful Sub-Area. Groundwater sampling is performed to evaluate contaminant levels and inform the owner of the domestic well of any exceedances. A soil vapor extraction system is currently being installed at the source area to address vapor intrusion concerns.

Site Background

The Site is in southern Davis County, Utah, about 10 miles north of Salt Lake City (Figure 1). Residential, industrial, agricultural, and commercial properties surround the Site. Part of an interstate highway (Interstate 15), railroad tracks, a shopping mall, and a petroleum refinery are also located within the Site's boundaries. From 1936 to 1986, Hatchco operated as a carrier of bulk petroleum, asphalt, petroleum products, and solvents. The company serviced tractor trailers and tank trucks on the south-central portion of the Site (OU1). OU1 includes the Hatchco property as well as a groundwater contaminant plume of trichloroethylene (TCE) and associated degradation products that extends under approximately 50 acres of land (Figure 2). The Utah Transit Authority owns the Hatchco property and uses the area as a paved parking lot for the TRAX light rail system.

OU2 includes the BCI and the former David Early properties (Figure 2), as well as a downgradient groundwater contaminant plume of tetrachloroethylene (PCE). The PCE plume, including its degradation products, covers approximately 400 acres. The half-acre BCI property is located at 344 South 500 West in Bountiful, Utah, where BCI operates a dry-cleaning business in a shopping center. The former David Early vehicle maintenance shop was located south of the BCI property. In 2020 the property was bought by the Wright Development Group. The vehicle maintenance shop was demolished in October 2020, and a multi-tenant commercial building was constructed and completed in September 2021. The present building includes a hair salon and coffee shop. Prior

to BCI's ownership, various owners operated dry-cleaning businesses at the property from 1940 to 1967. The property was connected to the city sewer system in 1966, a year before it was bought by BCI. Prior to this time, previous operators discharged wastewater into a septic system and drain field. Waste handling activities at OU1 and OU2 resulted in the release of wastes to soil and groundwater.

Groundwater at OU1 occurs in two zones, the shallow, unconfined interval and a deeper, confined zone. Groundwater in the shallow aquifer occurs beneath the OU2 site in lenticular sand and gravel zones interbedded with silt, clay, and peat beds and heterogeneous mudflow deposits. Locally, the shallow aquifer is divided into the Upper (U), Middle (M), and Lower (L) Zones, and the Middle Zone has been subdivided into the Middle-Shallow (MS) and Middle-Deep (MD) Zones. The Upper Zone is typically considered to be less than 80 ft below ground surface (bgs); the Middle-Shallow Zone is nominally 90 to 150 ft bgs; the Middle-Deep Zone is nominally 140 to 200 ft bgs; and the Lower Zone is greater than 200 ft bgs. Groundwater contamination at both OUs is limited to the shallow aquifer, with groundwater flowing west and northwest. Private wells are used for domestic and agricultural purposes and are sampled regularly for site contaminants of concern (COCs).

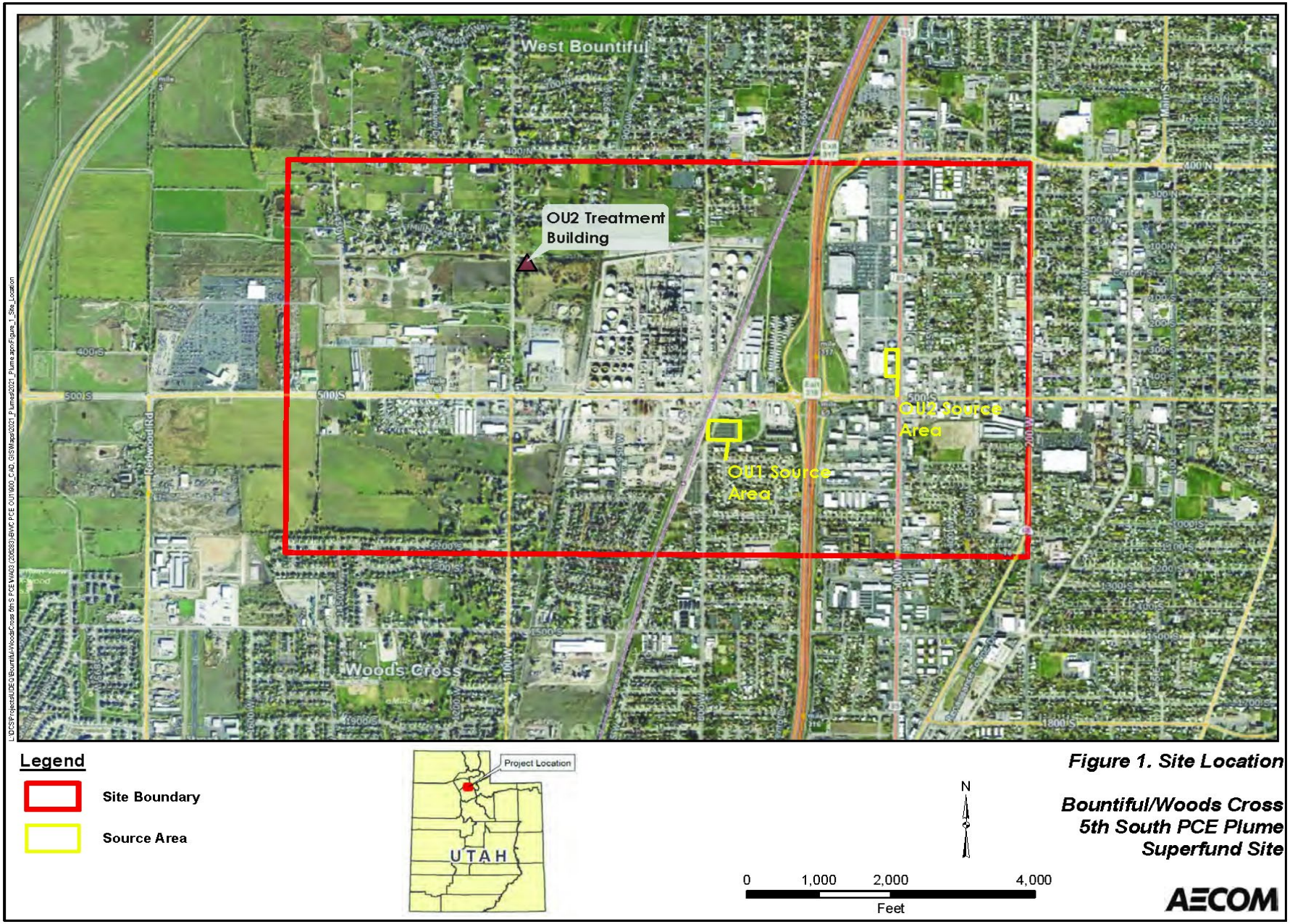


Figure 1. Site Location

Bountiful/Woods Cross 5th South PCE Plume Superfund Site

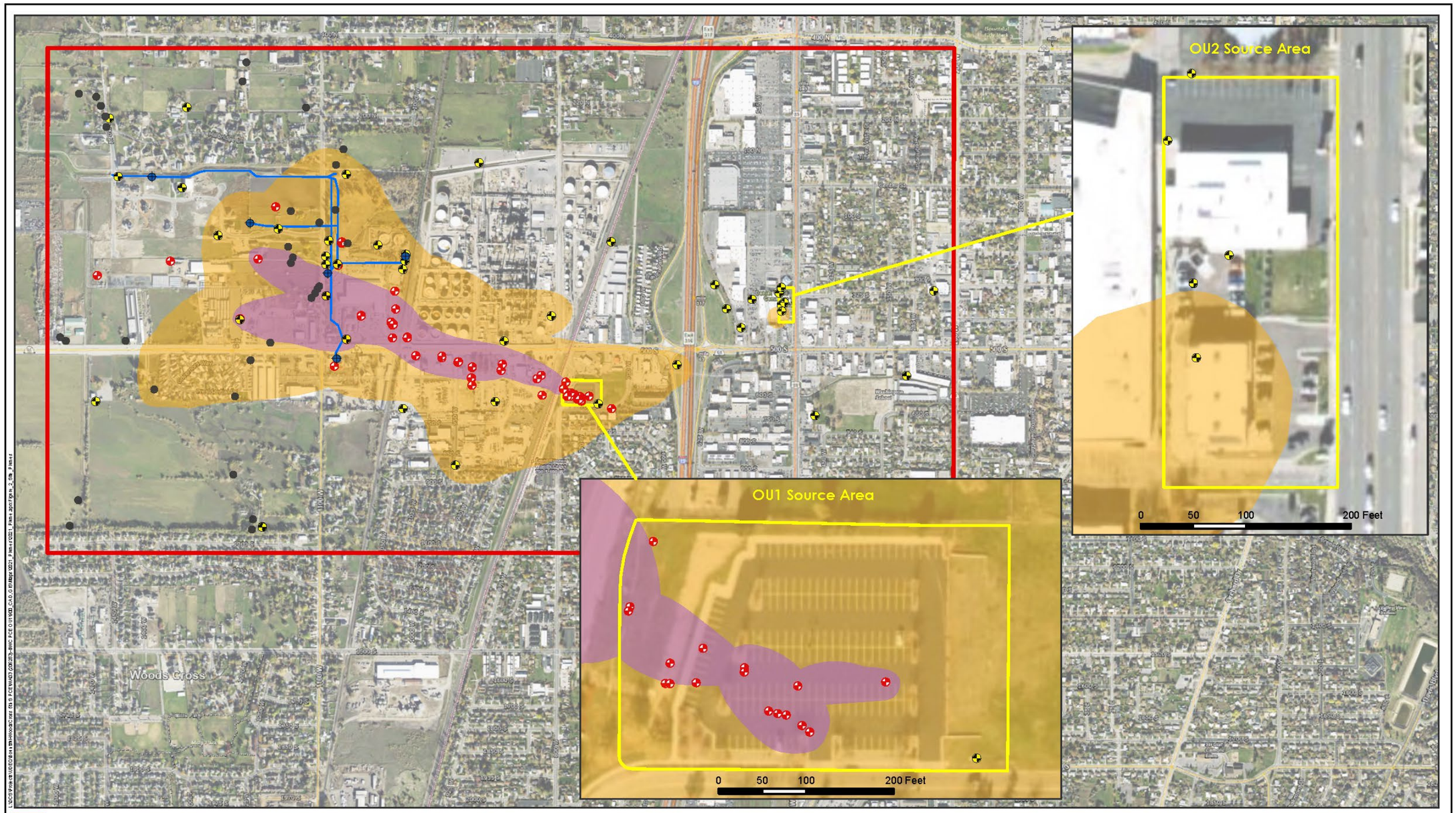


Figure 2. OU1 and OU2 Site Detail Map

Bountiful/Woods Cross
5th South PCE Plume
Superfund Site

AECOM

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Bountiful/Woods Cross 5th S. PCE Plume		
EPA ID: UT0001119296		
Region: 8	**State: Utah**	**City/County:** Bountiful, West Bountiful and Woods Cross/Davis

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the Site achieved construction completion?** No

REVIEW STATUS
Lead agency: State
Author name: Michael Storck/Tony Howes, State Project Managers
Author affiliation: Division of Environmental Response and Remediation
Review period: 1/19/2023 - 6/25/2023
Date of site inspection: 3/22/2023
Type of review: Statutory
Review number: 3
Triggering action date: 7/25/2018
Due date *(five years after triggering action date)*: 7/25/2023

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In December 2000, the EPA proposed listing the Site on the Superfund program's National Priorities List (NPL). The EPA finalized the Site's listing on the NPL in September 2001. A summary of the basis for taking action at the two OUs is provided below.

OU1 – Hatchco Property
Hatchco, the potentially responsible party (PRP), completed a human health baseline risk assessment for OU1 in 2003. It concluded that contaminated groundwater should not be used for drinking water or indoor domestic use. In addition, the risk assessment determined that surface and subsurface soil at OU1 does not pose a direct exposure concern to human health based on regulatory criteria established for trench worker exposure. The risk assessment did not evaluate direct exposure of a commercial worker or resident to surface soil since the Hatchco property was undeveloped and fenced at the time, minimizing direct human exposure. However, the risk

assessment identified subsurface soil as a potential source of contamination to groundwater. The EPA completed an ecological risk assessment in 2004. It concluded that exposure pathways to contaminated groundwater did not pose health concerns to ecological receptors. Table 1 presents a summary of the contaminated media and associated COCs and cleanup goals for OU1.

Table 1: Contaminated Media and Cleanup Goals OU1

COC	Subsurface Soil (µg/kg)	Groundwater[b] (µg/L)
Benzene	not required	5
Cis-1,2-dichloroethylene (cis-1,2-DCE)	not required	70
Naphthalene	not required	6.5
PCE	not required	5
TCE	60[a]	5
1,2,4-Trimethylbenzene	not required	70
Vinyl chloride	not required	2

Notes:

a. From Section 6.2 of the 2006 OU1 Record of Decision (ROD). Value is a default value based on a 20-fold dilution/attenuation factor.

b. From Section 6.4 and Section 13.2 of the 2006 ROD. Concentrations based on the maximum contaminant level (MCL). In the absence of an MCL, the lower of cancer risk level 10^{-4} or noncancer hazard quotient (HQ) of 1.0 was selected.

µg/kg = micrograms per kilogram
µg/L = micrograms per liter

OU2 – BCI and Wright Development Group (Formerly David Early Properties)

The EPA completed a baseline human health risk assessment for OU2 in 2005. It concluded that contaminated groundwater could pose unacceptable health risks due to direct ingestion of untreated groundwater, inhalation of volatile organic compounds (VOCs) in contaminated groundwater that are released into indoor air from indoor water uses, and inhalation of VOCs released from groundwater and subsurface soils that migrate upward through soil into indoor and sub-slab air (vapor intrusion). Ecological risks were below levels of concern. Table 2 presents a summary of the contaminated media and cleanup goals for OU2, as presented in the ROD.

Table 2: Contaminated Media and Cleanup Goals[a] OU2

COC	Subsurface Soil[b] (mg/kg)	Soil Vapor (µg/m³)		Groundwater (µg/L)		
		Groundwater Protection	Commercial[c]	Vapor Intrusion – Residential[c]	Vapor Intrusion – Commercial[c]	Ingestion[d]
Benzene	0.03	705	1,314	221	932	5/0
1,1-DCE	0.06	5,130	8,760	285	1,195	7/7
Cis-1,2-DCE	0.4	7,420	-	-	-	70/70
Trans-1,2-DCE	0.7	25,243	2,628	248	1,041	100/100
Ethylbenzene	13	124,393	43,800	5,868	24,648	700/700
PCE	0.06	2,148	2,079	96	484	5/0
Toluene	12	158,768	219,000	32,843	137,941	1,000/ 1,000
TCE	0.06	1,276	6,132	477	2,403	5/0
1,2,4-Trimethylbenzene	324	1,524	74	14	59	12[e]
1,3,5-Trimethylbenzene	324	1,457	74	15	61	12[e]
Vinyl chloride	0.01	1,647	1,394	34	169	2/0
Xylene, m-	210	1,645,708	4,380	634	2,661	10,000/ 10,000
Xylene, o-	190	1,153,415	4,380	904	3,797	10,000/
Xylene, p-	200	1,718,136	4,380	607	2,549	10,000

COC	Subsurface Soil[b] (mg/kg)	Soil Vapor (µg/m^3)		Groundwater (µg/L)		
		Groundwater Protection	Commercial[c]	Vapor Intrusion – Residential[c]	Vapor Intrusion – Commercial[c]	Ingestion[d]

Notes:

a. From Table A of the 2007 ROD.
b. Cleanup goal selected based on leaching to groundwater.
c. Cleanup goal based on the lower of cancer risk level 10^{-4} or noncancer HQ of 1.0.
d. The first value is the MCL, followed by the maximum contaminant level goal (MCLG) established under the Safe Drinking Water Act (SDWA).
e. MCL or MCLG not established; value based on an HQ of 1.0.

- = not sufficiently volatile or toxic to pose an inhalation risk for the vapor intrusion pathway
µg/m^3 = micrograms per cubic meter
mg/kg = milligrams per kilogram

Response Actions

A summary of response actions at the two OUs is provided below.

OU1 – Hatchco Property

In 1995, Hatchco performed a Phase I Environmental Survey of OU1. The survey identified several environmental issues, including chlorinated solvent contamination of the shallow aquifer. The EPA confirmed the contamination in groundwater with sampling in 1996. From 1995 to 1998, Hatchco removed structures associated with potential past releases of COCs, including an underground waste oil storage tank, a French drain and an underground oil/water separator. Through a Cooperative Agreement with the EPA, DERR conducted a preliminary assessment of the Hatchco property in 1998. It identified the wash rack and adjacent area as the primary source of OU1 contamination. In 1998, Hatchco conducted a pilot test, operating a low-volume air sparging system to remove vinyl chloride from the shallow aquifer. In September 2001, the EPA and Hatchco entered into an Administrative Order on Consent (AOC) to conduct a remedial investigation/feasibility study (RI/FS) for OU1. Hatchco completed the OU1 RI/FS from 2001 to 2004. In December 2004, the EPA decided to complete the RI/FS for OU2 prior to selecting the remedy for OU1 to allow for a broad assessment of site groundwater conditions. To avoid stalling OU1 work, the EPA conducted a pilot test in 2005 to collect data to support the remedial design for the proposed OU1 cleanup plan.

The EPA issued the OU1 ROD in September 2006. The intent of the overall OU1 remedy is to reduce contaminant concentrations emanating from the source area and to reduce concentrations in the downgradient plume as it flows through the biobarriers[1] to a level at which monitored natural attenuation (MNA) of the plume can be utilized to allow for reduction of contaminant concentrations to below maximum contaminant levels (MCLs). TCE is the only COC in subsurface soil that the EPA identified as representing a continuing source to groundwater contamination.

Remedial action objectives (RAOs) identified in the OU1 ROD consisted of the following:

- Reduce the potential for contaminant migration from sub-soils to groundwater and, therefore, to reduce the unacceptable risk to human health and the environment.
- Prevent unacceptable exposure to current and future human populations posed by ingestion of contaminated groundwater and prevent potential inhalation of VOCs released during the indoor use of contaminated groundwater.
- Return groundwater to beneficial use if possible or practicable.

[1] The biobarrier consists of a series of injection wells installed along a line perpendicular to the contaminated groundwater plume. Diluted electron donor solution is injected into the wells to promote a reducing environment for enhanced anaerobic bioremediation. As groundwater flows through the treatment biobarrier, TCE and other VOCs are reduced.

Components of the OU1 remedy are:

- Institutional controls (ICs) will be required to eliminate potential exposure to groundwater and ensure protectiveness of the remedy. At the source, the primary form of ICs will be proprietary controls, specifically, a restrictive covenant and easement which will require consultation with the EPA/UDEQ prior to any earth-disturbing activity (i.e., excavation of soil). In addition, ICs will restrict well drilling in areas affected by the plume.
- Injection of chemical/biological agents (food-grade compounds and microbes) into the contaminated subsurface soil and the saturated zone to enhance the biodegradation rates of COCs.
- Monitoring groundwater to ensure the plume will respond to treatment over time. New and selected existing monitoring wells will be used to track VOCs and natural attenuation parameters until the MCL's standards are achieved. The first monitoring event will establish a baseline and will take place prior to the first injection of biological/chemical agents into the contaminated zone. Monitoring will continue until the Remedial Action Objectives (RAOs) are met or as required by the first five-year review.
- Five-year reviews – the EPA, in consultation with UDEQ - will review the monitoring data and evaluate the protectiveness of the remedy. Also, in consultation with UDEQ, the EPA may modify the groundwater monitoring strategy as appropriate to ensure that the data gathered support the clean-up objectives. Five-year reviews will be required until the RAOs are met.

<u>OU2 – BCI and Wright Development Group (Formerly David Early Properties)</u>
In early 1996, the EPA conducted a removal action to provide bottled water to several homes using contaminated groundwater for domestic use. Through a Cooperative Agreement with the EPA, DERR conducted preliminary assessments of the BCI property in 1996. DERR identified a refinery, automotive maintenance facilities and drycleaners as the primary potential sources of OU2 groundwater contamination. Between November 1996 and May 1997, the EPA completed a second removal action, connecting homes using contaminated groundwater for domestic use to a municipal water system. The EPA took the lead on addressing suspected OU2 contaminant sources by completing an RI/FS between 2001 and 2006.

The EPA issued the OU2 ROD in September 2007 and RAOs identified in the ROD consisted of the following:

- Preventing direct ingestion of untreated groundwater as drinking water.
- Preventing exposure via inhalation of VOCs in contaminated groundwater that are released into indoor air from indoor water uses.
- Preventing exposure via inhalation of VOCs released from groundwater and soils that migrate upward through soil into indoor and subslab air.
- Restoring groundwater to its beneficial use.

Components of the OU2 remedy are:

- Excavation and disposal of shallow source area soil located in the northwest corner of the parking lot of the property. Post excavation and soil confirmation sampling, clean backfill will be placed in the excavated area and covered with asphalt. Excavated material will be tested, characterized and transported offsite for disposal at a licensed facility.
- Installation of a bioremediation recirculation groundwater treatment system consisting of injection and extraction wells. The wells will be installed in and around the source area. In this system, contaminated groundwater will be extracted from about 130 ft bgs. The extracted groundwater will be mixed with natural substances such as soybean oil and natural bacteria to accelerate the natural transformation/decomposition of the PCE. Depending on the vapor concentrations, the vapors released by the soil located next to the groundwater table will be extracted via a vacuum, treated (i.e., granular activated carbon) and/or released directly to ambient air.
- Providing alternate drinking water supply to impacted residents. It is estimated that up to 15 domestic wells may be impacted as the plume expands northwest.

- Installation of an extraction and injection system to contain the groundwater plume. The system will consist of approximately two extraction and four injection wells. Extraction wells will be used for hydraulic gradient control. The extracted groundwater will be cleaned as necessary using granular/liquid activated carbon and, as necessary, clean water will be injected into the aquifer.
- Monitoring groundwater to ensure the remedy responds as designed over time. New and selected existing monitoring wells will be used to confirm the effectiveness of the containment system and to demonstrate compliance with the cleanup standards. The first monitoring event will establish a baseline and will take place prior to the commencement of the Remedial Action (RA) for OU2. Monitoring will continue until the Remedial Action Objectives (RAOs) are met.
- Institutional controls (ICs) will be required to restrict the use of groundwater as a drinking water source and to ensure protectiveness of the remedy. At the source, the primary form of ICs will be an environmental covenant under Utah law, which, in addition to restriction on groundwater uses, will require consultation with the EPA/UDEQ-DERR prior to any earth-disturbing activity (i.e., excavation of soil).
- Five-year reviews - the EPA, in consultation with UDEQ-DERR, will review the monitoring data and evaluate the protectiveness of the remedy. Also, in consultation with UDEQ-DERR, the EPA may modify the groundwater monitoring strategy as appropriate to ensure that the data gathered supports the cleanup objectives. Five-year reviews will be required until the RAOs are met.

Status of Implementation

OU1 work was originally conducted by Hatchco under the 2001 RI/FS AOC until Hatchco claimed a limited ability to pay and entered into an Administrative Settlement Agreement and Order on Consent in December 2005 to settle its liability for all response costs incurred. The work at OU1 and OU2 was Fund-lead until 2019, with the EPA the lead agency and DERR the support agency. However, in 2019, the site lead transitioned to DERR and the EPA is now the support agency. A summary of the remedy implementation activities for each OU is summarized below, including remedial activities at the source areas and groundwater downgradient of the source areas.

OU1 – Hatchco Property

Source Area Remediation
The EPA completed the OU1 remedial design between December 2006 and September 2007. During the remedial design, the EPA observed groundwater contamination at a depth of 70 to 80 feet in the shallow aquifer, which is deeper than the 50-foot depth identified during the RI. Thus, injection wells were installed – shallow wells, paired wells at shallow and deep intervals, and deep wells to address subsurface soil and groundwater contamination. The EPA began on-site remedial action in September 2008, and the baseline sampling took place between October and November 2008. From December 2008 to February 2009, the EPA installed the source area and biobarrier #1 injection wells and injected slow-release electron donor solution (emulsified oil) and distributed bacteria capable of reductive dechlorination, followed by additional electron donor injections in 2010 (source area and biobarrier #1) and 2012 (biobarrier #1 only). In addition, periodic lactate injections have been completed in two localized areas of elevated contamination (hot spots) near monitoring wells HMW-17D and HMW-18D to promote more rapid degradation of contaminants. From July 2012 to November 2016, additional monitoring and injection wells were installed in the source area and biobarrier #1, followed by injections in these areas. In January 2017, the EPA completed targeted sodium lactate injections in the source area and hot spots. In July 2017, the EPA completed a more aggressive treatment approach of biorecirculation with permeability enhancement at the source area and within the hot spot located at well HMW-17D. UDEQ completed additional combined sodium lactate/emulsified oil injections in the source area in August 2020. Figure H-1 shows the locations of the OU1 wells and biobarriers.

Downgradient Groundwater Remediation
Based on the characterization data and four quarters of groundwater monitoring in wells downgradient of the source area from May 2009 to January 2010, the EPA determined that biobarriers #2 and #3 were needed. The

EPA installed biobarriers #2 and #3 and completed injections of slow-release electron donor solution (emulsified oil) between January and July 2011. The EPA completed phase 1 bioaugmentation at biobarriers #2 and #3 in December 2011 and phase 2 bioaugmentation in June 2012 to distribute bacteria capable of reductive dechlorination. In June and July 2013, additional injections at biobarriers #2 and #3 were completed with the addition of a combined sodium lactate/emulsified oil to increase reaction rates. In November 2014, additional downgradient monitoring wells and injection wells at biobarrier #3 were installed. From August to October 2015, additional injections of sodium lactate/emulsified oil occurred at biobarriers #2 and #3. In September 2019, the EPA completed permeability enhancement at hot spots near HMW-19D and HMW-14S, which are located between the downgradient biobarriers.

The OU1 remedy was determined to be operational and functional on August 19, 2020, starting the Long-Term Response Action period.

OU2 – BCI and Wright Development Group (Formerly David Early Properties)

The groundwater remedy for OU2 is currently in the operations and maintenance (O&M) phase. OU2 was transitioned from the long-term response action (LTRA) phase, which began in April 2012, to the O&M phase in May 2022. A summary of the remedial activities implemented within the source area and downgradient groundwater is provided below.

Source Area Remediation
Based on low PCE surface and subsurface soil concentrations near the BCI facility sampled during the RI, the EPA and DERR determined in 2008 that implementation of soil vapor extraction (SVE) and enhanced anaerobic bioremediation (EAB) in the source area, including the northwest corner of the parking lot, were not necessary. Direct-push soil sampling in the area north of the BCI building indicated that subsurface soil contaminant concentrations are below cleanup goals. Based on historical records, PCE may have been released from multiple sources within the BCI property, including a sanitary sewer line, numerous floor drains, a former septic system, and former process water sumps on the property. Historical information from 2004 determined that the sewer lateral between the BCI building and the sewer main on 500 West was not a source of contamination. A Solvent Saver Unit was attached to the clothes dryer used to reclaim PCE. Wastewater from the unit was discharged to a leach field prior to the sewer connection in 1966. The leach field is suspected to be the primary source of the contamination. There is no documentation that the leach field was excavated.

Ground-penetrating radar and utility location activities confirmed that a former septic tank was not located in the area north of the BCI building. The process water sumps in the BCI basement were excavated and sampled; 2008 sample results indicated no COC concentrations above the cleanup criteria established in the ROD. In 2012, the PCE dry-cleaning machine was replaced with a petroleum-based machine. However, soil gas concentrations remain elevated at the Site (based on five rounds of soil gas sampling between 2010 and 2014), which indicated that significant amounts of PCE remain in the area. The EPA approved a workplan in October 2017 to complete additional soil gas and indoor air sampling to understand vapor intrusion risk in the David Early office building and retail store building west of the OU2 source area (retail building).

The EPA sampled soil gas and indoor air in January 2018 at the David Early office building and the retail building and conducted additional soil gas and indoor air sampling in July 2018 in the BCI building, the David Early building, and the retail building. The results of this work (discussed in more detail in Appendix H and Section V) indicated that concentrations of PCE remain in soil gas beneath and in the surrounding area of the BCI building above the target concentration for vapor intrusion to indoor air but that indoor air within the David Early office building and the adjacent retail building does not exceed acceptable risk levels. Additional source area characterization work was completed in June 2019 to adequately characterize the soil gas plume and provide data for remedial design. The results of the 2018 and 2019 soil gas investigations (detailed in Appendix H) confirm that PCE remains in the shallow and deep soil gas above the vapor intrusion to indoor air pathway and the vapor intrusion to groundwater pathway, which lead the EPA to determine that source area soil gas remediation should be conducted. The design of a shallow and deep soil vapor extraction (SVE) system for the source area was completed in January 2021. The system is scheduled to be installed in mid-2023.

Groundwater Remediation

The EPA completed the remedial design to hydraulically capture the contaminant plume between April 2007 and September 2009. The remedy consists of a GWTS with discharge of treated effluent to the A-1 Canal in West Bountiful under Utah Pollutant Discharge Elimination System requirements. The treated groundwater then flows into the A-1 Canal, where it is placed into beneficial use as part of a wetlands mitigation project. Construction of the GWTS began in July 2010; it has been operating continuously since February 2011. Figure H-8 shows the location and layout of the GWTS. The extraction system includes four extraction wells installed in the middle aquifer zone along the centerline of the dissolved PCE plume, as well as, well vaults, submersible pumps and underground process piping. The treatment system consists of the treatment plant building, the groundwater treatment system and the discharge system. The treatment system removes PCE and other site contaminants from the groundwater using granular activated carbon (GAC). The EPA finished remedy construction for OU2 in April 2011. The system was in the LTRA phase until April 2022, and it transitioned into the O&M phase in May 2022. The extraction system originally included extraction wells EW-1 through EW-4, however, EW-4 was taken out of service in November 2018 due to a significant decrease in well efficiency. EW-4 was replaced in the system by EW-5, which was installed in December 2019.

Institutional Control (IC) Review

The 2006 OU1 ROD and the 2007 OU2 ROD both call for institutional controls to eliminate potential exposure to groundwater and ensure protectiveness of the remedy. In addition, combined institutional control objectives listed in the RODs for OU1 and OU2 include:

- Restrict the use of groundwater as a drinking water source until MCLs are met.
- Restrict new well development for drinking water and domestic use along the projected path of the contaminated groundwater plumes until MCLs are met.
- Recommend vapor intrusion mitigation in all permits for construction of new commercial (office space) and/or residential buildings plans on or along the projected path of the contaminated plumes.

Several property parcels at the Site have institutional controls in place (Table 5) that prevent any new well installations, require that remedy components are not disturbed or stipulate the need for vapor mitigation measures. In August 2017, the EPA prepared an Institutional Controls Implementation and Assurance Plan (ICIAP), with support from DERR, that identifies how institutional controls shall be implemented, maintained, enforced, modified and terminated (when applicable), and provides a summary of the status of the controls in place. The ICIAP identified a total of 63 parcels that require some form of institutional control to ensure protection of human health and protection of the remedy. The types of institutional controls in place or planned include environmental covenants, groundwater use restrictions, restricted area designations, deed notices, and private well sampling and notification.

DERR and the EPA have implemented informational institutional controls for most of the parcels in the form of a Notice of Environmental Condition, which is a property-specific notice filed with the Davis County Recorder to notify current and future property owners of certain conditions related to the Site. If the property owner will not voluntarily agree to placement of the environmental covenant, the EPA or the DERR will record the Notice with the Davis County Recorder. When the Davis County Recorder returns the recorded copy of the notice, the EPA or the DERR will place the original notice and recording information in the Site's files and mail a copy to the property owner.

In addition to filing deed notices on these properties, DERR has and will continue to monitor the contaminant concentrations in the wells on an annual basis. The results of the monitoring and subsequent actions will be shared with property owners. This is a voluntary program with access being granted by each property owner on an annual basis.

Table 3: Summary of Planned and/or Implemented ICs

Media That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objectives	Title of IC Instrument Implemented and Date (or planned)
OU1 Source Area	Yes	Yes	Hatchco Property Parcel 06-167-0003	The property is required to have active or passive organic vapor intrusion mitigation for structures constructed for commercial or residential purposes. The installation of wells, except for monitoring, is prohibited. Currently, no buildings exist on the property.	Implemented: Environmental Covenant for the Utah Transit Authority Parcel 06-167-0003 May 17, 2006
OU1 Groundwater	Yes	Yes	Properties above the OU1 TCE plume emanating from the Hatchco property	Restrict new applications for aquifer use.	Utah Division of Water Rights Groundwater Management Plan for the Bountiful Sub-Area[a,b] January 4, 1995
OU2 Source Area	Yes	Yes	BCI property	Prevent potential exposures via vapor intrusion.	Implemented: Environmental Covenant
OU2 well network	Yes	Yes	Properties with remedy components (see ICIAP)	The property will not be used in any manner that would interfere with or adversely affect the implementation, integrity or protectiveness of the response actions performed or to be performed at the Site.	Implemented: Environmental Covenant for Parcels 06-034-0070 06-034-0071 December 20, 2011 Environmental Covenant for the Security Investment Ltd Parcels 06-034-0097 06-034-0098 06-034-0019 06-033-0046 February 15, 2012
OU2 Groundwater	Yes	Yes	Properties above the OU2 plume emanating from the BCI property	Restrict new applications for aquifer use.	Utah Division of Water Rights Groundwater Management Plan for the Bountiful Sub-Area[a,b]
				Notify the EPA of any new well applications, regardless of history of water rights. This will allow the EPA to review and petition the Division of Water Rights to deny any "change in use" applications.	To be implemented: Restricted Area designation

Media That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objectives	Title of IC Instrument Implemented and Date (or planned)
				Notify current and future property owners of certain conditions related to the property.	To be implemented: Notice of Environmental Conditions
				Ensure private well users are aware of contamination	Implemented: Private well monitoring and notifications

Notes:

a. Section 73-5-15 of the Utah Code empowers the state engineer to regulate groundwater withdrawals. Through this authority, the Utah Division of Water Rights set forth the Ground Water Management Plan for the Bountiful Sub-Area of the East Shore Area. https://www.waterrights.utah.gov/wrinfo/mmplan/ugw/bountfl.htm.

b. The Ground Water Management Plan describes the Bountiful Sub-area as follows: "the southern boundary is the Davis-Salt Lake County line, the north boundary is the Centerville City-Farmington City line, the east boundary is the Wasatch Range, and the western boundary is the Jordan River and Farmington Bay."

Systems Operations/Operation and Maintenance (O&M)

OU1 has not entered the O&M phase. An O&M plan has been finalized by DERR/EPA and an operational and functional determination for OU1 was made on August 19, 2020. The OU1 remedy is now in the LTRA phase.

The groundwater remedy at OU2 began in 2012 and entered the O&M phase on June 22, 2022. O&M activities are occurring according to the 2017 GWTS O&M Manual. O&M activities are designed to ensure the effectiveness of the GWTS. The effectiveness of the groundwater treatment system is measured by evaluating hydraulic control of the middle zone to ensure that hydraulic plume control is being maintained and by monitoring water quality influent and effluent data to ensure the treatment system is performing in accordance with design specifications and meeting effluent water quality standards. Specific O&M activities include:

- Operating and maintaining the GWTS to achieve system operational goals.
  - Treat at least 42 million gallons of water per year.
  - Continuously operate at a minimum flow rate of 80 gallons per minute, with an operational uptime of at least 90 percent.
  - Comply with system effluent discharge and water rights requirements (maximum extraction volume of 52,136,229 gallons of water per year).
- Inspection, routine and preventive maintenance, and unscheduled corrective maintenance and repair of all components of the groundwater extraction, treatment and discharge systems.
- Monitoring treatment system performance, permit equivalent compliance and remedial progress.
- Determining the frequency of GAC change-out.
- Conducting GWTS performance and compliance water sampling.

DERR's contractor performs most site-wide O&M tasks associated with the groundwater monitoring. The South Davis Sewer District (SDSD) performs most groundwater treatment system O&M tasks. SDSD took over operation of the water treatment system in August 2011 and provides annual reports to UDEQ detailing O&M activities, and the contractor provides technical reports to DERR on an annual basis detailing monitoring results and system performance. Based on a review of the annual system performance reports, the system is functioning as designed, continues to meet operation goals and is compliant with effluent discharge requirements. In addition, the contractor has consistently made repairs on damaged well vaults and vapor probes as needed.

Efforts have been made to optimize GWTS O&M over the last five years. Extraction well pumping capacity is frequently tested, and flow rates are maximized. The set-point adjustments in lower-capacity extraction wells EW-1 and EW-4 have been optimized to improve pumping rates and drawdown in each well. Well EW-4 has been

taken out of service and replaced by EW-5. A PCE threshold value for triggering GAC change-out in the lead GAC vessel was established, resulting in optimal timing for GAC change-out. Backwashing procedures have been improved, resulting in longer carbon life.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determinations and statements from the previous FYR as well as the recommendations from the previous FYR and the status of those recommendations.

Table 4: Protectiveness Determinations/Statements from the 2018 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy at OU1 currently protects human health and the environment because no one is using contaminated groundwater for domestic uses. For the remedy to be protective in the long-term, the following actions need to be taken: 1) Implement institutional controls to restrict groundwater use near the TCE plume, i.e., prohibit new well drilling for domestic use and recommend vapor intrusion mitigation in all permits for construction planned on or along the projected path of the contaminated plume; and 2) Revise cleanup goals where toxicity values have changed.
2	Short-term Protective	The remedy at OU2 currently protects human health and the environment. Ongoing monitoring and notifications to private well users ensure all affected residents are aware of site conditions. For the remedy to be protective over the long-term, the following actions need to be taken: 1) Evaluate whether additional response action is warranted to prevent or reduce vertical migration of PCE contamination to the lower zone; 2) Implement institutional controls to restrict groundwater use near the PCE plume, i.e., prohibit new well drilling for domestic use and recommend vapor intrusion mitigation in all permits for construction planned on or along the projected path of the contaminated plume; and 3) Revise cleanup goals where toxicity values have changed and use the updated soil gas-to-indoor air attenuation factor for developing cleanup goals for soil gas.

Table 5: Status of Recommendations from the 2018 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1,2	Required institutional controls have not been implemented for all affected parcels.	Implement institutional controls called for in the ROD and the ICIAP.	Ongoing	The EPA and UDEQ continue to work to implement all necessary institutional controls called for in the ICIAP (see IC section of this FYR Report).	Not applicable
1,2	Toxicity values have changed for several COCs since the cleanup goals were established in the RODs. In addition, the default soil-gas-to-indoor-air attenuation factor used as a basis for developing the OU2 soil gas cleanup levels have changed.	Revise cleanup goals as necessary to incorporate current toxicity values and the updated soil-gas-to-indoor-air attenuation factor.	Ongoing	The EPA completed the Source Area Summary and Work Plan for the SVE Treatability Study, which includes updated toxicity values.	Not applicable
1	Total CAH concentrations detected at HMW-19D have not been significantly treated by the EAB injections.	Evaluate whether additional response action is warranted to address total CAHs at HMW-19D.	Completed	Permeability enhancement was performed in the vicinity of HMW-19D in 2019. As documented in the 2021 Annual Monitoring Report (and shown on Figures H-4 and H-7 of this FYR) total CAH concentrations have reduced significantly below the site action level of 200 ug/L.	9/1/2019
2	Current groundwater monitoring data suggest that a downward vertical hydraulic gradient may exist at MW03L and MW-14L, indicating that portions of the PCE plume have migrated to the lower zone and may not be captured by the GWTS.	Evaluate whether additional response action is warranted to prevent or reduce vertical migration of PCE contamination to the lower zone.	Ongoing	MW03L has been determined to be screened in the middle-deep zone and, therefore, does not accurately represent the lower zone. However, PCE concentrations in the lower zone appear to be decreasing and will continue to be evaluated.	Not applicable
2	The comprehensive evaluation of potential soil vapor intrusion associated with the source area at OU2 is not yet completed.	Complete the ongoing vapor intrusion evaluation of buildings that fall within the buffer zone of the OU2 source area plume.	Completed	The EPA conducted source area vapor intrusion sampling and evaluation in 2018 and 2019 and completed the Source Area Vapor Intrusion Investigation Report and the Additional Source Area Characterization Report, which assessed vapor intrusion in the source area.	3/1/2020

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available in the Davis Journal newspaper on March 3 (see Appendix D). It stated that the FYR was underway and invited the public to submit any comments to the EPA. The results of the review and the report will be made available at the Site's information repository, Davis County Library – South Branch, located at 725 South Main Street in Bountiful, Utah, and at http://eqedocs.utah.gov. The results of the review and the report will also be made available on the EPA's Site profile page at http://www.epa.gov/superfund/bountiful-woods-cross.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy implemented to date (Appendix E). The interviews are summarized below.

Matt Myers - General Manager, South Davis Sewer District: Myers said the South Davis Sewer District (SDSD) has not had any issues or concerns with the Groundwater Treatment System (GWTS) facility regulating the pump and treat remedy for the Operable Unit 2 (OU2) site. Myers said the extraction pumps and granulated carbon filter are functioning with great efficiency, requiring only general maintenance tasks, and is easy to manage by his staff. Myers said the facility implementation has made a lot of sense and is a successful partnership for UDEQ and the EPA.

Mark Taggart, Environmental Compliance Manager, Utah Transit Authority (UTA) – Operable Unit 1(OU1) - Property Owner: Taggart said he's not aware of any reported problems with the UTA property that would indicate that the remedy and institutional controls in place aren't working. Taggart expects all access needs are being met at this time and knows OU1 is being sampled by DERR contractors on a semiannual basis to assess MNA. Taggart wants to be involved with any Site developments and requested advance notice to communicate sampling activities with UTA Train Engineers working at the nearby Woods Cross Frontrunner commuter stop.

Bryce Bangerter, Bountiful Family Cleaners, Property Owner: Bryce Bangerter said it's been a long process and feels everything possible is being done to address PCE contamination at his Operable Unit 2 (OU2) property over the last five years. Bangerter said Bountiful Family Cleaners has been cooperative with everything asked of them and wants to do what's best for the necessary remediation work. Plans are in place to capture additional source material with additional SVE wells this summer, Bangerter said.

Resident Domestic Well Owner: The Resident Well Owner had two well samples testing above the national drinking water standard of 5 ppb since the last Five-Year Review. The most current well sample is below the MCL at 3.2 ppb. An immediate family member is taking care of the property owner and said they were the only ones living at the home. The property owner has not wanted to connect to municipal water as offered by the EPA as part of the 2007 Record of Decision (ROD). The Resident provided updated contact information and did not expect the property owner to change their mind and connect to municipal water in the event the well exceeds the MCL in the future.

Data Review

A summary of the Site-related contamination for OU1 and OU2 is presented in the following sections, with more detailed discussion and plume maps and trends included in Appendix H. Petroleum constituents have been detected in soil and shallow groundwater beneath the HollyFrontier Woods Cross Refinery and Light Oil Dock Terminal, and the groundwater plume is commingled with other contaminants within the OU1 and OU2 plumes. The HollyFrontier Refinery groundwater plume of petroleum contaminants (e.g., benzene, toluene, ethylbenzene, xylenes) is regulated under a corrective action plan by the UDEQ Division of Water Quality. Thus, this data review is focused on the chlorinated compounds PCE and TCE and associated breakdown products.

OU1

The data evaluated in this FYR include groundwater data collected through November 2021, focusing on the data collected since the last FYR (data from 2017 through 2021) to summarize the current extent of contamination as remediation continues in the shallow and deep portions of the shallow aquifer. The data are reviewed relative to concentrations near the source area and biobarrier #1, where the highest concentrations historically existed, followed by discussions on the extent of contamination in two areas downgradient of the source area. The downgradient areas include wells near biobarriers #2 and #3 and MNA wells in areas of the Site not treated. In addition, a summary of where contamination remains above the site-specific treatment criterion of 200 micrograms per liter (µg/L) for total TCE and PCE and its degradation products, referred to as total chlorinated aliphatic hydrocarbons (CAHs), is also provided. Figure H-1 (Appendix H) shows the location of the wells and biobarriers. The 2007 Remedial Design report specified EAB for areas containing total CAH concentrations greater than the site-specific treatment criterion of 200 µg/L and MNA for areas below 200 µg/L total CAHs.

Shallow Zone of Shallow Aquifer

Overall, COC concentrations have declined in the source area and biobarrier #1 since implementation of the injections in 2008. TCE and cis-1,2-dichloroethylene (cis-1,2-DCE) have achieved the cleanup goals of 5 µg/L and 70 µg/L, respectively, in the shallow zone at the source area (Figure H-2). These results indicate that source area and biobarrier #1 remediation has reduced the flux of COCs from the shallow zone to the downgradient plume.

The highest concentrations of COCs detected between biobarriers #2 and #3 (Figure H-2) are TCE at 20 µg/L detected in HMW-22S, cis-1,2-DCE at 140 µg/L detected in HMW-12SR and vinyl chloride at 83 µg/L detected in HMW-32S. TCE was detected at higher concentrations downgradient of biobarrier #3, with the maximum TCE concentration detected in HMW-18US (43 µg/L). TCE concentrations decline further west to below the cleanup goal. TCE degradation products cis-1,2-DCE and vinyl chloride follow a similar pattern, with concentrations at or above the MCL at HMW-39S, declining to below the cleanup goals further west at HMW-43S, demonstrating that MNA is reducing the concentrations over time and distance. As of November 2021, no shallow zone wells exhibit concentrations of total CAHs above 200 µg/L. It does not appear at this time that additional biobarrier amendment injections will be necessary.

Deep Zone of Shallow Aquifer

The concentration of TCE in the deep zone is higher than the concentration observed in the shallow zone; however, concentrations of both cis-1,2-DCE and vinyl chloride are relatively the same in the deep zone as in the shallow zone. In the source area, the highest TCE concentration in 2021 was 42 µg/L, observed in well HMW-3D (Figure H-5); however, this is much lower than the TCE concentrations observed above 1,000 µg/L in the source area in 2008, e.g., HMW-17D had a TCE concentration of 1,500 µg/L in 2008. The TCE concentration at HMW-17D in 2021, subsequent to the 2020 amendment injections, was 6.6 µg/L and the cis-1,2-DCE concentration was 130 µg/L, which is the highest concentration observed in the deep zone in 2021. This suggests that the 2020 amendment injection has been successful at augmenting biodegradation in this hot spot.

The highest vinyl chloride concentration in the deep zone is 96 µg/L, located at HMW-18D immediately downgradient of biobarrier #1 (Figure H-5), and concentrations remain above the cleanup goal downgradient to west of 1100 West but are below detection at the farthest downgradient well, HMW-42D. Concentrations of cis-1,2-DCE are below the cleanup goal downgradient of biobarrier #1, with the exception of the area around HMW-22D and HMW-24D. Concentrations of TCE remain above the cleanup goal in several areas downgradient from biobarrier #1, as shown on Figure H-5, but the TCE concentration is below detection at the farthest downgradient well, HMW-42D. As of November 2021, there is only one deep zone well that exhibits a concentration of total CAHs slightly above 200 µg/L, which is at HMW-18D (total CAH of 229 µg/L, Figure H-7). While the CAH concentrations in the deep zone should continue to be monitored, it does not appear at this time that additional biobarrier amendment injections will be necessary.

Overall, COC concentrations have declined in the areas both inside and outside the influence of the biobarrier amendment injections since implementation of the EAB remedy and subsequent amendment injections and

permeability enhancement activities. Furthermore, with the exception of one location in the deep zone, total CAH concentrations in both the shallow and the deep zones are below the action level of 200 µg/L, indicating that additional amendment injections will not likely be necessary. However, it may be necessary in the future to evaluate alternative approaches to decrease vinyl chloride to below the action level, as it appears that the degradation of vinyl chloride may have stalled.

OU2

The data included in this FYR include groundwater data collected through November 2021 to evaluate the performance and effectiveness of the GWTS, which began treating groundwater in 2011. This review focuses primarily on the extent of PCE contamination in groundwater, as this is the COC that is above the cleanup goal and is detected more widespread than other COCs. The GWTS has removed 45.15 pounds of PCE through December 2021, with an average of 3.41 annual pounds removed during the review period. Due to the small amount of PCE removal, the EPA and UDEQ initiated an optimization review in 2022 to evaluate the GWTS.

Groundwater Treatment System Performance Monitoring

The GWTS data indicate that the system is operating within its designed capacity and effectively removing PCE from Site groundwater. System influent routinely has PCE concentrations above the MCL while treatment system effluent samples collected during the review period were non-detect (Figure H-9). During the review period, there were no exceedances of effluent discharge limits for any of the analytes listed in the Utah Pollutant Discharge Elimination System (UPDES) equivalent permit.

Monitoring Well Results

PCE plume maps for 2021 compared to 2016 are presented in Figure H-10 and Figure H-11, respectively. Comparison of the maps shows that the most obvious change observed in 2021 is the sharp decrease in the extent of the PCE plume in the upper zone (Figure H-10). The PCE footprint has also decreased to a lesser extent in the middle zone and lower zone since 2016, and additional wells continue to define the plumes in both zones to the southwest. Water level data from 2021 indicates that the GWTS appears to induce hydraulic gradients near the extraction wells that affect middle zone hydraulic gradients in a way that is likely to prevent dissolved PCE migration to the west, northwest, and southwest (with the addition of EW-5) in the pumping area. As of 2022, all groundwater sampling at OU2 occurs in the spring, during the period of seasonal high groundwater levels.

Domestic Groundwater Well Monitoring

The EPA samples domestic supply wells annually in the spring for VOC analysis in accordance with the Long-term Monitoring Plan (LTMP). Over the review period, the number of domestic wells sampled has decreased from 33 in 2017 to 20 in 2021, primarily due to damaged or abandoned wells. The majority of the domestic wells are used for irrigation or stock watering, with only three wells used for residential supply: DW03, DW27, and DW35. This data review included data collected from 2017 through 2021. The review identified PCE as the only contaminant detected above the cleanup goal of 5 µg/L in six domestic wells (Table H-1). The highest PCE concentration detected was 11 µg/L in domestic well DW11 in April 2019. Only one of the wells with an MCL exceedance during the review period is used for residential supply, DW27. The PCE concentration at DW27 has historically fluctuated above and below the MCL, with it being above in 2016 (5.1 µg/L), 2018 (5.7 µg/L), 2020 (6.7 µg/L), and 2021 (6.3 µg/L) and below for the remaining years sampled. The preliminary, unvalidated, 2022 results at DW27 indicate that the PCE concentration is again below the MCL at DW27 (3.2 µg/L). It should be noted that the sample at DW27 is collected from the well head and not from the tap within the home; therefore, the concentration at the point of use is not known. The owners of DW27 have been offered a connection to the municipal water supply but have declined to be connected, as they stated they prefer well water. They were interviewed as part of this FYR and indicated that they currently have a filter on the water system at the tap; however, they are not certain of its efficacy (Appendix E).

DERR will continue to monitor the contaminant concentrations in the wells on an annual basis until sampling is no longer necessary or the residence is connected to a public water system. Letters are sent annually to the domestic well owners indicating the results of sampling activities and providing contact information should they have concerns or further questions.

Soil Gas and Indoor Air Monitoring

The soil gas and indoor air data evaluated in this FYR primarily include 2018 and 2019 data collected at the BCI and surrounding properties, including the former David Early office building and the retail building adjacent to the BCI property to the west. The BCI property is almost completely covered by a building and concrete and asphalt paving; the building houses three commercial businesses and includes a basement. The primary goal of soil gas and indoor air sampling is to monitor VOC concentrations in soil gas and indoor air to assess risk from subsurface vapor intrusion. Based on the VOC concentrations observed in January and July of 2018 in indoor air samples, calculated risks are within EPA's risk management range of 1×10^{-6} to 1×10^{-4} and less than a hazard quotient (HQ) of 1.0 based on a commercial land use in both the former David Early building and the retail building. However, the results indicated that while indoor air in the basement of the BCI building is within the acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}, the noncancer risk exceeds an HQ of 1.0 (primarily driven by TCE at one location), as shown in Appendix J. Additionally, the current PCE concentrations that remain in subsurface soil gas are at levels that exceed a target soil gas concentration for the vapor intrusion to indoor air pathway of 1,752 µg/m^3, with the highest concentration being 37,000 µg/m^3 at 12.75 to 14.5 ft bgs directly beneath the BCI building, and exceed the target soil gas concentration for the vapor intrusion to groundwater pathway of 2,148 µg/m^3, with the highest concentration being 18,000 µg/m^3 at 67-77 ft bgs along in the northwestern corner of the BCI parking lot (Appendix H). As a result, and as mentioned in other sections of this report, a source area SVE system has been designed and is scheduled to be installed during the summer of 2023.

Site Inspection

The Site inspection took place on 3/22/2023. Participants included DERR project managers Michael Storck and Tony Howes, Tammi Messersmith and Lawrence Cannon from AECOM, Angela Zachman, EPA RPM, and David Allison with DERR. The purpose of the inspection was to assess the protectiveness of the remedy. The Site inspection checklist and photographs are provided in Appendices F and G, respectively.

Site inspection participants met at the DERR to discuss the status of the OU1 and OU2 remedies. Participants then drove to see the OU1 source area (UTA parking lot) and biobarriers 1, 2 and 3. The only issue noted was with regards to several monitoring well covers that were missing that need to be replaced. The monitoring well covers were replaced on May 5, 2023. No other issues were noted. Participants then drove to the OU2 GWTS to observe the treatment system and discuss the system's performance. The inspection also included observing the A-1 Canal Discharge Poin, and extraction well locations for EW-1, EW-2, EW-3 and EW-5. The inspection ended with a tour of the Bountiful Family Cleaners (source area) including existing SVE wells that are located inside the basement of the building and around the perimeter of Bountiful Family Cleaners. No issues were noted.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

The remedies as implemented at OU1 and OU2 are functioning as intended. The EPA has finalized the O&M Plan and an "operational and functional" determination was made on August 19, 2020, for OU1. OU1 shallow groundwater continues to flow through the biobarriers at the Site, effectively treating COCs. As of November 2021, no shallow wells exhibit concentrations of total CAHs above 200 µg/L. Total CAH concentrations have continued to decline since 2011.

Deep-zone concentrations in OU1 exhibit an overall decline in COC concentrations in the source area and areas downgradient of the biobarrier amendment injections since implementation of the EAB remedy and additional permeability enhancement work. As of November 2021, only one well, HMW-18D (immediately downgradient of biobarrier #1), exhibits total CAHs above 200 µg/L (with the 2021 CAH concentration of 229 µg/L), primarily due to cis-1,2-DCE and vinyl chloride. The concentrations of cis-1,2-DCE and vinyl chloride have increased at

HMW-18D since amendment injections in the source area in 2020. This may be a rebound effect from source area amendment injection work in 2020, and concentrations in this area will continue to be monitored.

The OU2 GWTS data indicate that the system is operating within its designed capacity and is effectively removing PCE from Site groundwater. During the review period, the GWTS was shut down for four months, starting on December 12, 2018, due to issues with the water rights. Those issues were resolved and operation of the GWTS was restarted on April 17, 2019. Downgradient groundwater sampling results demonstrate that the GWTS has been effective in reducing PCE concentrations. In addition, plume maps over time show that the GWTS has also reduced the footprint of the PCE plume in the upper zone since treatment started. The footprint of the PCE plume in the upper zone that is above the 5µg/L cleanup standard has shrunk to the area east of Interstate 15, based on sampling results from April 2021 (Figure H-10) compared to a similar plume map based on September 2016 data (Figure H-11). Additionally, the footprint of the PCE plume in the middle zones in the northwestern portion of the plume has also shrunk to the area around EW-3 and MW-19MD/L.

All parcels within the Site boundaries have public water available. However, domestic wells exist and are sampled by UDEQ/DERR. The OU2 domestic well sampling program identified PCE as the only contaminant detected above the cleanup goal of 5 µg/L in groundwater samples from six of the 33 domestic wells sampled during this review period. According to the Annual 2021 Groundwater Monitoring and System Performance Report, most of the domestic wells are used only for irrigation and livestock. All properties in the area have access to the public water supply, but the EPA has identified three residential properties that are not connected at this time and that use the groundwater as their whole-house potable water supply. DW-27 is one of these wells. UDEQ/DERR will continue to monitor contaminant concentrations in the wells annually until sampling is no longer necessary or the residence is connected to a public water system. Monitoring results are shared with property owners. The domestic well sampling is a voluntary program with access being granted by each property owner on an annual basis. There are no restrictions or requirements to enforce. The owners of DW-27 have been notified of the MCL exceedance and have been offered a connection to the municipal water supply, which they have declined. They indicated that they prefer the well water and that there is a filter on the faucet, though they are not sure of the efficacy of the filter with regards to treating the contamination. Preliminary 2022 results indicate that the PCE concentration at DW-27 is below the MCL, which is likely a result of the new extraction well, EW-5, being brought online in June 2020. UDEQ/EPA will continue to closely monitor the concentrations at DW-27 and will proactively work with the well owner to inform them of any exceedances.

In August 2017, the EPA prepared an ICIAP with support from DERR. The ICIAP identified 63 parcels that require some form of institutional control to ensure protection of human health and protection of the remedy. DERR will continue to implement informational institutional controls for the affected parcels in the form of a Notice of Environmental Condition, which is a property-specific notice filed with the county recorder to notify current and future property owners of certain conditions related to the property.

An environmental covenant is in place for the OU1 source area Hatchco property that requires vapor intrusion mitigation for any structures constructed on the property. The installation of wells, except for monitoring, is prohibited. As per the ROD and ICIAP, a similar covenant will be placed on the OU2 source area parcels.

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

Question B Summary:

MCLs have not changed for those COCs with established criteria. An MCL has not been established for some OU1 groundwater COCs (naphthalene and 1,2,4-trimethylbenzene) and some OU2 groundwater COCs (1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene) (Appendix I). Thus, the cleanup levels were health-based levels (Appendix J). Toxicity values for these COCs have changed since the ROD was issued, and in 2014, the EPA updated default exposure assumptions. Further, OU2 health-based cleanup goals were reviewed by the EPA's contractors in 2016 using toxicity values from 2014 sources. Based on a screening-level risk evaluation assuming direct ingestion, the OU1 cleanup goals for naphthalene and 1,2,4-trimethylbenzene and the revised OU2 cleanup

goal for 1,3,5-trimethylbenzene slightly exceed the EPA's noncancer HQ threshold of 1.0 (Appendix J). Based on these results, UDEQ/EPA should evaluate whether to revise the cleanup goals to reflect the most current toxicity information.

In response to a recommendation in the previous FYR Report, the EPA recalculated the OU2 cleanup goals for soil gas and groundwater in 2016 using inhalation toxicity values current at that time. However, the recalculated cleanup goals have not yet been documented in a decision document modification. The risk evaluation performed during this FYR (Appendix J) identified that there have been several changes to toxicity values for Site COCs (vinyl chloride, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenezne, cis-1,2-DCE and trans-1,2-DCE), as well as an update to the default attenuation factor (AF) used for subslab soil gas to indoor air. Based on these changes, UDEQ/EPA should consider revising the cleanup goals further to incorporate current toxicity values and the update of the default AF. This is specifically relevant for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene because both these COCs have been detected in groundwater, soil gas and indoor air.

A screening-level risk evaluation of the leachability-based OU1 and OU2 soil cleanup goals was conducted during this FYR (Appendix J). It found that the cleanup levels are protective for UU/UE.

A screening-level vapor intrusion risk evaluation was conducted during this FYR (Appendix J) using the 2021 maximum observed concentrations of the COCs for OU1. The evaluation shows that the maximum observed TCE concentration, which is found at MW-18US, results in risk that exceeds the noncancer HQ of 1.0, based on industrial land use. This location is in a parking lot where there are no structures, so the risks are hypothetical. These results reinforce the need to implement institutional controls for properties above the OU1 plume as required by the 2006 ROD.

This FYR includes a review of an indoor air risk evaluation performed for the buildings overlying the shallow OU2 PCE plume at the source area, including the BCI building, the former David Early office building and the retail building. The results indicate that risk from indoor air at the former David Early office building and the retail building are within the EPA's acceptable risk range (Appendix J). Subsequent to that risk evaluation, in 2020, the David Early building was demolished, and a new commercial building was built in its place. The risk evaluation conducted for the BCI building indicated that while risk from indoor air in the basement of the BCI building is within the acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}; the noncancer risk exceeds an HI of 1.0 (primarily driven by TCE at one location). The EPA and DERR are installing a soil vapor extraction system in the source area in 2023 to address this and deeper vapor intrusion issues. Further downgradient, PCE is not present in the shallow zone.

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

Question C Summary:

The domestic well DW-27, which is used for residential supply, has had intermittent PCE results above the MCL since 2016 (the maximum being 6.7 µg/L in 2020), which calls into question the protectiveness of the remedy for OU2. However, with installation of the new extraction well, EW-5, that was brought online in June 2020, the PCE concentration at DW-27 appears to be decreasing, with the preliminary PCE concentration observed at that well (3.2 µg/L) in 2022 being below the MCL. Additionally, the owners of this well have been offered a connection to the municipal water supply but have declined, as they indicated they preferred well water. They were interviewed for this FYR and indicated that there is a filter on the tap in the house, though they were not sure of its efficacy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:

OU(s): OU1	Issue Category: Remedy Performance			
	Issue: Vinyl chloride concentrations suggest that degradation may be stalled at vinyl chloride.			
	Recommendation: Continue to monitor vinyl chloride concentrations during annual sampling events to ensure that degradation of vinyl chloride has not stalled.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	State	EPA	8/30/2024

OU(s): OU2	Issue Category: Remedy Performance			
	Issue: The evaluation of soil gas and indoor air associated with the source area at OU2 indicates a noncancer risk above the EPA acceptable level of an HI of 1.0 and that shallow and deep soil gas concentrations are above target concentrations for vapor intrusion to both indoor air and groundwater.			
	Recommendation: Complete installation of the SVE remediation system in the source area and monitor remedial results.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	State	EPA	9/30/2024

OU(s): OU1 and OU2	Issue Category: Other			
	Issue: Toxicity values have changed for several COCs since the cleanup goals were evaluated in 2016, as shown in Table J-5. In addition, the default soil-gas-to-indoor-air attenuation factor used as a basis for developing the OU2 soil gas cleanup levels has changed from 0.1 to 0.03 (Appendix J).			
	Recommendation: Revise cleanup goals as necessary to incorporate current toxicity values and the updated soil-gas-to-indoor-air attenuation factor. If necessary, the decision document will then need to be modified to include the new cleanup goals.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	8/30/2024

OU(s): OU1 and OU2	Issue Category: Institutional Controls			
	Issue: Required institutional controls have not been implemented for all affected parcels.			
	Recommendation: Implement institutional controls called for in the ROD and the ICIAP.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	8/31/2026

OTHER FINDINGS

Several additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- The yield around HMW-17D has been significantly decreased by amendment injections, even with an attempt at redevelopment in fall of 2021, making recent sampling at this location very difficult. Continue to monitor conditions at HMW-17D to see if yield improves. If yield does not improve, evaluate if surrounding wells provide adequate information in this area.
- Operational data from the GWTS indicates that it is removing a relatively small amount of PCE from the low concentration plume at OU2. Given this, the EPA is currently conducting an optimization review for OU2. The results of the optimization review will be evaluated and possibly incorporated into the OU2 LTMP or relevant decision document.
- Continue to monitor PCE at domestic well DW27 during annual groundwater sampling events in order to inform the owner of any exceedances of the drinking water MCL. PCE levels in DW27 have periodically fluctuated above the MCL, and the owner of the well has declined an offer to connect to the municipal drinking water supply.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)
Operable Unit: OU1 *Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU1 currently protects human health and the environment because no one is using contaminated groundwater for domestic uses. For the remedy to be protective over the long term, the following actions need to be taken: 1) Work with local municipalities to recommend vapor intrusion mitigation in all permits for construction planned on or along the projected path of the contaminated plume; and 2) Continue to monitor vinyl chloride concentrations during annual groundwater sampling events to ensure that degradation of vinyl has not stalled.

Protectiveness Statement(s)	
Operable Unit: OU2	*Protectiveness ~~Determination:~~ Will Determination:* Will be Protective
Protectiveness Statement: The remedy at OU2 currently protects human health and the environment. The one domestic well that is used for residential supply, and that has had an exceedance of the MCL for PCE during the review period (2017-2021), has a preliminary 2022 result that is below the MCL. Ongoing monitoring and notifications to private wells users ensure all affected residents are aware of Site conditions. For the remedy to be protective over the long term, the following actions need to be taken: 1) continue to monitor PCE at DW27 and inform the owner of any exceedances; 2) Complete installation and operation of the SVE remedial system in the source area.	

VIII. NEXT REVIEW

The next FYR Report for the Bountiful/Woods Cross 5th S. PCE Plume Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Additional Source Area Characterization Report for Bountiful/Woods Cross 5th South PCE Plume. OU2. Prepared by Pacific Western Technologies, Ltd., March 2020.

Administrative Order on Consent for Remedial Investigation/Feasibility Study for Respondent W.S. Hatch Company. September 26, 2001.

Annual 2018 Groundwater Monitoring and System Performance Report for Bountiful/Woods Cross 5th South PCE Plume Site – OU2. Prepared by Pacific Western Technologies, Ltd., September 2019.

Annual 2019 Groundwater Monitoring and System Performance Report for Bountiful/Woods Cross 5th South PCE Plume Site – OU2. Prepared by AECOM, February 2020.

Annual 2020 Groundwater Monitoring and System Performance Report for Bountiful/Woods Cross 5th South PCE Plume Site – OU2. Prepared by AECOM., December 2021.

Annual 2021 Groundwater Monitoring and System Performance Report for Bountiful/Woods Cross 5th South PCE Plume Site – OU2. Prepared by AECOM, January 2023.

Basis of Design Criteria Report for Bountiful/Woods Cross 5th South PCE Plume Site. OU2. Prepared by Pacific Western Technologies, Ltd., January 2021.

Bountiful Woods Cross 5th South PCE Plume NPL Site, Operable Unit 1, Bioremediation Treatment – Operational and Functional Determination. August 2020.

CERCLA Information System Site Information accessed from website: https://www.epa.gov/superfund/bountiful-woods-cross. Accessed March 2018.

Eleventh Annual Monitoring Report. Bountiful Woods Cross 5th South PCE Plume, Operable Unit 1. Davis County, Utah. Final. Prepared by CDM Smith. July 2020.

Environmental Covenant for Bountiful/Woods Cross 5th South PCE Plume Site between Davis County, the EPA, and Utah DEQ. Utah Code Ann. §§ 57-25-101. January 2012.

Evaluation and Screening of Remedial Technologies Technological Memo for Bountiful/Woods Cross 5th South PCE Plume. OU2. Prepared by Pacific Western Technologies, Ltd., May 2020.

Final 2020 Annual Groundwater Monitoring Report. OU1. Prepared by AECOM. August 2021.

Final 2021 Annual Groundwater Monitoring Report. OU1. Prepared by AECOM. October 2022.

Grant of Easement/Weber Basin Water Conservancy District/EW-5 Installation. OU2. February 2020.

Groundwater Extraction Well EW-5 Installation Report for Bountiful/Woods Cross 5th South PCE Plume. OU2. Prepared by Pacific Western Technologies, Ltd., September 2020.

Groundwater Extraction and Treatment System O&M Manual. Bountiful/Woods Cross 5th South PCE Plume Site/Revision 6. OU2. Prepared by Pacific Western Technologies, Ltd. July 2020.

Final Progress Report for Cooperative Agreement (V96867801) Long Term Monitoring Plan. OU2. Prepared by DERR. September 2022.

Institutional Controls Implementation and Assurance Plan. Bountiful/Woods Cross 5th South PCE Plume NPL Site. Prepared by EPA Region 8 and UDEQ. August 2017.

Long Term Monitoring Plan (Revision 2). Bountiful/Woods Cross 5th South PCE Plume. OU2. Prepared by AECOM. December 2022.

Ninth Annual Monitoring Report. Bountiful/Woods Cross 5th South PCE Plume, Operable Unit 1. Davis County, Utah. Final. Prepared by CDM Smith. April 2018.

Operation and Maintenance Manual, Bountiful/Woods Cross Operable Unit 1. Final. Prepared by CDM. September 2020.

Operation and Maintenance Plan, Bountiful/Woods Cross Operable Unit 1. Final. Prepared by CDM. September 2020.

Operation and Maintenance Plan, Bountiful/Woods Cross 5th South PCE Plume. OU2. Revision 3. Prepared by Pacific Western Technologies, Ltd. May 2020.

Record of Decision: Bountiful/Woods Cross, OU1 Bountiful/Woods Cross 5th South PCE Plume. Prepared by EPA Region 8, September 2006.

Record of Decision: OU2 Bountiful/Woods Cross 5th South PCE Plume, Utah. Prepared by EPA Region 8, September 2007.

Second Five Year Review Report for Bountiful/Woods Cross 5th South PCE Plume Superfund Site, Davis County, Utah. Prepared by EPA Region 8. July 2018.

Source Area Summary and Work Plan for SVE Treatability Study. Prepared by Pacific Western Technologies, Ltd. September 2016.

Soil Vapor Extraction Treatability Study Report, Rev.0. Prepared by Pacific Western Technologies, Ltd. October 2017.

Source Area Vapor Intrusion Investigation for Bountiful/Woods Cross 5th South PCE Plume Site – OU2. Prepared by Pacific Western Technologies, Ltd. March 2020.

Tenth Annual Monitoring Report. Bountiful/Woods Cross Operable Unit 1, Davis County, Utah. Final. Prepared by CDM. February 2019.

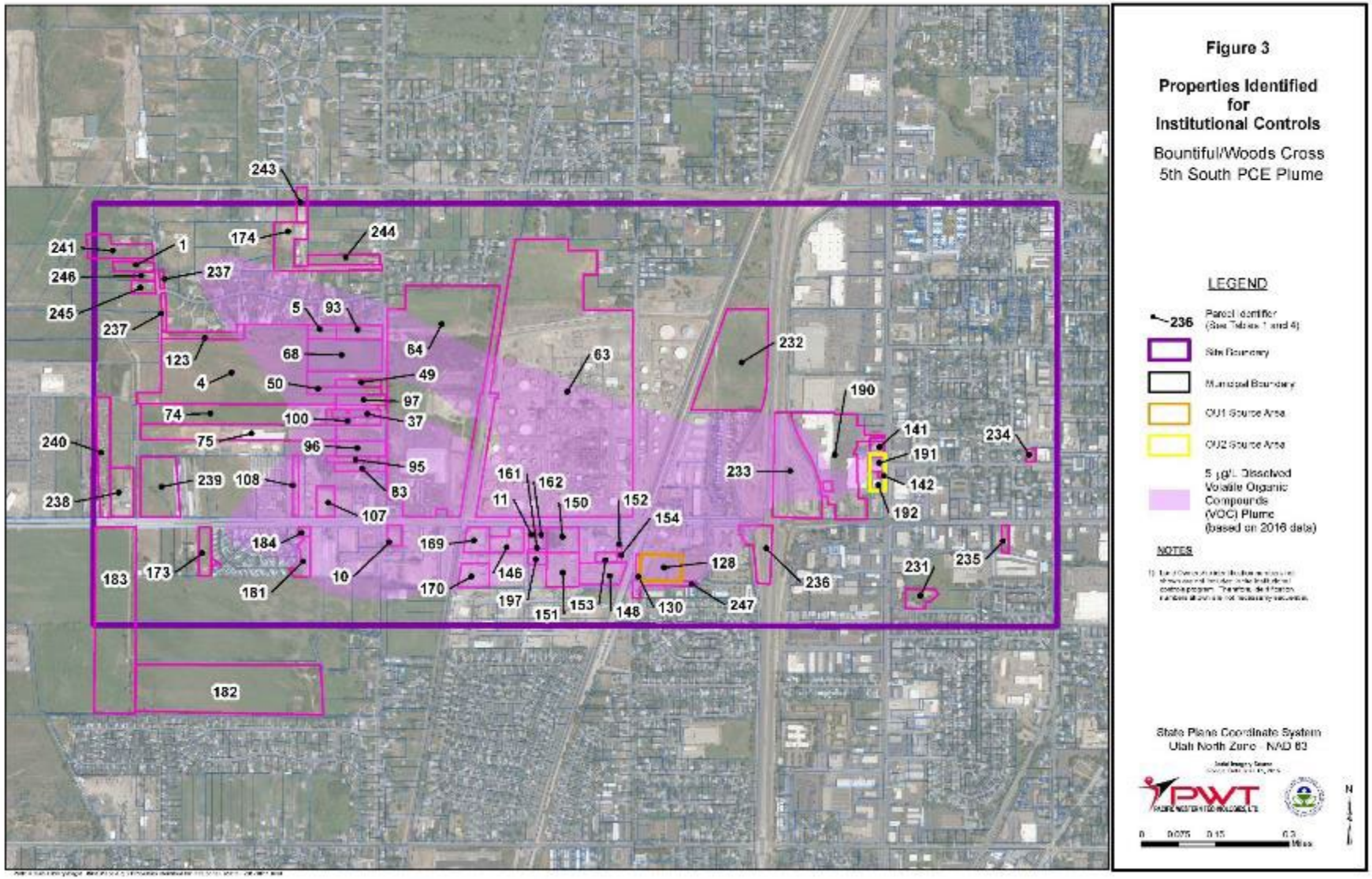
APPENDIX B – SITE CHRONOLOGY

Table B-1: Site-wide Chronology

Event	Date
EPA discovered contamination at the Site	June 22, 1995
Hatchco began removing structures associated with potential past releases of contaminants of concern at OU1	1995
EPA collected groundwater samples at OU1 to identify the extent of groundwater contamination	1996
EPA initiated a removal action to provide bottled water to several residential properties using contaminated groundwater for domestic use.	February 26, 1996
EPA completed the bottled water removal action at OU2	May 24, 1996
UDEQ, through a Cooperative Agreement with EPA, completed a preliminary assessment and identified the PCE in groundwater at OU2	July 24, 1996
EPA initiated a second OU2 removal action to connect several homes using contaminated groundwater to a municipal water system	November 18, 1996
EPA completed the second removal action at OU2	May 31, 1997
Hatchco completed the removal of structures associated with potential past releases of contaminants of concern at OU1	1998
UDEQ identified the sources of groundwater contamination at OU2	1998
UDEQ, through a Cooperative Agreement with EPA, completed a preliminary assessment and identified the sources of groundwater contamination at OU1	1998
Hatchco conducted a pilot test and operated a low-volume air sparging system to remove vinyl chloride from the shallow aquifer.	1998
EPA proposed the Site for listing on the NPL	December 1, 2000
EPA placed the Site on the NPL	September 13, 2001
EPA and Hatchco entered into an AOC to conduct an RI/FS for OU1	September 28, 2001
EPA initiated an RI/FS for OU2	December 3, 2001
EPA and BCI entered into an AOC to conduct an RI/FS for OU2	April 1, 2003
EPA initiated an RI to identify potential sources of VOCs and to determine the extent of groundwater contamination in OU2	April 2, 2003
Hatchco completed the RI/FS for OU1	July 2004
EPA sampled soil gas and indoor air under the BCI and David Early buildings at OU2	April 2005
EPA started the RI/FS for OU2	June 1, 2005
EPA initiated a Pilot Study Implementation Plan for OU1	July 2005
EPA completed the RI/FS for OU2	August 30, 2006
EPA signed the ROD for OU1	September 28, 2006
EPA began the remedial design for OU1	December 6, 2006
EPA began the first phase of the remedial design for OU2	April 10, 2007
EPA completed the remedial design for OU1	September 17, 2007
EPA initiated the remedial action for OU1	September 19, 2007
EPA signed the OU2 ROD EPA completed the initial RI/FS for OU1	September 27, 2007
EPA completed several soil gas and indoor air sampling events at the BCI building	2008
EPA initiated on-site remedial action construction for OU1	September 15, 2008
EPA began remedial action construction for OU2	September 10, 2009
EPA completed the first phase of the remedial design for OU2	September 29, 2009
EPA completed construction of the OU2 groundwater treatment system	January 18, 2011
BCI replaced the PCE dry cleaning machine with a petroleum hydrocarbon-based machine	January 28, 2012
EPA and UDEQ determined the OU2 remedy was operational and functional, beginning the LTRA period	April 13, 2012
EPA completed the remedial action for OU2	September 25, 2012

Event	Date
EPA completed annual soil gas and basement indoor air sampling at the BCI property	July 16, 2014
EPA completed annual soil gas and basement indoor air sampling at the BCI property	July 30, 2015
EPA began a second remedial design for OU2	April 27, 2016
EPA completed vapor sampling at the BCI property	October 14, 2016
EPA finalized the ICIAP	August 15, 2017
DERR and EPA conducted pre-final inspection for in situ bioremediation remedy at OU1	January 31, 2018
DERR received funding through cooperative agreements to conduct LTRA at OU1 ($1.57M) and OU2 ($1.94M)	September 25, 2018
The lead for the OU2 site transitioned from EPA to DERR	April 13, 2019
The lead for the OU1 site transitioned from EPA to DERR	May 15, 2019
O&F was achieved at OU1	August 19, 2020
O&M Manual for OU1 finalized by DERR	September 23, 2020
O&M Plan for OU1 finalized by DERR	October 1, 2020
RA Report for OU1 finalized by DERR	October 8, 2020
Basis of Design Criteria Report for design completed for conducting RA at source area (Bountiful Family Cleaners)	January 7, 2021
DERR and State Purchasing met with bidders for Solicitation for SVE Installation through an RFP	September 7, 2022
Brice Environmental Services Corporation was contractor selected to install SVE system at the source area	November 17, 2022
OU2 LTRA terminated on April 30, ~~2022~~2022, and O&M commenced on May 1, 2022	May 1, 2022
Optimization Review Kickoff Meeting with EPA and DERR to discuss site background and technical questions/answers on remedies selected for OU1 & OU2	January 11, 2023
Five Year Review Kickoff Meeting with EPA, DERR and AECOM	January 19, 2023
SVE Kickoff Meeting with Brice, DERR and AECOM to discuss schedule and timeline for completing SVE installation (180 days)	February 15, 2023

APPENDIX C – PLANNED INSTITUTIONAL CONTROL MAP



APPENDIX D – PRESS NOTICE

PUBLIC NOTICE
Third Five-Year Review Planned for the
Bountiful/Woods Cross 5th South PCE Plume Superfund Site
Davis County, Utah

The Utah Department of Environmental Quality, Division of Environmental Response and Remediation (UDEQ/ DERR), in cooperation with the U.S. Environmental Protection Agency (EPA) is conducting the third Five-Year Review of the Bountiful/Woods Cross 5th South PCE Plume. The purpose of a Five-Year Review is to determine whether or not the cleanup and other actions taken at the site are protective of human health and the environment. The 450-acre Bountiful/Woods Cross 5th South PCE Plume site is in southern Davis County, Utah.

Operations took place at two areas of the site. From 1936 to 1986, Hatchco operated on 13 acres of the Bountiful OU1 (Operable Unit One) site as a specialized carrier of bulk petroleum, asphalt, and petroleum products and solvents. Bountiful Cleaners, Inc. (BCI) operated at the Bountiful OU2 (Operable Unit Two) site and prior to the property's connection to public sewer, wastewater from the dry-cleaning facility likely discharged to a septic system. These historical operations contaminated groundwater with hazardous chemicals. The site was listed on the National Priorities List (NPL) in 2001 and the EPA selected remedies for the site in 2006 and 2007. Cleanup activities are ongoing.

UDEQ and EPA invites community participation in the Five-Year Review process. As part of the Five-Year Review process, community members are encouraged to contact UDEQ staff with any information that may help EPA make its determination regarding the protectiveness and effectiveness of the remedies at the site. The Five-Year Review will include community interviews, a review of site documents and data, and a site inspection to evaluate all remedy components. UDEQ will prepare a report for EPA summarizing the results and the Review will be completed by the summer 2023.

Additional site information is available at: DERR Offices located on the 1st Floor, at 195 North 1950 West, Salt Lake City, Utah, 84114. Please call for an appointment to review records at (801) 536-4100, Monday through Friday, from 8:30 A.M. to 4:30 P.M. Project documents are available online at: http://eqedocs.utah.gov/ using the search phrase "Bountiful Woods Cross 5th south PCE." Visit the EPA website at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0801528
If you would like more information about the review, please contact:
Michael Storck, UDEQ Project Manager, phone: (385) 391-8134 or email: mstorck@utah.gov
Dave Allison, UDEQ Community Involvement, phone: (385) 391-8143 or email: dallison@utah.gov
Angela Zachman, EPA Remedial Project Manager, phone: (303) 312-6923 or email: Zachman.Angela@epa.gov
3/3/23 J-01-223

APPENDIX E – INTERVIEW FORMS

Bountiful/Woods Cross 5th South PCE Plume Superfund Site
Five-Year Review
Interview of Community Members

Site Name: Bountiful/Woods Cross 5th South PCE Plume Superfund Site EPA ID: UT0001119296	March 22, 2023
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator, Michael Storck, Tony Howes, UDEQ/DERR Project Managers, and Angela Zachman, EPA Remedial Project Manager.
Person Contacted	
Mark Taggert - Environmental Compliance Manager	Utah Transit Authority – Property Owner
Utah Transit Authority 669 West 200 South Salt Lake City, UT 84101	Phone: (801)743-3882 Website: www.rideuta.com

1. **What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?** Mark Taggert is the Environmental Compliance Manager, for the Utah Transit Authority (UTA) which owns 3-acres of the former Hatchco site of Operable Unit 1 (OU1) where a TCE plume originates. The Utah Transit Authority is a special service district responsible for providing public transportation throughout the Wasatch Front of Utah. Taggart said he is relatively new in his UTA role and is knowledgeable about the site history. UTA operates a Park and Ride Lot and undeveloped 1.5 -acre lot at approximately 750 W 700 S, West Bountiful, Utah, located near the Woods Cross Frontrunner Train stop. Taggart said he's aware of the monitoring wells and several downgradient bio-barriers used to address trichloroethene (TCE)- contaminated groundwater on and near UTA property.

2. **What is your assessment of the current performance of the remedy in place at the Site?**
Taggart said he doesn't have any indication the institutional controls in place and monitored natural attenuation (MNA) remedy is not working as intended over the last five years. Taggart said he hasn't heard of any problems or seen report information from EPA or UDEQ and expects all needs are being met at this time. Taggart knows OU1 is being sampled by UDEQ contractors on a semiannual basis to assess monitored natural attenuation.

3. **Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?** Taggart said he's not heard any health or environmental concerns from the community. However, Taggart said an incident occurred at this location with a mistaken report of a possible bomb threat a few years ago. Someone called in seeing contractors working near an electrical box and became suspicious. The mistake stopped the commuter trains from running until communication was provided to UTA. Taggart requested advanced notice of any sampling activities be coordinated with UTA to inform train engineers going by the site.

4. **Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.** Having worked in his position for only 6-months, Taggart has not needed to meet with the regulators. Taggart exchanged contact information with EPA and UDEQ Project Managers for the site and would like any information of site developments he should be aware of. Taggart said he has a good rapport with his State and EPA peers.

5. **Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?** Taggart said the UTA property being a location of monitoring and bioremediation wells doesn't see any impact to the MNA remedy. Taggart said other than a couple of damaged well cover plates needing

replacement in the park and ride area, there are no issues for the UTA property. The well covers can become damaged in parking areas during snow removal and general parking traffic.

6. **Are you aware of any changes in projected land use(s) at the Site?** Taggart said he expects the undeveloped property, located just east of the parking area, to be developed in the near future. Taggart is aware of the institutional controls prohibiting well developments and expects any UTA plans to be coordinated and to conform to the appropriate environmental covenant.

7. **Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?** Taggart said he would request notification on any OU1 sampling activities to keep UTA Frontrunner staff informed and appreciated meeting the EPA and UDEQ Project Managers.

Bountiful/Woods Cross 5th South PCE Plume Superfund Site
Five-Year Review
Interview of Community Members

Site Name: Bountiful/Woods Cross 5th South PCE Plume Superfund Site EPA ID: UT0001119296	March 22, 2023
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator, Michael Storck, UDEQ/DERR Project Manager, and Angela Zachman, EPA Remedial Project Manager.
Person Contacted	
Property Owner: Bryce Bangerter	Organization: Bountiful Family Cleaners
Bountiful Family Cleaners 344 South 500 West Bountiful, UT 84010	Phone: (801) 295-1531

1. **What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?** Bryce Bangerter said it's been a long process and feels everything possible is being done to address PCE contamination at his Operable Unit 2 (OU2) property over the last five years. Bangerter said Bountiful Family Cleaners has been cooperative with everything asked of them and wants to do what's best for the necessary remediation work. Bangerter said a number of continuous cleanup activities have occurred to his family property with the installation of soil vapor extraction (SVE) wells over the years and isn't sure what else can be done. Plans are in place to capture additional source material with additional SVE wells this summer, Bangerter said.

2. **What is your assessment of the current performance of the remedy in place at the Site?** Bangerter said plans are in place to capture additional source material with additional Soil Vapor extraction (SVE) wells this summer, Bangerter said, this is another step which hopefully will eventually an end to work on their property. Bangerter said indoor air was evaluated for his employees and PCE hasn't been used at the dry-cleaning business for over a decade which has alleviated any health concerns at the business.

3. **Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?** Bangerter said no one from the community has expressed any concerns with their business. However, Bangerter said there is personal frustration with construction work on their property and feels his building has been damaged by some of the remedial actions over the years. Aside from SVE wells drilling holes into the basement concrete, there is a runoff drain gutter misaligned causing damage to his building. Bangerter said he has brought these concerns to project managers and contractors and wants repairs made to restore property conditions to pre-existing conditions. Especially knowing this is a long-term project doesn't want his building to be continually impacted or forgotten in the process.

4. **Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.** Bangerter said the only communications have been with UDEQ and EPA Project Managers and Contractors regarding plans for cleanup work.

5. **Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?** Bangerter said other working on finding additional PCE source contamination the plume is not causing additional problems to site conditions so controls must work as intended.

6. **Are you aware of any changes in projected land use(s) at the Site?** Bangerter said he has plans to remodel much the basement once the EPA and UDEQ finish work on the property. Nothing which could be accomplished during the remedial actions currently taking place within the basement.

7. **Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?** Bangerter said other than repairs to the building property they want to do what is right and continue to work with regulators to find a solution to the cleanup.

Bountiful/Woods Cross 5th South PCE Plume Superfund Site
Five-Year Review
Interview of Community Members

Site Name: Bountiful/Woods Cross 5th South PCE Plume Superfund Site EPA ID: UT0001119296	March 23, 2023
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator, Michael Storck, UDEQ/DERR Project Manager, and Angela Zachman, EPA Remedial Project Manager.
Person Contacted	
Matt Myers - General Manager, and Lanese Hendrickson - Deputy General Manager	South Davis Sewer District
South Davis Sewer District 1800 West 1200 North West Bountiful, Utah 84087	Phone: (801) 295-3469 Website: https://www.sdsd.us/

1. **What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?** Matt Myers is the South Davis Sewer District General Manager and is contracted with the UDEQ – DERR to operate the Operable Unit 2 (OU2) - Groundwater Treatment System (GWTS) facility regulating the pump and treat remedy for the site. The South Davis Sewer District is an independent special district which services and provides wastewater services to the south half of Davis County, Utah.

   Myers said the facility is successful and under budget for this type of work located at 30 North 1100 West, West Bountiful, UT. The GWTS is a 140-gallon per minute capacity system completed in 2010 and includes four extraction wells, treatment by liquid-phase granular activated carbon (GAC) absorption, and discharge to surface water. Myers said the District's main responsibilities are site reporting activities, operation and maintenance of the facility pumps, and carbon filter replacement and disposal.

2. **What is your assessment of the current performance of the remedy in place at the Site?**
   Myers said remediation with the activated carbon filter and discharge into the A-1 Canal is working efficiently and meeting site goals. Myers said the facility is effectively removing PCE from the confined aquifer and discharging water appropriately to the A-1 Canal. The South Davis Sewer District has fixed minor issues involving transfer pumps, winter heating, bag filters, and the backwashing of activated carbon tanks. Myers said the carbon filters are seeing break-through at approximately 1 ½-years and require replacement which is an economical rate. Myers says they are always evaluating filter methods, life expectancy and mass load, to improve performance and cost savings.

3. **Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?** Myers said he's not aware of any issues or concerns from the community regarding the remedial operations in place with the facility.

4. **Over the past five years, have there been any complaints, violations, or other incidents (e.g., vandalism, trespassing, or emergency responses) at or related to the Site requiring your office to respond? If so, please give details of the events and results of the response.** Myers said there was an area power outage which shutdown operations (a rare occurrence, never happened before) including notification alarms for a period of time within the last year. The shutdown did not impair site conditions. Myers said the facility has an alarm with phone notification in place at the facility for operation failures of which the District staff responds.

   The GWTS is designed to transfer treated groundwater to two discharge options, the sanitary sewer and the A-1 Extension canal. Under normal operating conditions the treated groundwater is discharged to the A-1 Extension canal and in emergency situations the discharge is switched to the sanitary sewer.

5. **Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.** Myers said the SDSD Staff visits the facility weekly and is located where drive-by happens daily. The facility operations have computer monitors to track performance history.

GWTS performance monitoring provides data that are used to verify that the extraction and treatment systems are operating properly and that hydraulic control is being maintained. Facility operations such as pump cycle times, coordinated level settings, and max-balance needs are monitored. Myers said the District is required to provide an Annual Report on the GWTS performance to the UDEQ-DERR.

6. **Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?** Myers said he's not aware of any changes to existing laws which impact the site remedy facility. Myers said the only consideration might be the discharge limits into the A-1 Canal may need to be looked at during high water years. Agreements with the EPA and UDEQ may have to be looked at if the discharge amounts increase according to the water rights for the State.

7. **Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?** Myers said the GWTS is functioning as it's supposed to and with efficiency which shows the facility implementation has made a lot of sense for the Site.

8. **Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?** Myers said the Extraction Well-3 (EW3) pump needs replacement once the winter weather clears, a general maintenance task. Myers said the only consideration might be the discharge limits into the A-1 Canal may need to be looked at during a high-water year. Myers said the UDEQ, EPA, and the District have always worked well together and expects nothing to change in the future.

Bountiful/Woods Cross 5th South PCE Plume Superfund Site
Five-Year Review
Interview of Community Members

Site Name: Bountiful/Woods Cross 5th South PCE Plume Superfund Site EPA ID: UT0001119296	March 30, 2023
Type of Contact: Teleconference	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator, Michael Storck, UDEQ/DERR Project Manager, and Angela Zachman, EPA Remedial Project Manager.
Person Contacted	
Resident- Property Owner- Resident	Domestic Well used for drinking water.
Address: N/A	

1. **What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?** The Resident said he did not know a lot about the Bountiful/Woods Cross 5th South PCE Plume Superfund cleanup history. However, having lived at the property growing-up, and in conversations with his Parents over the years, was aware of the property history. The Resident is an immediate family member acting as Spokesperson for the property owner who is in declining health and requires assistance.

   The Resident and his Father are the only ones living at the home where a domestic well is the only water supply used for drinking water. The Resident was informed by the Five-Year Review Staff there were conversations with his parents regarding well sampling detections above the maximum Contaminant Level (MCL) for Tetrachloroethylene (PCE) since the last Five-Year Review in 2018.

2. **What is your assessment of the current performance of the remedy in place at the Site?** The Resident said he could only look at the effectiveness of the remedy as it relates to their property. The Resident said his Parents connecting to the municipal water supply was never an option, reasoning they didn't like the taste of "City" water nor wanted the accompanying water bill. The Resident said he doesn't doubt EPA offered public water connections to his Parents' well according to the 2008 Record of Decision (ROD) and believes the required communication is currently happening with the regular Sampling Results Letters from EPA.

   The Resident was informed by the Five-Year Review Staff, the most recent well sample result taken in December 2022 was at 3.2 ppb for PCE, currently below the national drinking water standard of 5 ppb. During the last five years, the well sample results were below until exceeding the MCL in 2020 – at 6.7 ppb, and in 2021- at 5.2 ppb, for PCE. The Resident said his Parents had installed an alkaline water filter on the kitchen faucet a few years ago, he couldn't recall when, and the Resident said possibly because of being informed of the sampling results by EPA and UDEQ. The Resident said he doesn't think the water filter has been updated either and not sure it's even effective.

3. **Do you have any complaints or inquiries regarding site-related environmental issues or remedial activities in the past five years**? The Resident said he did not have any health risk concerns considering the PCE detections a couple of years ago and understands the current well water is below MCL standards at this time. His Mother passed away from cancer in 2019 and said she wondered if it could be related. However, the Resident doesn't feel at risk and didn't feel his Parents ever thought the water was unsafe enough to stop drinking from their well. The Resident said he understands the EPA and UDEQ, despite their efforts, cannot require his Father to connect to municipal water and doesn't think he'll ever change his mind.

4. **Have you participated in any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.** This is the first time, the Resident said, he has personally had any conversations with EPA and UDEQ Project Managers. He said his Parents would occasionally talk about the groundwater contamination and wasn't aware of the annual sampling results letters or previous discussions with EPA or UDEQ.

The recent difficulty by UDEQ contacting his Father was mentioned as the landline phone number was without voice mail and a reliance on mailing sampling letters to provide information. The Resident said this would not be a surprise with the decline in health of his Father. The Resident said his cell phone and email information would be best for any future communication and had exchanged information with the EPA and UDEQ site contacts to call with any questions. The Resident said he would keep an eye out for the mail and respond if necessary to any sampling result letters in the future.

5. **Are you aware of any changes in projected land use(s) at the Site?** The Resident said they needed to install a submersible pump in 2022 about 80-feet down in their well as they experienced a drop in artesian pressure. Something EPA and UDEQ Project Managers noted for the next sampling.

   The Resident said the property would be sold if his Father was no longer living there. There are no plans in place for selling the property at this time. Depending upon who buys the property, the Resident said the well circumstances would have to be discussed and disclosed appropriately.

6. **Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?** The Resident did not have any comments or suggestions regarding site management other than what regulators are currently doing. Coordination of contact information is established. The Resident was informed UDEQ will continue to sample and notify residential well owners of the results, including their property, and work is ongoing removing the PCE source from area groundwater.

APPENDIX F – SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Bountiful Woods Cross 5th South PCE Plume	**Date of inspection: 03/22/2023**
Location and Region: Bountiful, West Bountiful, Woods Cross/Region 8	**EPA ID: 0001119296**
Agency, office, or company leading the five-year review: DERR	**Weather/temperature: Overcast/35 degrees**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other _As part of groundwater treatment biobarriers were installed to treat groundwater downgradient of the source area at OU1

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** _____ _____ _____
   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 _UDEQ
Contact _Michael Storck_ Project Manager 02/22/23
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_____			
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_____			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☒ N/A
	Remarks_____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks_____			
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_____			

IV. O&M COSTS

1. **O&M Organization**

☒ State in-house ☒ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

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 5/1/22 To 01/31/23	$59,724	☐ 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: _____

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

A. Fencing

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

Remarks_____

B. Other Access Restrictions

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

Remarks_____

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

_____
_____
_____
_____

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____
_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks_____
_____

2. **Land use changes on site** ☒ N/A
Remarks_____
_____

3. **Land use changes off site** ☒ N/A
Remarks_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks_____
_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

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

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

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____
   .

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

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

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)_____
   ☐ Others_____
   ☒ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   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 Several monitoring well covers were missing and need to be replaced. Monitoring well covers were replaced on May 5, 2023

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_____

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The remedy at OU1 includes in-situ treatment of soil and groundwater with MNA following treatment and ICs. The remedy at OU2 is SVE for vadose zone soils and pumping and treatment of groundwater, provision of alternate drinking water source, MNA and ICs. The remedy as currently implemented is performing as intended and ICs are being implemented according to the 2017. Shallow and deep SVE wells will be installed at the source area (Bountiful Family Cleaners) in 2023 and will be monitored for up to five years.

B. Adequacy of O&M

LTRA activities ended on 4/30/20 and O&M activities started on 5/1/20 and include conducting annual monitoring of the monitoring and domestic wells. An optimization study at OU1 and OU2 started on 1/11/23.

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.
None noted

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
An optimization study was initiated by the optimization team on 1/11/23 to investigate the effectiveness of the remedies at OU1 and OU2 and provide recommendations for optimization options and complete a technical memorandum.

APPENDIX G – SITE INSPECTION PHOTOS

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful Third FYR Site Inspection	

Photo No.1	Date: 3/22/23

Description:OU1 Source Area HMW17D

Photo No.2	Date: 3/22/23

Description: OU1 Biobarrier 2

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful Third FYR Site Inspection	

Photo No.3	Date: 3/22/23

Description:
OU1 Biobarrier 3a

Photo No.4	Date: 3/22/23

Description:
OU1 Biobarruer 3b

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful FYR Site Inspection	

Photo No.5	Date: 3/22/23

Description:
OU1/HMW-39S
Furthest extent of OU1Plume

Photo No.6	Date: 3/22/23

Description:
OU2
Treatment Building

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful FYR Site Inspection	

Photo No.7	Date: 3/22/23

Description:
A-1 Canal Discharge

Photo No.8	3/22/23

Description:
OU2 EW-3

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful Third FYR Site Inspection	

Photo No.9	Date: 3/22/23

Description:
OU2- EW-2
Well Vault

Photo No.10	Date: 3/22/23

Description:
OU2- EW-5

PHOTOGRAPHIC LOG

Inspection Date: March 22, 2023	Bountiful Third Five Year Review	

Photo No.11	Date: 8/2/17

Description:
OU2
Gertsch Property
DW-27

Photo No.12	Date: 3/22/23

Description:
OU2 Source Area
Bountiful Family
Cleaners

APPENDIX H – DETAILED DATA ANALYSIS

A summary of the site-related contamination for OU1 and OU2 is presented in the following sections. The HollyFrontier Refinery has a benzene, toluene, ethylbenzene, xylenes, naphthalene and methyl tertiary butyl ether (MTBE) groundwater plume. Petroleum constituents have been detected in both soil and shallow groundwater beneath the HollyFrontier Woods Cross Refinery and Light Oil Dock Terminal, and the groundwater plume is commingled with other contaminants within the OU1 and OU2 plumes. However, these plumes will not be discussed further in this section since they are currently being regulated under a corrective action plan by the UDEQ Division of Water Quality. A series of plume maps for OU1 and OU2 are included at the end of this section for reference.

OU1

The data evaluated in this Five-Year Review (FYR) includes groundwater data collected through November 2021 to summarize the current extent of contamination as remediation continues in the shallow and deep portions of the aquifer. The data are reviewed relative to concentrations near the source area and biobarrier #1, where the highest concentrations historically exist, followed by discussions on the extent of contamination in two areas downgradient of the source area. The downgradient areas include wells near biobarriers #2 and #3 and MNA wells in areas of the Site not treated. In addition, a summary of where contamination remains above the site-specific treatment criterion of 200 µg/L for total TCE and PCE and its degradation products, referred to as total CAHs, is also provided. Figure H-1 shows the location of the wells and biobarriers. The 2007 Remedial Design Report specified in-situ enhanced anaerobic bioremediation (EAB) for areas containing total CAH concentrations greater than the site-specific treatment criterion of 200 µg/L and MNA for areas below 200 µg/L total CAHs.

Shallow Zone

Overall, COC concentrations have declined in the source area and biobarrier #1 since implementation of the injections in 2008. TCE and cis-1,2-DCE have achieved the cleanup goals of 5 µg/L and 70 µg/L, respectively, in the shallow zone at the source area (Figure H-2). The TCE degradation product vinyl chloride has decreased over time (Figure H-3). However, vinyl chloride concentrations remain above the cleanup goal of 2 µg/L in the source area, with the highest concentration observed in well HMW-15S (5.7 µg/L) (Figure H-2). These results indicate that source area and biobarrier #1 remediation has reduced the flux of COCs to the downgradient plume.

The concentrations of COCs detected between and immediately downgradient of biobarriers #2 and #3 are shown on Figure H-2, with the highest TCE (20 µg/L) detected in HMW-22S, the highest cis-1,2-DCE (140 µg/L) at HMW-12SR, and the highest vinyl chloride (83 µg/L) detected in HMW-32S. TCE was detected at higher concentrations downgradient of biobarrier #3, with the maximum TCE concentration detected in HMW-18US (43 µg/L). TCE concentrations decline to below the cleanup level of 5 µg/L west of 1100 West. TCE degradation products cis-1,2-DCE and vinyl chloride both decrease downgradient of the biobarrier #3. The highest concentrations of cis-1,2-DCE are located at MW-18US (84 µg/L) and HMW-39S (70 µg/L), which are at or slightly above the cleanup level of 70 µg/L. The highest concentration of vinyl chloride downgradient of 1100 West is in HMW-39S (10 µg/L). The concentrations of cis-1,2-DCE and vinyl chloride further west of HMW-39S drop below cleanup levels, demonstrating that MNA is reducing the concentrations over time and distance.

As groundwater flows through the biobarriers at the Site, COCs are being treated and clean water is migrating through the higher-permeability aquifer intervals downgradient of the biobarriers. As of November 2021, no wells in the shallow zone exhibit a concentration of total CAHs above 200 µg/L, with the highest total CAH concentrations observed at HMW-12SR (162.74 µg/L) (Figure H-4). It does not appear at this time that additional biobarrier amendment injections will be necessary. However, it may be necessary to evaluate alternative approaches to decrease vinyl chloride to below the action level, as it appears that the degradation of vinyl chloride may have stalled.

Deep Zone

The concentrations of TCE in the deep zone are generally higher than observed in the shallow zone in the source area. The highest source area TCE concentration in 2021 was 42 µg/L, observed in well HMW-3D, with four other wells also having TCE concentrations above the action level of 5 µg/L (Figure H-5). While TCE concentrations in numerous wells in the source area remain above the action level (Figure H-5), the EAB remedy has resulted in significant reduction of TCE at the source area, where concentrations have drastically decreased from the historically observed values that ranged from 26,000 µg/L at HMW-17D to 2,300 µg/L at HMW-18D (Figure H-6). The concentrations of cis-1,2-DCE and vinyl chloride in the deep zone are generally higher than observed in the shallow zone in the source area, with the highest cis-1,2-DCE concentration (130 µg/L) observed at HMW-102D and the highest vinyl chloride concentration (96 µg/L) observed at HMW-18D (Figure H-5). These concentrations indicate that the EAB remedy continues to degrade TCE in the deep zone of the source area. One issue to note in the source area is that after the 2020 amendment injections at the source area hot-spot of HMW-17D, that well no longer seems to have sufficient yield to collect a sample. HMW-17D was redeveloped in the fall of 2021 and while a sample was collected at that time, no sample was able to be collected the following spring of 2022. It appears that the injection activities have greatly reduced the yield of the formation surrounding HMW-17D.

The highest concentrations of COCs in the deep zone are located between biobarriers #1 and #2, with the highest concentration of TCE (91 µg/L) at HMW-28D and the highest concentrations of cis-1,2-DCE (63 µg/L) and vinyl chloride (16 µg/L) at HMW-19D (Figure H-5). Concentrations of the three COCs decline further downgradient from biobarrier #3 and west of 100 West where: with the exception of at HMW-40D and HMW-27D, concentrations of TCE are below the cleanup goal; cis-1,2-DCE is below the cleanup goal; and with the exception of at HMW-27D, vinyl chloride is below the cleanup goal.

As with the shallow zone, overall, COC concentrations have declined in the areas outside the influence of the biobarrier amendment injections since implementation of the EAB remedy. As of November 2021, only one well, HMW-18D (in the source area), exhibits total CAHs above 200 µg/L at a concentration of 229 µg/L (Figure H-7). The CAH exceedance in HMW-18D is only marginally above the 200 µg/L action level and is primarily due to TCE degradation products showing that the injections are breaking down TCE. Further, preliminary 2022 results indicate that with the exception of vinyl chloride, TCE and its degradation products are all below their respective MCLs and total CAH concentration has dropped to 15.7 µg/L. As with the shallow zone, it does not appear at this time that additional amendment injections will be necessary. However, it may be necessary to evaluate alternative approaches to decrease vinyl chloride to below the action level, as it appears that the degradation of vinyl chloride may have stalled, as it is an aerobic process and not anaerobic.

OU2

The data included in this FYR includes groundwater data collected through November 2021 to evaluate the performance and effectiveness of the GWTS which began treating groundwater in 2011. Concentrations were compared against the ROD cleanup goals. In addition, a summary of the groundwater results in domestic wells is provided, as well as the results of vapor intrusion studies that have occurred since the previous FYR. This review focuses on the extent of PCE contamination in groundwater, as PCE exhibited widespread exceedances of the cleanup goal during the review period and PCE is the only COC that has exceeded the cleanup goal during the review period, with the exception of TCE, which has only had two exceedances (one in 2017 and one in 2019).

Groundwater Treatment System Performance Monitoring

The effectiveness of the GWTS (Figure H-8) is measured by evaluating hydraulic control of the middle zone to ensure that hydraulic plume control is being maintained, and by monitoring influent and effluent water quality data to ensure the treatment system is meeting applicable effluent water quality standards. This data review included treatment system data from January 2017 through December 2021. During this period, the GWTS was shut down for four months, starting on December 12, 2018, due to issues with the water rights. Those issues were resolved and operation of the GWTS was restarted on April 17, 2019. Additionally, in November 2018 EW-4 was taken out of service due to a significant decrease in flow and PCE mass removal and the process to replace it with

EW-5 was initiated. Installation of EW-5 began in December 2019 and was completed in May 2020, and it was brought online in the GWTS in June 2020.

The hydraulic containment system performance is evaluated by monitoring water levels and water quality in the surrounding monitoring wells. According to the Annual 2021 Groundwater Monitoring and System Performance Report (2021 Annual Report), regional changes in groundwater elevations have continued due to drought and reduced natural recharge as well as contributions from water production at nearby domestic, municipal and industrial wells. Groundwater drawdown has been observed in monitoring wells near extraction wells. The 2021 Annual Report indicates that the GWTS appears to induce hydraulic gradients near the extraction wells and appears to affect middle zone hydraulic gradients in a way that is likely to prevent dissolved PCE migration to the west, northwest, and southwest (with the addition of EW-5) in the pumping area.

Treatment system samples are analyzed for the full list of VOCs, including PCE, TCE, cis-1,2-DCE, vinyl chloride, MTBE, benzene, toluene, ethylbenzene, total xylenes and naphthalene. As expected, system influent consistently has PCE concentrations above the MCL, which have remained relatively stable over the review period (11-13 µg/L range), with the exception of a brief spike in concentrations (up to 18 µg/L) in the spring of 2021, but then returned to the 11-13 µg/L range in the summer of 2021(Figure H-9). Treatment system effluent samples collected during the review period were all non-detect and hence below maximum allowable discharge limits (Figure H-9). During the review period, there were no exceedances of effluent discharge limits for any of the analytes listed in the UPDES equivalent permit. The GWTS data indicates that the system is operating within its designed capacity and removing PCE from site groundwater. The influent flow rate over the review period began around 70 gpm, decreased to around 50 gpm until EW-5 was brought online, at which point it increased to around 85 gpm. Subsequent optimization of operations for pump longevity has decreased flow to around 75 gpm. The GWTS has removed 45.15 pounds of PCE through December 2021, with the average annual pounds removed during the review period being 3.41 pounds. This is a relatively small amount of PCE removal and given the low levels of PCE in the plume (the highest concentration observed in April 2021 was 16 µg/L, as presented below) and the well documented inefficiency of pump and treat systems at remediating low concentration plumes, it may be beneficial to evaluate if there are receptors that need to be addressed.

Monitoring Well Results

PCE plume maps for 2021 compared to 2016 are presented in Figures H-10 and Figure H-11, respectively. Comparison of the maps shows that the footprint of the PCE plume in the upper zone has decreased. The most obvious changes observed in 2021 are the sharp decrease in the extent of the PCE plume in the upper zone and the more modest decreases in the extent of the PCE plume in the middle and lower zones. The footprint of the PCE plume above the 5 µg/L cleanup standard in the upper zone had extended west of Interstate 15 and now is only observed around the source area, based on sampling results from April 2021 compared to the plume map from September 2016. The PCE footprint in the middle zone has receded along the western boundary and the PCE footprint in the lower zone has receded along the southern boundary.

During the annual 2021 groundwater monitoring event conducted in April, PCE was detected in 35 of the 46 wells sampled, with concentrations ranging from 0.21 µg/L to 16 µg/L. The PCE concentration ranges in the upper, middle and lower zones during the April 2021 sampling event are as follows:

- Upper zone: PCE was detected in four of the seven wells sampled, with concentrations ranging from 0.28 µg/L (MW-06U) to 9.3 µg/L (MW-15R). Three of the ten wells attempted to be sampled were dry.
- Middle zone (includes middle shallow and middle deep wells): PCE was detected in 25 of the 32 wells sampled, with concentrations ranging from 0.21 µg/L (MW-32MS) to 16 µg/L (MW-34).
- Lower zone: PCE was detected in six of the seven wells sampled, with concentrations ranging from 0.32 µg/L (MW-19L) to 9.3 µg/L (MW-14L).

In general, PCE concentrations appear to be declining across the site, with a maximum in 2017 of 24 µg/L and a maximum in 2021 of 16 µg/L. The plume also appears to be receding, with the middle and lower zones receding in the northwestern portion of the site and the upper zone receding in the eastern portion of the site to the source

area (Figures H-10 and H-11). At the time this FYR was being written, an optimization effort was underway that will evaluate these trends further. The results of this optimization should be incorporated into the monitoring program for the site and should be evaluated during the next FYR.

According to the 2021 annual groundwater monitoring report, a slight downward vertical hydraulic gradient exists across the site, with the strongest downward gradient observed (-0.73 ft/ft at MW-09) in the source area from the upper to middle zones. A more moderate downward gradient is observed in the mid-plume area from the middle zone to the lower zone, with the highest downward gradient from the middle to the lower zone observed at MW-14 (-0.17 ft/ft). This middle to lower zone downward hydraulic gradient, coupled with the fact that PCE is detected in the lower zone at concentrations above the MCL (5 µg/L), indicates that portions of the PCE plume have migrated to the lower zone and may not be captured by the GWTS (extraction wells are not screened in the lower zone). However, preliminary PCE concentrations detected in 2022 (the 2022 annual report was not complete at the time this FYR was conducted, but preliminary results were available) indicate that PCE concentrations in the lower zone have decreased, with the only lower zone PCE MCL exceedance observed at MW-12L. The concentration of PCE in the lower zone should continue to be monitored to confirm this decrease and inform the status of migration in the lower zone.

The extent of the dissolved PCE plume above the MCL (5 µg/L), as defined by the current monitoring well network and the furthest detected value of PCE, is about 1.4 miles west-northwest of the source. As of the 2021 groundwater monitoring event, all monitoring wells identified by the Long Term Monitoring Plan (LTMP) for sampling are sampled in the spring during the period of seasonal high groundwater levels, with only a small subset sampled in the fall during low groundwater levels to evaluate the effect of the new extraction well. Starting in 2022, sampling is only conducted during the spring and only water levels are measured in the fall. However, even with 2021 sampling being conducted during the period of highest groundwater levels, BC01U, MW04U and MW05U continue to be dry and not able to be sampled.

Domestic Groundwater Well Monitoring

The EPA samples domestic supply wells annually in the spring for VOC analysis, in accordance with the LTMP. Over the review period, the number of domestic wells attempted to be sampled has decreased from 33 in 2017 to 20 in 2021, primarily due to damaged or abandoned wells. The majority of the domestic wells are used for irrigation or stock watering, with only four wells used for residential supply: DW03, DW07, DW27, and DW35. DW07 is no longer sampled, as PCE has always been non-detect at this well and it was determined that it is screened significantly below the plume. Domestic wells are only sampled if they are artesian or if they have dedicated sampling equipment. There is also one municipal supply well (West Bountiful 5th South Well) and two industrial supply wells (Woods Cross Refining Co. Well #2 and Well #3) that are sampled periodically by the well owners.

This data review included data collected from 2017 through 2021. The review identified PCE as the only contaminant detected above the MCL of 5 µg/L (which is the cleanup goal) in the six domestic wells shown on Table H-1, with the highest concentration being 11 µg/L in domestic well DW11 in April 2019. When flowing, water from DW11 is used for irrigation and stock watering, however, DW11 has not been artesian since 2019 and therefore has not been sampled. Only one of the wells with an MCL exceedance during the review period is used for residential supply, DW27. The PCE concentration at DW27 has historically fluctuated above and below the MCL, with it being above in 2016 (5.1 µg/L), 2018 (5.7 µg/L), 2020 (6.7 µg/L), and 2021 (6.3 µg/L) and below the remaining years sampled. The preliminary 2022 results at DW27 indicate that the PCE concentration is again below the MCL at DW27 (3.2 µg/L). Letters are sent annually to the domestic well owners indicating the results of sampling activities and providing contact information should they have concerns or further questions. It should be noted that the sample at DW27 is collected from the well head and not from the tap within the home, therefore, the concentration at the point of use is not known. The owners of DW27 were interviewed as part of this FYR and indicated that they currently have a filter on the water system at the tap, however, they are not certain of its efficacy (Appendix E).

Table H-1: PCE Concentrations Detected in Domestic Wells Above the Cleanup Goal of 5 µg/L (2017-2021)

	PCE Concentrations (µg/L)				
Well	**April 2017**	**April 2018**	**April 2019**	**May 2020**	**April 2021**
DW11	NS/NA	9.6	11	NS/NA	NS/NA
DW14	NS/NA	7.1	NS/NU	NS/NU	NS/NU
DW15L	NS/NA	1.8	NS/NA	7.4	NS/NA
DW15D	6.3	6.0	-	6.9	NS/NA
DW19	NS/NA	NS/NA	NS/NA	7.7	NS/NA
DW27	4.4	5.7	2.6	6.7	6.3
Notes: NS/NA = not sampled, not artesian NS/NU = not sampled, no longer in use					

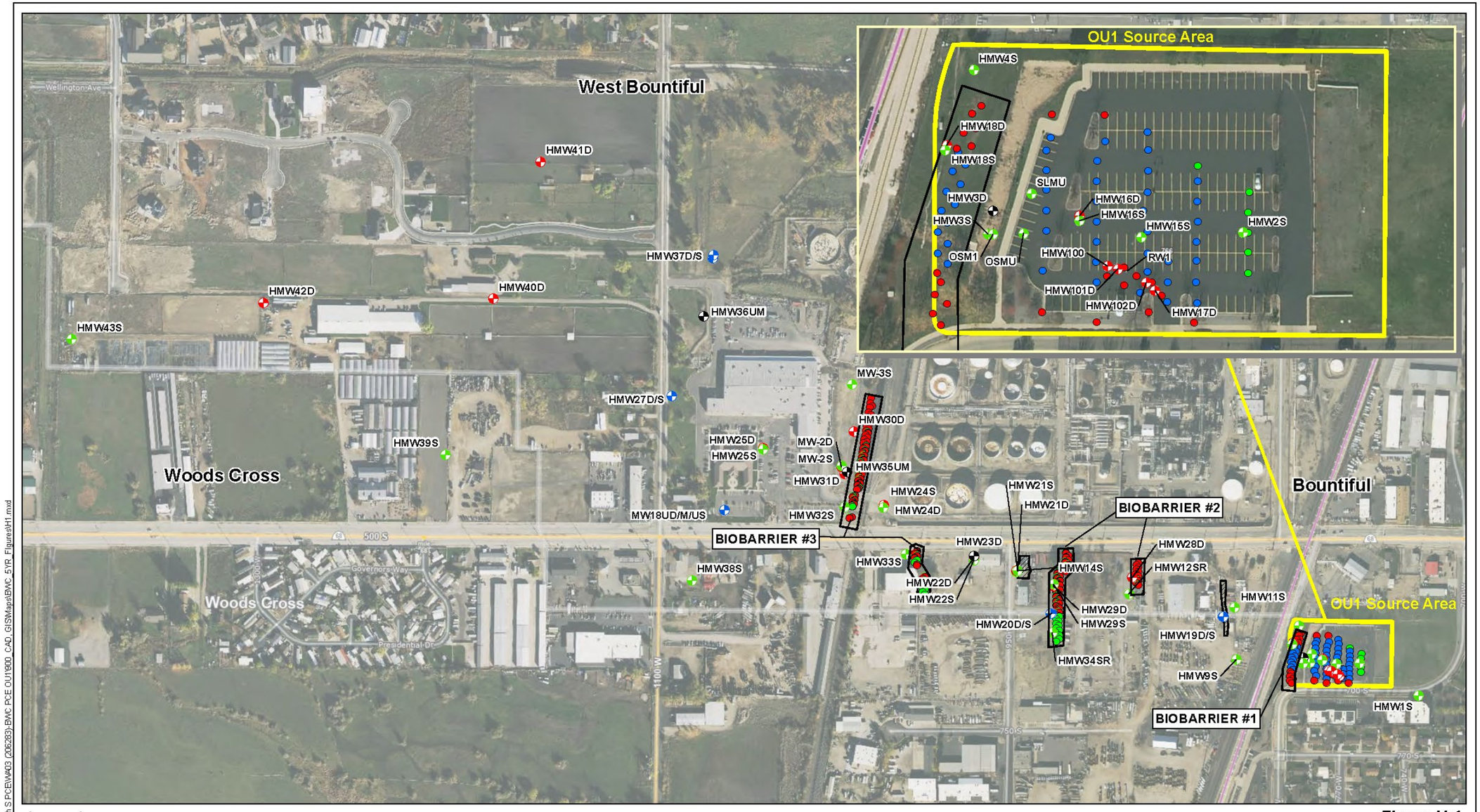
Soil Gas and Indoor Air Monitoring

The soil gas and indoor air data evaluated in this FYR include 2018 through 2019 data collected at the BCI property, as well as the David Early office building south of the BCI property (which is no longer present) and the retail building west of the BCI property (*Source Area Vapor Intrusion Investigation Report* dated March 6, 2020, and the *Additional Source Area Characterization Report* dated March 6, 2020). These properties are almost completely covered by buildings and concrete and asphalt paving; the BCI building houses three commercial businesses and includes a basement. The primary goal of soil gas and indoor air sampling was to monitor VOC concentrations in soil gas and indoor air, to monitor changes in building conditions, and to assess risk from subsurface vapor intrusion.

Indoor air and soil gas sampling conducted from 2013 to 2015 at and surrounding the BCI building indicated that EPA-calculated vapor intrusion risks were within the EPA's risk management range of 1×10^{-6} to 1×10^{-4} and less than a HQ of 1.0 based on a commercial land use. However, the PCE concentrations that remain in subsurface soil gas are at a level that does not allow for unrestricted use. Additional soil gas sampling occurred in 2016 to determine the extent of the soil vapor plume emanating from the BCI building area and to pilot test soil vapor extraction (SVE) in the source area. The 2016 results indicated that PCE plume is centered beneath the BCI building and extends out north and south of the building to an undefined extent and extends to depths greater than 80 feet beneath the BCI building. It also indicated that two additional buildings required vapor intrusion sampling and evaluation – the David Early office building south of the BCI property (which has since been demolished and the area redeveloped) and the retail building west of the BCI property. The results of the SVE pilot test indicated that it is an option for source area remediation, however, although soil gas PCE concentrations were decreased in some areas, a limited mass of PCE was removed (0.36 pounds); the study recommended additional site characterization and plume delineation. The additional work to further characterize soil gas in the source area and vapor intrusion risk in the surrounding buildings was performed in 2018 and additional source area site characterization to further delineate the soil gas plume and support source area remediation was performed in 2019; both are described further below.

In January and July 2018, additional soil gas and indoor air samples were collected from the source area, as well as from the former David Early office building, the retail building to the west, and from the basement of the BCI building. The results of this work indicated that concentrations of PCE remain in soil gas beneath and in the surrounding area of the BCI building above the target concentration for vapor intrusion to indoor air. A risk evaluation was performed on the indoor air data, which demonstrated that indoor air within the David Early office building and the adjacent retail building does not exceed acceptable risk levels (Appendix J). However, the results indicated that while risk from indoor air in the basement of the BCI building is within the acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}, the noncancer risk exceeds an HI of 1.0 (primarily driven by TCE at one location). The 2018 report also recommended that additional soil gas plume characterization be conducted.

Additional source area characterization was conducted in May and June 2019. The results of the 2019 work were generally consistent with the conceptual site model in the source area and, when coupled with the soil gas data collected in July 2018, adequately characterized the shallow and the deep soil gas plumes. The data indicates that the shallow soil gas plume has PCE concentrations above the target soil gas concentration for the vapor intrusion to indoor air pathway of 1,752 µg/m^3, with the highest concentration being 37,000 µg/m^3 at 12.75 to 14.5 ft bgs directly beneath the BCI building, and that the deep soil gas plume has PCE concentrations above the target soil gas concentration for the vapor intrusion to groundwater pathway of 2,148 µg/m^3, with the highest concentration being 18,000 µg/m^3 at 67-77 ft bgs along in the northwestern corner of the BCI parking lot. It should be noted that the bulk of the 2019 data was generated by a portable gas chromatograph and the data validation indicated that those results should not be used for quantitation. Sufficient data was also collected to support design of a full-scale SVE system for remediation of the shallow and deep soil gas plume in the source area.



Legend

- Shallow Upper Zone Monitoring Well
- Deep Upper Zone Monitoring Well
- Lower Zone Monitoring Well
- Paired Monitoring Wells
- OU1 Source Area
- Shallow Injection Well
- Deep Injection Well
- Paired Injection Well
- 2019 Hydraulic Permeability Enhancement (HPE) Area

Notes:
RW1 is shown as a deep well in the LTMP, however, it is being shown as a shallow well on these figures because the screened interval, groundwater elevation, and CAH concentration profile are all consistent with other shallow wells in the area.

N

0 200 400 800 Feet

Figure H-1:
OU1 Monitoring Well and Biobarrier Locations
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 1
2021 (13th) Annual Monitoring Report

AECOM

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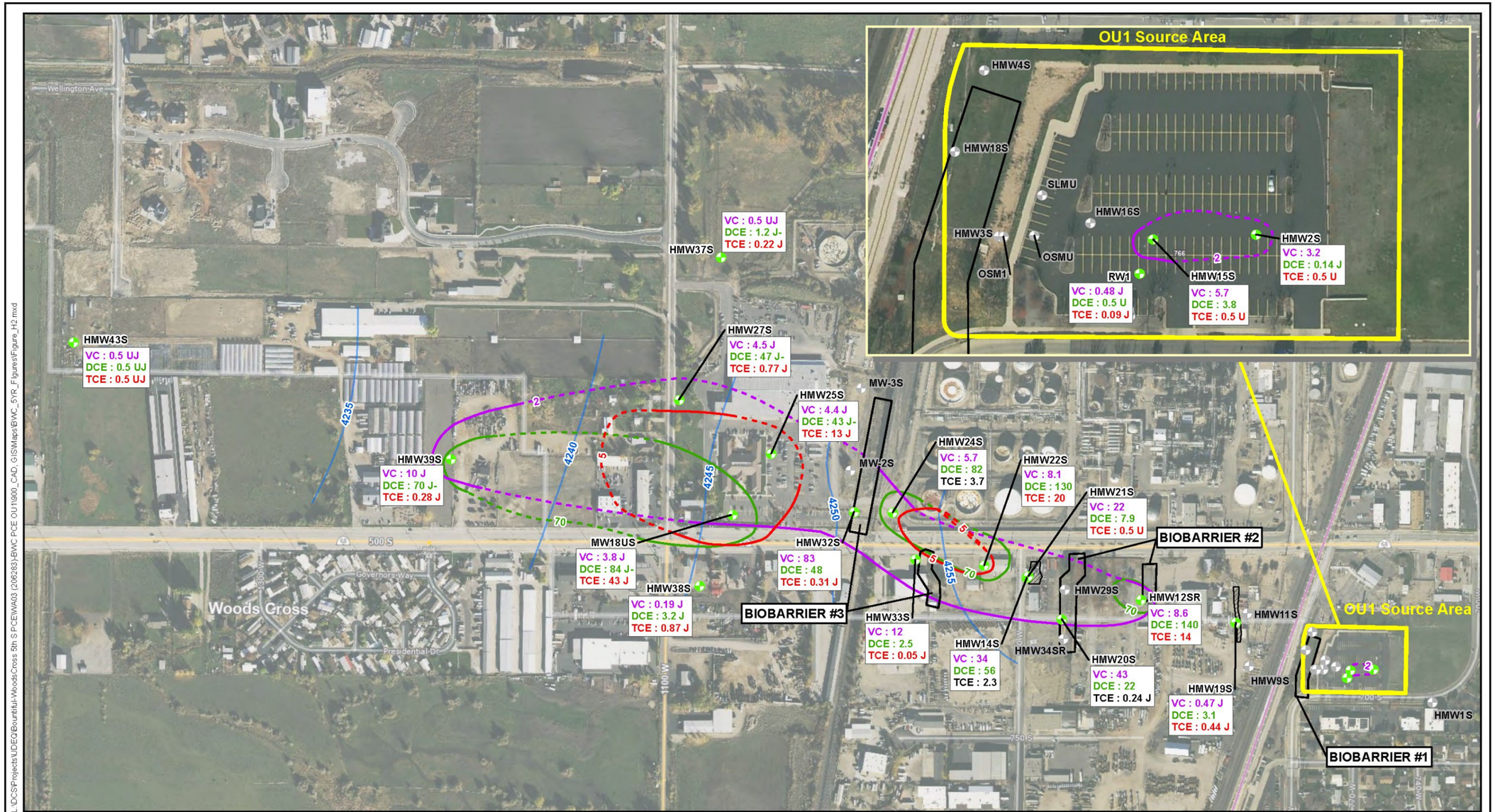

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Legend

- Shallow Upper Zone Monitoring Well - Sampled November 2021 (Concentrations shown in ug/L)
- Shallow Upper Zone Monitoring Well - Not Sampled
- OU1 Source Area
- 2019 Hydraulic Permeability Enhancement (HPE) Area
- 5 µg/L TCE Isoconcentration Line (Dashed where inferred)
- 70 µg/L CIS-1,2-Dichloroethene Isoconcentration Line (Dashed where inferred)
- 2 µg/L Vinyl Chloride Isoconcentration Line (Dashed where inferred)

Notes:
TCE - Trichloroethene
µg/L - Micrograms per liter

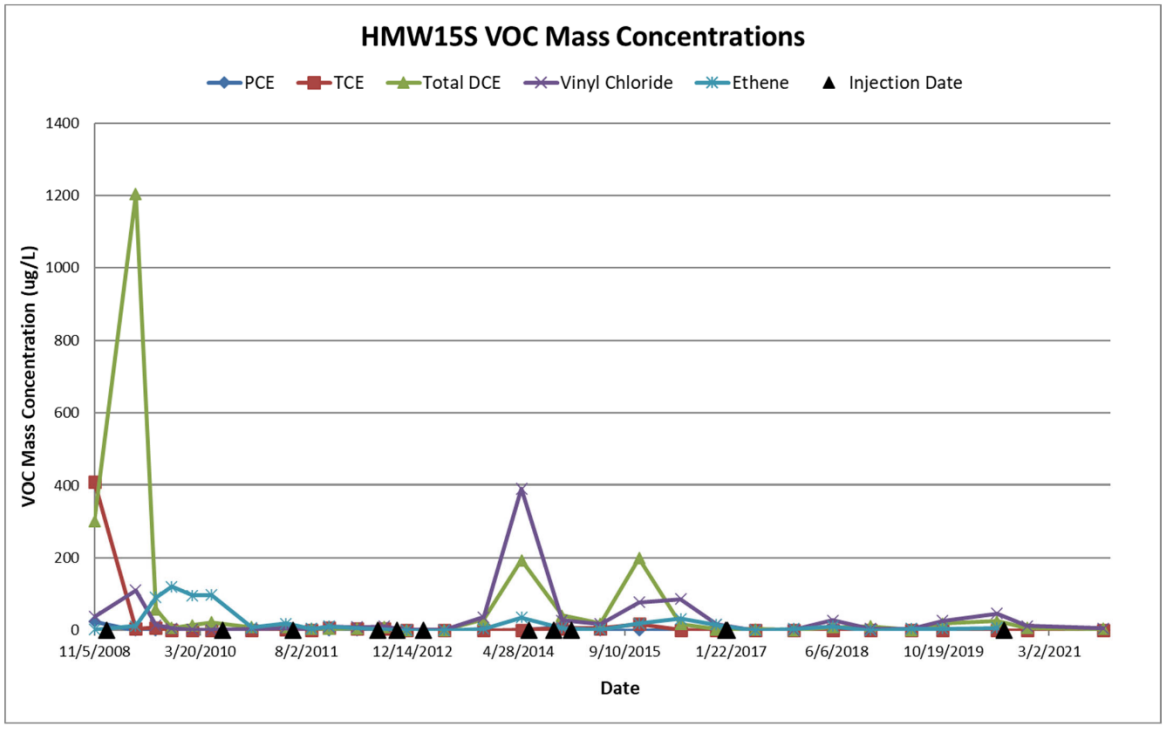
N

0 250 500 1,000 Feet

Figure H-2:
Extent of Trichloroethene, CIS-1,2-Dichlorothene, and Vinyl Chloride in the Shallow Aquifer - OU1
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 1
Taken from the 2021 (13th) Annual Monitoring Report

AECOM

Figure H-3: VOC Concentration Over Time in Monitoring Well HMW-15S



Legend

- Shallow Upper Zone Monitoring Well - Sampled November 2021
- Shallow Upper Zone Monitoring Well - Not Sampled
- 3.93 — November 2021, Total Chlorinated Alphatic Hydrocarbon (CAH) Concentration (µg/L)
- OU1 Source Area
- 2019 Hydraulic Permeability Enhancement (HPE) Area

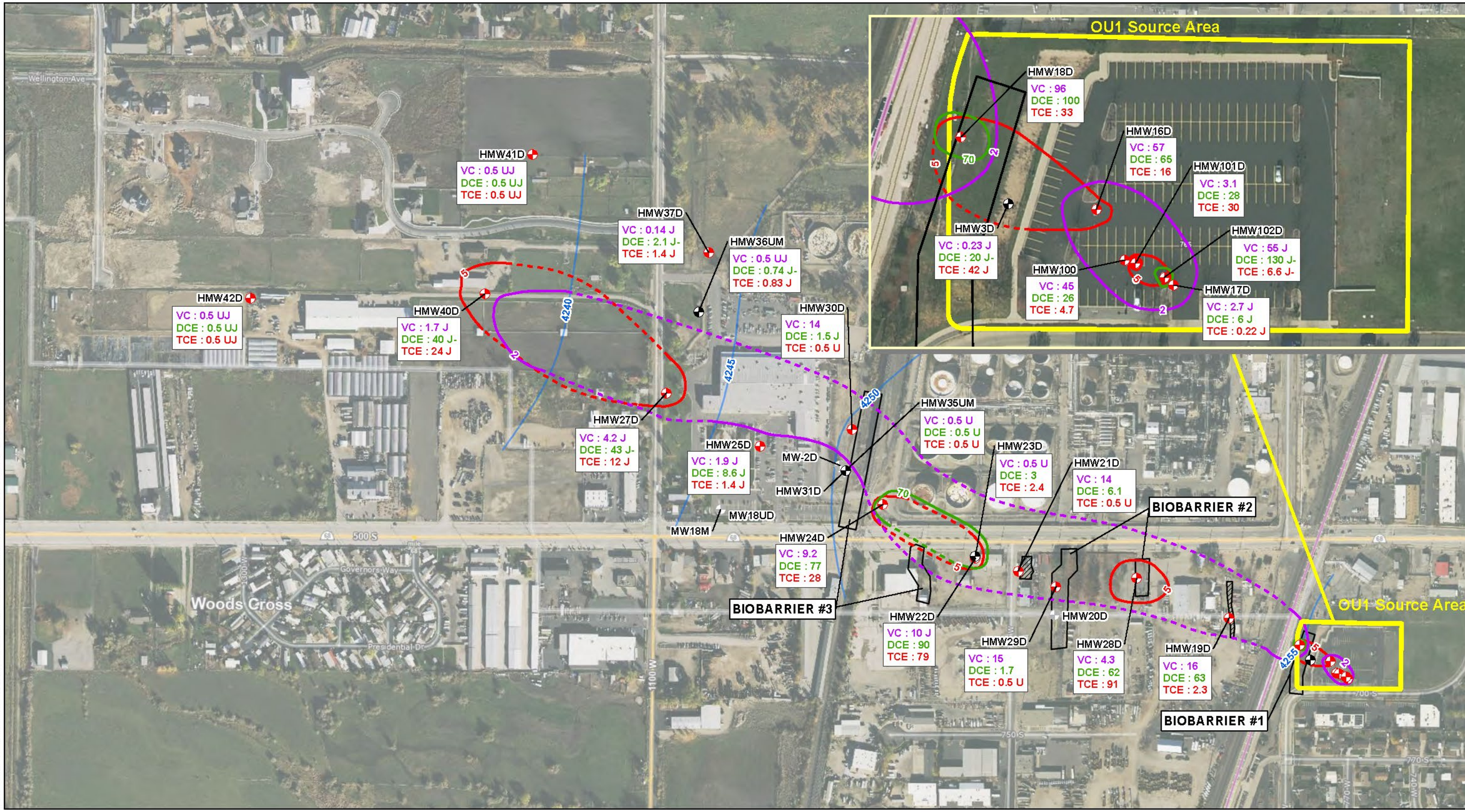
Notes:
CAH - Chlorinated Alphatic Hydrocarbon
Site Action Level for
Total CAHs = 200 µg/L
µg/L - Micrograms per liter

N

0 250 500 1,000 Feet

Figure H-4:
Extent of Total CAHs in the Shallow Aquifer - OU1
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 1
Taken from 2021 (13th) Annual Monitoring Report

AECOM



Legend

- Deep Upper Zone Monitoring Well - Sampled November 2021 (Concentrations shown in ug/L)
- Lower Zone Monitoring Well - Sampled November 2021 (Concentrations shown in ug/L)
- Deep Upper Zone Monitoring Well - Not Sampled
- OU1 Source Area
- 2019 Hydraulic Permeability Enhancement (HPE) Area
- 5 µg/L TCE Isoconcentration Line (Dashed where inferred)
- 70 µg/L CIS-1,2-Dichloroethene Isoconcentration Line (Dashed where inferred)
- 2 µg/L Vinyl Chloride Isoconcentration Line (Dashed where inferred)

Notes:
TCE - Trichloroethene
µg/L - Micrograms per liter

N

0 250 500 1,000 Feet

Figure H-5:
Extent of Trichloroethene, CIS-1,2-Dichlorothene, and Vinyl Chloride in the Deep Aquifer - OU1
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 1
Taken from the 2021 (13th) Annual Monitoring Report

AECOM

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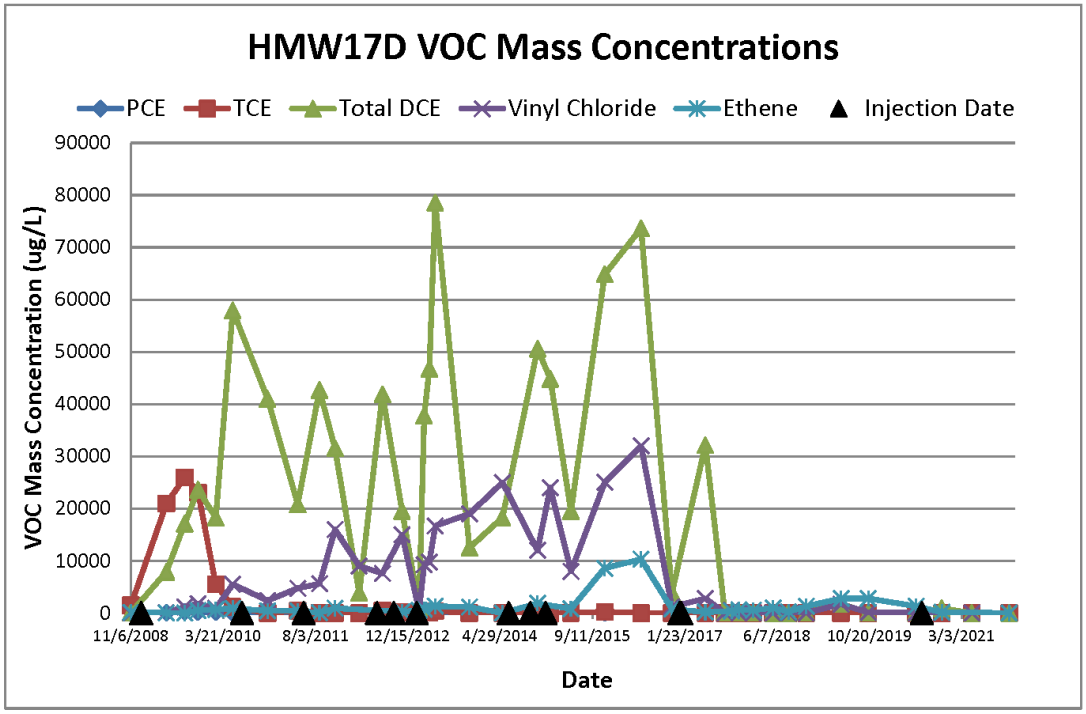
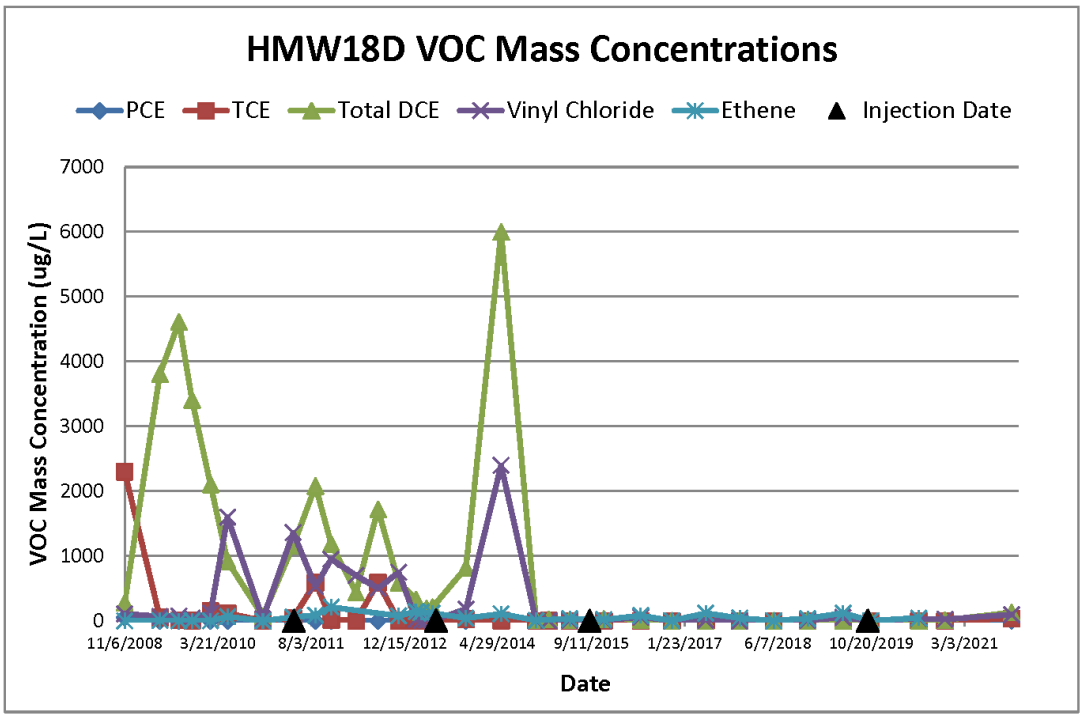
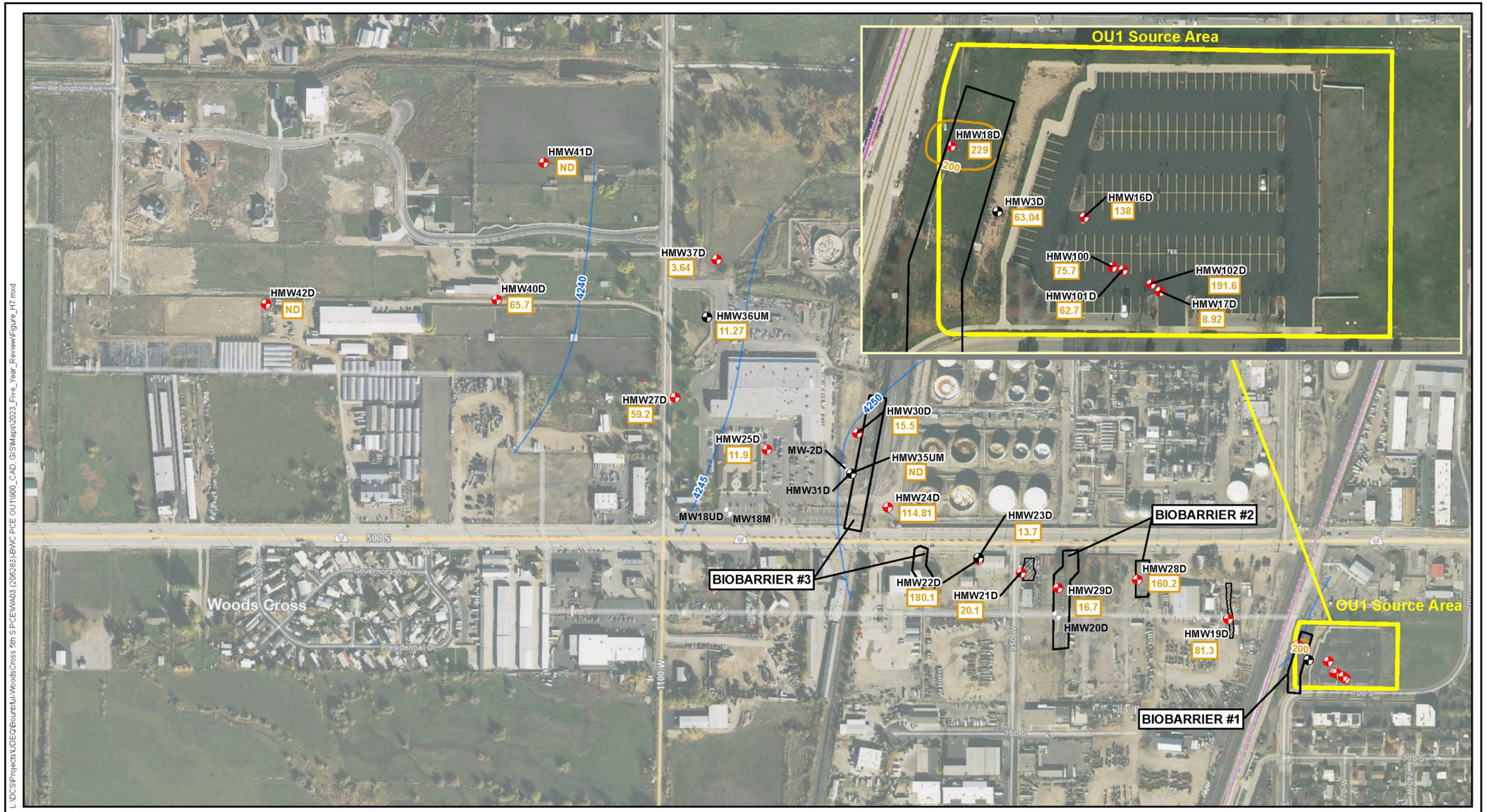
Figure H-6: VOC Concentration Over Time in Monitoring Wells HMW-17D and HMW-18D







Legend

- Deep Upper Zone Monitoring Well - Measured November 2021
- Deep Upper Zone Monitoring Well - Not Sampled
- Lower Zone Monitoring Well - Measured November 2021
- OU1 Source Area
- 0.5 U — November 2021, Total Chlorinated Alphatic Hydrocarbon (CAH) Concentration (µg/L)
- 200 µg/L Total CAH Isoconcentration Line (Dashed where inferred)
- 2019 Hydraulic Permeability Enhancement (HPE) Area

Notes:
CAH - Chlorinated Alphatic Hydrocarbon
Site Action Level for
Total CAHs = 200 µg/L
µg/L - Micrograms per liter
ND - Chlorinated Aliphatic Hydrocarbons were analyzed for, but were not detected above the laboratory reporting limits

N

0 250 500 1,000 Feet

Figure H-7:
Extent of Total CAHs in the Deep Aquifer - OU1
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 1
Taken from the 2021 (13th) Annual Monitoring Report

AECOM

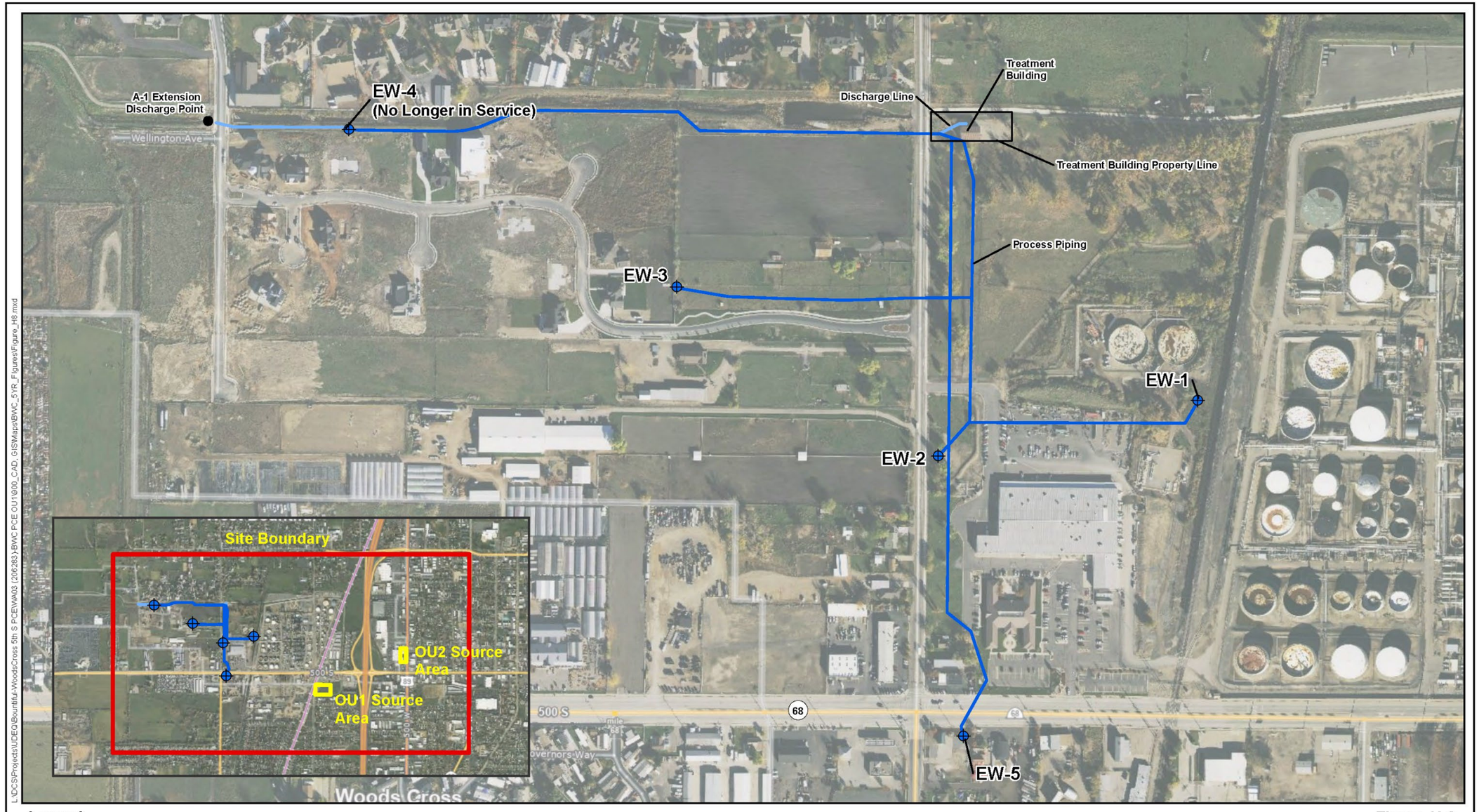


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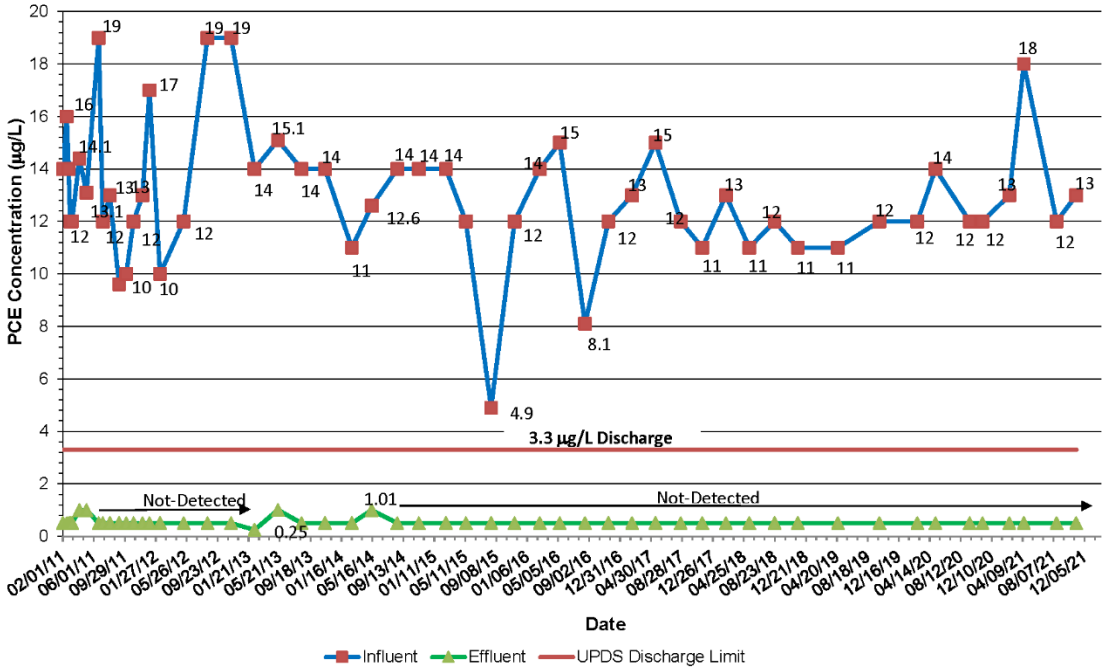
Figure H-8:
OU2 Groundwater Extraction and Treatment System Location and Layout
Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 2

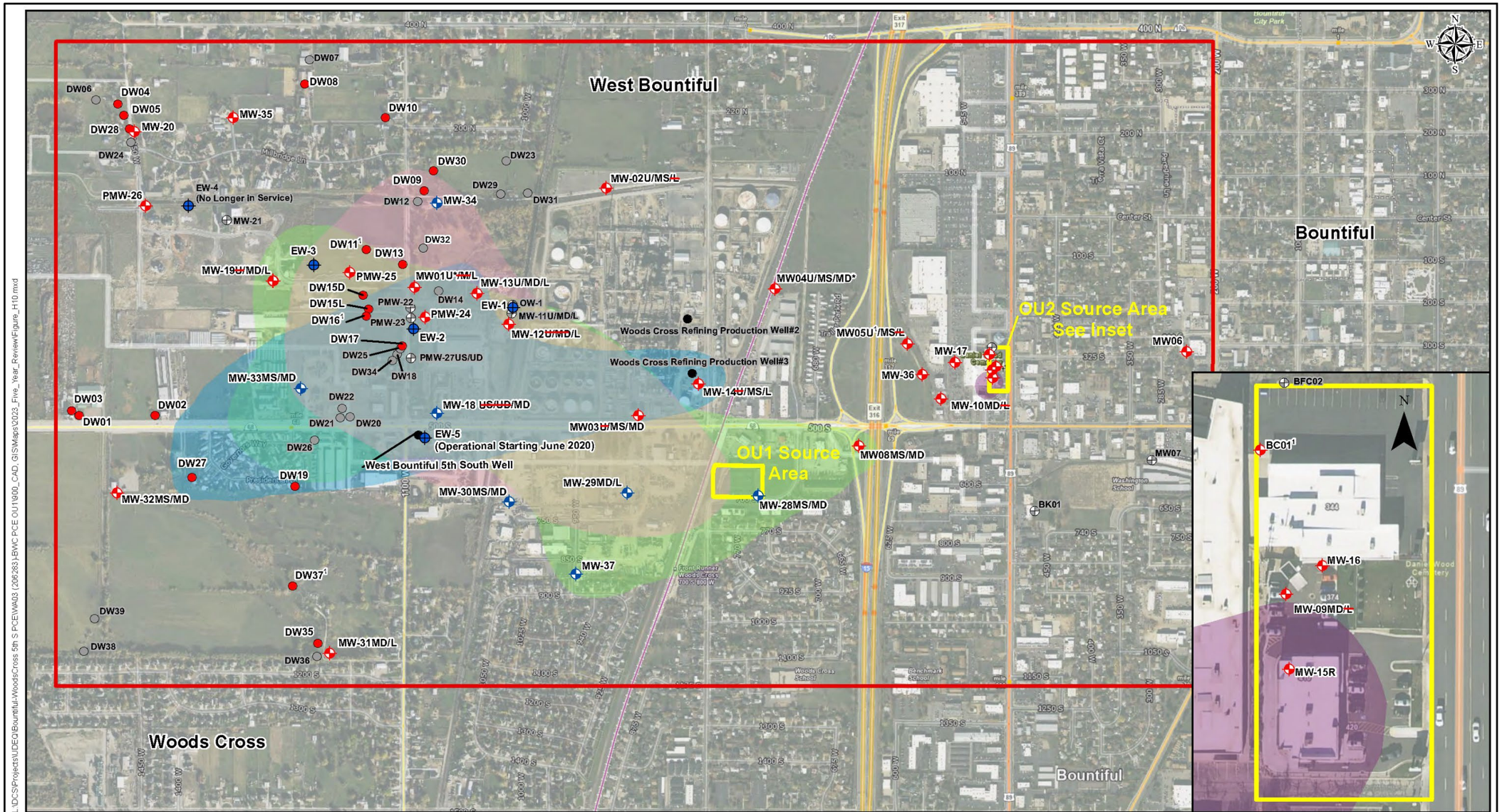
AECOM

Figure H-9.

GWTS Influent & Effluent PCE Concentrations vs. Discharge Limit

Bountiful/Woods Cross 5th South PCE Plume, OU2





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Groundwater Extraction Well
Groundwater Monitoring Well - Sampled Spring Only
Groundwater Monitoring Well - Sampled Spring and Fall
Groundwater Monitoring Well - Not Sampled
Domestic Well - Sampled Spring Only
Domestic Well - Not Sampled
Municipal/Production Well - Not Sampled

US/~~MS/MD~~

Red line denotes zone or zones within well that were not sampled
Upper Zone 5 µg/L Dissolved PCE Plume
Middle Shallow Zone 5 µg/L Dissolved PCE Plume
Middle Deep Zone 5 µg/L Dissolved PCE Plume
Lower Zone 5 µg/L Dissolved PCE Plume

Notes:
U - Upper Zone
MS- Middle Shallow Zone
MD - Middle Deep Zone
L - Lower Zone
* - Well only sampled in Spring
1 - Well was dry, unable to sample

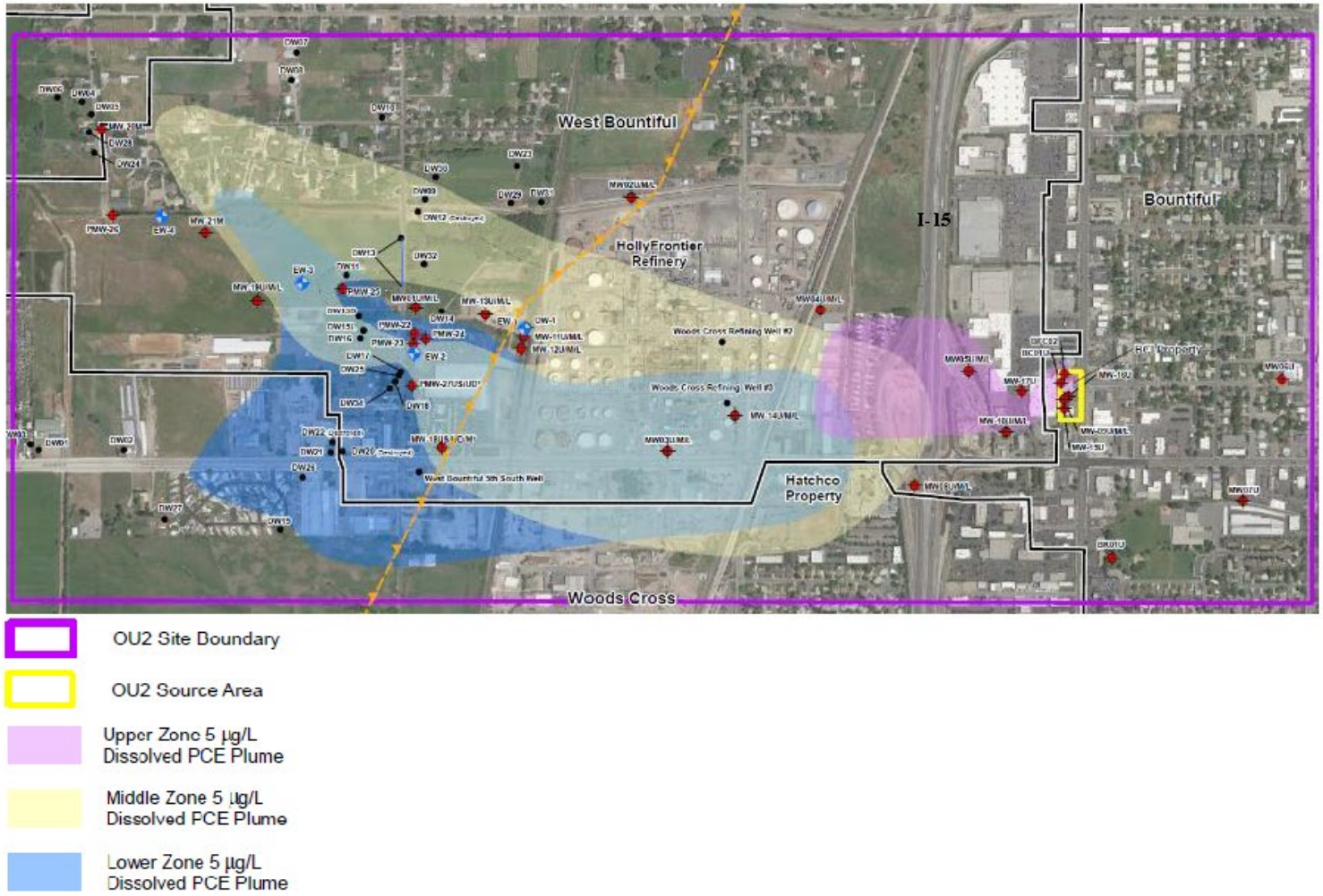
0 500 1,000 2,000 Feet

Figure H-10:
OU2 Dissolved PCE Plume Across All Surficial Zones - April 2021

Bountiful/Woods Cross
5th South PCE Plume
Operable Unit 2

AECOM

Figure H-11: OU2 Dissolved PCE Plume Across All Surficial Aquifer Zones – September 2016



Source: Annual 2016 Groundwater Monitoring Report and System Performance Report. Prepared by PWT. April 2017.

APPENDIX I – APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) REVIEW

Remedial actions are required to comply with the ARARs identified in the decision documents for the Site. In performing the FYR, any newly promulgated standards including revised chemical-specific requirements (such as MCLs, ambient water quality criteria), revised action and location-specific requirements, and state standards if they were considered ARARs in the ROD, are reviewed to establish whether the new requirement indicates that the remedy is no longer protective.

Groundwater ARARs

The OU1 and OU2 RODs established federal MCLs established under the SDWA as the contaminant-specific ARARs for the groundwater COCs at the Site. No changes were identified in this review when comparing the ARARs cited in the RODs to current MCLs (Table J-1).

Table I-1: Previous and Current ARARs for Groundwater COCs

COC	ARAR Listed in the OU1 and OU2 RODs (µg/L)	Current ARAR (µg/L)[b]		ARAR Change
		OU1	OU2	
Benzene	5	5	5	None
1,1-DCE	7	NA	7	None
Cis-1,2-DCE	70	70	70	None
Trans-1,2-DCE	100	NA	100	None
Ethylbenzene	700	NA	700	None
Naphthalene	-	-	NA	None
PCE	5	5	5	None
Toluene	1,000	NA	1,000	None
TCE	5	5	5	None
1,2,4-Trimethylbenzene	-[a]	-	-	None
1,3,5-Trimethylbenzene	-	NA	-	None
Vinyl chloride	2	2	2	None
Xylene, m-	10,000	NA	10,000	None
Xylene, o-	10,000	NA	10,000	None
Xylene, p-	10,000	NA	10,000	None

Notes:

a. The 2006 OU1 ROD selected 70 µg/L as the MCL for this compound. However, an MCL has not been established for this compound. It is possible that the value listed was inadvertently referring to the MCL for 1,2,4-trichlorobenzene.

b. Based on the SDWA primary MCL. Current federal SDWA standards can be found at: https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants (accessed 3/5/2018).

NA = contaminant not a COC for the OU

- = MCL not available for this COC; ROD cleanup goal was health-based

Soil ARARs

The OU1 and OU2 RODs did not specify ARARs for soil. Soil cleanup goals were developed based on protection of groundwater.

APPENDIX J – SCREENING-LEVEL RISK REVIEW

Changes in Standards and To-Be-Considered (TBC) Values
Since the OU1 and OU2 RODs were issued in 2006 and 2007, respectively, there have not been any changes to the federal MCLs for the groundwater COCs (see Appendix I).

Changes in Toxicity and Other Contaminant Characteristics
An MCL has not been established for two OU1 groundwater COCs – naphthalene and 1,2,4-trimethylbenzene and two OU2 groundwater COCs 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene. Toxicity values for these groundwater COCs have changed since the RODs were issued and the EPA updated default exposure assumptions in 2014. To determine if the cleanup goals for these COCs remain protective, this FYR compared the risk-based cleanup goals against the EPA's most current Regional Screening Levels dated November 2022 (RSLs), because the RSLs incorporate current toxicity values and standard default exposure factors.

Table J-1 shows that the OU1 cleanup goal for naphthalene and 1,2,4-trimethylbenzene and the OU2 cleanup goal for 1,3,5-trimethylbenzene slightly exceed the EPA's noncancer HQ threshold of 1.0. Based on these results, the EPA should evaluate whether the cleanup goals should be revised for these three COCs to reflect the most current toxicity information to monitor remedy performance.

Table J-1: Risk-Evaluation of OU1 and OU2 Groundwater COCs without Established MCLs

COC	Cleanup Goal (µg/L)	Tap Water RSL[a] (µg/L)		Cancer Risk[b]	Noncancer HQ[c]
		1 x 10^{-6} Risk	HQ = 1.0		
OU1					
Naphthalene	6.5	0.12	6.1	4 x 10^{-5}	**1.1**
1,2,4-Trimethylbenzene	70	-	56	-	**1.3**
OU2					
1,2,4-Trimethylbenzene	15[d]	-	56	-	0.3
1,3,5-Trimethylbenzene	120[d]	-	60	-	**2.0**

Notes:
a. Current EPA RSLs, dated November 2022, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
b. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk:
cancer risk = (cleanup goal ÷ cancer-based RSL) × 10^{-6}.
c. The noncancer HQ was calculated using the following equation:
HQ = cleanup goal ÷ noncancer-based RSL.
d. The 2016 revised cleanup goals included in the OU2 Source Area Summary and Work Plan for SVE Treatability Study. October 2017.
e. **Bold** = value exceeds noncancer HQ of 1
- = cancer risk or noncancer HQ could not be calculated; toxicity values not established
N/A = cleanup goal not specified in the OU2 ROD

The baseline risk assessments did not calculate risks for unrestricted exposures to contaminated soil since the source areas are located within commercial/industrial settings. However, to determine if the leachability-based cleanup goals for OU1 and OU2 are protective based on direct contact exposure, the cleanup goals were compared to the most conservative direct contact-based values protective of future residential exposure. As shown in Table J-2 and Table J-3 for OU1 and OU2, respectively, the soil cleanup goals for OU1 and the revised cleanup goals for OU2 are well below the EPA's risk management range of 1 x 10^{-6} to 1 x 10^{-4} and the noncancer HQs are well below the threshold of 1.0.

Table J-2: Risk-Evaluation of OU1 TCE Soil Cleanup Goal

Contaminant	Cleanup Goal OU1 ROD (mg/kg)[a]	Residential Soil RSL[b] (mg/kg)		Cancer Risk[c]	Noncancer HQ[d]
		1 x 10^{-6} Risk	HQ = 1.0		
Trichloroethylene	0.06	0.94	4.1	6 x 10^{-8}	0.02

Notes:

a. From Section 6.2 of the 2006 OU1 ROD; default value based on a 20-fold dilution/attenuation factor.
b. Current EPA RSLs, dated November 2022, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
c. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk:
cancer risk = (Cleanup goal ÷ cancer-based RSL) × 10^{-6}.
d. The noncancer HQ was calculated using the following equation:
HQ = cleanup goal ÷ noncancer-based RSL.

Table J-3: Risk-Evaluation of OU2 Subsurface Soil Cleanup Goals

Contaminant	2016 Proposed Revised Cleanup Goal for OU2 Soil (mg/kg)[a]	Residential Soil RSL[b] (mg/kg)		Cancer Risk[c]	Noncancer HQ[d]
		1 x 10^{-6} Risk	HQ=1.0		
Benzene	0.005	1.2	82	4 x 10^{-9}	0.00006
1,1-DCE	0.05	-	230	-	0.0002
Cis-1,2-DCE	0.2	-	160	-	0.001
Trans-1,2-DCE	0.6	-	1,600	-	0.0004
Ethylbenzene	.03	5.8	3,400	5 x 10^{-9}	0.00001
PCE	0.04	24	81	2 x 10^{-9}	0.0005
Toluene	14	-	4,900		0.003
TCE	0.003	0.94	4.1	3 x 10^{-9}	0.0007
1,2,4-Trimethylbenzene	0.4	-	300	-	0.001
1,3,5-Trimethylbenzene	3.4	-	270	-	0.01
Vinyl chloride	0.0001	0.059	70	2 x 10^{-9}	0.000001
Xylene, m-	3.7	-	550	-	0.007
Xylene, o-	3.7	-	650	--	0.006
Xylene, p-	3.7	-	560		0.007

Notes:

a. Presented in Table 1 of the OU2 Source Area Summary and Work Plan for SVE Treatability Study. October 2017.
b. Current EPA RSLs, dated November 2022, are available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
c. The cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1 x 10^{-6} risk:
cancer risk = (Revised cleanup goal ÷ cancer-based RSL) × 10^{-6}.
d. The noncancer HQ was calculated using the following equation:
HQ = revised cleanup goal ÷ noncancer-based RSL.

According to the 2006 ROD for OU1, the vapor intrusion exposure pathway was evaluated in the baseline risk assessment using groundwater concentrations in the upper zone. The results indicated that the cancer risk were within the EPA's risk management range for industrial land use scenarios and below the noncancer HQ of 1.0 for both residential and industrial land use scenarios. Residential cancer risks exceeded 1 x 10^{-4} for some wells but the risks were future risks since the areas overlying the plume are in industrial use. However, toxicity values to evaluate noncancer HQs have changed for TCE and have become more stringent since the 2006 ROD. A

screening-level vapor intrusion risk evaluation was conducted using the maximum detected primary COC concentrations detected in the shallow zone to determine if there are current exposure concerns associated with this exposure pathway. Table J-4 shows that the noncancer HQ exceeds 1.0 at well location HMW-18US, which is located in a parking lot. These results reinforce the need for institutional controls as required by the 2006 ROD to recommend vapor intrusion mitigation in all permits for new construction of commercial (office space) and/or residential buildings planned on or along the projected path of the contaminated plume. However, as the TCE concentrations continue to decrease across the site, it is also recommended that UDEQ update the screening-level vapor intrusion evaluation to determine the future need for vapor intrusion mitigation.

Table J-4: Screening-Level Vapor Intrusion Evaluation of TCE and Vinyl Chloride in OU1 Upper Zone

COC	2021 Maximum Detection (µg/L)		Commercial/Industrial Indoor Air	
			Risk	Noncancer HQ
Cis-1,2-DCE	140	HMW-12SR	--	0.13
TCE	43	MW18US	5.79×10^{-6}	**1.98**
Vinyl chloride	83	HMW-32S	3.38×10^{-5}	0.296
Total			3.96×10^{-5}	2.38

Notes:

a. Risk and noncancer HQ calculated using EPA's 2022 version of the vapor intrusion calculator using default exposure assumptions for commercial/industrial worker and site-specific groundwater temperature of 15 degrees Celsius. www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator.

-- = EPA has not established inhalation toxicity values for this COC

In response to a recommendation in the previous FYR Report, the EPA evaluated OU2 cleanup goals for soil gas and groundwater using current inhalation toxicity values as presented in the September 2016 Source Area Summary and Work Plan for the SVE Treatability Study (SVE Work Plan). The cleanup goals were evaluated for changes to the toxicity values for a number of OU2 COCs. According to the SVE Work Plan, the cleanup goals evaluated the EPA's toxicity values as reflected in EPA's 2014 RSL Contaminants Table. The cleanup levels were used to interpret vapor intrusion risks in the Annual 2015 Soil Gas and Indoor Air Report published in January 2016. However, the EPA has updated the RSL Contaminants Table annually since 2014. Based on a comparison of the toxicity values used to evaluate the OU2 2016 -cleanup goals compared to the most current toxicity values listed in the EPA's November 2022 RSL Contaminants Table (Table J-5), the inhalation toxicity value for vinyl chloride became more stringent, the inhalation toxicity value for 1,2,4-trimethylbenzene became less stringent, and new inhalation toxicity values are now available for 1,3,5-trimethylbenzene, cis-1,2-DCE and trans-1,2-DCE.

In 2015, the EPA updated the default attenuation factor (AF) for subslab soil gas-to-indoor air from 0.1 to 0.03. The AF was used in the evaluation of soil cleanup goals for subslab soil gas. If the revised AF is applied to examine the cleanup goals, the goals would be higher by a factor of 3.3. While the 2016 cleanup goals are more stringent, UDEQ should consider revising the 2016 cleanup goals to incorporate current toxicity values for vinyl chloride, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenezne, cis-1,2-DCE and trans-1,2-DCE and the default AF of 0.03 to support remedy decisions regarding vapor intrusion analyses. Given that toxicity values have changed, the cleanup goals need to be re-evaluated. If necessary, a decision document will then need to be modified to include the new cleanup goals

Table J-5: Comparison of 2014 and 2022 Inhalation Toxicity Values Used to Develop OU2 Cleanup Goals

COC	Inhalation 2014 Toxicity Values[a]		Inhalation 2022 Toxicity Values[b]		Toxicity Value Change
	IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	
Benzene	7.8×10^{-6}	0.03	7.8×10^{-6}	0.03	None
1,1-DCE	-	0.2	-	0.2	None
Cis-1,2-DCE	-	-	-	0.04	New value
Trans-1,2-DCE	-	-	-	0.04	New value
Ethylbenzene	2.5×10^{-6}	1.0	2.5×10^{-6}	1.0	None
PCE	2.6×10^{-7}	0.04	2.6×10^{-7}	0.04	None
Toluene	-	5.0	-	5.0	None
TCE	4.1×10^{-6}	0.002	4.1×10^{-6}	0.002	None
1,2,4-Trimethylbenzene	-	0.007	-	0.06	Less stringent
1,3,5-Trimethylbenzene	-	-	-	0.06	New value
Vinyl chloride	4.4×10^{-6}	0.1	4.4×10^{-6}	0.08	More stringent
Xylene, m-	-	0.1	-	0.1	None
Xylene, o-	-	0.1	-	0.1	None
Xylene, p-	-	0.1	-	0.1	None

Notes:

a. Toxicity values obtained from EPA's 2014 RSL Contaminants Table for developing the revised cleanup goals in the September 2016 SVE Work Plan.

b. Current toxicity values obtained from EPA's RSLs, dated November 2022, available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

IUR = inhalation unit risk

RfC = reference concentration.

$\mu g/m^3$ = micrograms per cubic meter

Due to the proximity of occupied buildings near the OU2 source area, the EPA collected soil gas and indoor air samples from the former David Early office building and the retail building in January and July 2018 and from the BCI building in July 2018, which were reported in the *Source Area Vapor Intrusion Investigation Report*, March 2020. A human health characterization was conducted using the most current EPA toxicity values and guidance and the maximum detected COCs in the indoor air at these buildings, as detailed in the above referenced report and summarized in Table J-6. As shown in Table J-6 the cumulative cancer risk and noncancer HI predicted for the former David Early office building and the retail building are below or at the lower end of the EPA's risk management range of 1×10^{-6} to 1×10^{-4} and below the cumulative noncancer HI of 1.0. These results indicate that vapor intrusion is currently not posing unacceptable risks for a commercial exposure land use based on the January and July 2018 data. However, the risk results for the BCI building shown in Table J-6 indicate that while the cumulative cancer risk is within the EPA's risk management range of 1×10^{-6} to 1×10^{-4}, the cumulative noncancer risk exceeds an HI of 1.0. Therefore, there may be concern for potential adverse effects at the BCI building. It should be noted that this noncancer risk exceedance results from TCE in indoor air at one location and that TCE has a high likelihood of being from a non-soil gas (non-plume-related) source.

Table J-6: Summary of Risks and Hazards from Inhalation of VOCs in Indoor Air at OU2 (taken from Source Area Vapor Intrusion Investigation Report, March 2020)

COC (only COCs detected are listed)	Sample Point I.D.	Maximum COC Concentration (µg/m³)	Exposure Conc.[1] for Cancer Risk (µg/m³)	Inhalation Unit Risk (1 / µg/m³)	Target Cancer Risk [2] (unitless)	Exposure Conc.[1] for Non-Cancer Risk (µg/m³)	Inhalation RfC (mg/m³)	Hazard Quotient [3] (unitless)
July 2018 Sampling Event - BCI Building Basement								
PCE	IA22	34	2.8	2.6E-07	**7.2E-07**	7.76	4.0E-02	**0.19**
TCE	IA22	33	2.69	4.1E-06	**1.1E-05**	7.53	2.0E-03	**3.77**
1,2,4-Trimethylbenzene	IA18	39	NA	NA	**NA**	8.90	6.0E-02	**0.15**
1,3,5-Trimethylbenzene	IA18	5.6	NA	NA	**NA**	1.28	6.0E-02	**0.02**
Benzene	IA15, IA22	1.9	0.15	7.8E-06	**1.2E-06**	0.43	3.0E-02	**0.01**
Toluene	IA22	5.3	NA	NA	**NA**	1.21	5.0E+00	**0.00**
Ethylbenzene	IA20	0.7	0.06	2.5E-06	**1.4E-07**	0.16	1.0E+00	**0.00**
m,p-Xylenes	IA20	2.2	NA	NA	**NA**	0.50	1.0E-01	**0.01**
o-Xylene	IA22	1.3	NA	NA	**NA**	0.30	1.0E-01	**0.00**
				Cumulative Risk/Hazard =	**1.3E-05**			**4.15**
David Early Building January and July 2018 Sampling Events								
PCE	IA14	0.83	0.1	2.6E-07	**1.8E-08**	0.19	4.0E-02	**0.00**
1,2,4-Trimethylbenzene	IA14	0.60	NA	NA	**NA**	0.14	6.0E-02	**0.00**
Benzene	IA15	1.9	0.15	7.8E-06	**1.2E-06**	0.43	3.0E-02	**0.01**
Toluene	IA15 (Dup)	3.1	NA	NA	**NA**	0.71	5.0E+00	**0.00**
m,p-Xylenes	IA14	2.0	NA	NA	**NA**	0.46	1.0E-01	**0.00**
o-Xylene	IA14	0.62	NA	NA	**NA**	0.14	1.0E-01	**0.00**
				Cumulative Risk/Hazard =	**1.2E-06**			**0.03**
Retail Building January and July 2018 Sampling Events								
PCE	IA17	1.2	0.1	2.6E-07	**2.5E-08**	0.27	4.0E-02	**0.01**
1,2,4-Trimethylbenzene	IA12	1.1	NA	NA	**NA**	0.25	6.0E-02	**0.00**
Benzene	IA12	1.5	0.12	7.8E-06	**9.5E-07**	0.34	3.0E-02	**0.01**
Toluene	IA17	52	NA	NA	**NA**	11.87	5.0E+00	**0.00**
Ethylbenzene	IA17	2.3	0.19	2.5E-06	**4.7E-07**	0.53	1.0E+00	**0.00**
m,p-Xylenes	IA12	5.9	NA	NA	**NA**	1.35	1.0E-01	**0.01**
o-Xylene	IA17	2.5	NA	NA	**NA**	0.57	1.0E-01	**0.01**
				Cumulative Risk/Hazard =	**1.4E-06**			**0.04**

NOTES:

COC = Chemical of Concern

PCE = Tetrachloroethene

TCE = Trichloroethene

Conc. = Concentration

µg/m³ = Micrograms per cubic meter

mg/m³ = Miligrams per cubic meter

NA = Not Applicable/Available

RfC = Refence Concentration for chronic inhalation exposure

The current IUR and Inhalation RfC values shown are from the Regional Screening Level Composite Worker Ambient Air Table (TR=1E-6, HQ=1) November 2019. Available on-line at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

The Target Cancer Risk and Hazard Quotient levels for the worker exposure scenario were calculated using EPA's *Supplemental Guidance for Inhalation Risk Assessment* (EPA-540-R-070-002, January, 2009) as follows:

[1] - Exposure Concentration (µg/m³) = (CA × ET × EF × ED) / AT
[2] - Target Cancer Risk (unitless) = EC × IUR
[3] - Hazard Quotient (unitless) = EC / (Toxicity Value × 1000 µg/mg)

Where:
CA = contaminant concentration in air (µg/m³)
ET = exposure time (8 hours/day)
EF = exposure frequency (250 days/year)
ED = exposure duration (25 years)
AT (cancer risk) = averaging time (70 years × 365 days/year × 24 hours/day)
AT (non-cancer risk) = averaging time (25 years × 365 days/year × 24 hours/day)
EC = exposure concentration (µg/m³)
IUR = inhalation unit risk (1 / µg/m³)
Toxicity Value = Inhalation RfC (mg/m^3)

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