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SEP 26 2017

Ref: 8EPR-SR

James E Briggs
Chief, Operations Branch
ACSIM DAIM-ODB
600 Army Pentagon
Washington, DC 20310-0600

Re: Five-Year Review Report for Defense Depot Ogden, Weber County, Utah

Dear Mr. Briggs:

Thank you for submitting the Five-Year Review Report for Ogden Defense Depot Ogden, Weber County, Utah. On September 5, 2017 the U.S. Environmental Protection Agency (EPA) received an addendum to the Five-Year Review Report conducted in 2012; the 2017 Five-Year Review supersedes this addendum. The EPA in consultation with the State of Utah concurs with your assessment that the remedy for Operable Unit 1 is protective of human health and the environment. We agree to defer protectiveness for Operable Unit 4, and we will be expecting an addendum by January 2019. This information will be included in the EPA's annual Superfund Five-Year Review Report to Congress.

We will be tracking the issues or recommendations in Table 20 and 21 of this Five-Year Review in the EPA's Superfund Environmental Management System (SEMS). Until the addendum is complete, the environmental indicators for this site are "current human exposure is controlled and a protective remedy is in place" and "contaminated groundwater migration under control."

The due date for the next five-year review report will be September 27, 2022.

Sincerely,

Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

cc: Muhammad Slam, UDEQ
Nicholas Montgomery, US Army

U.S. ARMY

MATERIEL COMMAND

FINAL

FIVE YEAR REVIEW REPORT
FIFTH FIVE YEAR REVIEW REPORT FOR THE FORMER DEFENSE DEPOT OGDEN WEBER COUNTY, UTAH

Defense Depot Ogden, Utah (DDOU)

September 2017

US Army Corps of Engineers ®
Sacramento District

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Five Year Review Report

Fifth Five Year Review Report

for

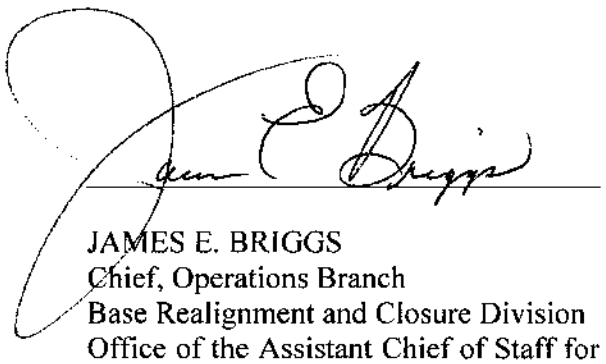
The Former Defense Depot Ogden
Weber County, Utah

FINAL
September 2017

PREPARED BY:

US Army Corps of Engineers
Sacramento District
CESPK-ED
1325 J Street
Sacramento, California

Approved By: Date:



18 Sept 2017

JAMES E. BRIGGS
Chief, Operations Branch
Base Realignment and Closure Division
Office of the Assistant Chief of Staff for
Installation Management

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List of Acronyms and Abbreviations

AFFF	Aqueous Film Forming Foam
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Chemical of Concern
CWSID	Central Weber Sewer Improvement District
DCE	Dichloroethene
DDOU	Defense Depot Ogden, Utah
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
DLA	Defense Logistics Agency
FFA	Federal Facility Agreement
FOST	Finding of Suitability for Transfer
gpm	Gallons per minute
LUC	Land Use Control
MAROS	Monitoring and Remediation Optimization System
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NPL	National Priority List
NOT	Non-Operational Test
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
RAA	Remedial Action Alternative

List of Acronyms and Abbreviations

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
ROD	Record of Decision
RSL	Regional Screening Level
TBC	To Be Considered
TCE	Trichloroethene
UCL	Upper Confidence Limit
UDEQ	Utah Department of Environmental Quality
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
US	United States
USACE	United States Army Corps of Engineers
UU/UE	Unlimited Use/Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The United States (US) Army Corps of Engineers (USACE), on behalf of the US Army Base Realignment and Closure (BRAC) office, has conducted the fifth five year review of remedial actions implemented at Defense Depot Ogden, Utah (DDOU), located in Weber County, Utah. The five year review was completed for cleanup sites at DDOU where a remedy has been implemented that leaves contamination in place at concentrations above levels that would allow for unlimited use and unrestricted exposure (UU/UE). This review was triggered by the completion of the Fourth Five Year Review for DDOU signed in October 2012. This five year review was conducted for the period from January 2012 through January 2017.

The purpose of this five year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The Department of Defense is the lead federal agency for the cleanup at DDOU. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), the US Environmental Protection Agency (EPA) Region 8 provides regulatory oversight, and the Utah Department of Environmental Quality (UDEQ) is the state support agency.

DDOU was activated in 1941 and served primarily as a supply depot until it closed in 1997. Reuse of portions of the former Depot began in late 1997. All of the former Depot land area and buildings have been transferred by land deed back to the City of Ogden, the original owner. The Department of Defense retains responsibility for all remediation activities required as a result of past military activities on the installation. DDOU was listed on the National Priorities List (NPL) in 1987. Cleanups at the DDOU are completed via the CERCLA process.

In 1989, DDOU, EPA and the UDEQ signed a Federal Facility Agreement (FFA). It specified the process by which decisions would be made for the cleanup and establishment of cleanup goals. EPA divided the site into four separate areas, or operable units (OUs), to better address site cleanup. The following two OUs have remedies in place with ongoing requirements and are fully evaluated in this review:

- OU-1: Monitored Natural Attenuation
- OU-4/OU-4 Hotspot: Groundwater Extraction

OU-2 achieved Response Complete in 2002 and is discussed briefly in this report. The soil remedy for OU-3 was completed in 1993 and the associated contaminated groundwater is currently being addressed through the OU-1 remedy. Because OU-2 and OU-3 have achieved UU/UE further reviews are not necessary and these OUs will not be discussed in future reports.

A summary of the DDOU remedial action objectives (RAOs) for each of the OUs is presented in Table ES-1 below.

Table ES-1: DDOU Remedial Action Objective (RAO) Summary

OU/Common Name	ROD Date	Description	RAOs	Remedy
OU-1 Burial Site 1	ROD Amend 8/10/10 ESD 9/13/00 ROD 6/26/92	Includes • Contaminated soil along Plain City Canal • Shallow aquifer • SILC plumes	Soil: Comply with Industrial cleanup standards.	Soil removal and off-site disposal (completed).
			GW: • Restore shallow GW to MCLs at points of compliance. • Comply with ARARs (based on SDWA MCLs)	P&T MNA for VC in SILC plumes to ensure that plumes do not: • Migrate offsite • Get larger • Establish trends of increasing contamination levels.
			Reduce threat to onsite workers.	IC/LUC's • Residential use prohibited. • GW use prohibited.
OU-4 Burial Sites 4-A thru 4-E & OU4 Hotspot	ESD 10/15/12 Amend 8/9/00 ROD 8/3/92	Includes burial sites: • 4-A through E • OU4 Hotspot • 2 vinyl chloride plumes • 1 cis-1,2-DCE plume	Soil: • Prevent contaminant migration from soil to shallow GW that could result in contaminant concentrations above RAOs for GW. • Prevent direct human contact w/ contaminated soil. • Remediate or remove soils to achieve an excess cancer risk of 10^{-4} to 10^{-6}. • Meet ARARs. • Remove water purification tablets.	Soil: • Excavation and removal of soil & debris from 4-A, 4-E and OU4 Hotspot (completed). • Removal of water purification tablet bottles from 4-D (completed).
			GW: • Prevent exposure to contaminated GW. • Remediate GW to achieve an excess cancer risk of 10^{-4} to 10^{-6}. • Ensure that contaminant concentrations avoid chronic health effects.	GW: • Pump-and-discharge to sewer. OU-4 Hotspot specific remedies: • Soils underneath buildings left in place. • Treatment of contaminated saturated soils using ORC. • Extraction and treatment of Hotspot plume via trench and ozonation. Discharge to sewer. • IC - Land use restrictions re: soil underneath buildings.

Table ES-1: DDOU Remedial Action Objective (RAO) Summary

OUs Not Evaluated in 2017 Five Year Review			
OU	**Common Name**	**Why Not Evaluated**	**Notes**
OU-2	French Drain & Parade Ground	UU/UE	Source and soil removal to UU/UE levels. Soybean oil treatment for GW. GW confirmation samples below cleanup goals.
OU-3	Burial Site 3	UU/UE	Soil removal to UU/UE.

5YR = Five Year Review
COCs = Contaminants of concern
CWA = Chemical warfare agent
GW = Ground water
MNA = Monitored natural attenuation
ORC = Oxygen Releasing Compound system
OU = Operable unit
P&T = Pump and treat treatment technology
RAOs = Remedial action objectives
SILC = Small, isolated low-concentration
UU/UE = unlimited use/unrestricted exposure
SDW = Safe Drinking Water Act

OU	COCs	Clean-Up Goal or Standard * SDW MCL	OU	COCs	Clean-Up Goal or Standard * SDW MCL
1	**Soil**		**3**	**Soil**	
	PCBs	25 mg/kg		Mercury	2 mg/kg
	Dioxin	1 µg/kg		N-nitrodiphenylamine	1,250 mg/kg
	Furans	1 µg/kg		1,1,2,2-Tetrachlorethane	30 mg/kg
	GW			TCE	490 mg/kg
	Vinyl chloride	2 µg/l*		(Adamsite, Chloroacetophenone,	
	cis-1,2-DCE	70 µg/l*		Mustard, Thiodiglycol, Chloro-	DL
	TCE	5 µg/l*		pierin, Lewisite, Phosgene)	
2	**Soil**		**4**	**Soil**	
	Bromacil	<16 ppm (goal)		PCB (Aroclor 1260)	25 mg/kg
	Chlordane	<1 ppm (goal)		Benzene	210 mg/kg
				cis-1,2-DCE	700 mg/kg
				Arsenic	35 mg/kg
				Lead	500 mg/kg (1,850 for Disposal Trench A)
				TCDD	1 µg/kg
				Vinyl chloride	3.2 mg/kg
	GW			**GW**	
	TCE	4.9 µg/l*		Vinyl chloride	2 µg/l*
	PCE	4.9 µg/l*		Benzene	5 µg/l*
	cis-1,2-DCE	69.9 µg/l*		cis-1,2-DCE	70 µg/l*
				PCB (Aroclor 1260)	0.5 µg/l*
				TCDD	0.00003 µg/l*

Based on this five year review, the OU-1 remedy is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. As concentrations of contaminants in groundwater continue to decline slightly above and below the cleanup levels, an exit strategy to achieve Response Complete for OU-1 should be discussed.

The protectiveness of remedies at OU-4 is deferred until further assessment of vapor intrusion is performed at the OU-4 Hotspot. Currently, the potential exposure of warehouse/construction workers at Buildings 15C and 16C to soil vapors from contaminated soil/groundwater left in place beneath the buildings is unknown. The potential exposure to soil gas through vapor intrusion at OU-4 will also need to be assessed for future development on the site. Residual soil contamination in the OU-4 source area remains in place and may represent a continual source of groundwater contamination through leaching to groundwater. Review of cost-effective options to decrease the potential leaching of contaminants in soil may be considered to optimize the current groundwater remedy. Awareness of institutional controls for the OU-4 Hotspot area listed in the 2000 Record of Decision Amendment and the Quitclaim Deed should be increased through an Institutional Controls Monitoring and Awareness Program.

Table 1: Five Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Defense Depot Ogden		
EPA ID: UT9210020922		
Region: 8	**State:** UT	**City/County:** Weber County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** US Army		
Author name (Federal or State Project Manager): Christopher Goddard, Mark Jones, Bridget Floyd		
Author affiliation: US Army Corps of Engineers		
Review period: 1/1/2017-6/30/2017		
Date of site inspection: 1/18/2017		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/27/2012		
Due date (five years after triggering action date): 9/27/2017		

Table 1: Five Year Review Summary Form

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five Year Review:				
OU-1, OU-2, OU-3				
Issues and Recommendations Identified in the Five Year Review:				
OU(s): OU-4	**Issue Category: Remedy Performance**			
	Issue: The potential exposure of soil gas through vapor intrusion at OU-4 due to contaminated soil/ groundwater has not been assessed for future development on the site.			
	Recommendation: Perform a soil vapor assessment of the OU-4 groundwater plume and source area. Work plan to complete the soil vapor assessment for both OU-4 and OU-4 Hotspot was sent to EPA/UDEQ for concurrence on June 1, 2017. EPA approved the work plan on August 4, 2017.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Army	EPA	1/1/2019
OU(s): OU-4	**Issue Category: Remedy Performance**			
	Issue: The potential exposure of soil gas through vapor intrusion at OU-4 due to buried waste has not been assessed for current warehouse/ construction workers at Buildings 15C and 16C (OU-4 Hotspot area).			
	Recommendation: Perform a soil vapor assessment of the OU-4 Hotspot area for current warehouse/construction workers at Buildings 15C and 16C. Work plan to complete the soil vapor assessment for both OU-4 and OU-4 Hotspot was sent to EPA/UDEQ for concurrence on June 1, 2017. EPA approved the work plan on August 4, 2017.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Army	EPA	1/1/2019
OU(s): OU-4	**Issue Category: Institutional Controls**			
	Issue: The institutional controls for the OU-4 Hotspot area include restriction of disturbance of contaminated waste and building foundations. Although the institutional control of signage listed in the 2000 ROD Amendment and the Quitclaim Deed has been implemented, signs are not located near the buried waste and the text may be too vague to prevent digging.			
	Recommendation: Replace existing signs, revise sign text with more detailed information, and relocate to the correct locations. Implement and increase awareness of institutional controls for the OU-4 Hotspot through an Institutional Controls Monitoring and Awareness Program.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Army	EPA	10/1/2018

Table 1: Five Year Review Summary Form

Issues/Recommendations				
OU(s): OU-4	**Issue Category: Remedy Performance**			
	Issue: Residual soil contamination in the OU-4 source area remains in place and may represent a continual source of groundwater contamination through leaching to groundwater.			
	Recommendation: Review of cost-effective options to decrease the potential leaching of contaminants in soil may be considered to optimize the current groundwater remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Army	EPA	1/1/2019
OU(s): OU-4	**Issue Category: Remedy Performance**			
	Issue: The existing monitoring well network is not representative of the remaining plume. Other than occasionally, the remaining OU-4 plume is not routinely monitored (that is, other than the extraction system effluent, extraction wells within the plume are not monitored).			
	Recommendation: Evaluate whether extraction wells should be routinely monitored. Evaluate changes to the monitoring well network, as well as the OU-4 Hotspot extraction trench.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Army	EPA	1/1/2019

Protectiveness Statement(s)		
Operable Unit: OU-1	Protectiveness Determination: Protective	Addendum Due Date (if applicable): N/A
Protectiveness Statement: The OU-1 remedy is protective of human health and the environment and potential exposure pathways that could result in unacceptable risks are being controlled through land use controls (LUCs) which prohibit groundwater use and residential land use as groundwater restoration continues to progress.		
Operable Unit: OU-4	Protectiveness Determination: Protectiveness Deferred	Addendum Due Date (if applicable): 12/31/19
Protectiveness Statement: A protectiveness determination of the remedy at OU-4 cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: vapor intrusion assessment of the OU-4 Hotspot area, OU-4 groundwater plume, and OU-4 soil contamination. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination will be made. Additionally, awareness of institutional controls for the OU-4 Hotspot area listed in the 2000 ROD Amendment and the Quitclaim Deed should be increased through an Institutional Controls Monitoring and Awareness Program. In the interim, LUCs are working to prohibit exposures via groundwater use and residential land use.		

Table 1: Five Year Review Summary Form

Sitewide Protectiveness Statement (if applicable)	
Protectiveness Determination: Protectiveness Deferred	Addendum Due Date (if applicable): 12/31/19
Protectiveness Statement: The sitewide protectiveness for DDOU is deferred until further vapor intrusion assessment of OU-4 is completed.	

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1.0 INTRODUCTION

The United States (US) Army Corps of Engineers (USACE), on behalf of the US Army Base Realignment and Closure (BRAC) office has conducted the fifth statutory five year review of remedial actions implemented at Defense Depot Ogden, Utah (DDOU), located in Weber County, Utah. A site location map is included as Figure 1.

1.1 The Purpose of the Review

The purpose of this five year review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five year review reports. In addition, the five year review report identifies issues found during the review, if any, and provides recommendations to address them.

1.2 Who Conducted the Five Year Review

The USACE Sacramento District conducted a five year review of the remedial actions implemented at DDOU in Weber County, Utah. This review was conducted from January 2012 through January 2017. The review was conducted and written by Mr. Christopher Goddard, Environmental Engineer, USACE; Mr. Mark Jones, Toxicologist, USACE; and Ms. Bridget Floyd, Geologist, USACE; with assistance from Mr. Marc Sydow, USACE. This report documents the results of the review.

1.3 Other Review Characteristics

This is the fifth five year review conducted for DDOU. This review was triggered by the completion of the Fourth Five Year Review signed on October, 24 2012. DDOU was listed on the National Priorities List (NPL) in 1987. The implementation of active cleanups at the DDOU is completed via the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. This five year review was conducted for the period from January 2012 through January 2017.

In 1989, DDOU, US Environmental Protection Agency (EPA) and the Utah Department of Environmental Quality (UDEQ) signed a Federal Facility Agreement (FFA). It specified the process by which decisions would be made for the cleanup and establishment of cleanup goals. EPA divided the site into four separate areas, or operable units (OUs), to better address site cleanup. The following two OUs have remedies in place with ongoing requirements and are fully evaluated in this review:

- OU-1: Monitored Natural Attenuation (MNA)
- OU-4/OU-4 Hotspot: Groundwater Extraction

OU-2 achieved Response Complete in 2002 and is discussed briefly in this report. The soil remedy for OU-3 was completed in 1993 and the associated contaminated groundwater is currently being addressed through the OU-1 remedy. Because OU-2 and OU-3 have achieved unlimited use/unrestricted exposure (UU/UE) further reviews are not necessary and these OUs will not be discussed in future reports.

2.0 SITE CHRONOLOGY

Important site events and relevant dates in the site chronology for the two active remedy sites are shown in Table 2.

Table 2: Chronology of Remedy Site Events

Event	OU-1	OU-4
Initial discovery of problem or contamination	1984	1980
Pre-NPL responses	1984-1987	1980 -1987
NPL listing	1987	1987
Remedial Investigation/Feasibility Study complete	1985-1991	1991
Record of Decision (ROD) signature	1992	1992
Remedial design start	1992	1993
Remedial design complete	1994	1995
Remedial action	1994 to Present	1995 to Present
ROD Amendments or Explanation of Significant Differences (ESDs)	2000 ESD 2010 ROD Amendment	2000 ROD Amendment 2012 ESD

3.0 BACKGROUND

3.1 Geology and Hydrogeology

The facility is located in a topographically flat area within the Great Salt Lake Valley of the Lake Bonneville Basin. Surface elevations at the depot vary from 4,292 feet above mean sea level at the northern boundary to 4,247 above mean sea level at the southwestern boundary. The Ogden site is drained by Mill and Four-Mile Creeks, which traverse it from east to west. Much of Four-Mile Creek is encased in pipe where it flows across the Ogden site. Both creeks are diverted into irrigation ditches west of the Ogden site, which then feed into the Weber River three miles west of the Ogden site.

The Ogden site is underlain by unconsolidated lacustrine and alluvial deposits of Quaternary and Recent age. The principle groundwater resources in the area are part of the East Shore Area hydrogeologic division. The main aquifers in the East Shore Area are the Sunset and Delta aquifers, which are confined and lie at depths of between 200 to 400 feet and 500 to 700 feet below ground surface (bgs), respectively.

Groundwater below the facility is found at shallow depths of 5 to 13 feet bgs, generally in an unconfined to semi-confined aquifer of clayey, silty, sandy gravel with relatively low water yields of naturally poor quality based on average total dissolved solids values. The shallow aquifer in the area of the Ogden site is classified by the state of Utah as a Class II aquifer, which is a potential future source of drinking water. Recharge to the shallow aquifer is principally by seepage from the Weber River, canals, small streams, and infiltration of precipitation and excess irrigation water. Groundwater levels are generally highest in June and July, presumably due to infiltration from full irrigation canals and irrigation, and lowest in January and February. The overall hydraulic gradient, generally less than 0.003, and inferred groundwater flow directions, to the northwest in the southern portions, and to the southwest in the northern portions of the Ogden site, tend to remain more or less unchanged from high to low groundwater level seasons.

The shallow, unconfined aquifer is underlain, at a depth of about 20-30 feet bgs, by a silty clay aquitard with a thickness of 50 to 100 feet. A deeper confined aquifer was located at 125 feet bgs in the northern part of the Ogden site. It exhibits artesian conditions. Thus, there is a relatively strong upward component of the hydraulic gradient between the deeper confined aquifer and the shallow aquifer. No contamination has been detected in samples collected from the deeper aquifer.

3.2 Land and Resource Use

The facility was activated in 1941 and served primarily as a supply depot until it closed in 1997. Reuse of portions of the former Depot began in late 1997. All of the former Depot land area and buildings were transferred by land deed back to the City of Ogden, the original owner. The Army developed two Finding of Suitability to Transfer (FOST) documents that, with EPA concurrence with Army's determination that the property to be conveyed was not contaminated, allowed the transfer of 544 acres of uncontaminated property to the Ogden Local Redevelopment Authority. The development of additional FOSTs was completed in August 2003. The Department of Defense retains responsibility for all remediation activities required as a result of past military activities on the installation.

The former Depot has been renamed the Business Depot Ogden. It is undergoing rapid large-scale redevelopment by the Boyer Company, the Master Lessor and Developer (for example, in 2015 a 480,000 square foot building was completed immediately east of OU-1, and two 100,000 square foot buildings were completed to the south-southeast of the site). Redevelopment includes the installation of new buried utilities, road realignments and improvements, and construction of large warehouses and office/commercial buildings, as well as landscaping and other improvements. A number of the old wooden Depot warehouses have been torn down, but there are still quite a few of the brick warehouses that have been rehabilitated and are in use. There is about 9.5 million square feet of industrial and office space at the Business Depot.

There have been no changes in land use, expected land use, or exposure routes or receptors on or near the site since the last five year review in 2012. DDOU been recognized for its successful redevelopment. The Business Depot Ogden was awarded the prestigious Facility of the Year Award by the National Association of Installation Developers in August, 2002. This award recognizes facilities that make outstanding achievements in revitalizing BRAC communities.

3.3 No Further Action Sites

The following sections briefly discuss two OUs that have reached Response Complete and UU/UE, and therefore are not further evaluated in this report. Exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy are still valid for these two OUs.

3.3.1 Operable Unit 2

OU-2 was formerly associated with three soil contamination areas: French drain area, Former Pesticide Storage Building, and the Former Burn Pits Parade Ground Area; and an associated groundwater plume of trichloroethene (TCE).

The French Drain Area was used for mixing and loading pesticides and herbicides between the early 1970s and 1985. A total of 245 tons of soil contaminated with chlordane and bromacil was excavated in four stages between 1991 and 1994. The former Pesticide Storage Building was used for storing and mixing pesticides until January 1984. In 1997, soil samples revealed concentrations of DDT below the residential screening level. Therefore, no additional investigation or remedial action for pesticides was conducted. The Former Burn Pits Parade Ground Area contained two oil and solvent burning pits which operated from 1955 to 1965. The source of the soil contamination later identified at the burn pits appears to have been organic solvents and oil or diesel fuel that were poured into shallow pits and ignited for the purpose of fire training. The soil contamination was the only identified source of groundwater contamination in the OU-2 groundwater plume, which extended down gradient, northwesterly, from the Burn Pits area.

A groundwater plume containing TCE and cis-1,2-dichloroethene (DCE) contamination exceeding the Maximum Contaminant Levels (MCLs) was monitored between 1986 and 1991. A groundwater extraction treatment system was installed in 1992 and was comprised of 10 extraction wells, 20 gravity-fed injection wells, and a treatment plant where the extracted groundwater was treated with an air stripping tower. The treatment system operated from 1992 to 1998. The system removed 3.7 pounds of TCE and 10.2 pounds of cis-1,2-DCE. In 1999, additional soil investigations revealed a 5-foot-thick oily smear zone in the Burn Pits area. In 2000, an excavation

was conducted in the Burn Pits to remove approximately 2,575 cubic yards of contamination and 1,000 gallons of contaminated groundwater. Soybean oil was also placed in the backfill and injected throughout the aquifer to augment natural biodegradation and to accelerate the groundwater cleanup.

Compliance monitoring after the completion of the remedial actions revealed all cleanup goals for the contaminated soil and groundwater at OU-2 as specified and required by the ROD were achieved by 2002. Response Complete was achieved and approval of site closure was approved by EPA and the UDEQ on August 12, 2002.

OU-2 did not leave any contamination in place that would prevent UU/UE, and exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are still valid; therefore, no further evaluation or technical assessment will be completed in this or future five year reviews.

3.3.2 Operable Unit 3

OU-3 was located near the southwestern corner of the former Depot and consists of four separate disposal areas designated as Burial Sites 1, 3-A, 3-B, and 3-C, and the Mustard Storage Facility. Burial Site 1 was located in the southwest corner of the Ogden Site (now part of the Ogden Nature Center). The burial site was reportedly used in the mid-1940s to dispose of riot control agent and white smoke containers. Remedial action including soil excavation at Burial Site 1 was completed in June 2001. Burial Site 3-A was located east of Burial Site 3-B, and in the southwest-central part of the original OU-1 groundwater plume. Materials were disposed of at six discrete burial areas within the site from the early 1950s to the mid-1960s. Buried material included military chemical warfare agent identifications kits, empty 55-gallon drums, gas mask air purification canisters, two small jars of an oil-based paint, broken glass containers, smoke and tear gas grenades. Between 1994 and 1995, 234 cubic yards of waste materials were excavated for offsite disposal. Burial Site 3-B was located northeast of Burial Site 1. Only non-toxic materials were disposed of in this small site. Burial Site 3-C was located northwest of Burial Site 3-A and contained tens of thousands of small glass jars containing halazone water purification tablets. Between October 26, 1993 and November 11, 1993 705 cubic yards of waste materials were excavated from the site.

The soil remediation at OU-3 was completed in 1993 and documented in the Remedial Completion Report. Residual contamination in groundwater associated with OU-3 was remediated as part of OU-1. OU-3 did not leave any soil contamination in place that would prevent UU/UE, and exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are still valid; therefore, no further evaluation or technical assessment will be completed in this or future five year reviews. Groundwater contamination associated with OU-3 is addressed under OU-1 and discussed throughout this report.

4.0 PROGRESS SINCE THE LAST REVIEW

The following issues were identified during the 2012 Fourth Five Year Review:

Table 3: Actions Taken Since the Last Five Year Review

OU	Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Status/Date of Action
OU-4 Hotspot	Worker exposure to contaminants in subsurface soil between Buildings 15C and 16C	Ensure by regular inspection that proper signs are posted on inside and outside walls of Buildings 15C and 16C, that no disturbance of the soil beneath the foundations of the Buildings is permitted without written approval and that the concrete slab floors remain intact.	Army	Ongoing	Institutional controls listed in the ROD Amendment and the Deed for FOST 3 have been imple-mented. Required warning signs are posted outside of the buildings. The site inspection and interviews indicate that there has been no soil disturbance and the concrete slab floors are intact.	Continued in the next 5YR.
OU-4 Hotspot	The potential exposure of soil gas through vapor intrusion at OU-4 Hotspot due to buried waste has not been assessed for current ware-house/construc-tion workers at Buildings 15C and 16C.	Perform a soil vapor assessment of the OU-4 Hotspot area for current warehouse/construction workers at Buildings 15C and 16C and ensure/ check that the concrete slab floors remain intact and impervious to vapors.	Army	Ongoing	A draft soil vapor assessment of the OU-4 source and Hotspot areas has been prepared and was sent to EPA/ UDEQ for concur-rence on June 1, 2017. EPA approved the work plan on August 4, 2017.	Continued in the next 5YR.
OU-4	Residual soil contamination in the OU-4 source area remains in place and may represent a continual source of groundwater contamination through leaching to groundwater.	Review of cost-effective options to decrease the potential leaching of contaminants in soil may be considered to optimize the current groundwater remedy.	Army	Ongoing	No action has been performed to evaluate this issue; however, the continuing/de-creasing low concen-trations of vinyl chloride and cis-1,2-DCE suggest that if there is still a source of VOC contamina-tion then the source area is not leaching significant amounts of contaminants to groundwater.	Continued in the next 5YR.

Table 3: Actions Taken Since the Last Five Year Review

OU	Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Status/Date of Action
OU-4	The potential exposure of soil gas through vapor intrusion at OU-4 due to contaminated soil/groundwater has not been assessed for future develop-ment on the site.	Perform a soil vapor assessment of the OU-4 source area for future buildings/workers.	Army	Ongoing	A draft soil vapor assessment work plan of the OU-4 source and Hotspot areas has been prepared and was approved by EPA on August 4, 2017.	Continued in the next 5YR.
OU-4	Continued operations of OU-4 Hotspot extraction trench to prevent offsite migration of plume.	Determine if additional remedial measures are warranted at former OU-4 Hotspot disposal/burn pit to reduce time that extraction trench must operate to meet RAOs.	Army	Ongoing	Contaminated soil still remains in place at the OU-4 Hotspot source area. However, groundwater chemical of concern (COC) levels at the OU-4 Hotspot are consis-tently below the applicable MCLs. The 2012 ESD states that in the near-term, the OU-4 Hotspot system will continue to operate as a “fail safe” system to insure no off-site migration of contaminants above MCLs. However, if continued monitoring consistent with the ESD’s proposed revised monitoring plan indicates that operation of the OU-4 Hotspot system is no longer needed, EPA and UDEQ may be petitioned to allow for shutdown, and ultimately removal, of the OU-4 Hotspot system.	Continued in the next 5YR.

5.0 FIVE YEAR REVIEW PROCESS

This five year review was completed for the three remedy sites with signed decision documents where contamination remains in place at levels preventing UU/UE.

5.1 Administrative Components of the Five Year Review Process

The USACE Sacramento District conducted the five year review of DDOU under authorization from the Army BRAC Division. This review was conducted from January 2012 through January 2017. The review was conducted and written by Mr. Christopher Goddard, Environmental Engineer, USACE; Mr. Mark Jones, Toxicologist, USACE; and Ms. Bridget Floyd, Geologist, USACE; with assistance from Mr. Marc Sydow, USACE. This report documents the results of the review. Comments received from the EPA and the USACE responses to those comments are provided in Appendix A.

5.2 Community Notification and Involvement

A public notice was made available by publishing in the local newspaper, the Ogden Standard-Examiner, on February 19, 2017, stating that there was a five-year review and inviting the public to submit any comments to USACE:

> Five-Year Review
> Former Defense Depot, Ogden, Utah
>
> The U.S. Army Corps of Engineers, in conjunction with the U.S. Army and the U.S. Environmental Protection Agency (EPA), has conducted a Five-Year Review of Former Defense Depot Ogden Utah (DDOU). DDOU operated as an Army supply depot until its closure in 1997. The transfer of ownership of the facility to Ogden City was completed in 2003 and the property is now operating as a commercial park. Soil and groundwater at DDOU have been contaminated from past onsite activities including solid and liquid waste burial sites and burn pits. Remedies have been put in place to address the contamination at each of the impacted sites under the oversight of the EPA and Utah Department of Environmental Quality. Final remedies have included groundwater extraction and discharge into the sanitary sewer and monitored natural attenuation of groundwater.
>
> This is the fifth Five-Year Review conducted at DDOU. This Five-Year Review evaluated the effectiveness of the cleanup remedies at two cleanup sites, Operable Unit 1 and Operable Unit 4, and determined whether the remedies continue to be protective of human health and the environment. Based on the findings of this five year review, the Operable Unit 1 remedy is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. The determination of protectiveness of remedies at Operable Unit 4 is deferred until further assessment of vapor intrusion is performed at the Operable Unit 4 Hotspot area. The overall protectiveness of Ogden DDOU is deferred until further assessment of vapor intrusion is performed at the OU-4 Hotspot.
>
> The final five-year review report is available for public review at the Boyer Company office within the Business Depot Ogden located at 1150 Depot Drive, Suite 100, Ogden, UT. If you have any questions or comments, you may contact Mr. Christopher Goddard of the U.S. Army Corps of Engineers at (916) 557-6796.

The Tear Sheet and proof of publication for the public notice in the Ogden Standard-Examiner is included in Appendix B. No questions or comments from the public were posed to the USACE or the US Army during the review time. A second public notice will be posted in the same newspaper upon completion of the five year review indicating where the review is available for public review.

5.3 Document Review

Historical documents for DDOU were referenced and stored in multiple locations. Applicable documents were selected from the Sacrament District USACE repository and the onsite repository. Applicable documents to this review are listed in Table 4.

The following documents were reviewed regarding OU-1:

Table 4: Document Review List

Site	Document Name	Date
OU-1	EPA Superfund Record of Decision: Ogden Defense Depot (DLA), EPA ID: UT9210020922, OU 01, Ogden, UT	June 1992
OU-1	Evaluation Report Non-Operational Test of Pump-and-Treat System, Defense Depot, Hill, Utah – Operable Unit No. 1	January 2008
OU-1	EPA Superfund Proposed Plan, Defense Depot, Hill, Utah (DDHU), Ogden Site Operable Unit No. 1	September 2009
OU-1	EPA Superfund Record of Decision Amendment, Defense Depot, Hill, Utah (DDHU), Ogden Site Operable Unit No. 1	September 2009
OU-1	Fourth Five Year Review Report for the Former Defense Depot Ogden Weber County, Utah	August 2012
OU-1	OU-1 Demolition and Removal Completion Report, Operable Unit 1, Defense Distribution Depot Hill Utah, Ogden, Utah	January 2013
OU-1	Annual Groundwater Compliance Report, Operable Unit 1, Defense Distribution Depot Hill Utah, Ogden, Utah	September 2015
OU-1	Annual Groundwater Compliance Report, Operable Unit 1, Defense Distribution Depot Hill Utah, Ogden, Utah	February 2017 (Draft)

The following documents were reviewed regarding the OU-4/OU-4 Hotspot:

Site	Document Name	Date
OU-4	EPA Superfund Record of Decision: Ogden Defense Depot (DLA), EPA ID: UT9210020922, OU 04, Ogden, UT	September 1992
OU-4 and OU-4 Hotspot	EPA Superfund Record of Decision Amendment: Ogden Defense Depot (DLA), EPA ID: UT9210020922, OU 04, Ogden, UT	August 9, 2000
OU-4 and OU-4 Hotspot	Quitclaim Deed: Former Defense Distribution Depot Ogden, Utah. Weber County, Utah. No. DACA05-9-03-535	July 2003

Site	Document Name	Date
OU-4 Hotspot	Special Warranty Deed, Parcel number 15-349-0002, Deed Entry number 2038803, Grantee: Petersen Properties, L.L.C.	June 2004
OU-4	Summary of Groundwater Monitoring 70- and 90-Day Post-ISCO Treatment Events Chemical Soil Mixing Pilot Scale Treatability Study	October 2, 2009
OU-4	Final Chemical Soil Mixing Pilot Scale Treatability Study Evaluation Report	July 2, 2010
OU-4	Explanation of Significant Differences (ESD) for Final Record of Decision and Responsiveness Summary (ROD) for Operable Unit 4 (OU-4), Defense Distribution Ogden, Utah (DDOU)	January 2012
OU-4 and OU-4 Hotspot	Fourth Five Year Review Report for the Former Defense Depot Ogden Weber County, Utah	August 2012
OU-4	OU-4 Demolition and Removal Completion Report, Operable Unit 4, Defense Distribution Depot Hill, Ogden, Utah	June 2016
OU-4	OU-4 System Modification Completion Report, Operable Unit 4, Defense Distribution Depot Hill, Ogden, Utah	October 2016
OU-4 and OU-4 Hotspot	Semi-Annual Operations Report, First Half, Twenty First Year, Operable Unit 4 and Operable Unit 4 Hotspot, Groundwater Treatment Systems, Defense Distribution Depot Hill, Ogden, Utah	December 2016
OU-4 and OU-4 Hotspot	Semi-Annual Operations Report, Second Half, Twenty First Year, Operable Unit 4 and Operable Unit 4 Hotspot, Groundwater Treatment Systems, Defense Distribution Depot Hill, Ogden, Utah	February 2017 (Draft)

Table 5 presents the documents reviewed regarding various cleanup or screening standards:

Table 5: Regulatory Document Review List

Site	Document Name	Date
OU-1/OU-4	EPA National Primary Drinking Water Regulations (MCLs)	October 2016

The RAOs for both sites state the groundwater will be monitored for COCs and compared to MCLs. The identified COCs for groundwater along with their respective action level are shown in Table 6 and Table 7 below.

Table 6: Groundwater Action Levels – OU-1

COC	Groundwater Action Level (µg/L)	Basis
cis 1,2-DCE	70	MCL
TCE	5	MCL
Vinyl chloride	2	MCL

No changes to the MCLs have been made since the signing of the ROD in 1992. As discussed previously, vinyl chloride has historically been the only COC to exceed the MCL in groundwater at OU-1. An inhalation reference concentration (RfC) was issued by EPA for TCE in September 2011 which may affect vapor intrusion evaluations, but does not affect the ground water action level.

Table 7: OU-4 Groundwater Cleanup Standards

COC	Groundwater Action Level (µg/L)	Basis
Benzene	5	MCL
cis-1,2- DCE	70	MCL
Vinyl chloride	2	MCL
PCBs	0.5	MCL
Dioxins/Furans	0.00003	MCL

No changes to the MCLs have been made since the signing of the ROD in 1992. The 2012 ESD for OU-4 modifies the list of COCs to benzene, cis-1,2-DCE, and vinyl chloride since there is no history of exceedances in groundwater for PCBs or dioxins/furans. An RfC was issued by EPA for TCE in September 2011 which may affect vapor intrusion evaluations, but does not affect the groundwater action level. The COC list could need revision in the future based on the vapor intrusion evaluation.

Table 8: OU-4 Soil Cleanup Standards

COC	Soil Remediation Criteria (mg/kg)	Basis
Arsenic	35	Corresponds to a theoretical upper-bound incremental lifetime cancer risk of 1×10^{-4}
Lead	500 (1,850 for Disposal Trench A)	Typical remediation criterion for residential soils at CERCLA sites
PCBs	25	To Be Considered (TBC) remediation criterion based on EPA Directive 9355.4-01FS, "A Guide on Remedial Actions at Superfund Sites with PCB Contamination"
Dioxins/Furans	0.001	TBC criterion from the "General Approach Used by the Dioxin Disposal Advisory Group (DDAG) Regarding Pentachlorophenol Waste (also PCBs)" by P. des Rosiers, November 1988

Table 8: OU-4 Soil Cleanup Standards

COC	Soil Remediation Criteria (mg/kg)	Basis
Benzene	210	Corresponds to theoretical upper-bound incremental lifetime cancer risk of 1×10^{-5} under a future residential soil ingestion scenario
cis-1,2-DCE	700	Corresponds to a hazard quotient of 0.1 under this scenario
Vinyl chloride	3.2	Corresponds to theoretical upper-bound incremental lifetime cancer risk of 1×10^{-5} under a future residential soil ingestion scenario

Since the signing of the ROD in 1992, there have been a few changes in soil cleanup standards. These changes are identified in Section 7.6.2, which compare the soil remedial criteria established in the 2000 ROD amendment to current (adjusted to a cancer risk of 1×10^{-4}) EPA worker screening levels (https://www.epa.gov/risk/ regional-screening-levels-rsls) which are appropriate TBC criteria for OU-4. While the screening level for lead is lower compared to the ROD cleanup value (for Disposal Trench A), removal of contaminated soils at OU-4 has effectively isolated contaminants in vadose-zone soils from potential direct human exposure. Therefore, surface and near-surface soils at OU-4 do not represent a completed receptor exposure pathway.

5.4 Site Inspection

On January 18, 2017, a site inspection of DDOU was conducted by Mr. Christopher Goddard, Environmental Engineer, Mr. Mark Jones, Toxicologist, and Ms. Bridget Floyd, Geologist, of the Sacramento District of USACE accompanied by Mr. Marc Sydow, Technical Team Lead and Senior Geologist of Sacramento District of USACE, and Mr. Nicholas Montgomery, of Tooele Army Environmental BRAC Office. The purpose of the inspection was to assess the protectiveness of the remedy.

The remedy sites: OU-1, OU-4, and OU-4 Hotspot were visited during the inspection. No issues or remedy deficiencies were observed during the site inspection with the exception of the OU-4 Hotspot. The buildings 15C and 16C floorings were inspected and found to be relatively intact with little or no cracking. Although signage discussing excavation restrictions were observed outside the buildings, the signs are incorrectly placed. The site inspection checklist is included in Appendix C, and photographs documenting the site inspection are also included in Appendix D.

5.5 Interviews

During the five year review process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below.

On January 18, 2017, an interview of Mr. Blake Wahlen of the Boyer Company, Mr. Ross Sollars and Ms. Christy Seiger-Webster of AEEC, Mr. Nicholas Montgomery of the US Army, Mr. Mohammad Slam of the UDEQ, and Mr. Marc Sydow of the USACE was conducted by Mr. Christopher Goddard, Environmental Engineer, Mr. Mark Jones, Toxicologist, and Ms. Bridget

Floyd, Geologist, of the Sacramento District of USACE at the onsite office of Boyer Company at Business Depot Ogden. A record of the interview is included in Appendix E.

During the group interview, Mr. Wahlen, who serves as the General Manager for the Business Depot Ogden, indicated that there has not been any recent problems with environmental issues at the site. Boyer Company has developed over 5 million square feet of new commercial space and extended railroad tracks to the project. He also stated that there are new tenants near the OUs but no new property owners. All indicated that generally there has been little public interest in the project. Monitoring wells are not currently interfering with business development, it is not anticipated that the wells at OU-4 will interfere with business development. However, the wells at OU-1 may be a problem in the future. One well at OU-1 was moved in conjunction with the construction of building 961 W.

On January 18, 2017, an interview of Mr. Jake Brian of Petersen, Inc. and site visit of the Petersen, Inc. buildings was conducted by Mr. Christopher Goddard, Environmental Engineer, Mr. Mark Jones, Toxicologist, and Ms. Bridget Floyd, Geologist, of the Sacramento District of USACE at the onsite office of Petersen, Inc. at Business Depot Ogden. A record of the interview is included in Appendix E. (Note that Mr. Rob Despain, Vice President of Business Development, who was interviewed for the last five-year review, was unavailable.) Mr. Brian has worked for Petersen onsite for 2 years. Mr. Brian was not aware of the environmental issues associated with the site, nor that waste was left in place in the former disposal trenches underneath Building 16C. He was also not aware of the required signage; however during the site visit with Mr. Brian, these signs were observed to be in place but appeared to be located away from the location of the former trenches. Currently, Petersen Inc. has no plans to disturb soil underneath or around Building 16C.

On April 3, 2017, an interview of Ms. Jennifer Graham, Assistant Director of the Weber County Cultured Parks and Recreation was conducted by Mr. Mark Jones, Toxicologist of the Sacramento District of USACE via a telephone conference. A record of the interview is included in Appendix E. The OU-4 groundwater extraction system is located within a portion of the Weber County fairgrounds parking area. Ms. Graham is aware of the project and extraction system. She is kept informed on the project and is satisfied with the level of communication she receives. She is aware of the excavation restrictions due to the underground structures associated with the extraction system. She was appreciative that the wells within the parking area are now flush-mount, given the frequent vehicle traffic, including the parking of horse trailers. At some point the county would like to make improvements to the parking area, including grading, paving, and lighting, but understands the long-term process associated with cleaning up the site.

On April 21, 2017, an interview of Ms. Natasha Davis and Mr. Rob Stites of EPA Region 8 was conducted by Mr. Christopher Goddard, Environmental Engineer, Mr. Mark Jones, Toxicologist, and Ms. Bridget Floyd, Geologist, of the Sacramento District of USACE via a telephone conference. A record of the interview is included in Appendix E. Ms. Davis is the current EPA Remedial Project Manager for the project. Mr. Stites indicated that the remedies have performed well, with stabilized plumes and only vinyl chloride remaining. He had no issues; however, suggested that reducing conditions in groundwater at OU-1 could be making vinyl chloride more recalcitrant. He was also concerned that the vapor intrusion study planned for OU-4 be conducted as soon as possible. Both were amenable to site closure, with Mr. Sites citing recent EPA guidance on using the 95 percent upper confidence limit (UCL) to evaluate the attainment of cleanup levels.

6.0 OPERABLE UNIT 1

OU-1 is located in the southwestern part of DDOU and is associated with the contaminated burn-pit debris backfill formerly placed in the Plain City Canal. Small debris burial sites at OU-1 were the source of the shallow groundwater plume of chlorinated solvents. A site map of OU-1 is included as Figure 2.

6.1 OU-1 History of Contamination

Plain City Canal was the irrigation canal between two branches of Mill Creek. From 1969 to 1973, the canal was filled with burn-pit debris from Burial Site 4-A, a burial site formerly located near the northern facility boundary in OU-4. The backfill was comprised of glass, ash, charcoal, asphalt, partially burned plastic-coated electrical wire, wood, concrete, and metal fragment mixed with silty sand and gravel. Two other burials sites, Burial Site 1 and Burial Site 3-B, are associated with contaminated soil at OU-1. Burial Site 1 was reportedly used for the disposal of riot control agents including chloroacetophenone and Burial Site 3-B contained over 1,000 pairs of rubber boots.

6.2 OU-1 Initial Response

A records search in 1979 by the U.S. Army Toxic and Hazardous Materials Agency identified three locations, including OU-1, on DDOU where hazardous materials might have been used, stored, treated, or disposed of. These locations were recommended for further study. Defense Depot Ogden, Utah was proposed for inclusion on the NPL in 1984 and the decision was finalized in July of 1987.

In 1981, two monitoring wells were installed at OU-1 to assess for potential groundwater contamination associated with the canal and burial sites. Volatile organic compounds (VOCs) were discovered in groundwater, which led to the installation of additional monitoring wells, routine sampling of monitoring wells, soil boring installations, a soil-gas survey, and several test pits from 1985 through 1991. The results of the site investigations confirmed the presence of pesticides, polychlorinated biphenyls (PCBs), metals, dioxins and furans detected in the canal backfill and chlorinated solvents in groundwater. The canal backfill was considered as one of the sources for the VOCs in groundwater at OU-1, even though VOCs were not detected in the backfill.

The most widespread VOCs detected in the groundwater of the shallow aquifer at OU-1 historically are vinyl chloride and cis-1,2-DCE, both breakdown products of TCE, which is detected very locally near potential source areas. However, vinyl chloride is the only VOC or COC that has ever been detected at concentrations exceeding its respective MCL in groundwater.

6.3 OU-1 Basis for Remedial Action

In 1992, the Final ROD and Responsiveness Summary for OU-1 was signed between the US Army and EPA to document the selected remedy and specify the RAOs. According to the OU-1 ROD, remedial action for OU-1 was required to reduce the principal threats posed by contaminated soil and shallow groundwater that may occur as a result of future exposure of residents or onsite construction workers. This was done by removing a source of VOC contamination in soil and remediating contaminated shallow groundwater for beneficial use in the future. A brief risk assessment was completed for OU-1 in the ROD, but the ROD specifically states “the remedy for

OU-1 was not based on the risk assessment but rather upon Applicable or Relevant and Appropriate Requirements (ARARs) for groundwater and prevention of future groundwater contamination for soil." An analysis of ARARs and TBC criteria or guidance for the project is included in Appendix F.

The ROD states that the remedy of offsite disposal of soil and debris and on-site groundwater treatment was selected to meet groundwater ARARs and prevent future exposure to contaminated soil and groundwater.

The ROD for OU-1 outlines the following RAOs:

- Protection of human health and the environment through the following engineering controls including excavation and removal of all backfilled soil and debris from the Plain City Canal to comply with the established cleanup criteria listed in the ROD.
- Extraction and treatment of all groundwater until contaminant concentrations of TCE, cis-1,2-DCE, and vinyl chloride are below their MCLs in all OU-1 groundwater compliance samples.
- Compliance with ARARs.
- Chemical-specific requirements: The groundwater quality ARARs for OU-1 are based on the Safe Drinking Water Act MCLs, the maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

The OU-1 ROD specified that when the groundwater contaminant concentrations had been maintained below the MCLs for one year, the groundwater treatment will be shut down but compliance monitoring will continue until the next scheduled statutory five year review. If the remediation goals are exceeded during the shutdown in any compliance monitoring well, groundwater treatment will recommence and this procedure will be repeated. However, if the compliance is maintained until the next scheduled statutory review, the remedy will be considered complete. The groundwater monitoring plan for OU-1 (JMM, 1993) specified that compliance at each monitoring well is to be based on the mean or average concentration over time.

6.4 OU-1 Remedial Actions

The original OU-1 remedy selected in the 1992 ROD consisted of excavation of contaminated soil with offsite disposal along with groundwater extraction and treatment via air stripping and granular activated carbon, if necessary. A ROD Amendment, signed in 2010, changed the selected remedy to MNA. Although not selected as part of the remedy, land use controls (LUCs) have been implemented during the property transfer in 2003 restricting groundwater usage at OU-1.

6.4.1 OU-1 Soil Excavation

The remediation of the backfill materials in the part of the Plain City Canal associated with OU-1 was completed in August 1994 by excavating approximately 5,000 cubic yards of contaminated soil and backfilling the canal with clean fill materials.

A BRAC Site Investigation Report identified the entire remaining portion of the Plain City Canal as warranting additional investigation prior to transferring land ownership back to the City of

Ogden. Thirteen separate areas along the Canal were identified in the Plain City Canal Remedial Investigation Report as requiring remediation. Soil remediation of the backfill materials was completed in December 1999. It included excavation and disposal of backfill from 2,250 linear feet along the Canal. This additional remedial action triggered an ESD for the OU-1 ROD in July 2000. The ESD explains the significant differences between the soil remediation cleanup level, costs of the cleanup and the increased volume of soil excavated from the Plain City Canal as listed in the original ROD. Confirmation samples collected after completion of the excavations were below the cleanup criteria for soil specified in the ROD allowing for UU/UE of soil. Table 9 compares the soil remedial criteria established in the ROD to current (adjusted to a cancer risk of 1×10^{-4}) EPA worker screening levels (https://www.epa.gov/risk/ regional-screening-levels-rsls) which are appropriate TBC criteria for OU-1.

Table 9: OU-1 Soil Cleanup Standards Compared to 2017 EPA Regional Screening Levels

COC	Soil Remediation Criteria[1] (mg/kg)	Current Worker RSL[2] (mg/kg)
PCBs	25[1]	94 (C)
Dioxins	0.001[1]	0.0022 (C)
Furans	0.001[1]	0.0022 (C)

1 1992 OU-1 ROD
2 Worker Regional Screening Levels (RSL) from https://www.epa.gov/risk/regional-screening-levels-rsls (EPA, 2017), adjusted to a cancer risk of 1×10^{-4} (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC').
mg/kg = milligrams per kilogram.

Additional investigations included soil gas surveys and soil borings in 2000-2001, but no additional potential source areas were identified. The RAOs for the soil removal, including meeting the cleanup criteria, specified in the ROD for confirmation sampling were met after the final excavation. No further remedial action or investigation of soil has been completed since the ROD requirements for soil have been met.

6.4.2 OU-1 Groundwater Extraction

The selected remedy for groundwater remediation at OU-1 included extracting 75 to 100 gallons per minute (gpm) from a treatment system of approximately 12 extraction wells, treating it via air stripping followed by granular activated carbon, if necessary, and reinjecting treated groundwater into the shallow aquifer. A 16-extraction well system was installed in 1994 and was designed to pump, treat and reinject groundwater at a rate of 100 gpm, plus or minus 25%. Two air stripping towers were installed, a primary and backup unit, and no granular activated carbon unit was ever required.

To further enhance the recovery and treatment of contaminated groundwater, the original extraction system was optimized in 2001 by installing two new extraction wells in areas of persistent exceedances and shutting off eight extraction wells that had been pumping uncontaminated groundwater. This optimization reduced the system flow-through to approximately 50 gpm.

In 2003, in conjunction with the operating pump-and-treat system, an additional remediation alternative of in-situ chemical oxidation was attempted by injecting a chemical oxidant, Oxygen Release Compound®, at 84 points in three areas of persistent low-level vinyl chloride

contamination at OU-1. This technology is used to enhance natural aerobic biodegradation of VOCs, but no decrease in vinyl chloride concentrations was noted following the injections.

In early 2005, four extraction wells, five injection wells and four compliance monitoring wells located beyond the extent of the remaining plume were abandoned in the northern portion of OU-1 to improve roads and surface drainage for the site development. Between 1994 and 2005, the OU-1 groundwater pump-and-treat system treated and reinjected over 363 million gallons of groundwater.

By May 9, 2005, total flow-through of the system was down to approximately 30 gpm and on May 9, 2005, UDEQ and EPA approved the Non-Operational Test (NOT) Work Plan to shut the system off and conduct quarterly groundwater monitoring for two years. The baseline sampling event for the NOT and total shutdown of the system was completed in June 2005. Per the recommendations in the NOT Evaluation Report (USACE, 2008) and Addendum (USACE, 2009) and the OU-1 ROD Amendment, annual groundwater sampling of seven wells for VOCs has been performed since completion of the NOT.

6.4.3 OU-1 Monitored Natural Attenuation

As part of the NOT, two years (2005-2007) of quarterly groundwater sampling and subsequent annual groundwater sampling did not shown an increase in contaminant levels or areal extent of the groundwater contamination. Because the NOT showed that the pump-and-treat system was no longer providing any significant decrease in groundwater contamination, a Proposed Plan and ROD Amendment were finalized in 2010 to change the selected remedy from pump-and-treat to MNA. The treatment system was stopped in 2005. Demolition and removal of the system was completed in 2013.

Seven monitoring wells (ESE-12, JMM-19, AEHA-09, JMM-22, 1EW-03, 1EW-04, and 1EW-12) are sampled on an annual basis for VOCs and MNA parameters including pH, temperature, specific conductance, oxygen reduction potential, dissolved oxygen, turbidity, alkalinity, chloride, total and soluble iron, manganese, nitrate, nitrite, sulfate and sulfide, total organic carbon, and methane. Monitoring wells are shown on the site map on Figure 2.

According to the ROD Amendment, one or more of the following observations could lead to re-consideration of this remedy, if confirmed by four or more consecutive annual rounds of sampling:

- Increase in levels of parent contaminants (e.g. TCE and/or cis-1,2-DCE), indicating that other sources may be present;

- Concentration levels of parent contaminants and daughter products differ significantly from predictions (i.e. increase significantly and sustain the increase for four or more rounds of sampling);

- Contaminant plumes increase significantly in extent or volume over recent historical sizes.

An evaluation of the effectiveness of MNA at OU-1 is included in detail in Section 6.5.1.

6.4.4 OU-1 Institutional Controls

Although not specifically listed as part of the remedy in the 1992 ROD, LUCs have been implemented at OU-1 and are discussed in the 2010 ROD Amendment. The Quitclaim Deed between the US Secretary of the Army and Ogden City for the former depot, dated July 24, 2000 for FOST 2 includes a number of land use restrictions, requirements and conditions that relate to remedial action activities, including the following:

1. The Army maintains the right to:
   a. Access the property to conduct and oversee any investigations of air, water, sediments and soils, response action, remedial action, removal action or corrective action as defined under CERCLA to protect human health and the environment;
   b. Install, operate, maintain and/or remove groundwater monitoring, extraction and treatment systems and perform monitoring of groundwater.

2. The Army will remove contaminated groundwater treatment systems and properly abandon wells and wellfield piping.

3. The City of Ogden shall not access, modify or otherwise tamper with, disrupt, inflict damage, obstruct or impede any groundwater monitoring, extraction and/or treatment systems and equipment.

4. The City of Ogden and all successors and assigns shall not conduct nor allow its agents to conduct any disturbance of the groundwater underlying specified Parcels (the area of the OUs) without prior written approval of the Army, EPA and UDEQ.

5. The City of Ogden shall not inject any materials into monitoring or treatment system wells or extract any fluids from them.

6. The City of Ogden and all successors and assigns shall not conduct nor allow its agents to conduct any disturbance of the groundwater underlying specified parcels (the areas of the OUs) without prior written approval of the Army, EPA and UDEQ

Agreements between the Department of Defense and the City of Ogden ensure that the DDOU Reuse Plan specifies the zoning of the Business Park Ogden land as industrial/commercial. This zoning restriction is consistent with the level of cleanup goals and criteria for soil and groundwater contamination at the various contaminated subsites that have been remediated at the former Depot.

6.5 OU-1 Data Review

The sections below discuss the current and historical data for OU-1 along with the evaluation of currently implemented remedies including the MNA and institutional controls.

6.5.1 OU-1 Groundwater Data

Utilizing historic groundwater data from OU-1 from December 2003 to June 2016, concentrations of vinyl chloride were evaluated using the Mann-Kendall statistical analysis and linear regression. This analysis was completed using the Air Force Center for Environmental Excellence's

Monitoring and Remediation Optimization System (MAROS) software which was also used for the 2010 ROD Amendment and the 2012 Five-Year Review report. The purpose of the analysis was to evaluate the effectiveness of MNA at OU-1 and to determine if concentrations show stable or decreasing trends. The statistical analysis was performed on monitoring wells 1EW-03, 1EW-04, 1EW-12, AEHA-09, JMM-19, and JMM-22. Analysis could not be performed on monitoring wells ESE-12 as data from this well have historically been below laboratory reporting limits.

The Mann-Kendall test is a non-parametric procedure that is often used to analyze trends in data over time. With the data provided by the long term groundwater monitoring for OU-1, the Mann-Kendall Statistic was calculated, and the concentration trend and the confidence in the trend were determined. A positive value of the Mann-Kendall Statistic implies that the majority of the differences between earlier and later measurements are positive, suggesting an upward trend. A negative value for the Mann-Kendall Statistic implies a decreasing trend and a value near zero indicates a roughly equal number of positive and negative differences. The larger the absolute value of the Mann-Kendall Statistic, the stronger the evidence for an actual increasing or decreasing trend.

MAROS summary sheets for OU-1 for each well used and a summary statistics for the site are attached in Appendix G. At OU-1, the Mann-Kendall Statistic, confidence in trend, and concentration trend are shown in Table 10 below:

Table 10: Results of Mann-Kendall Analysis Using MAROS for OU-1 Wells

Monitoring Well	Mann-Kendall Statistic	Confidence in Trend	Concentration Trend
1EW-03	-20	76.2%	Stable
1EW-04	-4	60.0%	Stable
1EW-12	-30	86.2%	Stable
AEHA-09	-58	95.7%	Decreasing
JMM-19	25	78.0%	No Trend
JMM-22	-108	100%	Decreasing

Given the highly variable data observed in JMM-19, no trend was able to be determined with confidence. Stable or decreasing trends were found in all other wells included in the analysis: 1EW-03, 1EW-04, 1EW-12, AEHA-09, and JMM-22.

Linear regression examines the relationship between a response and a predictor. For groundwater concentration analysis, the observed relationship between the response (difference in vinyl chloride concentration) and predictor (time) is evaluated to determine if it is statistically significant. The resulting slope is the slant of the regression line which represents the change in vinyl chloride concentration that occurs within an increase by one sampling event. The slopes, confidence in trends, and concentration trends shown in Table 11 were found for OU-1:

Table 11: Results of Linear Regression Analysis Using MAROS for OU-1 Wells

Monitoring Well	Ln Slope	Confidence in Trend	Concentration Trend
1EW-03	-4.6 E-5	59.3%	Stable
1EW-04	-4.7 E-4	81.9%	Stable
1EW-12	-1.4 E-4	87.1%	Stable
AEHA-09	-2.3 E-4	97.3%	Decreasing
JMM-19	-4.4 E-5	64.2%	Stable
JMM-22	-4.7 E-4	99.9%	Decreasing

Stable and decreasing trends were indicated for all wells included in the analysis: 1EW-03, 1EW-04, 1EW-12, AEHA-09, JMM-19, and JMM-22.

By examining the concentrations over time combined with the results of the Mann-Kendall and linear regression analysis, it appears the groundwater concentrations of vinyl chloride are stable and decreasing in all OU-1 monitoring wells. It has been noted that the upgradient Ogden Nature Center may be influencing groundwater chemistry at OU-1. This may be affecting the attenuation of vinyl chloride leading to the stable trends described above. As more monitoring data becomes available, additional statistical analysis should be completed as part of the monitoring program to insure that these trends continue, and concentrations are not increasing in groundwater. Concentration over time graphs of monitoring wells are also included in Appendix G.

According to the ROD Amendment, the MNA remedy is considered to be working as expected if concentrations of parent contaminants (e.g. TCE and/or cis-1,2-DCE) do not increase, concentration levels of parent contaminants and daughter products show stable or decreasing trends, and contaminant plumes remain constant or decrease in extent or volume. No detections of TCE have been reported above the laboratory detection limit since the ROD Amendment was signed in 2010 and concentrations of cis-1,2-DCE remain low. As indicated above, concentrations of vinyl chloride show stable or decreasing trends in all wells. The extent of the groundwater plume has remained constant as demonstrated by the fact that no additional wells have exhibited concentrations of vinyl chloride.

The MNA remedy is functioning as intended in the ROD Amendment. Monitoring and statistical analysis should be continued in the future; however, a Response Complete determination for OU-1 and concurrence of site closure from EPA and UDEQ should be considered as vinyl chloride concentrations have been steadily declining (or have no trend in some wells) and are below or only slightly above the MCL in all monitoring wells. For example, only monitoring wells JMM-19 (3.6 µg/L) and 1EW-12 (2.68 µg/L) had concentrations slightly above the MCL (2 µg/L) in the most recent (2016) monitoring event. Concentrations in all other wells were below this level. Therefore, need for future monitoring at OU-1 appears to be limited.

6.5.2 OU-1 Soil Gas Data

A soil gas investigation was completed at OU-1 in order to locate potential secondary sources of contamination. This investigation was done prior to the completion of the groundwater extraction and no current soil gas data has been collected. No buildings or structures are located or are planned to be located above the groundwater plume (although, in 2015 a 480,000 square foot building was completed immediately east of the site, and two 100,000 square foot buildings were completed to

the south-southeast of the site). However, the current institutional controls do not restrict the construction of a structure over the groundwater plume and the vapor intrusion pathway was not considered during the risk assessment. A further discussion of the potential for exposure of contaminated soil gas is included below in Technical Assessment Question B below.

6.6 OU-1 Technical Assessment

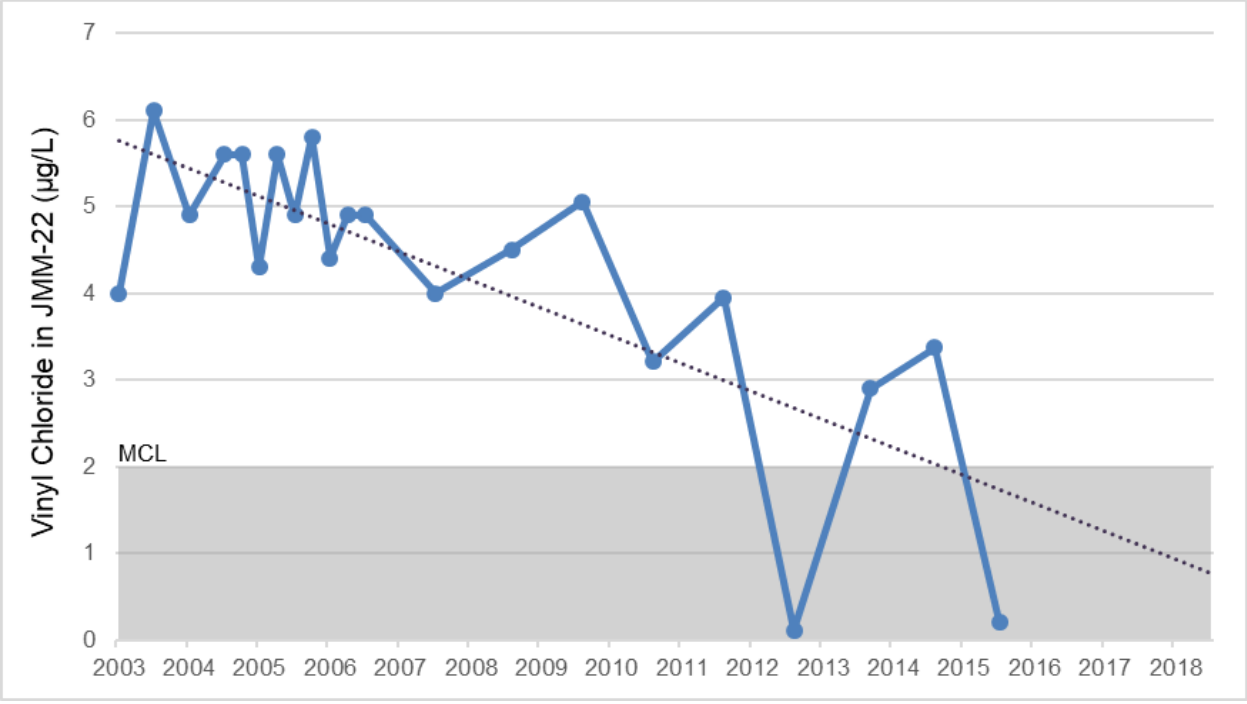
The assessments of remedy effectiveness are typically presented separately for each site undergoing a remedy and where contamination remains on site that prevents unrestricted use.

The assessment is focused on answering three questions:

- **Question A**: Is the remedy functioning as intended by the decision documents?
- **Question B:** Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?
- **Question C:** Has any other information come to light that could call into question the effectiveness or performance of the remedy?

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

Yes, the remedy of MNA is functioning as intended by the 2010 ROD Amendment. As discussed in Section 6.5.1, concentrations of vinyl chloride are stable or decreasing with the possible exception of data from JMM-19. Concentrations over time graphs are included in Appendix G and graph showing concentrations over time from the monitoring well with the highest concentration, JMM-22, is shown below:



According to the linear regression projection of this representative monitoring well using only the data collected during the summer months, concentrations will likely continue to decrease to below the MCL for vinyl chloride within a reasonable amount of time, approximately two to three years.

• **OU-1 Institutional Controls Evaluation:** According to the Quitclaim Deed, the institutional controls related to the cleanup at OU-1 have been implemented as listed in Section 6.4.4. The City of Ogden and its developers have not disturbed the area of OU-1 or the associated treatment system or wellfield. As confirmed by the Five Year Review site inspection and interviews with the property manager, no groundwater wells have been or are planned for installation on the DDOU property including OU-1. The institutional controls continue to restrict access to the contaminated groundwater plume which protects against human exposure while the plume is attenuating. All institutional controls that have been implemented at OU-1 continue to be upheld and no violations have been found.

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

• **Changes in Standards and To Be Considered:** A review of the 1992 ROD, the 2000 ESD, and the 2010 ROD amendment show that there is no longer a completed soil exposure pathway for COCs and that groundwater is the only media of concern for OU-1. The cleanup values established for groundwater are based on EPA federal MCLs or state of Utah MCLs for cis-1,2-DCE, TCE, and vinyl chloride. Table 12 compares the 1992 ROD MCLs to the current MCLs, showing that no changes to these standards have occurred. The MCLs are ARARs for this site, and there are no other ARARs or TBC criteria or guidance that apply to the selected remedy established in the 2010 ROD amendment.

Table 12: Groundwater Action Levels – OU-1

COC	Groundwater Action Level (µg/L)	2016 Federal MCL[1] (µg/L)	2017 Utah MCL (µg/L)[2]
cis 1,2-DCE	70	70	70
TCE	5	5	5
Vinyl chloride	2	2	2

MCL = Maximum Contaminant Level

1 Obtained from https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants as of October 2016 (EPA, 2016a).

2 Obtained from https://rules.utah.gov/publicat/code/r309/r309-200.htm as of January 2017.

The RAOs for the soil removal, including meeting the cleanup criteria, specified in the ROD for confirmation sampling were met after the final excavation. No further remedial action or investigation of soil has been completed since the ROD requirements for soil have been met. No soil contamination was left in place that would prevent UU/UE, and exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are still valid.

• **Changes in Exposure Pathways:** No known or completed exposure pathways currently exist from domestic use of groundwater. However, exposure of off-site residents and onsite workers is considered to be a potential exposure pathway. It is unlikely, however, that this shallow, low-yield aquifer would be used as a domestic water supply, and use of groundwater is regulated by the state

of Utah via issuance of well drilling permits. Further, there is a deed restriction limiting the property to industrial or commercial use. A review of the human health risk assessment and subsequent source area investigations indicates that there have been no changes in exposure pathways evaluated. OU-1 remains industrial with no changes to land immediately adjacent to the property.

Inhalation of indoor air impacted by volatile compounds in groundwater was not evaluated in the risk assessment and is a potentially complete exposure pathway. To assess potential risks associated with vapor intrusion, the most recent maximum detection of groundwater concentrations were compared to relevant screening criteria in Table 13. The commercial target groundwater screening criteria for TCE and vinyl chloride were obtained from EPA's Vapor Intrusion Screening Level (VISL) calculator (EPA, 2016b; https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-levels-visls) (Note that inhalation toxicity criteria are not available for cis-1,2-DCE therefore, target groundwater screening criteria for vapor intrusion have not been established). EPA VISLs were used because none are available from the state of Utah. Table 13 shows that maximum detected groundwater concentrations at OU-1 do not pose a potential threat to indoor workers.

Table 13: Comparison of Groundwater Concentrations to Commercial Groundwater to Indoor Air Screening Levels – OU-1

COC	Maximum Detected Groundwater Concentration[1] (µg/L)	Commercial Groundwater to Indoor Air Screening Level[2] (µg/L)
cis 1,2-DCE	6.39	--
TCE	ND (RL = 1.0)	22 (NC)
Vinyl chloride	3.60	250 (C)

[1] 2016 groundwater sampling event.

[2] VISLs are based on model default parameters for the commercial scenario (25 year exposure duration, 250 days/year exposure frequency, 8 hours/day exposure time, generic attenuation factor of 0.001, and a target cancer risk of 1×10^{-4} or non-cancer hazard quotient of 1.0 (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC').

• **Changes in Toxicity, Other Contaminant Characteristics, and Risk Assessment Methodologies:** A review of the human health risk assessment and ecological risk assessment shows that the methodologies applied are still protective and appropriate. Although there have been changes to the values for toxicity and exposure parameters, and contaminant properties, the applicable MCLs have not been modified, and therefore the protectiveness of the remedies for groundwater contamination has not changed.

• **Expected Progress Toward Meeting RAOs:** As discussed in Section 6.5.1, remaining concentrations in groundwater are slightly above the MCL but show stable and generally decreasing trends. Based on this data, it appears that the concentrations will soon reach the MCL. All other RAOs have been met.

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

No, no other information has come to light that calls into question the effectiveness of the remedy.

7.0 OPERABLE UNIT 4 (OU-4) AND OPERABLE UNIT 4 HOTSPOT (OU-4 HOTSPOT)

OU-4 is adjacent to the northern boundary of DDOU. It consists of Burial Sites 4-A through 4-E and a groundwater plume delineated by vinyl chloride with low concentrations of cis-1,2-DCE and TCE. The OU-4 Hotspot is located in the northwestern part of the Ogden site and comprises a groundwater plume of vinyl chloride contamination emanating from the area of a former oil pit and disposal trenches in the area between and under Buildings 15C and 16C.

7.1 OU-4 History of Contamination

OU-4 is composed of waste disposal burial sites referred to as Burial Sites 4-A through 4-E as shown on Figure 3. Burial Site 4-A contained two shallow burning pits that were used from the mid-1950s to 1975. Wood, crating material, paper, dispensary wastes, and used motor oils and greases mixed with solvents were disposed of and burned at this burial site. Burial Site 4-B was reportedly used for the disposal of fluorescent lighting tubes from the mid-1950s to the late 1960s. Burial Site 4-C consisted of four shallow trenches used as a sanitary landfill from 1969 to 1972 to primarily dispose of cans of jelly and jam. Methyl bromide cylinders were reportedly disposed of at Burial Site 4-D between the mid-1940s and mid-1960s, but only halazone water purification tablets were found. Burial Site 4-E was used as an oil holding/burning pit for waste oils and spent solvents from the mid-1950s to the mid-1960s. The wastes were also set on fire to provide training for the Depot's fire department. Burial Site 4-E is the most northerly of the OU-4 burial sites and is located adjacent to the northern boundary of the former Depot. Burial Site 4-E was the primary source of the OU-4 plume.

The OU-4 Hotspot includes the area of a former oil pit and disposal trenches in the area between and under Buildings 15C and 16C. The oil pit was believed to be circular with a diameter of about 60 feet. Building 16C may have been constructed over a small portion of the pit. Waste oils were poured onto the surface and burned at the oil pit between 1941 and about 1951. Office, construction and residential waste and debris were also disposed of in a series of six trenches. The wastes were burned after adding accelerants, possibly including kerosene, diesel fuel and waste oil.

7.2 OU-4 Initial Response

The records search in 1979 by the US Army Toxic and Hazardous Materials Agency identified locations, including OU-4, on DDOU where hazardous materials might have been used, stored, treated, or disposed. These locations were recommended for further study. Defense Depot Ogden, Utah was proposed for inclusion on the NPL in 1984 and the decision was finalized in July of 1987.

In 1981, four monitoring wells were installed at OU-4 to assess for potential groundwater contamination associated with the burial sites. Sampling of the wells confirmed a release of VOCs into groundwater. Investigations of soil and groundwater were completed in the 1980's to define the nature and extent of contamination.

A very limited soil investigation in the early 1990s indicated that waste materials buried at Burial Site 4-E were the most likely source of VOC groundwater contamination at OU-4. Burial Site 4A-North, located just south of 4-E was identified as a secondary source. The COCs in

groundwater at OU-4 were vinyl chloride, benzene, cis-1,2-DCE, TCE, PCBs (Aroclor 1260) and arsenic. The area of attainment for vinyl chloride (defined as the 2 µg/L contour) at OU-4 was estimated to be 50 acres (about 3,900 feet long) in 1992. The total volume of groundwater within this area of attainment was estimated as 65 million gallons assuming the entire saturated thickness of the shallow aquifer was contaminated.

During the installation of the OU-4 groundwater treatment system in 1995, additional contamination was discovered including vinyl chloride detected at some of the proposed injection well locations. Investigations into this additional area of contamination revealed evidence of a source of soil contamination found between Buildings 15C and 16C. These sources of contamination have been identified as former disposal trenches and an Oil Pit and are referred to as the OU-4 Hotspot.

7.3 OU-4 Basis for Remedial Action

The Final ROD and Responsiveness Summary for OU-4 were signed in August 1992. The ROD for OU-4 addresses remedial activities for both soil and groundwater. Under the ROD, soil and debris was to be excavated and transported offsite for disposal and groundwater was to be treated on site using groundwater extraction with air stripping and granular activated carbon treatment (if necessary).

According to the OU-4 ROD, remedial action for OU-4 was required to reduce the threats posed by contaminated soil and shallow groundwater to off-site and on-site residents who may use shallow groundwater from a well installed in the contaminant plume, on-site residents who may consume crops or livestock exposed to contaminated groundwater, future construction workers exposed to contaminated soil during excavation activities, and future residents, including children, that may ingest contaminated soil.

The ROD states that the remedy of offsite disposal of soil and debris and on-site groundwater treatment was selected to meet groundwater ARARs and prevent future exposure of contaminated soil and groundwater.

The ROD for OU-4 outlines the following RAOs:

- Prevent contaminant migration from the soil into the shallow ground-water system that could result in contaminant concentrations the exceed the remedial action objectives for ground water,
- Prevent direct human contact with contaminated soil,
- Remediate or remove soils to achieve an excess cancer risk of 10^{-4} to 10^{-6},
- Meet ARARs,
- Remove the water purification tablets,
- Prevent accidental ingestion and dermal contact with ground water containing carcinogens and non-carcinogens in excess of chemical-specific ARARs,

- Remediate ground water to achieve an excess cancer risk of 10^{-4} to 10^{-6}, and

- Ensure that contaminant concentrations avoid chronic health effects.

Health-based cleanup criteria have been included as remediation goals to ensure that the remedy complies with the National Contingency Plan (NCP) that the acceptable risk range of 10^{-6} to 10^{-4} should be achieved by the remedy, with a risk of one in one million as the goal of the remediation. Groundwater remedial action goals for individual contaminants are drinking water MCLs. Confirmation samples were collected from soils remaining in the excavation to verify compliance with the cleanup criteria.

An Amendment was made to the OU-4 ROD in September 2000 to describe the fundamental changes made to the final remedy for OU-4 because of the discovery of the groundwater exceeding the MCL and the presence of buried waste at the OU-4 Hotspot. Institutional controls prohibiting disturbance of the concrete building floors and subsurface soils are included in the ROD Amendment. The institutional controls include the following:

1. Restricting the property for commercial and industrial use only.

2. Not permitting access for use of the groundwater underlying the property without the written approval of the Defense Logistics Agency (DLA), EPA, and UDEQ.

3. Ensuring that future users of the property do not tamper, damage, or impede the groundwater treatment or monitoring systems.

4. Not permitting excavation, digging, or disturbance of the soil beneath the foundations of Buildings 359 (15C) and 367 (16C) without written approval of the DLA, EPA, and UDEQ.

5. Restricting the disturbance of foundation elements for Buildings 359 and 367 which would result in direct human contact with the underlying soils without written approval of the DLA, EPA, and UDEQ.

6. Placement of warning signs within Building 359 and 367 and within any future buildings constructed on the Building 359 and 367 sites stating, "No Excavation Beneath the Building Foundation without Prior Approval".

The selected remedy for the OU-4 Hotspot also consists of excavation and off-site disposal of soils (former oil pit and disposal trenches) between the buildings, containment of contaminated soils under the buildings, institutional controls, groundwater collection and treatment through ozonation, and in-situ treatment of Oil Pit soils.

The ROD amendment specified groundwater within the OU-4 Hotspot contaminant plume was being remediated using a 300-ft long extraction trench, treatment, and sanitary sewer discharge. Extracted groundwater entered an ozonation treatment system which breaks down vinyl chloride and other VOC's present in the groundwater within the OU-4 Hotspot. The ozonation system was designed to reduce vinyl chloride concentrations to below its MCL of 2 µg/L. Since the treatment system resulted in the complete destruction of contaminants, there are no air emissions.

7.4 OU-4 Remedial Actions

The following sections describe remedial actions completed at OU-4 and the OU-4 Hotspot. The original OU-4 remedy selected in the 1992 ROD consisted of excavation of contaminated soil with offsite disposal and groundwater extraction and treatment via air stripping and granular activated carbon, if necessary. A ROD Amendment, signed in 2000, describes the fundamental changes made to the final remedy for OU-4 Hotspot due to the discovery of contaminated groundwater and buried waste at the OU-4 Hotspot. A January 2012 ESD was prepared to change the OU-4 remedy from extraction, treatment, and injection of groundwater to the extraction and direct discharge of extracted groundwater into the Central Weber Sewer Improvement District (CWSID) where it is treated with commingled sewage and other liquid wastes.

7.4.1 OU-4 Soil Remediation

Between November 1993 and July 1994, approximately 9,300 cubic yards of contaminated soil and debris were excavated and disposed of in a RCRA-permitted Subtitle C landfill facility in accordance with the ROD. Bottles of water purification tablets excavated from 4-D were incinerated at Chemical Waste Management's Port Arthur, Texas facility.

Based on confirmation samples collected after the excavation, sources of VOCs still remain in the area of Burial Sites 4-A and 4-E where shallow soil excavation was conducted. These source areas continued to contribute to groundwater contamination as evidenced by the high contaminant concentrations in the OU-4 monitoring wells. Based on these observations, the existing treatment systems would not be capable of cost-effectively restoring contaminated groundwater within a reasonable time-frame. Therefore, a Remedial Action Alternative (RAA) Investigation was conducted. Field activities including the drilling of soil borings for the RAA Investigation commenced in the areas of Burial Sites 4-A and 4-E, now referred to as the North Wellfield, in March and April 2006 (Kleinfelder, 2006).

As a result of the RAA, in-situ chemical oxidation was selected as a supplemental remedy to address the residual contaminated soil at the OU-4 source area, Burial Sites 4-A and 4-E. A chemical oxidation pilot study was conducted between 2006 and 2009 which included determining baseline soil and groundwater conditions, administering Klozur CR® to the OU-4 treatment cell, and monitoring of the soil and groundwater post in-situ treatment. The purpose of the study was to determine the effectiveness of the treatment by oxidizing the residual concentrations of cis-1,2-DCE, TCE, vinyl chloride, and benzene in soil at OU-4. Conclusions of the study included that contaminants adsorbed to the soil may have mobilized into groundwater due to soil mixing causing an increase in groundwater concentrations in surrounding monitoring wells. Based on groundwater and soil investigations completed after implementation of the pilot study, in-situ treatment was not recommended as a treatment alternative for OU-4. However, the mobilization of contaminants from the soil into groundwater may facilitate contaminant mass removal through groundwater extraction.

The 2012 ESD provides a more focused and aggressive groundwater extraction strategy in the source area. Post soil mixing results indicate that the COCs in soil are below the applicable limits defined in the 1992 ROD. However, TCE, which is listed as a COC for groundwater but not soil, exceeded the current (adjusted to a cancer risk of 1×10^{-4}) EPA regional screening level (RSL). Further assessment is recommended to review cost-effective options to decrease the potential

leaching of contaminants in soil may be considered to optimize the current groundwater remedy. Groundwater and soil monitoring results are discussed in Sections 7.5.1 and 7.5.3, respectively, below.

7.4.2 OU-4 Groundwater Extraction System

Construction of the OU-4 groundwater treatment system took place between January 1994 and May 1995, and the system has been in operation since July 1995. The system was designed to extract contaminated groundwater, treat it to remove VOCs, and re-inject the treated groundwater into the shallow aquifer. The OU-4 groundwater treatment system consisted of 33 groundwater extraction wells, subsurface conveyance pipelines, a groundwater treatment plant, 22 injection wells, and a sewer discharge connection. The volume of groundwater extracted, treated at the OU-4 plant and injected into the ground or discharged since full-scale operations began in July 1995 through June 2016, was over 710 million gallons.

On July 8, 2009, extraction well 4EW-1 was shut off due to excessive fouling through the system caused by the chemical injections used during the pilot study soil mixing activities in the North Wellfield. After shutdown, all injection wells were manually pumped, swabbed, and flushed multiple times over the period of a week in an attempt to minimize the impact of the bio-growth on the wells. In late March 2010, modifications were performed on the system to allow for discharge to the CWSID sanitary sewer system. By eliminating groundwater injection, the problems with excessive fouling in the wells was corrected. Also, since filtering of the treated groundwater is not necessary in order to meet sanitary sewer discharge compliance requirements, a bag filter bypass line was installed to isolate the bag filters from the system process when discharging to the sanitary sewer. In order to meet reporting requirements of the CWSID, an electromagnetic flow meter capable of precisely measuring cumulative flow totals and instantaneous flow rates was installed on the plant discharge. Complete details of the modifications performed on the system are found in the AEEC Technical Memorandum titled Installation of a Direct Discharge into CWSID System (AEEC, 2010).

On April 1, 2010, treated groundwater was rerouted to bypass the injection well network and discharge to the CWSID sanitary sewer system. A CWSID permit allows for direct discharge of up to 200 gpm of treated groundwater to the sanitary sewer. The discharge flow is being reported to the CWSID on a quarterly basis. Extraction wells 4EW-1 and 4EW-2 were brought back on line on April 1, 2010 in order to maximize mass extraction and plume capture.

On January 19, 2011, the influent piping was diverted to bypass the surge tank, stripper feed pumps and stripper towers. The modifications were recommended after several months of sampling ensured to the CWSID that the contamination levels would remain below the permissible discharge limits. Permit No. UST002, CWSID Industrial Wastewater Permit, allows the direct discharge from the treatment process at OU-4 into CWSID's collection and treatment system without treatment as long as effluent limitations and monitoring requirements are met. The effluent limits are 50 µg/L for benzene and 2.13 milligrams per liter for total VOCs. Parameters must be monitored quarterly. Treatment resumed on April 12, 2011 pending the finalization of the ESD due to the ROD requirements that extracted groundwater is treated prior to discharge.

The 2012 ESD was prepared to clarify changes to the OU-4 groundwater extraction system described in the ROD and ROD Amendment. The ESD was prepared to change the OU-4

requirement from extraction, treatment, and injection of groundwater to the extraction and direct discharge of extracted groundwater into the CWSID where it is treated with commingled sewage and other liquid wastes. The ESD also included a reduction in the extraction well network and allows for unused portions of the OU-4 system to be removed to facilitate redevelopment of the area. The ESD also updates the groundwater monitoring plan and modifies the list of COCs to benzene, cis-1,2-DCE, and vinyl chloride. Continued capture of the reduced plume by a reduced extraction system has been demonstrated since April 2010 by the transitional pump-treat-and-discharge system approved by EPA and UDEQ and managed by USACE. The ESD was approved in January 2012 and demolition and removal of the unnecessary portions of the OU-4 groundwater treatment system was completed in 2014.

7.4.3 OU-4 Hotspot Soil Excavation

Between September 1998 and January 1999, 4,775 tons of hazardous waste soil and debris were excavated from the OU-4 Hotspot area between Buildings 15C and 16C including the Oil Pit, Trench A, Trench B and Test Pit #1 shown on Figure 3. An unknown amount of contaminated soil and debris beneath the buildings were left in place. The area of the backfilled excavation was capped with asphalt paving where it existed previously. No samples were collected beneath Buildings 15C and 16C. However, approximately 3,000 pounds of Oxygen Releasing Compound were placed in the bottom of the excavation to promote biodegradation of residual petroleum hydrocarbons in the saturated zone beneath excavated areas.

7.4.4 Operable Unit 4 Hotspot Groundwater Extraction System

The OU-4 Hotspot groundwater extraction system was designed to intercept VOC-contaminated groundwater originating from the OU-4 Hotspot source area under Buildings 15C and 16C to prevent off-site migration. The system began full-time operation in April 1999. The OU-4 Hotspot treatment system consisted of an extraction trench and an ozone/peroxide treatment system. The extraction trench is 300 feet long and extends down into an underlying clay layer. The trench is located along the western DDOU former property boundary. The extraction trench contains one sump equipped with two sump pumps that alternately pumped the captured groundwater to the OU-4 Hotspot treatment plant.

The OU-4 Hotspot treatment plant includes two 600-gallon reaction tanks that were designed to receive extracted groundwater from the trench. Two hydrogen peroxide storage tanks and metering pumps were installed to feed hydrogen peroxide into the extracted groundwater prior to entering the reaction tanks. Ozone was added to each of the reaction tanks in order to treat the water via ozone destructor. Treated groundwater was discharged to the sanitary sewer according to the terms of a permit with the CWSID (Permit No. UST002).

Use of the hydrogen peroxide and ozone reactors was discontinued September 3, 2003, following operational problems with the ozone destructor. It was determined that oxidation treatment was not necessary because concentrations of vinyl chloride had never been detected above the laboratory reporting limit at the effluent of the OU-4 Hotspot extraction system. Currently, the OU-4 Hotspot remediation consists of extraction of groundwater from the trench and discharge directly to the sanitary sewer. Sampling results indicate that oxidation and aeration of the contaminants occurs when the groundwater is exposed to air in the extraction trench.

The OU-4 Hotspot groundwater extraction system continues to operate as a “fail-safe” system along the west former property boundary to insure there is no off-site migration of contaminants in the unlikely event the down gradient portion of the plume reappears.

7.4.5 OU-4 Institutional Controls

According to the 1992 OU-4 ROD, contaminated groundwater at OU-4 would only pose a significant threat to human health if it were ingested; because the shallow groundwater is not currently used as a potable water supply, there is currently no complete pathway for significant human exposure to the contaminated groundwater. To maintain protectiveness into the future, institutional controls have been implemented to prevent the future use of contaminated groundwater. There have been four Quitclaim Deeds between the US Secretary of the Army and Ogden City for property transferred under each FOST. For this part of the former Depot, there were two Quitclaim Deeds: one recorded with Weber County, Utah on December 21, 2001 for FOST 3 and one on September 24, 2003 for FOST 4. Both deeds include two restrictive covenants that control use such that “the Grantee, its successors and assigns, shall not “use, or allow any use of the Restricted Property for other than commercial or industrial purposes and it shall not be used for residential purposes”, and “access, extract, or use groundwater, nor inject any materials into any wells located on the Restricted Property.”

Institutional controls which restrict soil disturbance at the OU-4 Hotspot are listed in the OU-4 ROD Amendment and the December 2001 Quitclaim Deed for FOST 3 which includes the “Restricted Property”. The institutional controls include the following:

1. Restricting the property for commercial and industrial use only.

2. Not permitting access for use of the groundwater underlying the property without the written approval of the DLA, EPA, and UDEQ.

3. Ensuring that future users of the property do not tamper, damage, or impede the groundwater treatment or monitoring systems.

4. Not permitting excavation, digging, or disturbance of the soil beneath the foundations of Buildings 359 (15C) and 367 (16C) without written approval of the DLA, EPA, and UDEQ.

5. Restricting the disturbance of foundation elements for Buildings 359 and 367 which would result in direct human contact with the underlying soils without written approval of the DLA, EPA, and UDEQ.

6. Placement of warning signs within Building 359 and 367 and within any future buildings constructed on the Building 359 and 367 sites stating, "No Excavation Beneath the Building Foundation without Prior Approval".

7.5 OU-4 Data Review

Below discusses the current and historical data for OU-4 and OU-4 Hotspot along with the evaluation of the currently implemented remedies including institutional controls.

7.5.1 OU-4 Soil Data

The current understanding of residual contaminated soil left in place after the original excavations of the source is based on data collected from the pilot study. Soil samples were collected for OU-4 to study the effectiveness of the chemical soil mixing pilot study conducted at the OU-4 source area. The pilot study was conducted in a small area, thus samples may not be representative of the contamination left in place. Two baseline samples were collected before soil mixing and then three samples were collected 90 days after soil mixing. TCE, vinyl chloride, cis-1,2-DCE, and benzene were the COCs of focus for the sampling. The soil sample results for the baseline and post soil mixing (90 days after mixing) are summarized in Table 14 below.

Table 14: Soil Results of the OU-4 Pilot Study

COC	Baseline Collected in 2006 (µg/kg)	Post Soil Mixing Collected in 2009 (µg/kg)	MCL-Based SSL[1] (µg/kg)	Current Worker RSL[2] (µg/kg)
TCE	<3,100; <3,000	43,000; 38,000; 3,300	1.8	19,000 (NC)
Vinyl chloride	<3,100; <3,000	150; <100; <110	0.69	17,000 (C)
cis-1,2-DCE	24,000; 5,000	23,000; 20,000; 2,500	21	2,300,000 (NC)
Benzene	520; <3,000	810; 650; <210	2.6	42,000 (NC)

[1] MCL-based soil screening level (SSL) from https://www.epa.gov/risk/regional-screening-levels-rsls (EPA 2017). Note that SSLs were designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, SSLs are based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface, do not reflect site-specific conditions, and should not be used for remedial action decisions.
[2] Worker Regional Screening Levels (RSL) from https://www.epa.gov/risk/regional-screening-levels-rsls (EPA 2017), adjusted to a cancer risk of 1×10^{-4} (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC').
µg/kg = micrograms per kilogram.

Samples taken post-soil mixing were collected as close as possible to the locations of samples collected for the baseline. Most of the contaminants exhibited an increase in concentration after the soil mixing, which may indicate mixing may have caused some mobilization of contaminants or could be a result of heterogeneous distribution of chemicals in the sample locations. No further soil remediation has occurred at OU-4. However, the changes to the groundwater extraction system as outlined in the 2012 ESD are expected to capture any mobilized contaminants to the groundwater.

Vinyl chloride, cis-1,2-DCE, and benzene are listed in the ROD as COCs with remediation goals for soil, but TCE is only listed as a COC with a remediation goal for groundwater. Vinyl chloride, cis-1,2-DCE, and benzene results from Table 14 show that soil remaining in that section of the OU-4 source area does not exceed the cleanup criteria established in the OU-4 ROD or the current (adjusted to a cancer risk of 1×10^{-4}) EPA worker RSLs for these contaminants. However, the levels of TCE found in soil collected in 2009 exceed the current (adjusted to a cancer risk of 1×10^{-4}) EPA worker RSL and could potentially be a source of cis-1,2-DCE and vinyl chloride. Soil may continue to act as source of groundwater contamination through leaching. The

groundwater cleanup may not reach cleanup levels until the residual soil contamination is addressed.

At the OU-4 Hotspot, soil was excavated according to the remedy and confirmatory samples collected. However, an unknown amount of contaminated soil remains in place underneath Building 15C and 16C. No soil samples were collected underneath these buildings as access is limited.

7.5.2 OU-4 Soil Gas Data

No formal soil gas assessment has been completed at OU-4. The potential exposure of soil gas through vapor intrusion at OU-4 due to buried waste has not been assessed for current warehouse/construction workers at Buildings 15C and 16C (OU-4 Hotspot area). Also, the potential exposure of soil gas through vapor intrusion at OU-4 due to contaminated soil/groundwater has not been assessed for future development on the site. A work plan to conduct a soil gas investigation prepared by the Army to assess the potential exposure of soil gas through vapor intrusion at OU-4, including at the OU-4 Hotspot area was sent to EPA and UDEQ for concurrence on June 1, 2017. EPA approved the work plan on August 4, 2017.

7.5.3 OU-4 Groundwater Data

Thirty-six (36) groundwater monitoring wells have historically been used to evaluate groundwater elevations on a semi-annual basis. VOC concentrations have been monitored in 16 of these wells, designated as compliance wells, for groundwater sampling also on a semi-annual basis. As stated previously, the 2012 ESD updates the compliance monitoring plan for OU-4 to more closely and accurately delineate the remaining plume. The 2012 ESD identifies that only vinyl chloride, cis-1,2-DCE and benzene remain as COCs in groundwater at OU-4. However, in recent monitoring, none of the COCs have been detected above their respective MCLs in the compliance monitoring wells. TCE and benzene have not been detected recently in compliance monitoring wells.

The most recent groundwater monitoring event for the OU-4 compliance wells was in June 2016. This sampling event gives the best estimation of the current extent of the OU-4 groundwater plume based on vinyl chloride concentrations. The area of the VOC plume is typically illustrated by creating isoconcentration contour maps. Vinyl chloride and DCE were not detected above their MCLs in the groundwater compliance samples during the June 2016 monitoring event. Results of the sampling are shown on Figure 4. An isoconcentration contour showing the location of detected vinyl chloride is shown on Figure 4 as a green dashed line. As discussed in Section 7.4.4, vinyl chloride is detected above the MCL in the OU-4 extraction system effluent samples, as well as extraction wells (note that extraction wells were not sampled in June 2016). An isoconcentration contour showing the location of vinyl chloride above the MCL is shown on Figure 4 as a red solid line.

The original extent of the plume is shown on Figure 5 from October 1995. Compared to the plume shown on Figure 5 from October 1995, the June 2016 plume on Figure 4 is much smaller and there are lower concentrations of vinyl chloride overall. All COCs have been below their respective MCLs since the July 2014 sampling event. **The June 2016 sampling event is the fifth consecutive sampling event with all compliance well sample concentration results for the COCs below their applicable MCLs, meeting the remedial goals listed in the ROD.**

As part of the five year review, the Mann-Kendall test and linear regression statistics were performed on select compliance wells at OU-4 and the OU-4 Hotspot using the Air Force program MAROS. The wells used for the analysis were selected because of detections of cis-1,2-DCE or vinyl chloride either above or near the applicable MCLs. Procedures used to analyze the groundwater data from OU-4 are the same as procedures used to evaluate OU-1 and explained in Section 7.5.1. Historic vinyl chloride data from compliance monitoring wells JMM-08, JMM-09, JMM-57, JMM-64, and HS-08 were analyzed and historic cis-1,2-DCE data from compliance wells JMM-08 and JMM-09 were also analyzed. Data used for the analysis came from the semi-annual sampling events of the compliance wells for the time period of December 2003 to June 2016. Since non-compliance wells are not included in the semi-annual sampling events and there is not enough data to perform statistical analysis, the data from those wells including the December 2010 sampling event were not used. Tables 15 and 16 are summary tables of the trend results of Mann-Kendall and Linear Regression for each well. A full report on each well can be found in Appendix H.

Table 15: Results of Mann-Kendall Analysis Using MAROS for OU-4 and OU-4 Hotspot Wells

Monitoring Well	COC	Mann-Kendall Statistic	Confidence in Trend	Concentration Trend
JMM-08	cis-1,2-DCE	-167	100%	Decreasing
JMM-09	cis-1,2-DCE	-61	93.1%	Probably Decreasing
HS-08	Vinyl chloride	-224	100%	Decreasing
JMM-08	Vinyl chloride	-172	100%	Decreasing
JMM-09	Vinyl chloride	-151	100%	Decreasing
JMM-57	Vinyl chloride	-106	99.3%	Decreasing
JMM-64	Vinyl chloride	-155	100%	Decreasing

Table 16: Results of Linear Regression Analysis Using MAROS for OU-4 and OU-4 Hotspot Wells

Monitoring Well	COC	Ln Slope	Confidence in Trend	Concentration Trend
JMM-08	cis-1,2-DCE	-8.9 E-4	100%	Decreasing
JMM-09	cis-1,2-DCE	-1.7 E-5	56.6%	No Trend
HS-08	Vinyl chloride	-5.2 E-4	100%	Decreasing
JMM-08	Vinyl chloride	-1.7 E-3	100%	Decreasing
JMM-09	Vinyl chloride	-3.1 E-4	100%	Decreasing
JMM-57	Vinyl chloride	-3.0 E-4	99.8%	Decreasing
JMM-64	Vinyl chloride	-4.0 E-4	100%	Decreasing

As seen from Tables 15 and 16, most of the wells show a decreasing trend in contamination levels. However, no trend could be determined for cis-1,2-DCE in well JMM-09 using the linear regression test, but the Mann-Kendall test indicated it was probably decreasing. None of the wells show increasing concentration trends. Also, all the wells that were used for the statistical trend analysis have been below the applicable MCLs for at least five years. While the compliance wells all show stable or decreasing concentrations, it is difficult to determine the overall trend of the groundwater plume since many of the wells that define the extents of the plume are not sampled

routinely. With the implementation of the 2012 ESD, the selection of compliance wells was modified. Trend analysis should be routinely performed to evaluate the more contaminated wells for all COCs (vinyl chloride, cis-1,2-DCE, and TCE). This future trend analysis can be used to determine if residual contamination in the source is continuing to leach into groundwater.

At the OU-4 Hotspot, the concentrations of vinyl chloride, cis-1,2-DCE, and TCE are consistently below the applicable MCLs. The highest levels of vinyl chloride contamination in the past five years has been found at monitoring well HS-08, but vinyl chloride levels in this well have not been detected above the MCL since January of 2007. The low concentrations of vinyl chloride and cis-1,2-DCE suggest that residual VOC contamination in the soil beneath Building 15C and 16C may be limited in extent and is not leaching to groundwater.

7.5.4 Operable Unit 4 Groundwater Extraction System

In the past five years, the OU-4 groundwater extraction system has operated at a greater than 97.5% run-time. Historically, frequent down-time of the system was due to the frequent biofouling of the injection wells causing a back-pressure shutdown at the treatment plant. After the system effluent was no longer injected into the aquifer, down-times are only associated with routine maintenance of the system components or power outages.

The effluent concentrations typically are below the MCLs for all COCs except vinyl chloride, which consistently exceeds its MCL. Although vinyl chloride levels exceed the MCL, the levels are acceptable for discharge to the CWSID. In December 2013 and in compliance with the 2012 ESD, the OU-4 treatment system was modified to six extraction wells discharging directly to the CWSID.

During the last monitoring event (June 2016), approximately 590 grams of cis-1,2-DCE and 460 grams of vinyl chloride were removed (between January 1, 2016 and June 30, 2016). The mass removal of VOCs from the extraction system indicates the operation of the system is still warranted to decrease mass in the groundwater plume.

7.5.5 Operable Unit 4 Hotspot Groundwater Extraction System

Effluent concentrations at the OU-4 Hotspot extraction system are consistently below the MCL for benzene, cis-1,2-DCE, TCE, and vinyl chloride. Typically the effluent concentrations are also below the laboratory reporting limits.

As of June 2016, the OU-4 Hotspot treatment system had extracted and discharged almost 120 million gallons since the system started. The last monitoring event (June 2016) showed no mass of cis-1,2-DCE or vinyl chloride was removed.

The 2012 ESD states that the Hotspot trench will remain operational in the short term to insure that the planned modifications to the OU-4 treatment system do not allow any contaminated groundwater to travel beyond the Depot boundaries. Given the low mass removal rate and the fact that the surrounding monitoring wells do not exhibit concentrations above MCLs for any COCs as shown on Figure 4, it appears that the operation of the OU-4 Hotspot extraction system is currently unnecessary as the groundwater upgradient of the system no longer contains concentrations of COCs exceeding the MCLs.

7.6 OU-4 Technical Assessment

The assessments of remedy effectiveness are typically presented separately for each site undergoing a remedy and where contamination remains on site that prevents unrestricted use.

The assessment is focused on answering three questions:

- **Question A**: Is the remedy functioning as intended by the decision documents?
- **Question B**: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?
- **Question C**: Has any other information come to light that could call into question the effectiveness or performance of the remedy?

7.6.1 Question A: Are the remedies functioning as intended by the decision documents?

The remedy has been modified since the original ROD was signed in 1992 and amended in 2000. A 2012 ESD changed the remedy from extraction, treatment, and injection of groundwater to the extraction and direct discharge of extracted groundwater into the CWSID where it is treated with comingled sewage and other liquid waste. Continued capture of the reduced plume by a reduced extraction system has been demonstrated since April 2010 by the transitional pump, treat, and discharge system approved by EPA and UDEQ and managed by USACE. As discussed in Section 7.5.1, concentrations of vinyl chloride and cis-1,2-DCE are stable or decreasing in monitoring wells based on data from treatment start up through June 2016. Data also indicates that the groundwater extraction system is successfully reducing contamination levels below the applicable MCLs in compliance wells. However, effluent concentrations of vinyl chloride still consistently exceeds its MCL, although the levels are acceptable for discharge to the CWSID.

For OU-4 Hotspot, the concentrations of vinyl chloride and cis-1,2-DCE are consistently below the applicable MCLs. The highest levels of vinyl chloride contamination in the past five years have been seen at HS-08. Even this well has not had vinyl chloride levels above the MCL since January of 2007 when the concentration was 2.3 µg/L. Effluent concentrations to the OU-4 Hotspot groundwater extraction system are consistently below the MCL and laboratory detection limits for benzene, cis-1,2-DCE, TCE, and vinyl chloride. The low concentrations of vinyl chloride and cis-1,2-DCE suggest that if there is still a source of VOC contamination in the soil beneath Building 15C and 16C that was left during excavation of the former Oil Pit, then the source area is not leaching significant amounts of contaminants to groundwater. The groundwater treatment trench has reached its objective of reducing concentrations in groundwater below the MCL and may no longer be necessary.

• **OU-4 Institutional Controls Evaluation:** The Quitclaim Deeds between the US Secretary of the Army and Ogden City for this part of the former Depot, recorded with Weber County, Utah on December 21, 2001 for FOST 3 and on September 24, 2003 for FOST 4 include two restrictive covenants that control land use such that “the Grantee, its successors and assigns, shall not use, or allow any use of the Restricted Property for other than commercial or industrial purposes and it shall not be used for residential purposes.” and “access, extract, or use groundwater, nor inject any materials into any wells located on the Restricted Property.” These restrictions are currently being

followed. The property overlaying OU-4 soil and groundwater contamination remain as industrial property with no residential usage. No disturbance to the contaminated groundwater has occurred.

No institutional controls currently exist that prevent the construction of structures over the contaminated soil and groundwater at OU-4 where future commercial workers could be exposed to contaminated soil gas through vapor intrusion. Since no formal vapor intrusion assessment has been completed for OU-4, it is unknown if additional institutional controls are required to prevent exposure for future workers. A work plan to conduct a soil gas investigation prepared by the Army to assess the potential exposure of soil gas through vapor intrusion at OU-4, including at the OU-4 Hotspot area was sent to EPA and UDEQ for concurrence on June 1, 2017. EPA approved the work plan on August 4, 2017.

Institutional controls in the 2000 ROD Amendment and the December 2001 Quitclaim Deed for FOST 3 regarding the OU-4 Hotspot have not been fully implemented. The Deed and ROD Amendment state that excavation, digging, or disturbance of the soil beneath the foundations or the foundation elements of Building 15C and 16C is not permitted without written approval of the DLA, EPA, and UDEQ. The property manager of Building 15C, the Boyer Company, was aware of these digging restrictions and of coordinating with the Army regarding invasive work that may disturb the groundwater treatment system components and work near or under Buildings 15C and 16C. During the 2012 Fourth Five Year Review, the property owner of Building 16C, Petersen, Inc., was made aware of the digging restrictions or need for excavation work approval and were made aware of the presence of buried waste under their building. The Deed and ROD Amendment also state that there will be placement of warning signs on Buildings 15C and 16C and within any future buildings constructed on the Building 15C and 16C sites stating, “No Excavation Beneath the Building Foundation without Prior Approval.” These signs have been placed as directed since the 2012 Fourth Five Year Review and were found during the site inspection discussed in Section 7.4 (as noted in that section, the signs were found to be incorrectly placed). Both the digging restrictions and signage requirements are listed in Petersen’s deed for Building 16C.

Although the property owners have been made aware of the institutional controls and the institutional control of signage has been implemented, it is recommended that an Institutional Controls Monitoring Program be implement to increase awareness of institutional controls for the OU-4 Hotspot area listed in the 2000 ROD Amendment and the Quitclaim Deed. At this time, there has been no disturbance of the soil left in place underneath Buildings 15C and 16C. However, if awareness of the restrictions is not maintained, the remedy may not be protective in the future.

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

Evaluation of potential vapor intrusion is an ongoing, unresolved issue mainly at the OU-4 Hotspot in the short term, but also at the OU-4 wellfield in the future. A soil gas survey should be conducted to determine the risks posed by this issue and whether or not the remedy is effective. A work plan to conduct a soil gas investigation prepared by the Army to assess the potential exposure of soil gas through vapor intrusion at OU-4, including at the OU-4 Hotspot area was sent to EPA and UDEQ for concurrence on June 1, 2017. EPA approved the work plan on August 4, 2017.

• **Changes in Standards and To Be Considered:** A review of the 1992 ROD shows that soil cleanup values were established for 10 compounds; arsenic, benzene, benzo(a)pyrene, cis-1,2-

DCE, dioxins/furans, lead, PCBs, total petroleum hydrocarbons as diesel, total petroleum hydrocarbons as motor oil and vinyl chloride. However, the ROD also stated that these values were established only if a hotspot was found, and the 2000 ROD amendment established cleanup values for seven compounds at the OU-4 Hotspot; arsenic, benzene, cis-1,2-DCE, dioxins/furans, lead, PCBs and vinyl chloride. Table 17 compares the soil remedial criteria established in the 2000 ROD amendment to current (adjusted to a cancer risk of 1×10^{-4}) EPA worker screening levels (https://www.epa.gov/risk/ regional-screening-levels-rsls) which are appropriate TBC criteria for OU-4. Removal of contaminated soils at OU-4 has effectively isolated contaminants in vadose-zone soils from potential direct human exposure. Therefore, surface and near-surface soils at OU-4 do not represent a completed receptor exposure pathway. However, the level of contamination left in place at the OU-4 Hotspot is unknown and possible exposure pathways are discussed below.

Table 17: OU-4 Soil Cleanup Standards Compared to 2017 EPA Regional Screening Levels

COC	Soil Remediation Criteria[1] (mg/kg)	Current Worker RSL[3] (mg/kg)
Arsenic	35[1]	300 (C)
Benzene	210[1]	420 (NC)
cis-1,2- DCE	700[1]	2,300 (NC)
Dioxins/Furans	0.001[1]	0.0022 (C)
Lead	500[1]/**1,850**[2]	800 (NC)
PCBs	25[1]	94 (C)
Vinyl chloride	3.2[2]	170 (C)

1 1992 OU-4 ROD
2 2000 OU-4 ROD amendment
3 Worker Regional Screening Levels (RSL) from https://www.epa.gov/risk/regional-screening-levels-rsls (EPA, 2017), adjusted to a cancer risk of 1×10^{-4} (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC').
mg/kg = milligrams per kilogram.
NA – Not available
Bolded values indicate the remedial goal exceeds the current adjusted RSL

The cleanup values established for groundwater are based on EPA federal MCLs or state of Utah MCLs for benzene, cis-1,2-DCE, dioxins/furans, PCBs and vinyl chloride. Table 18 compares the 1992 ROD MCLs to the current MCLs, showing that no changes to these standards have occurred. The MCLs are ARARs for this site, and the selected remedy complies with current ARARs and TBC criteria or guidance.

Table 18: OU-4 Groundwater Cleanup Standards Compared to MCLs

COC	Groundwater Action Level (µg/L)	2016 Federal MCL[1] (µg/L)	2017 Utah MCL[2] (µg/L)
Benzene	5	5	5
cis-1,2- DCE	70	70	70
Vinyl chloride	2	2	2
PCBs	0.5	0.5	0.5
Dioxins/Furans	0.00003	0.00003	0.00003

MCL = Maximum Contaminant Level
1 Obtained from https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants as of October 2016.
2 Obtained from https://rules.utah.gov/publicat/code/r309/r309-200.htm as of January 2017.

• **Changes in Exposure Pathways:** No known or completed exposure pathways currently exist from domestic use of groundwater. It is unlikely that this shallow, low-yield aquifer would be used as a domestic water supply, and use of groundwater is regulated by the state of Utah via issuance of well drilling permits. Further, there is a deed restriction limiting the property to industrial or commercial use. A review of the human health risk assessment and subsequent source area investigations indicates that there have been no changes in exposure pathways evaluated. OU-4 remains industrial with no changes to land immediately adjacent.

Inhalation of indoor air impacted by volatile compounds in groundwater was not evaluated in the risk assessment and is a potentially complete exposure pathway. To assess potential risks associated with vapor intrusion, the most recent maximum detection of groundwater concentrations were compared to relevant screening criteria in Table 19. The commercial target groundwater screening criteria for TCE and vinyl chloride were obtained from EPA's VISL calculator (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-levels-visls) (Note that inhalation toxicity criteria are not available for cis-1,2-DCE therefore, target groundwater screening criteria for vapor intrusion have not been established). EPA VISLs were used because none are available from the state of Utah. Table 19 shows that maximum detected groundwater concentrations at OU-4 do not pose a potential threat to indoor workers.

Table 19: Comparison of Groundwater Concentrations to Commercial Groundwater to Indoor Air Screening Levels – OU-4

COC	Maximum Detected Groundwater Concentration[1] (µg/L)	Extraction System Effluent Concentration[2] (µg/L)	Commercial Groundwater to Indoor Air Screening Level[3] (µg/L)
Benzene	< 2.0	1.95	600 (NC)
cis 1,2-DCE	3.05	17	--
TCE	< 2.0	3.29	22 (NC)
Vinyl chloride	1.54	13.2	250 (C)

[1] June 2016 groundwater sampling event.
[2] Extraction well data are not available from the June 2016 groundwater sampling event; therefore, system effluent concentrations are shown for comparison.
[3] VISLs are based on model default parameters for the commercial scenario (25 year exposure duration, 250 days/year exposure frequency, 8 hours/day exposure time, generic attenuation factor of 0.001, and a target cancer risk of 1×10^{-4} or non-cancer hazard quotient of 1.0 (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC').

The maximum detected vinyl chloride concentration from a sample collected from the OU-4 system effluent is also below the relevant screening criterion for indoor air risk due to groundwater. This does provide an indication of what concentrations are within the source area. Therefore, indoor air may pose a risk to receptors in an industrial setting, should a building ever be constructed over the OU-4 source area. Further, volatiles left in place under existing buildings at the OU-4 Hotspot have not been characterized or evaluated for potential current impact to indoor workers. Soil is the main concern at the OU-4 Hotspot since concentrations in groundwater in the OU-4 Hotspot area are consistently below the MCL.

• **Changes in Toxicity, Other Contaminant Characteristics, and Risk Assessment Methodologies:** A review of the human health risk assessment and ecological risk assessment shows that the methodologies applied are still protective and appropriate. There have been changes

to the values for toxicity parameters and contaminant properties. For example, an RfC was issued by EPA for TCE in September 2011 which may affect vapor intrusion evaluations. However, the selected cleanup levels of the remedy are based on MCL and not risk-based calculations, and therefore the protectiveness of the remedies for groundwater contamination has not changed.

• **Expected Progress Toward Meeting RAOs:** As discussed in Section 7.5.1, the most recent data collected as part of the soil mixing pilot study at OU-4 shows that remaining concentrations in soil comply with the established cleanup criteria listed in the ROD and the current worker RSLs. However, soil in the OU-4 source area may continue to act as a source of groundwater contamination through leaching. It appears that the groundwater cleanup may not reach cleanup levels until the residual soil contamination is addressed. Groundwater data collected in non-compliance wells in May 2016 show that there are still levels of vinyl chloride that exceed the MCL in the OU-4 area. Statistical analysis of the compliance wells indicates decreasing trends for vinyl chloride and cis-1,2-DCE, but there is not enough data to analyze trends in the non-compliance wells and completely characterize the plume.

At the OU-4 Hotspot, soil excavation and off-site disposal has been conducted to meet applicable RAOs. However, it is unknown whether the RAOs are being met where contamination was left in place underneath buildings 15C and 16C. The RAOs for groundwater at the OU-4 Hotspot have been achieved. All levels of cis-1,2-DCE and vinyl chloride in monitoring wells and effluent of the treatment system are consistently below the MCL.

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

Yes, EPA has identified perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), a family of man-made chemicals that are part of the chemical makeup of aqueous film forming foam (AFFF), as emerging contaminants (EPA, 2014). An emerging contaminant is a chemical or material that is characterized by a perceived, potential, or real threat to human health or the environment or by lack of published health standards. These chemicals were used in a variety of products such as surfactants and fire suppressant foams. It is unknown whether the fire training activities at the site may have used PFOS or PFOA, and to date no data have been collected. Because data are unavailable to support the contention that, if present, PFOS and PFOA residual levels are not a threat to human health and the environment after the extensive remediation at OU-4, limited groundwater sampling and analysis is planned for PFOA and PFOS. These data will be addressed in the next five year review.

8.0 ISSUES

The following issues were identified during this fifth five year review related to the protectiveness of the on-going actions at DDOU. Suggested recommendations for issues and optimization of the remedies are included in Section 9.0.

Table 20: Issues Identified in the Fifth Five Year Review

OU	Issue	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
4	1. The potential exposure of soil gas through vapor intrusion at OU-4 due to contaminated soil/groundwater has not been assessed for future development on the site.	N	Y
4	2. The potential exposure of soil gas through vapor intrusion at OU-4 due to buried waste has not been assessed for current warehouse/construction workers at Buildings 15C and 16C (OU-4 Hotspot area).	N	Y
4	3. Institutional controls for the OU-4 Hotspot area including restricting disturbance of contaminated waste and building foundations listed in the 2000 ROD Amendment and Quitclaim Deed for FOST 3 have been implemented; however, required signage has been placed in the wrong location and sign text may be too vague to prevent digging.	N	Y
4	4. Residual soil contamination in the OU-4 source area remains in place and may represent a continual source of groundwater contamination through leaching to groundwater.	N	Y
4	5. The existing monitoring well network is not representative of the remaining plume. Other than occasionally, the remaining OU-4 plume is not routinely monitored (that is, other than the extraction system effluent, extraction wells within the plume are not monitored).	N	Y

9.0 RECOMMENDATIONS

The following recommendations are presented to address the protectiveness issues identified in Section 8.0:

Table 21: Recommendations to Address Issues Identified in the Fifth Five Year Review

Operable Unit Site Description	Issue Type	Issue	Recommendation	Affects Protectiveness		Milestone Date
				Current	Future	
OU-4 Burial sites 4-A through 4-E and OU-4 Hotspot	RP	The potential exposure of soil gas through vapor intrusion at OU-4 due to contaminated soil/ groundwater has not been assessed for future development on the site.	Perform a soil vapor assessment of the OU-4 groundwater plume and source area.	N	Y	1/1/2019
	RP	The potential exposure of soil gas through vapor intrusion at OU-4 due to buried waste has not been assessed for current warehouse/construction workers at Buildings 15C and 16C (OU-4 Hotspot area).	Perform a soil vapor assessment of the OU-4 Hotspot area for current ware-house/construction workers at Buildings 15C and 16C.	N	Y	1/1/2019
	IC	Institutional controls for the OU-4 Hotspot area including restricting disturbance of contaminated waste and building foundations listed in the 2000 ROD Amendment and Quitclaim Deed for FOST 3 have been implemented; however, required signage has been placed in the wrong location and sign text may be too vague to prevent digging.	Move existing signs to correct location, and evaluate/revise sign text.	N	Y	4/1/2018
			Implement and increase aware- ness of institutional controls for the OU-4 Hotspot area listed in the 2000 ROD Amendment and Quitclaim Deed for FOST 3 through an Institutional Controls Monitoring Program.	N	Y	10/1/18
	RP	Residual soil contamination in the OU-4 source area remains in place and may represent a continual source of groundwater contamination through leaching to groundwater.	Review of cost-effective options to decrease the potential leaching of contaminants in soil may be considered to optimize the current groundwater remedy.	N	Y	1/1/2019

Table 21: Recommendations to Address Issues Identified in the Fifth Five Year Review

Operable Unit Site Description	Issue Type	Issue	Recommendation	Affects Protectiveness		Milestone Date
				Current	Future	
	RP	The existing monitoring well network is not representative of the remaining plume. Other than occasionally, the remaining OU-4 plume is not routinely monitored (that is, other than the extraction system effluent, extraction wells within the plume are not monitored).	Evaluate whether extraction wells should be routinely monitored.	N	Y	7/1/2018
			Evaluate changes to the monitoring well network, as well as the OU-4 Hotspot extraction trench.			1/1/19

Issue types: RP = remedy performance IC = institutional or land use controls
Lead Agency: Army
Oversight Agencies: EPA and UDEQ

The following recommendations are made to optimize the performance of the remedies but are not related to protectiveness issues:

1. Perform statistical analysis of groundwater data in an annual groundwater monitoring report for OU-1 to confirm that concentrations are not increasing. Given recent monitoring results and trends, the Army should consider petitioning for a Response Complete determination for OU-1 and approval of site closure from EPA and UDEQ.

2. As data from the current compliance wells at OU-4 becomes available, statistical analysis of groundwater data should be performed to confirm that concentrations of more contaminated wells continue to decline.

3. Monitoring well concentrations and effluent concentrations to the OU-4 Hotspot treatment system are consistently below laboratory reporting limits and applicable MCLs for vinyl chloride and cis-1,2-DCE. Following performance of a soil vapor study, and dependent on the results, the Army should consider petitioning for a Response Complete determination from EPA and UDEQ for all but the OU-4 source area.

10.0 PROTECTIVENESS STATEMENTS

The OU-1 remedy is protective of human health and the environment and potential exposure pathways that could result in unacceptable risks are being controlled through LUCs which prohibit groundwater use and residential land use as groundwater restoration continues to progress.

A protectiveness determination of the remedy at OU-4 cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: vapor intrusion assessment of the OU-4 Hotspot area, OU-4 groundwater plume, and OU-4 soil contamination. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination will be made. Additionally, awareness of institutional controls for the OU-4 Hotspot area listed in the 2000 ROD Amendment and the Quitclaim Deed should be increased through an Institutional Controls Monitoring and Awareness Program. In the interim, LUCs are working to prohibit exposures via groundwater use and residential land use.

The sitewide protectiveness for DDOU is deferred until further vapor intrusion assessment of OU-4 is completed.

11.0 NEXT REVIEW

The sixth five-year review report for DDOU is scheduled to be completed by September 27, 2022, five years from the completion date of this review.

12.0 REFERENCES

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EPA. 2017. Regional Screening Levels (RSL). https://www.epa.gov/risk/regional-screening-levels-rsls. June.

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FIGURES

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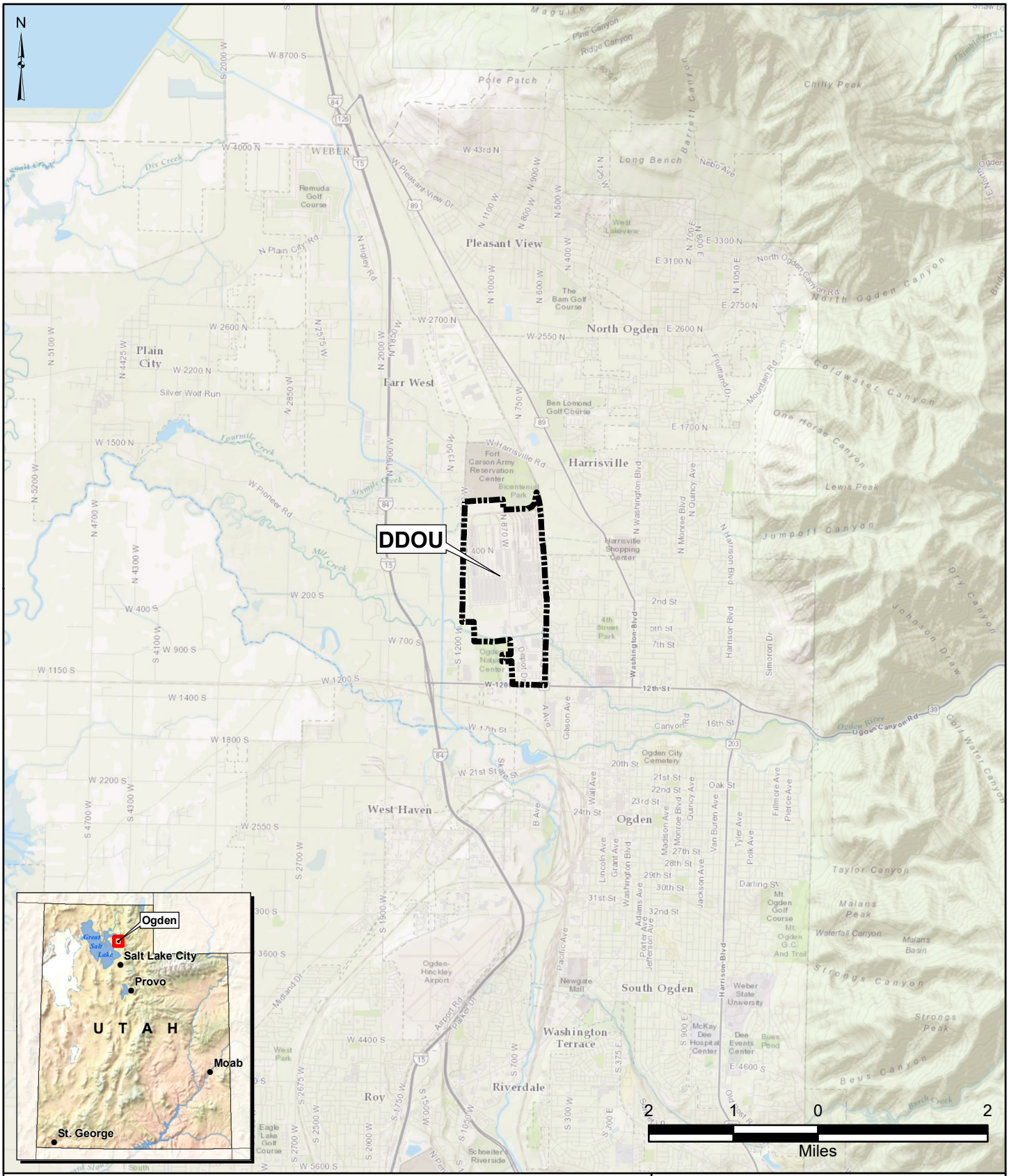
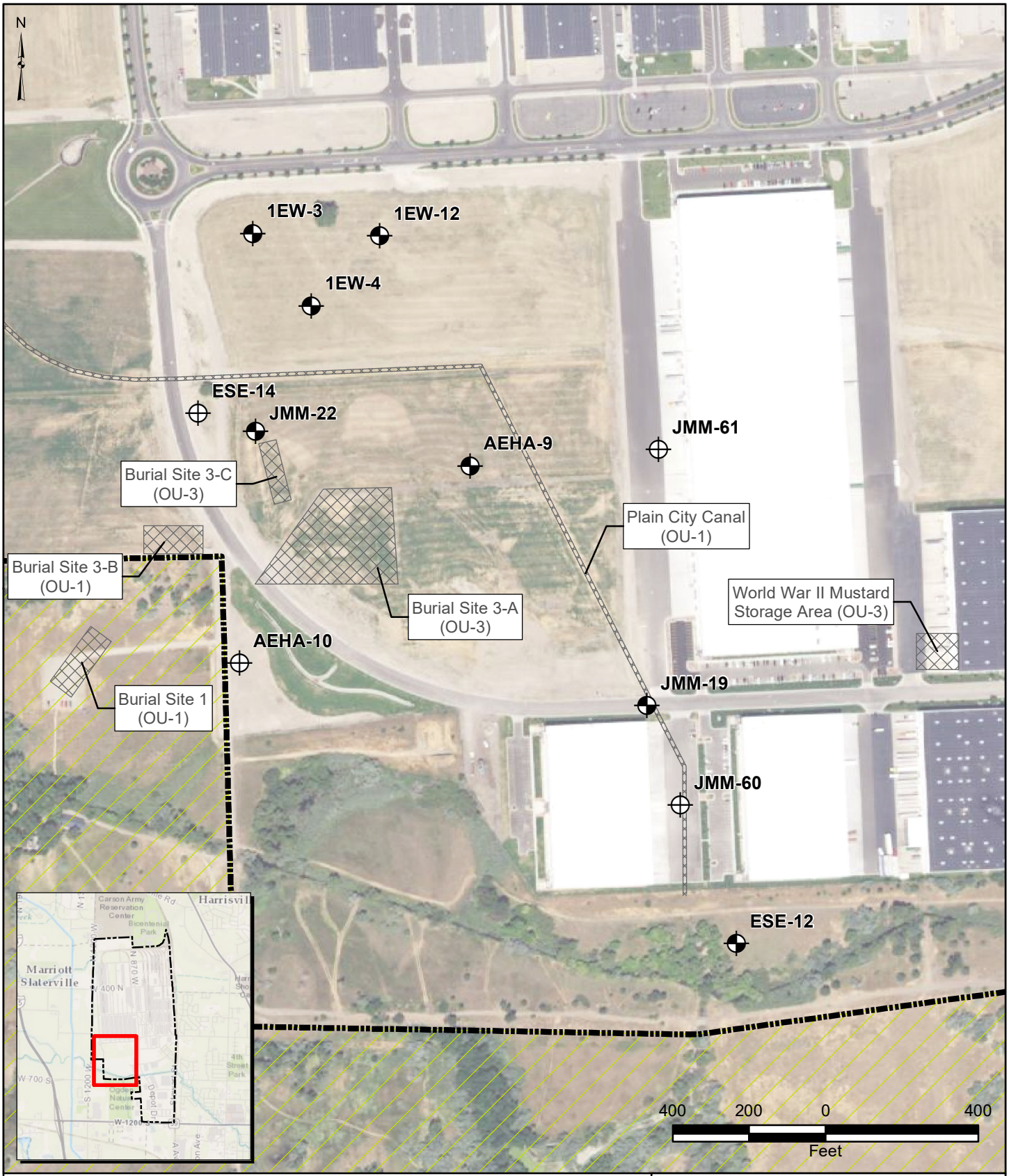


FORMER DEFENSE DEPOT OGDEN, UTAH (DDOU)
WEBER COUNTY, UTAH

FIGURE 1

SITE LOCATION MAP

Prepared by	Date	FILE: GIS/DDOU_FYR/FIGURE_1.MXD
USACE	08/28/17	



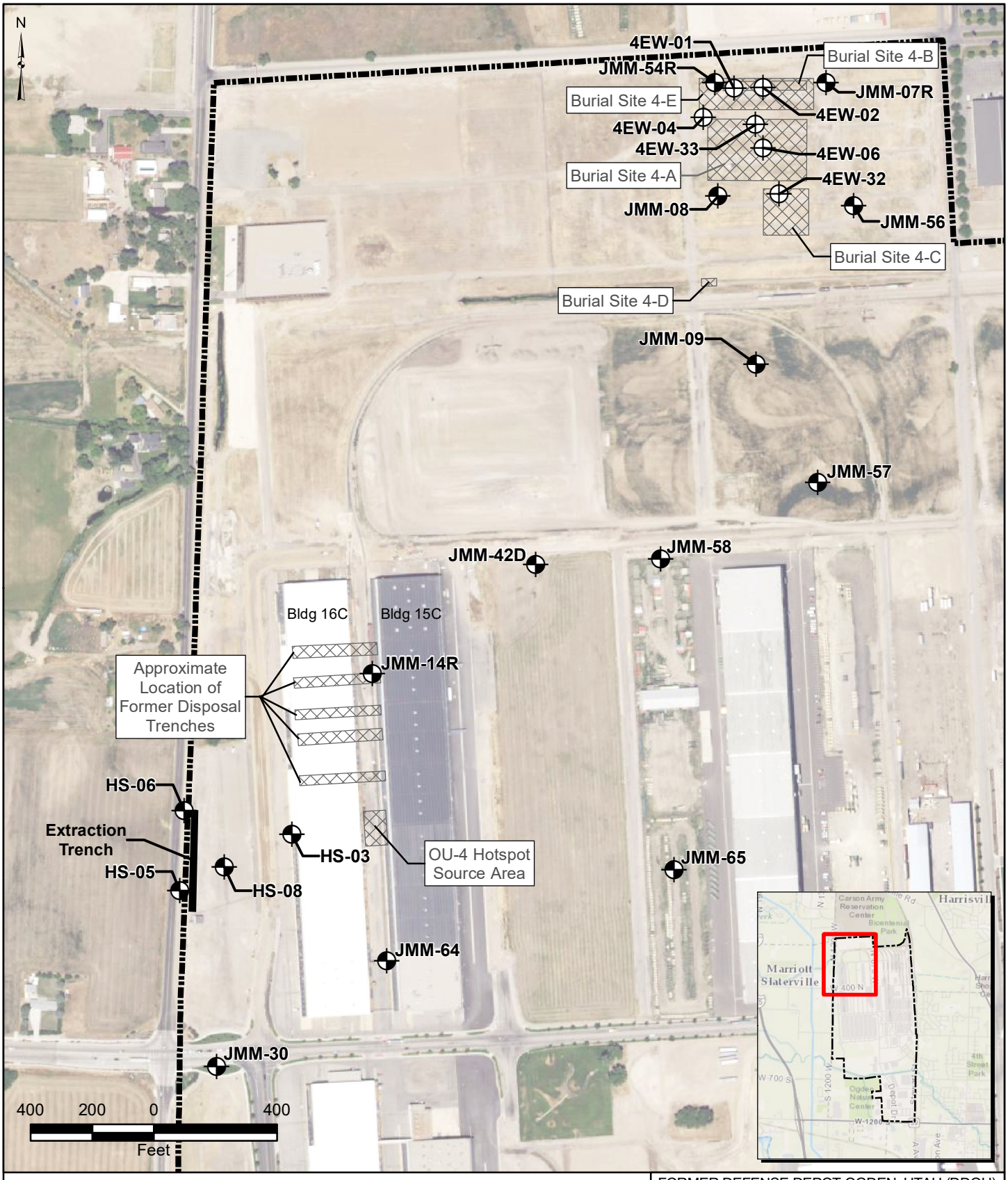
DDOU Boundary
Ogden Nature Center
OU-1 Historical Features
Compliance Monitoring Well
Elevation Monitoring Well

FORMER DEFENSE DEPOT OGDEN, UTAH (DDOU)
WEBER COUNTY, UTAH

FIGURE 2

OPERABLE UNIT-1
SITE MAP

Prepared by	Date	FILE: GIS/DDOU_FYR/FIGURE_2.MXD
USACE	08/28/17	



DDOU Boundary

OU-4 Historical Features

Compliance Monitoring Well

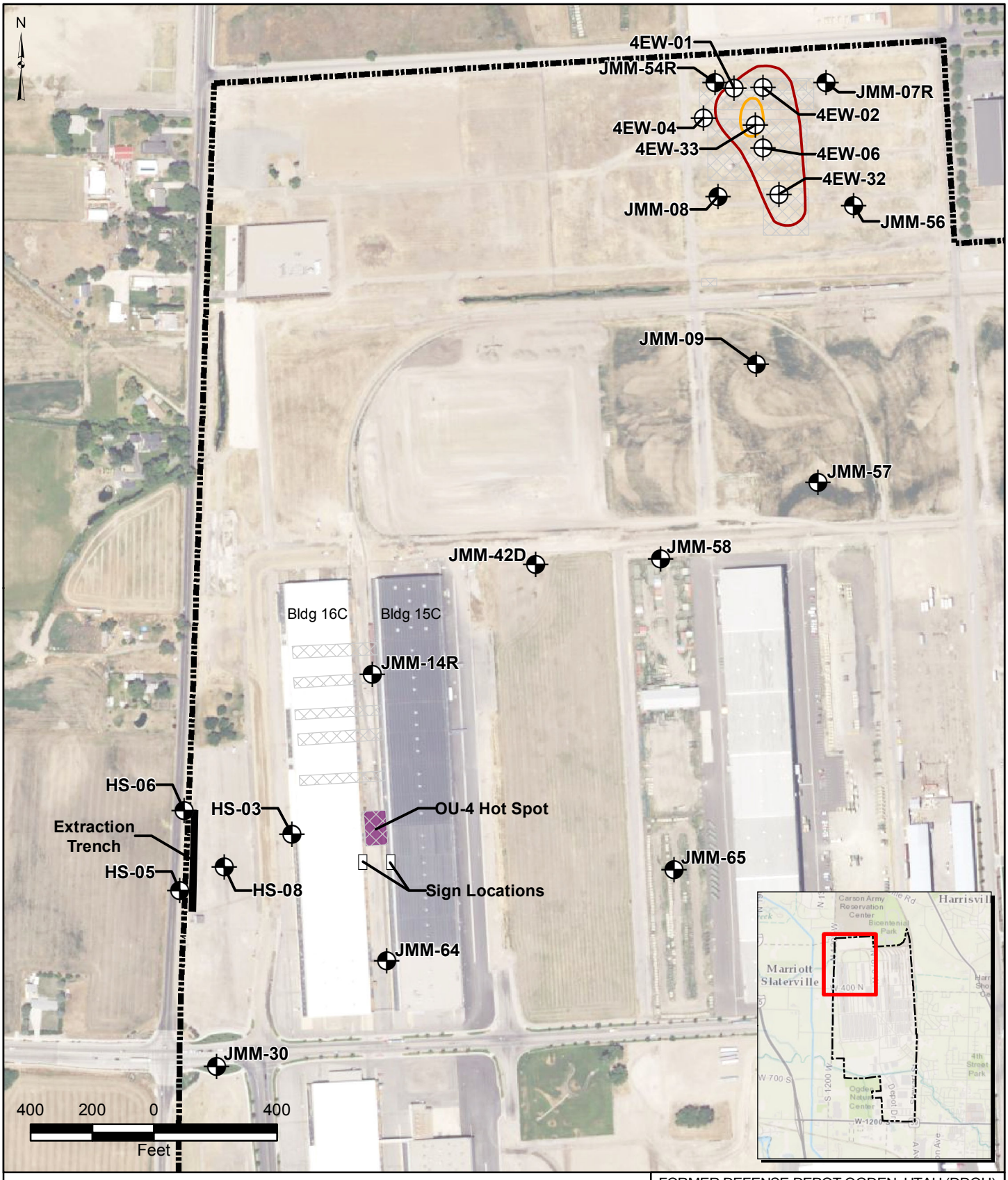
Extraction Well

FORMER DEFENSE DEPOT OGDEN, UTAH (DDOU)
WEBER COUNTY, UTAH

FIGURE 3

OPERABLE UNIT-4
SITE MAP

Prepared by	Date	FILE: GIS/DDOU_FYR/FIGURE_3.MXD
USACE	08/28/17	

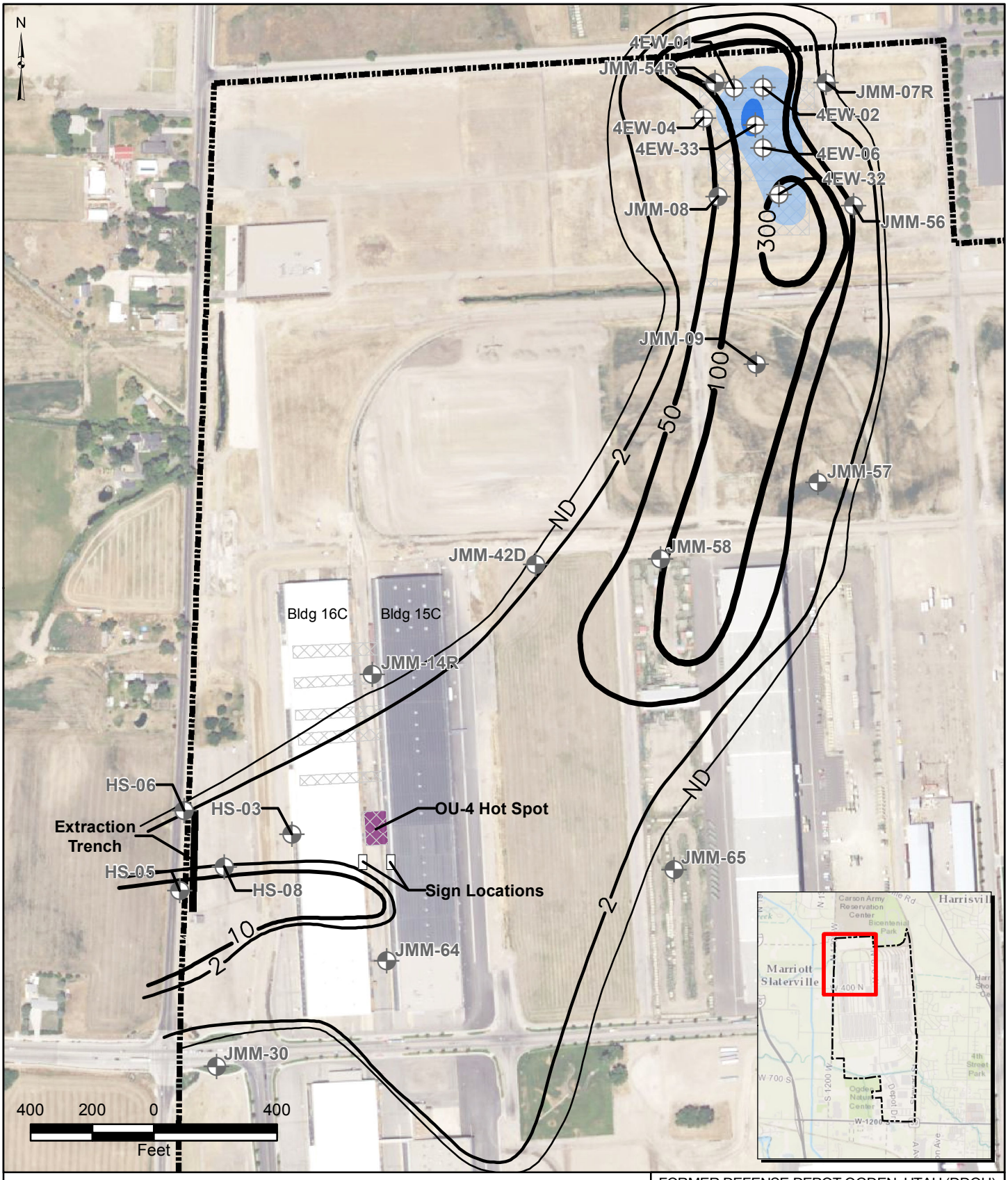


FORMER DEFENSE DEPOT OGDEN, UTAH (DDOU)
WEBER COUNTY, UTAH

FIGURE 4

OU-4 GROUNDWATER CONCENTRATIONS JUNE 2016

Prepared by	Date	FILE: GIS/DDOU_FYR/FIGURE_4.MXD
USACE	08/28/17	



DDOU Boundary

OU-4 Historical Features

June 2016 Contours

Vinyl Chloride >MCL (2.0 µg/L)

20.0 µg/L Vinyl Chloride

Compliance Monitoring Well

Extraction Well

Note: All wells used to develop the 1995 isoconcentration lines are not included on this figure.

FORMER DEFENSE DEPOT OGDEN, UTAH (DDOU)
WEBER COUNTY, UTAH

FIGURE 5

OU-4 GROUNDWATER CONCENTRATIONS OCTOBER 1995

Prepared by	Date	FILE: GIS/DDOU_FYR/FIGURE_5.MXD
USACE	08/28/17	

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APPENDIX A

EPA COMMENTS ON THE DRAFT FINAL FIVE YEAR REVIEW REPORT AND THE USACE RESPONSE TO COMMENTS

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U.S. Army Corps of Engineers	Draft Final Five Year Review Report, Ogden DDHU	CESPK-ED

Project:	Former Defense Depot Ogden, Ogden, Utah				
Document:	Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden				
Reviewers:	Ms. Natasha Davis, US Environmental Protection Agency			**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
General Comments					
1			The protectiveness deferred status is appropriate for the site and requires submittal of an addendum once the milestones have been accomplished. Amend the Addendum due date to the milestone date.	Agreed. An addendum due date of December 31, 2019 has been added to the report. This should provide sufficient time to conduct the necessary vapor intrusion assessment.	
2			The technical evaluation belongs after the 5YR process and the progress since the last 5YR, so the issues and recommendations come right after it. The technical evaluation should incorporate what came out of the process.	Agreed. This report has been revised as suggested.	
3			The report should include the RAO summary table provided during the 5YR review training last year. The table could appear somewhere in the beginning material; background, or basis for taking action area. It's a planning tool, but it's also good orientation in the report.	Agreed. The RAO summary table(s), as provided by EPA has been incorporated into the Executive Summary of the report.	
4			When evaluating whether residual soil contamination is a source to GW, use the soil screening levels for protection of GW not the human health RSLs. Amend throughout the document.	Agreed. These values have been added, where applicable.	
5			The OU1 MNA remedy is protective, but appears to be functioning marginally. The OU1 statistical analysis indicated that VC concentrations appear to be declining in only two wells, the other wells are stable or have no trend. The 2015/2016 Annual GW Compliance Report, Table 4 showed ORP values are negative with low DO values, indicating the GW environment appears to be anaerobic and reductive. Discussion of the impact of a reductive environment should be included in the report.	Agreed. The following has been added to Section 4.5.1: "It has been noted that the upgradient Ogden Nature Center may be influencing groundwater chemistry at OU 1. This may be affecting the attenuation of vinyl chloride leading to the stable trends described above."	
6			OU2 and OU3 have achieved UU/UE, which is the regulatory requirement for no longer evaluating areas of a site in a 5-year review. Confirm that assumptions used in determining UU/UE are still valid. This can be done in an appendix, and the message from the appendix can be distilled to a minimum amount of text in the report. Use UU/UE instead of, or in addition, to Response Complete throughout the report.	Agreed. The last sentences in the paragraph of the Executive Summary and Section 1.3 discussing these OUs have been changed to: "Because OU-2 and OU-3 have achieved unlimited use/unrestricted exposure (UU/UE) further reviews are not necessary and these OUs will not be discussed in future reports." In addition, UU/UE has been added to Section 3.3, as well as the following sentence: "Exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid for these two OUs."	

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

U.S. Army Corps of Engineers	Draft Final Five Year Review Report, Ogden DDHU	CESPK-ED

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Document:	Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden				
Reviewers:	Ms. Natasha Davis, US Environmental Protection Agency			**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
7			The OU4 VI workplan approval should be documented in the report. When discussing VISL, the conclusions need to be reproducible. Attach the assumptions that went into running the model in an appendix.	Agreed. EPA approval of the work plan has been added where appropriate. The footnotes in Tables 12 and 18 have been revised to read: "VISLs are based on model default parameters for the commercial scenario (25 year exposure duration, 250 days/year exposure frequency, 8 hours/day exposure time, generic attenuation factor of 0.001, and a target cancer risk of 1×10^{-4} or non-cancer hazard quotient of 1.0 (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC')."	
8			Changing the OU4 MW network may be necessary as the MWs are no longer representative of the remaining plume. This is an issue that needs to appear in the report and Issues and Recommendations table.	See response to comment #43c.	
Specific Comments					
Operable Units 2 and 3					
9			If toxicity or other factors effecting UU/UE are no longer valid, this affects the protectiveness, so confirmation of the changes needs to be included in this 5YR and continued in future 5YRs. Add this clarifying information to section 3.3, the last paragraph in section 3.2.1 and the second paragraph in section 3.3.2.	See response to general comment #6. Also, the following has been inserted into Sections 3.3.1 and 3.3.2: "…and exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are still valid…"	
10			Use UU/UE instead of, or in addition, to Response Complete to confirm that soil and source removal to UU/UE took place in these remedies in the executive summary, section 1.3 and section 3.3.	See response to general comment #6.	
Operable Unit 1					
11			The RAOs listed on Page 7 include RAs taken at the site; RAOs are the fundamental basis for taking action and determining protectiveness. Restate the RAOs to reflect the objectives as outlined in the RAO summary table provided during the 5YR training. Attached.	Agreed. The RAO summary table(s), as provided by EPA has been incorporated into the Executive Summary of the report.	
12			Page 10, Section 4.5.1 should address concerns raised in two of the interviews regarding the impact of the Ogden Nature Center on GW chemistry.	Agreed. The following has been added to Section 4.5.1: "It has been noted that the upgradient Ogden Nature Center may be influencing groundwater chemistry at OU-1. This may be affecting the attenuation of vinyl chloride leading to the stable trends described above."	

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U.S. Army Corps of Engineers	Draft Final Five Year Review Report, Ogden DDHU	CESPK-ED

Project:			Former Defense Depot Ogden, Ogden, Utah		
Document:			Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden		
Reviewers:			Ms. Natasha Davis, US Environmental Protection Agency	**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
13			Page 12, Section 4.5.1 last paragraph discusses the potential for achieving a response complete determination at OU1. The text may be over optimistic, as the OU1 statistical analysis indicated that VC concentrations appear to be declining in only two wells, the other wells are stable or have no trend. Revise text to include this information. Additionally, if the Army would like to consider GW at OU1 as response complete, the EPA has a GW closeout strategy that needs to be consulted.	Agreed. This information has been added to (now) Section 6.5.1.	
14			Page 12, Section 4.5.2 includes some land use changes regarding construction in 2015 of three buildings on or near OU1. Add this information to the Land and Resource Use section 3.2.	Agreed. This information has been added to Section 3.2.	
15			Page 13, Include the evaluation of ICs at OU1 in Question A.	Agreed. This information has been added to (now) Section 6.6.1.	
16			Page 13, It is not required to answer the technical evaluation questions with yes/no.	Comment noted.	
17			Page 14, Section 4.6.2, Question B should include a statement that soil and source removal to UU/UE took place at OU1. During the 5YR it needs to be confirmed that assumptions used in establishing UU/UE have not changed and if they have, whether those changes affect protectiveness. Include information about UU/UE and whether the OU1 UU/UE assumptions were evaluated. This can be done in an appendix, and the message from the appendix can be distilled to a minimum amount of text in the report.	Agreed. The following has been added to (now) Section 6.6.2 (after Table 11): "The RAOs for the soil removal, including meeting the cleanup criteria, specified in the ROD for confirmation sampling were met after the final excavation. No further remedial action or investigation of soil has been completed since the ROD requirements for soil have been met. No soil contamination was left in place that would prevent UU/UE, and exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are still valid."	
18			Page 14, last paragraph includes a reference to the VISL calculator used to derive values in Table 6. Include an appendix with the defaults and values used when running the VISL calculator.	Agreed. The footnote in (now) Table 12 has been revised to read: "VISLs are based on model default parameters for the commercial scenario (25 year exposure duration, 250 days/year exposure frequency, 8 hours/day exposure time, generic attenuation factor of 0.001, and a target cancer risk of 1×10^{-4} or non-cancer hazard quotient of 1.0 (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC')."	

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U.S. Army Corps of Engineers	Draft Final Five Year Review Report, Ogden DDHU	CESPK-ED

Project:	Former Defense Depot Ogden, Ogden, Utah				
Document:	Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden				
Reviewers:	Ms. Natasha Davis, US Environmental Protection Agency			**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
19			Page 15, Table 6 shows that GW is not posing a cancer risk to indoor workers, however, there may be a concern for potential health effects and some response action may be necessary based on the hazard index. Please amend the statement above Table 6 to reflect the hazard risk and include the hazard quotient values in the table.	Agreed. See response to comment #18 above.	
20			Page 15, changes in toxicity in section 4.6.2, OU1 soils were removed to UU/UE standards for PCBs, furans, and dioxins. Those standards have changed since the 2012 5YR. Include discussion of whether OU1 remains UU/UE for soils.	Agreed. See response to comment #17 above.	
Operable Unit 4					
21			Page 17, The second paragraph states that a secondary source of contamination was discovered between buildings 15C and 16C. However, the paragraph above states that burial site 4A-North was identified as a secondary source. Amend the discrepancy in numbering sources.	Agreed. The second 'secondary' has been deleted.	
22			Page 17, RAOs listed in the 5YR are remedial actions taken at OU4, not the RAOs. The attached RAO summary table paraphrases OU4 RAOs, which are listed in section 5.1.1 of the 1992 OU4 ROD, and section 4.2 of the 2010 OU4 ROD Amendment. RAOs inform the risk based reason why the remedy was chosen and are important to determining protectiveness. Amend section 4.2.	Agreed. The RAO summary table(s), as provided by EPA has been incorporated into the Executive Summary of the report.	
23			Page 19, The last paragraph is confusing as it starts with a discussion of residual soil contamination and ends with a discussion of GW and soil vapor. Break up the paragraph or add transition sentences to avoid confusion. Consider removing VI from the paragraph as it is discussed below.	Agreed. The paragraph has been edited as suggested.	
24			Page 19, The last paragraph includes a sentence about TCE exceeding the RSL. Including this sentence in the paragraph confuses the RSL tables with any evaluation that may have occurred during the RI/FS to determine clean up values. Do not confuse the RSLs for protection of human health with SSLs for protection of GW. However, the RSL is an ultra-low number, which can be superseded with better numbers after site specific analysis in the RI/FS. Clarify whether the RI/FS analysis is still appropriate.	Agreed. See response to comment #25 below.	

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Document:	Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden				
Reviewers:	Ms. Natasha Davis, US Environmental Protection Agency			**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
25			Page 23, The last sentence in the paragraph below Table 7 includes a statement about mobilization of contaminants from soil to GW, yet Table 7 does not include a column for RSL soil screening levels for protection of GW. Add the column or remove the statement.	Agreed. Soil-screening levels have been added to the table (now Table 13), with the following footnote: "Note that SSLs were designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, SSLs are based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface, are not reflected of site-specific conditions, and should not be used for remedial action decisions."	
26			Page 23, The second paragraph below Table 7 states that TCE found in soil exceeds industrial RSLs and could be a source of contamination to GW, however, soil screening levels for protection of GW are different than industrial RSLs. Amend the paragraph to clarify.	Agreed. See response to comment #25 below.	
27			Page 24, The statement in bold is inconsistent with other text regarding the outfall and extraction wells. It appears OU4 MWs are no longer representative of the remaining plume. Changing the MW network may be necessary. This is an issue that needs to appear in the Issues and Recommendations table.	See response to comment #43c.	
28			Page 26, The first sentence of the third paragraph on the page includes the mass removal of DCE and VC from the June 2016 sampling event, however, it is unclear what time period this covers. Is this a monthly removal, year to date, cumulative since the system was operational? Clarify the statement.	Agreed. The following has been added to that sentence: …"(between January 1, 2016 and June 30, 2016)."	
29			Page 26, Need to include the evaluation of ICs at OU4 in Question A.	This discussion is included in the last paragraph of Question A.	
30			Page 28, The first paragraph in section 5.6.1 includes a statement (on page 27/28) that the GW treatment system is successfully reducing contamination levels below MCLs. However, the treatment system for OU4 was abandoned in 2012 and now source area GW is extracted and directly discharged to the POTW. Change GW "treatment" system to GW "extraction" system.	Agreed. This change has been made to the report.	

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Item	**Ref**		**Comment**	**Response**	
31			Page 28, section 5.6.2, The second paragraph includes a discussion of the differences between the soil clean-up values established in the 1992 ROD and 2000 ROD amendment with current industrial RSL values; thus, leading the reader to doubt the risk assessment completed as part of the ROD. The paragraph ends with a statement contradicting the discussion because removal of soil isolated contaminants, and they aren't a risk. Recommend rephrasing, not using RSLs at the benchmark, consulting a toxicologist for the more appropriate, defensible numbers to compare. Text and maybe table 10 clarifications are needed.	Agreed. Note that the RSLs have been adjusted to reflect an acceptable cancer risk of 1×10^{-4}. This is to be consistent with the Five-Year Review Guidance which states that human health determinations should be based on whether the cancer risk could now be greater than 10^{-4} and/or the hazard index could be greater than 1 for non-carcinogenic effects (and consistent with EPA's risk management range 10^{-6} to 10^{-4}). RSLs now indicate whether they are based on the 1×10^{-4} cancer risk or non-cancer hazard index of 1. The text has been revised to reflect these adjusted screening levels.	
32			Page 29, The last paragraph includes a reference to the VISL calculator used to derive values in Table 12. Include an appendix with the defaults and values used when running the VISL calculator.	Agreed. The footnote in (now) Table 18 has been revised to read: "VISLs are based on model default parameters for the commercial scenario (25 year exposure duration, 250 days/year exposure frequency, 8 hours/day exposure time, generic attenuation factor of 0.001, and a target cancer risk of 1×10^{-4} or non-cancer hazard quotient of 1.0 (screening level based on cancer risk is indicated with a 'C' while that based on non-cancer is indicated with a 'NC')."	
33			Page 30, Table 12 should include GW values from the extraction wells. The table shows that GW is not posing a cancer risk to indoor workers, however, GW may still pose a health hazard. See comment 19 above.	Agreed; however, extraction well data are not available from the June 2016 groundwater sampling event; therefore, system effluent concentrations are shown for comparison. A footnote with this information has been added along with the system effluent concentrations.	
34			Page 30, change in toxicity paragraph needs to include VI. Modify the paragraph to be exposure route specific.	Agreed. The following sentence has been added to that section: "For example, an RfC was issued by EPA for TCE in September 2012 which may affect vapor intrusion evaluations."	
35			Page 30, progress toward meeting RAOs, The paragraph should reference the non-compliance well samples taken in May 2016, not December 2010.	Agreed. The suggested change has been made to the report.	
Other Issues					
36			Page 32, a. Progress since the last review goes before the technical evaluation. b. There are five items in Table 13 but there are only four issues listed in section 8, Table 19. Modify to be consistent. c. Add to the "action taken" column that the signage at buildings 15C and 16C was in the wrong place for OU4 Hotspot.	Agreed regarding a. This change has been made to the report. Regarding b., the issues identified in (now) Table 3 are those from the previous (2012) Five-Year Review report, while those identified in Table 19 are those identified in this current (2017) Five-Year Review report. Regarding c., the misplaced signage was not identified as an issue in the previous (2012) Five-Year Review and therefore, is not included in this table.	

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Reviewers:			Ms. Natasha Davis, US Environmental Protection Agency	**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
37			Page 34, Five Year Review Process section typically goes before the technical evaluation.	Agreed. The report has been revised as suggested.	
38			Page 35 & 36, According to the statistical analysis several additional GW monitoring reports were evaluated in this five-year review. Table 14 includes only two compliance reports for OU1 and two for OU4, add the other sources of data evaluated.	Data were not necessarily obtained from each individual groundwater monitoring report. Documents listed are those reviewed for the Five-Year Review report.	
39			Page 37, Paragraph below Table 16 and Table 17 includes a statement about an RfC for TCE issued by EPA in 2012. This RfC was issued in 2011. Amend the statement.	Agreed. This change has been made to the report.	
40			Page 37, Table 18 is missing the lead cleanup level of 1850 mg/kg for disposal trench A.	Agreed. This change has been made to the report.	
41			Page 38, The paragraph below Table 18 – see comment 32 above about section 5.6.2 on page 28.	See response to comment #31. Based on this, the text has been revised to read: "While the screening level for lead is lower compared to the ROD cleanup value (for Disposal Trench A), removal of contaminated soils at OU 4 has effectively isolated contaminants in vadose-zone soils from potential direct human exposure."	
42			Page 40, Table 19, a. Current and Future Protectiveness columns should be switched to be consistent with guidance. b. All of these issues affect future protectiveness, change all answers to Y. c. Add a fifth issue, both the extraction wells and the effluent have higher concentrations than the MW network. This affects future but not current protectiveness.	Agreed regarding a and b. Regarding c., extraction wells (and effluent) logically have higher concentrations. This is not considered a current issue for the Five-Year Review (nor was it identified in the previous [2012] review). The conclusion of the Five-Year Review is that the OU 4 remedy is that potential risks are being controlled through prevention of human exposure to contaminated groundwater with the effective use of institutional controls while contamination continues to naturally attenuate. As noted in the report, data also indicates that the groundwater extraction system is successfully reducing contamination levels below the applicable MCLs in compliance wells. Recognizing that effluent concentrations of vinyl chloride still consistently exceeds its MCL, although the levels are acceptable for discharge to the CWSID.	

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

U.S. Army Corps of Engineers	Draft Final Five Year Review Report, Ogden DDHU	CESPK-ED

Project:			Former Defense Depot Ogden, Ogden, Utah		
Document:			Draft Final Five Year Review Report, Fifth Five Year Review Report for the Former Defense Depot Ogden, Weber County, Ogden		
Reviewers:			Ms. Natasha Davis, US Environmental Protection Agency	**Date:**	8/15/2017
Item	**Ref**		**Comment**	**Response**	
43			Page 41, Table 20, a. Recommendation 3 should be broken up into two recommendations; one for moving signage and a second for increasing awareness. b. Moving signage should not take until 2019, propose a much sooner milestone date. c. Add the fifth issue discussed in comment 43c, that the MWs are not representative of the remaining plume. The recommendation would be to evaluate whether changes in the MW network are needed.	Agreed regarding a. and b. Regarding c., the following has been added as a fifth issue to Table 19: "The existing monitoring well network is not representative of the remaining plume. Other than occasionally, the remaining OU-4 plume is not routinely monitored, other than the extraction system effluent (that is, extraction wells within the plume are not monitored)." This has also been added to Table 20 with the following recommendations: "Evaluate whether extraction wells should be routinely monitored." and "Evaluate changes to the monitoring well, including the OU-4 Hotspot extraction trench."	
44			Page 42, Add language to the second item that includes the new issue of evaluating the MW network.	See response to comment #43c.	
45			Page 43, A strong protectiveness statement should reflect the RAOs. Replace the last part of the OU1 statement with "…controlled through land use controls which prohibit GW use and residential land use as GW restoration progresses." Add this sentence to the end of the protectiveness statement for OU4: "In the interim, LUCs are working to prohibit exposures via GW use and residential land use." Add the word sitewide before "protectiveness" in the last paragraph. See attached DDOU IR and PS document.	Agreed. These changes have been made to the report.	
46			Page 44, Add the due date of 9/27/2022 to be more specific in the sentence.	Agreed. This change has been made to the report.	
47			Figure 4, locate the hotspot on the map.	Agreed. This change has been made to the report.	
48			Figure 5, Include the blue shading and isocontours in the legend. Locate the hotspot.	Agreed. This change has been made to the report.	
49			Appendix A, Add a column indicating if the ARARs from the ROD have changed. Missing the ARAR for the Clean Water Act pretreatment permit used for discharge of GW at OU4.	Agreed. This change has been made to the report.	

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

APPENDIX B

OGDEN STANDARD-EXAMINER TEAR SHEET

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Standard-Examiner
Sunday, February 19, 2017

Classifieds

Announcements

Carpool
I live in Clearfield and need of a ride **To & From** my job. I work at Orbital ATK in the Freeport Center. My hours are 6 am to 6:30 pm, Sunday – Wednesday. Will pay $10 every two weeks. Call 1-801-648-2368 or email me at: meriahsmith@comcast.net

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LOST
Green & White Parakeet, very friendly bird. Last seen in the South Ogden area. Please call 801-710-1882 if found. $50 reward.

Employment

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Weber County I.T. $20.76/hr- FT
With Benefits – APPLY:
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Seasonal Parks Maintenance Workers
Woods Cross City is accepting seasonal applications for Public Works/ Parks Maintenance. 40 hour work week, pay range $10.00 - $12.00 per hour depending on experience. No experience req. Job openings close on February 21, 2017 or until filled. Starting date March 15, 2017. For full description and duties see website. Must possess a valid Utah drivers license and pass a drug screening. Apply in person at Woods Cross Municipal Building 1555 South 800 West Woods Cross, UT 84087 or online at **www.woodscross.com** (employment opportunities) Applications can be emailed to **jsims@woodscross.com** Woods Cross City uses E- Verify and is an equal opportunity employer

Mental Health and Substance Abuse Coordinator
Summit County is currently recruiting for a Mental Health and Substance Abuse Coordinator. This will be a contract position. Will work collaboratively with staff and the community in coordination of mental health and substance abuse services with Summit County partners. Minimum Qualifications: Bachelors degree from an accredited college or university; and five (5) years experience in managing coalitions involving public health or other community benefits; or an equivalent combination of education and experience. Special Qualification: Valid, non-restricted driver's license and reliable transportation. Please send letter of interest, resume and references to: Summit County, Personnel Department, P.O. Box 128, Coalville, Utah 84017.
For a copy of the complete job description please go to **www.summitcounty.org** E.O.E. **Closing Date: Friday, March 3, 2017 at 5 P.M.**

Construction Laborers
Romero Construction, Inc., 1675 South Hwy 89, Perry, Utah 84302, 1-435-225-0188 is hiring construction laborers to perform the following duties: labor associated with concrete construction such as positioning and setting forms, pouring cement, reinforcement, grading, digging, and loading and unloading materials. Lifting required up to 50lbs. No education required. 6 months experience. Ongoing on the job training provided. $14.11/hr. $21.17 O.T. 8:00 am 5:00 pm, M-F. No overtime expected. Job opportunity is a full time position. 15 positions available for temporary peak load work 04/03/2017 11/30/2017. Work to be performed in Box Elder County area jobsites. Transportation provided to and from area job site at employers expense from a central pick up location. H-2B application concurrently filed concerning these positions. Employer will make all deductions from workers paycheck required by law. Transportation (including meals and, to the extent necessary, lodging) to the place of employment will be provided, or its costs to workers reimbursed, if the worker completes half the employment period. Return transportation will be provided if the worker completes the employment period or is dismissed early by the employer. Employer will provide workers at no charge all tools, supplies & equipment required to perform the job. U.S. applicants may send resumes to Dept. of Workforce Services, **Attn: Kim Lam, reference job order #1201997, fax (801) 526-9633; or mail to: DWS, PO Box 45249, 4 th Floor, SLC, UT 84145-0249, or via email: foreignlabor@utah.gov.**

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Clearfield Job Corps Center is looking for a full-time LPN to work in our Wellness Services department. For more information and to apply please visit www.mtctrains.com MTC is an Equal Opportunity Employer Employer Minority/Female/Disability/Veterans

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Legals

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Legals

Five-Year Review
Former Defense Depot, Ogden, Utah

The U.S. Army Corps of Engineers, in conjunction with the U.S. Army and the U.S. Environmental Protection Agency (EPA), has conducted a Five-Year Review of Former Defense Depot Ogden Utah (DDOU). DDOU operated as an Army supply depot until its closure in 1997. The transfer of ownership of the facility to Ogden City was completed in 2003 and the property is now operating as a commercial park. Soil and groundwater at DDOU have been contaminated from past onsite activities including solid and liquid waste burial sites and burn pits. Remedies have been put in place to address the contamination at each of the impacted sites under the oversight of the EPA and Utah Department of Environmental Quality. Final remedies have included groundwater extraction and discharge into the sanitary sewer and monitored natural attenuation of groundwater.
This is the fifth Five-Year Review conducted at DDOU. This Five-Year Review evaluated the effectiveness of the cleanup remedies at two cleanup sites, Operable Unit 1 and Operable Unit 4, and determined whether the remedies continue to be protective of human health and the environment. Based on the findings of this five year review, the Operable Unit 1 remedy is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. The determination of protectiveness of remedies at Operable Unit 4 is deferred until further assessment of vapor intrusion is performed at the Operable Unit 4 Hotspot area. The overall protectiveness of Ogden DDOU is deferred until further assessment of vapor intrusion is performed at the OU-4 Hotspot.
The final five-year review report is available for public review at the Boyer Company office within the Business Depot Ogden located at 1150 Depot Drive, Suite 100, Ogden, UT. If you have any questions or comments, you may contact Mr. Christopher Goddard of the U.S. Army Corps of Engineers at (916) 557-6796.

Pub. February 19, 2017 848642

REQUEST FOR CONTRACTOR BIDS

Ogden City is seeking bids for the FY2017 Water - 5 Projects construction project. The work generally consists of, but is not limited to: upsizing water lines in five locations in Ogden City, road reconstruction in two of the five areas, and extension of the storm drain in one area. Miscellaneous utility work may be required.
Contract Documents may be obtained beginning Tuesday, February 21, 2017. It can be downloaded at no charge on the Ogden City Website, http://bids.ogdencity.comu
The documents may also be picked up at the office of the Ogden City Engineer, located at 2549 Washington Boulevard, Suite 760, Ogden, Utah 84401 for a fee of $150.00 (By request only).
MANDATORY PRE-BID: mandatory pre-bid meeting will be held on **Tuesday, March 7th** at **10:00 am.** The meeting will be held at the Ogden City Offices located at 2549 Washington Blvd in the 7th floor conference room.
Sealed bids will be received at the Ogden City Information Desk located at 2549 Washington Boulevard, on the 2nd floor until **Thursday, March 23rd at 3:00 pm**, at which time Bids will be publicly opened in the 7th floor Conference Room. **LATE BIDS WILL NOT BE ACCEPTED.**
For further information, contact Jonathan Knight of Ogden City at (801) 629-8938.
OWNERS RIGHTS RESERVED: The Owner reserves the right to accept or reject any bid that best serves its convenience and/or is found to be in the best interest of the City.
Ogden City encourages and welcomes bids from women and minority-owned businesses.
Published February 19th, February 26th, and March 5th, 2017. Same was also published online at Utahlegals.com, according to Section 45-1-101, Utah Code, Annotated, beginning on the first date of publication and for at least 30 days thereafter.

Pub. Feb. 19, 26, Mar. 5, 2017 885074

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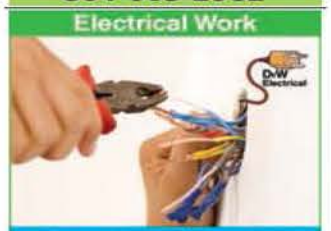
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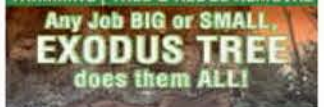
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APPENDIX C

SITE INSPECTION CHECKLIST

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I. SITE INFORMATION

Site name: *Ogden DDOU*	**Date of inspection:** *01/18/17*
Location and Region: *Weber County, Utah*	**EPA ID:** *UT9210020922*
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Sacramento District*	**Weather/temperature:** *Cool, clear 25°F*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other:
- ☒ Long Term Management
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M Project Manager** *Mr. Ross Sollars* (Name) *Project Manager* (Title) *January 18, 2017* (Date)

Interviewed ☒ at site ☐ at office ☐ by phone Phone number: N/A

Problems, suggestions: *Mr. Sollars noted no problems with the treatment plants at the OU-1, OU-4, and OU-4 Hotspot other than occasional vandalism.*

2. **O&M site manager** *N/A* (Name) *N/A* (Title) *N/A* (Date)

Interviewed ☐ at site ☐ at office ☐ by phone Phone number: N/A

Problems, suggestions:

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: *Mo Slam*
Problems; suggestions: *Discussed in Appendix C, Interview Records.*

4. **Other interviews** ☒ Report attached.

See Appendix E, Interview Records.

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: *Stored onsite at each of the pump houses.*			
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: *Stored onsite at each of the pump houses.*			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks: *N/A*			
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: *N/A*			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks: *N/A*			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks: *N/A*			
7.	**Groundwater Monitoring Records**	■ Readily available	■ Up to date	☐ N/A
	Remarks: *N/A*			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	■ N/A
	Remarks: *N/A*			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	■ N/A
	■ Water (effluent)	■ Readily available	■ Up to date	☐ N/A
	Remarks: *N/A*			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	■ N/A
	Remarks: *N/A*			

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** *Cost information was not requested.*	
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: *Cost information was not requested.*	

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
   Remarks: T*he fence around the OU-4 treatment plant remained secured and intact.*

B. Other Access Restrictions

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

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): *None*
Frequency: *None*
Responsible party/agency: *None*
Contact: *None* (Name) *None* (Title)

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
Remarks: *There are no reporting or inspection requirements for the deed restrictions. The institutional control of warning signs placed within buildings 15C and 16C stating "No Excavation Beneath the Building Foundation without Prior Approval" as listed in the 2000 ROD Amendment and Quitclaim Deed was not satisfactorily implemented. The signs were not located near the buried waste and the text was too vague to prevent groundbreaking. No evidence of disturbance of the buried waste beneath Building 15C and Building 16C was observed. There should be a responsible party for checking on institutional controls and a system for accountability.*

2. **Adequacy** ■ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks: *ICs will be adequate when properly implemented and enforced.*

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident
   Remarks: *Occasional vandalism of the OU-4 System Control Building as reported by AEEC.*

2. **Land use changes on site** ☐ N/A
   Remarks: *Over 5 million square feet of commercial space has been developed. None of the developments are immediately adjacent to either OU.*

3. **Land use changes off site** ☐ N/A
   Remarks: *The nature preserve continues to grow, which has been affecting the groundwater chemistry of the site.*

VI. GENERAL SITE CONDITIONS

A. Roads ◙ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ◙ Roads adequate ☐ N/A
   Remarks: *None*

B. Other Site Conditions

Remarks: *None*

VII. LANDFILL COVERS ☐ Applicable ◙ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths: *N/A* Widths: *N/A* Depths: *N/A*
   Remarks: *N/A*

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks: *N/A*

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks: *N/A*

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent: *N/A* Height: *N/A*
   Remarks: *N/A*

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent _____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks: *N/A*

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
   Areal extent: *N/A*
   Remarks: *N/A*

B. Benches ☐ Applicable ◉ N/A

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

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
   Remarks: *N/A*

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
   Remarks: *N/A*

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
   Remarks: *N/A*

C. Letdown Channels ☐ Applicable ◉ N/A

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

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type: *N/A* Areal extent: *N/A*
   Remarks: *N/A*

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

5. **Obstructions** Type: *N/A* ☐ No obstructions
   ☐ Location shown on site map Areal extent: *N/A*
   Size: *N/A*
   Remarks: *N/A*

6. **Excessive Vegetative Growth** Type: *N/A*
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Areal extent: *N/A*
   Remarks: *N/A*

D. Cover Penetrations ☐ Applicable ◉ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance
   ☐ N/A
   Remarks: *N/A*

2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: *N/A*
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: *N/A*
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: *N/A*
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks: *N/A*
E. Gas Collection and Treatment	☐ Applicable ◙ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks: *N/A*
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks: *N/A*
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks: *N/A*
F. Cover Drainage Layer	☐ Applicable ◙ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks: *N/A*
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks: *N/A*
G. Detention/Sedimentation Ponds	☐ Applicable ◙ N/A
1.	**Siltation** Areal extent: *N/A* Depth: *N/A* ☐ N/A ☐ Siltation not evident Remarks: *N/A*
2.	**Erosion** Areal extent: *N/A* Depth: *N/A* ☐ Erosion not evident Remarks: *N/A*
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks: *N/A*
4.	**Dam** ☐ Functioning ☐ N/A Remarks: *N/A*

H. Retaining Walls ☐ Applicable ◙ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement: *N/A* Vertical displacement: *N/A*
   Rotational displacement: *N/A*
   Remarks: *N/A*

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks: *N/A*

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

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent: *N/A* Type: *N/A*
   Remarks: *N/A*

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks: *N/A*

VIII. VERTICAL BARRIER WALLS ☐ Applicable ◙ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent: *N/A* Depth: *N/A*
   Remarks: *N/A*

2. **Performance Monitoring** Type of monitoring: *N/A*
   ☐ Performance not monitored
   Frequency: *N/A* ☐ Evidence of breaching
   Head differential: *N/A*
   Remarks: *N/A*

IX. GROUNDWATER/SURFACEWATER 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: *None*

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ◙ Good condition ☐ Needs Maintenance
   Remarks: *None*

3. **Spare Parts and Equipment**
   ◙ Readily available ◙ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks: *None*

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

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks: *N/A*

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks: *N/A*

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: *N/A*

C. Treatment System ☐ Applicable ◙ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters Sediment 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: *Groundwater is pumped and discharged directly to a sanitary sewer without treatment.*

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ◙ Good condition ☐ Needs Maintenance

Remarks: *None*

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

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

Remarks: *None*

4. **Discharge Structure and Appurtenances**

☐ N/A ◙ Good condition ☐ Needs Maintenance

Remarks: *None*

5. **Treatment Building(s)**

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

☐ Chemicals and equipment properly stored

Remarks: *None*

6.	**Monitoring Wells** (pump and treatment remedy) ■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition ■ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: *Many monitoring wells were not located due to 2+ feet of snow on the ground.*
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
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked☐ Functioning ■ Routinely sampled ☐ Good condition ■ All required wells located ■ Needs Maintenance ☐ N/A Remarks: *Well ESE 14 near OU-1 needed maintenance—PVC well casing and steel stovepipe both missing caps and adjacent bollards had been knocked down. This appears to be an isolated incident of vandalism and not a recurring problem with site management.*
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.). *See Main Five-Year Review Report.*
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. *See Main Five-Year Review Report.*
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, which suggest that the protectiveness of the remedy may be compromised in the future. *See Main Five-Year Review Report.*
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. *See Main Five-Year Review Report.*

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APPENDIX D

SITE PHOTOGRAPHS

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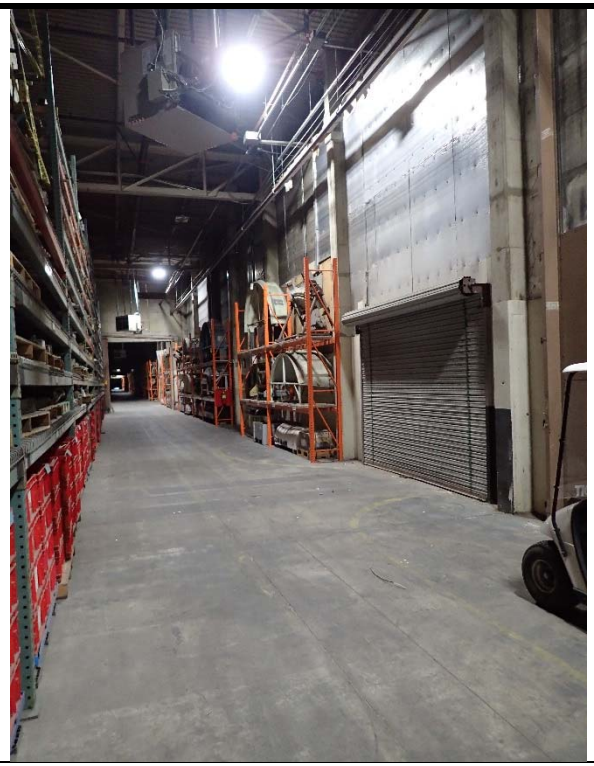
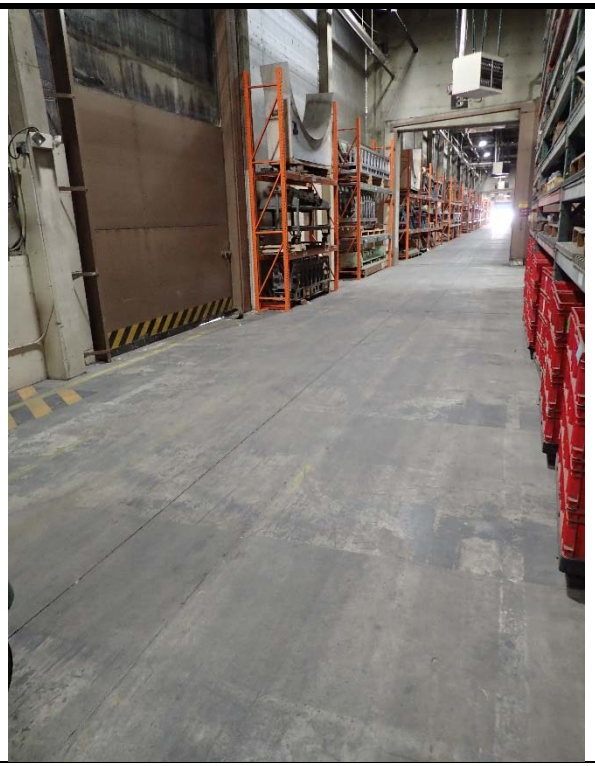


Interior of Building 16C



Interior of Building 16C

Exterior of Building 16C

Building 16C Looking Toward Building 15C

Former Trench Area between Buildings 15C and 16C

Former Trench Area between Buildings 15C and 16C

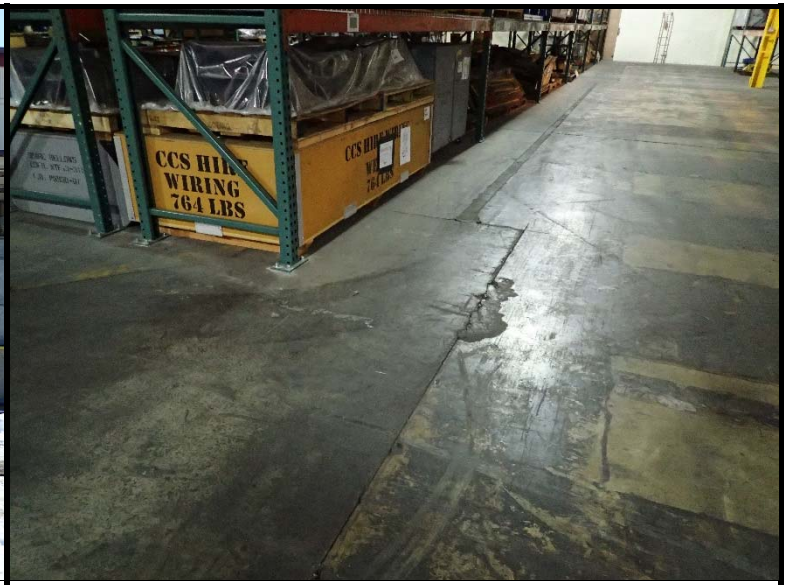
Former Trench Area between Buildings 15C and 16C

Former Trench Area between Buildings 15C and 16C

Warning Sign on Building 15C

Warning Sign on Building 15C

Warning Sign on Building 16C



Interior of Building 15C Flooring

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APPENDIX E

INTERVIEW RECORDS

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INTERVIEW RECORD

Site Name: Ogden DDOU		**EPA ID No.: UT9210020922**
Subject: Five-Year Review		**Time:** 900-1100 **Date:** 01/18/17
Type: ☐ Telephone ◉ Visit ☐ Other **Location of Visit:** Former Ogden DDOU		☐ Incoming ☐ Outgoing

Contact Made By:

Name: Mr. Christopher Goddard	**Title:** Environmental Engineer	**Organization:** USACE – SPK
Name: Mr. Mark Jones	**Title:** Toxicologist	**Organization:** USACE – SPK
Name: Mr. Marc Sydow	**Title:** Geologist	**Organization:** USACE – SPK
Name: Ms. Bridget Floyd	**Title:** Geologist	**Organization:** USACE – SPK

Individual Contacted:

Name: Mr. Blake Wahlen	**Title:** Property Manager	**Organization:** Boyer Company
Name: Mr. Nicholas Montgomery	**Title:** BRAC Env. Coordinator	**Organization:** US Army
Name: Mr. Mohammad "Mo" Slam	**Title:** Remedial Project Manager	**Organization:** UDEQ
Name: Ms. Christy Seiger-Webster	**Title:** Environmental Engineer	**Organization:** AEEC
Name: Mr. Ross Sollars	**Title:** Project Manager	**Organization:** AEEC
Name: Mr. Marc Sydow	**Title:** Geologist	**Organization:** USACE

Summary Of Conversation

1. **What has been the nature and duration of your involvement in the project?**
   - Mo: I started with the project in 1989. I have very positive views of the project, which has made a lot of progress.
   - Blake: I came on in 2001. It has been a very successful economic development project and furthermore a success for all of Northern Utah. There hasn't been problems with environmental issues lately. We've developed over 5 million square feet of new commercial space and extended railroad tracks to the project.
   - Ross: I started in 1999 and have been with the project through multiple contractors. I started on OU2 which was the first site to close a pump and treat system in EPA Region 8. Excellent use of BRAC money. Great cooperation between stakeholders.
   - Nick: I started in 2010. My responsibility is more high-level: budget, regulator answers, etc. USACE is doing a good job.

2. **Have there been changes in the area in land use or property ownership?**
   - Blake: There has been a lot of new construction [see map]. There were no vapor barriers installed under building 1040, the new building near the hot spot. However, there are ventilation systems in all new buildings. There are new tenants near the OUs but no new property owners. Petersen owns buildings 16b and 16c and may have sold off a portion of undeveloped land. The parcel north of the railroad already has a deed restriction limiting use to recreation.
   - Marc: The vapor intrusion study recommended in the last FYR is still under review by the EPA.
   - Mo: A few years ago, there was a newspaper story about former workers in the military building 11c [specific use is classified] reported health effects. Nothing ever came of these complaints as far as we know.

3. **Has there been significant public interest in the project?**
   - All: There has been little interest in the project.

INTERVIEW RECORD

Site Name: Ogden DDOU		**EPA ID No.: UT9210020922**
Subject: Five-Year Review		**Time:** 900-1100 **Date:** 01/18/17
Type: ☐ Telephone ◉ Visit ☐ Other **Location of Visit:** Former Ogden DDOU		☐ Incoming ☐ Outgoing

Contact Made By:

Name: Mr. Christopher Goddard	**Title:** Environmental Engineer	**Organization:** USACE – SPK
Name: Mr. Mark Jones	**Title:** Toxicologist	**Organization:** USACE – SPK
Name: Mr. Marc Sydow	**Title:** Geologist	**Organization:** USACE – SPK
Name: Ms. Bridget Floyd	**Title:** Geologist	**Organization:** USACE – SPK

Individual Contacted:

Name: Mr. Blake Wahlen	**Title:** Property Manager	**Organization:** Boyer Company
Name: Mr. Nicholas Montgomery	**Title:** BRAC Env. Coordinator	**Organization:** US Army
Name: Mr. Mohammad "Mo" Slam	**Title:** Remedial Project Manager	**Organization:** UDEQ
Name: Ms. Christy Seiger-Webster	**Title:** Environmental Engineer	**Organization:** AEEC
Name: Mr. Ross Sollars	**Title:** Project Manager	**Organization:** AEEC
Name: Mr. Marc Sydow	**Title:** Geologist	**Organization:** USACE

Summary Of Conversation

4. **Have there been new wells installed on or near the site?**
   - Christy: To our knowledge no new wells have been installed in the last five years. In addition, it is incredibly difficult to get permission to drill new water wells along the Wasatch Front due to exhausted water rights so there is a small risk of future wells.

5. **Are the existing monitoring wells interfering with business development?**
   - Blake: The monitoring wells are not currently interfering with business development. We do not anticipate the wells will be in the way on OU4, but the wells on OU1 may be a problem in the future. A well was moved in conjunction with the construction of building 961W.

6. **What are your thoughts on site closure?**
   - Marc: The USACE does not object to the idea of site closure, but the current operations are so inexpensive that it would difficult to make the financial argument to go for closure with federal dollars.
   - Mo: UDEQ would support closure.
   - Ross: Closure requires 8 sampling events below 2 ppb of Vinyl Chloride. The current levels vary between 1-4 ppb. We missed closure by one sampling event a few years ago—now that we've switched to annual sampling the requirement will be harder to meet.
   - Christy: The variations in Vinyl Chloride concentrations are a function of water chemistry which is influenced by the new nature preserve.
   - Nick: It would be worthwhile to engage the EPA and make sure they know the status of this site.
   - All: Agree.

INTERVIEW RECORD

Site Name: Ogden DDOU		**EPA ID No.: UT9210020922**
Subject: Five-Year Review		**Time:** **Date:** 01/18/17
Type: ☐ Telephone ◉ Visit ☐ Other **Location of Visit:** Former Ogden DDOU		☐ Incoming ☐ Outgoing

Contact Made By:

Name: Mr. Christopher Goddard	**Title:** Environmental Engineer	**Organization:** USACE – SPK
Name: Mr. Mark Jones	**Title:** Toxicologist	**Organization:** USACE – SPK
Name: Ms. Bridget Floyd	**Title:** Geologist	**Organization:** USACE – SPK

Individual Contacted:

Name: Mr. Jake Bryan	**Title:** Division Manager	**Organization:** Petersen, Inc.

Summary Of Conversation

1. **How long have you been with the company?**
   Jake: 2 Years.

2. **Are you aware of the environmental history of the site?**
   Jake: No.

3. **Are you aware of the signage requirements?**
   Jake: No, but my predecessor may have been. I am unaware if the signs are still up.

4. **Do you have any anticipated need to break ground on the site?**
   Jake: No.

5. **Is Petersen still the property owner of this parcel?**
   Jake: The Petersen Company is separate from the property owner, Petersen Properties. You can contact Jared Hadley from Petersen Properties at (801) 710-2718 or jared.hadley@petersenинc.com.

INTERVIEW RECORD

Site Name: Ogden DDOU		**EPA ID No.: UT9210020922**
Subject: Five-Year Review		**Time:** **Date:** 04/03/17
Type: ◉ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☑ Outgoing
Contact Made By:		
Name: Mr. Mark Jones	**Title:** Toxicologist	**Organization:** USACE - SPK
Individual Contacted:		
Name: Ms. Jennifer Graham	**Title:** Assistant Director	**Organization:** Weber County Cultured Parks and Recreation

Summary Of Conversation

1. **Are you aware of the remedial action occurring at Ogden DDHU? If so, what is your overall impression of the project?**
   Yes, she is aware of the remedial actions of the project. Ross Sollars periodically discusses the progress of the project, and any activities that occur. For example, he discussed the system building in the parking area prior to it being built, and worked with them so that it matched the look and style of the existing fairground buildings for a cohesive look. This was appreciated.

2. **Are you aware of the presence of a groundwater extraction system and wells within your property?**
   Yes, she is aware of the extraction system and wells.

3. **Are the digging restrictions legally stated in your deed or known through informal communication?**
   She is aware of the digging restrictions, and knows that there are underground structures associated with the extraction system that need to be maintained. She is happy that the wells are now flush-mount, which minimizes impacts with parking on the property (e.g., horse-trailers).

4. **Do you feel well informed about the site's activities and progress? Would you like to be more informed on remediation progress and activities?**
   She feels adequately informed about the site and does not feel the need for any additional information, except as needed, which Mr. Sollars has been good at providing.

5. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?**
   She stated that they were anxious that the site be considered clean, as this would allow them to make improvements to the parking, such as grading, asphalt, lighting, etc. but understands the process. Also, currently they do not have a written lease with the city for the use of the site for parking, so any improvements would need a more formal agreement with the city.

INTERVIEW RECORD

Site Name: Ogden DDOU		**EPA ID No.: UT9210020922**
Subject: Five-Year Review		**Time:** **Date:** 04/21/17
Type: ◉ Telephone ☐ Visit ☐ Other **Location of Visit:**		☐ Incoming ☑ Outgoing

Contact Made By:

Name: Mr. Christopher Goddard	**Title:** Environmental Engineer	**Organization:** USACE – SPK
Name: Mr. Mark Jones	**Title:** Toxicologist	**Organization:** USACE – SPK
Name: Ms. Bridget Floyd	**Title:** Geologist	**Organization:** USACE – SPK

Individual Contacted:

Name: Mr. Rob Stites	**Title:** Chief, Unit C EPR-SR	**Organization:** US EPA, Region 8
Name: Ms. Natasha Davis	**Title:** Remedial Project Manager	**Organization:** US EPA, Region 8

Summary Of Conversation

1. **What has been the nature and duration of your involvement in the project?**
   Rob: Was the Remedial Project Manager for a brief time in the early 1990s, has been tangentially involved since then, and is the supervisor of the current Remedial Project Manager.
   Natasha: Stated in the unit in February 2017 and does not have much history with the project.

2. **In your opinion, how have the remedies performed at OU-1 and OU-4/OU-4 Hotspot?**
   Rob: Remedies have performed fairly well, plumes have stabilized and only vinyl chloride is left.

3. **Do you have any concerns related to the OU-1 ROD Amendment switching the remedy to MNA or the ESD for OU-4 which modified the need for system effluent treatment?**
   Rob: No issues, the trends have been well demonstrated and remedy is performing as expected. Suggested that current reducing conditions in groundwater could be driving the vinyl chloride recalcitrance.

4. **Have there been performance, maintenance, or monitoring problems in the past five years that caused you concern about the remedy?**
   Rob: Primary concern is that the vapor intrusion study still has not been performed since the last five-year review.

5. **In your opinion, has the communication between various parties at the site been good?**
   Rob: Agreed that communication has been good, and recognized that EPA's Remedial Project Manager role has been spotty.

6. **What improvements do you see as necessary for the remedy?**
   Rob: Conducting the vapor intrusion study.

7. **Are there any other issues that may affect the protectiveness of the remedy?**
   Rob: None, except for the vapor intrusion study.

8. **Are there any other issues you would like to discuss?**
   Rob: None. EPA is amenable to site closure based on the available data. Cited recent EPA groundwater guidance that provides a statistical approach for the attainment of cleanup, based on the 95% UCL concentration at or below the MCL for three to four years, on a well-by-well/temporal basis.

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APPENDIX F

ARAR ANALYSIS

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Appendix F: Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Analysis for OU-1, OU-4 and OU-4 Hotspot, DDOU, Ogden, Utah

Act/Authority	Requirements	Status	Change Since ROD?	Citation for Federal Requirements	Citation for Utah Requirements
Federal Safe Drinking Water Act	National Primary Drinking Water Standards-maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs) and regulation implementation Establishes health- and technology-based standards for public drinking water systems. Also establishes drinking water quality goals set at levels at which no adverse health effects are anticipated, with an adequate margin of safety.	Relevant and Appropriate	No	40 CFR 141 40 CFR 142 40 CFR 143 40 CFR 131	
Federal Water Pollution Control Act (Clean Water Act)	Permit (No. UST002) to discharge from treatment process to the Central Weber Sewer Improvement District's treatment plant and related sewerage facilities.	Relevant and Appropriate	Yes	33 USC Section 1251 et seq.	
Environmental Protection Agency Guidance	EPA Regional Screening Levels (RSLs) Provides risk-based concentrations for contaminants that are used for screening level evaluations of environmental measurements.	To Be Considered	Yes	www.epa.gov/risk/regional-screening-levels-rsls	

Appendix F: Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Analysis for OU-1, OU-4 and OU-4 Hotspot, DDOU, Ogden, Utah

Act/Authority	Requirements	Status	Change Since ROD?	Citation for Federal Requirements	Citation for Utah Requirements
Resource Conservation and Recovery Act	Identification and listing of hazardous waste Identifies solid wastes that are subject to regulation as hazardous wastes. Also establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.	Applicable	No	40 CFR 261 40 CFR 262	
Utah Monitoring and Water Quality: Drinking Water Standards	Establishes primary drinking water standards R309-200-6; establishes welfare based standards for public water systems (secondary maximum contaminant levels). Is relevant and appropriate for inorganic contamination. Not applicable to OU-1 as contamination is organic.	Applicable	No		UAC R309-200-5 UAC R309-200-6
Environmental Response and Remediation	R311-211-5(a) 1; for water-related corrective action, the Maximum Contaminant Limits (MCLs) established under the Federal Safe Drinking Water Act apply. R311-211-5(c); provisions for establishing higher cleanup levels could be evoked as necessary. This ARAR would be evaluated at minimum during the statutory 5 year review.	Applicable, Relevant and Appropriate	No		UAC R311-211-5

Appendix F: Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Analysis for OU-1, OU-4 and OU-4 Hotspot, DDOU, Ogden, Utah

Act/Authority	Requirements	Status	Change Since ROD?	Citation for Federal Requirements	Citation for Utah Requirements
Groundwater Protection	~~R315-8-6~~R315-264-92; establishes groundwater protection standards for hazardous waste TSDFs. Standards include ground water monitoring requirements and maximum concentra-tions of hazardous constituents allowable before corrective action must be implemented.	Relevant and Appropriate	Yes		~~UAC R315-8-6~~ UAC R315-264-92
Solid and Hazardous Waste, Cleanup and Risk-Based Closure Standards	R315-101-3; Principle of Non-degradation; requires control of the source and non-degrada-tion beyond existing contamination levels. Applicable for remedial activities including site management, corrective action and closure.	Applicable, Relevant and Appropriate	No		UAC R315-101
Utah Ground-Water Quality Protection Regulations	R317-6-2.1; Ground Water Quality Standards; sets standards for the protection of ground water quality; R3-17-6-3; defines characteristics of groundwater classes R317-6-6.15G; can be used to set alternate standards.	Applicable, Relevant and Appropriate	No		UAC R317-6

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APPENDIX G

OU-1 STATISTICAL ANALYSIS

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MAROS Site Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

User Defined Site and Data Assumptions

Hydrogeology and Plume Information:

Groundwater Seepage Velocity:	7000	ft/yr
Current Plume Length:	1000	ft
Current Plume Width:	100	ft
Number of Tail Wells:	1	
Number of Source Wells:	5	

Downgradient Information:

Distance from Edge of Tail to Nearest:

Downgradient receptor:	10000 ft
Downgradient property:	10000 ft

Distance from Source to Nearest:

Downgradient receptor:	20000 ft
Downgradient property:	20000 ft

Contaminants of Concern (COC's)

VINYL CHLORIDE

Well Summary

Well Name	Source / Tail / Delineation	Record Count	Sample Date Range Minimum	Sample Date Range Maximum	Priority Constituent
AEHA-09	S	21	12/15/2003	6/13/2016	VINYL CHLORIDE
JMM-19	T	20	6/3/2004	6/13/2016	VINYL CHLORIDE
JMM-22	S	21	12/15/2003	6/13/2016	VINYL CHLORIDE
1EW-03	S	18	6/14/2005	6/13/2016	VINYL CHLORIDE
1EW-04	S	8	7/29/2009	6/13/2016	VINYL CHLORIDE
1EW-12	S	18	6/14/2005	6/13/2016	VINYL CHLORIDE

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Time Period: 12/15/2003 **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
VINYL CHLORIDE								
1EW-03	S	18	18	0.81	-20	76.2%	No	S
1EW-04	S	8	8	0.82	-4	64.0%	No	S
1EW-12	S	18	18	0.40	-30	86.2%	No	S
AEHA-09	S	21	21	0.37	-58	95.7%	No	D
JMM-19	T	20	20	0.44	25	78.0%	No	NT
JMM-22	S	21	21	0.38	-108	100.0%	No	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-03 **Time Period:** 12/15/2003 **to** 6/13/2016

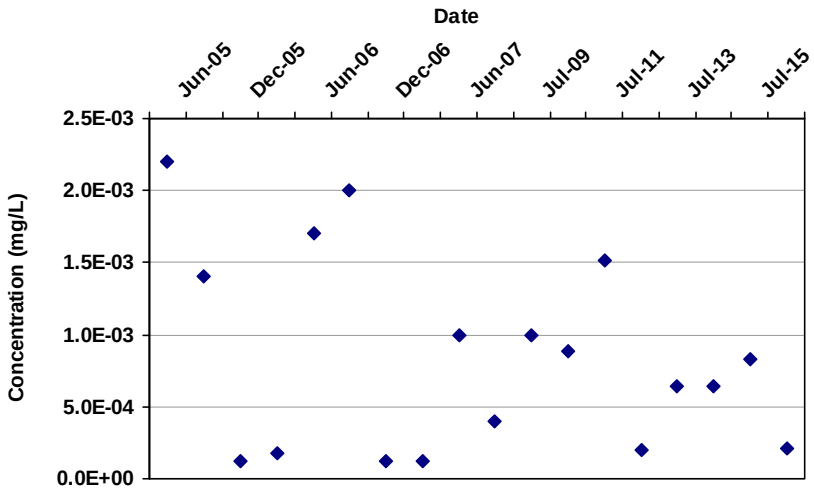
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-20

Confidence in Trend:

76.2%

Coefficient of Variation:

0.81

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-03	S	6/14/2005	VINYL CHLORIDE	2.2E-03		1	1
1EW-03	S	9/20/2005	VINYL CHLORIDE	1.4E-03		1	1
1EW-03	S	12/5/2005	VINYL CHLORIDE	1.2E-04		1	1
1EW-03	S	3/11/2006	VINYL CHLORIDE	1.8E-04		1	1
1EW-03	S	6/10/2006	VINYL CHLORIDE	1.7E-03		1	1
1EW-03	S	9/10/2006	VINYL CHLORIDE	2.0E-03		1	1
1EW-03	S	12/1/2006	VINYL CHLORIDE	1.2E-04		1	1
1EW-03	S	3/24/2007	VINYL CHLORIDE	1.2E-04		1	1
1EW-03	S	6/7/2007	VINYL CHLORIDE	1.0E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-03	S	6/5/2008	VINYL CHLORIDE	4.0E-04		1	1
1EW-03	S	7/28/2009	VINYL CHLORIDE	1.0E-03		1	1
1EW-03	S	7/1/2010	VINYL CHLORIDE	8.8E-04		1	1
1EW-03	S	7/6/2011	VINYL CHLORIDE	1.5E-03		1	1
1EW-03	S	7/6/2012	VINYL CHLORIDE	2.0E-04		1	1
1EW-03	S	7/3/2013	VINYL CHLORIDE	6.4E-04		1	1
1EW-03	S	8/19/2014	VINYL CHLORIDE	6.4E-04		1	1
1EW-03	S	7/20/2015	VINYL CHLORIDE	8.3E-04		1	1
1EW-03	S	6/13/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-04 **Time Period:** 12/15/2003 **to** 6/13/2016

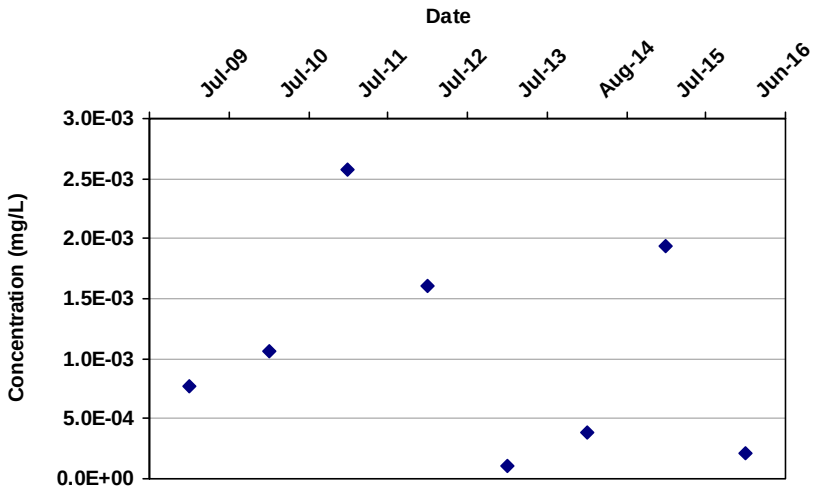
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-4

Confidence in Trend:

64.0%

Coefficient of Variation:

0.82

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-04	S	7/28/2009	VINYL CHLORIDE	7.7E-04		1	1
1EW-04	S	7/1/2010	VINYL CHLORIDE	1.1E-03		1	1
1EW-04	S	7/6/2011	VINYL CHLORIDE	2.6E-03		1	1
1EW-04	S	7/6/2012	VINYL CHLORIDE	1.6E-03		1	1
1EW-04	S	7/3/2013	VINYL CHLORIDE	1.1E-04		1	1
1EW-04	S	8/19/2014	VINYL CHLORIDE	3.8E-04		1	1
1EW-04	S	7/20/2015	VINYL CHLORIDE	1.9E-03		1	1
1EW-04	S	6/13/2016	VINYL CHLORIDE	2.1E-04		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-12 **Time Period:** 12/15/2003 **to** 6/13/2016

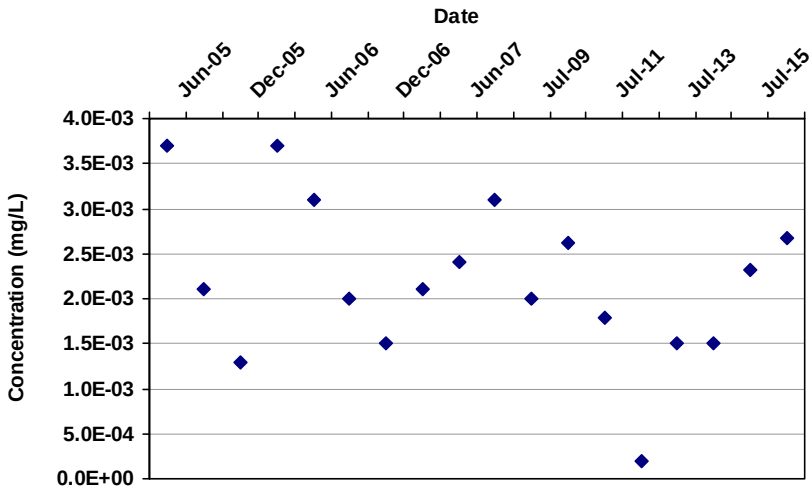
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-30

Confidence in Trend:

86.2%

Coefficient of Variation:

0.40

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-12	S	6/14/2005	VINYL CHLORIDE	3.7E-03		1	1
1EW-12	S	9/20/2005	VINYL CHLORIDE	2.1E-03		1	1
1EW-12	S	12/5/2005	VINYL CHLORIDE	1.3E-03		1	1
1EW-12	S	3/11/2006	VINYL CHLORIDE	3.7E-03		1	1
1EW-12	S	6/10/2006	VINYL CHLORIDE	3.1E-03		1	1
1EW-12	S	9/10/2006	VINYL CHLORIDE	2.0E-03		1	1
1EW-12	S	12/1/2006	VINYL CHLORIDE	1.5E-03		1	1
1EW-12	S	3/24/2007	VINYL CHLORIDE	2.1E-03		1	1
1EW-12	S	6/7/2007	VINYL CHLORIDE	2.4E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-12	S	6/5/2008	VINYL CHLORIDE	3.1E-03		1	1
1EW-12	S	7/28/2009	VINYL CHLORIDE	2.0E-03		1	1
1EW-12	S	7/1/2010	VINYL CHLORIDE	2.6E-03		1	1
1EW-12	S	7/6/2011	VINYL CHLORIDE	1.8E-03		1	1
1EW-12	S	7/6/2012	VINYL CHLORIDE	2.0E-04		1	1
1EW-12	S	7/3/2013	VINYL CHLORIDE	1.5E-03		1	1
1EW-12	S	8/19/2014	VINYL CHLORIDE	1.5E-03		1	1
1EW-12	S	7/20/2015	VINYL CHLORIDE	2.3E-03		1	1
1EW-12	S	6/13/2016	VINYL CHLORIDE	2.7E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: AEHA-09 **Time Period:** 12/15/2003 **to** 6/13/2016

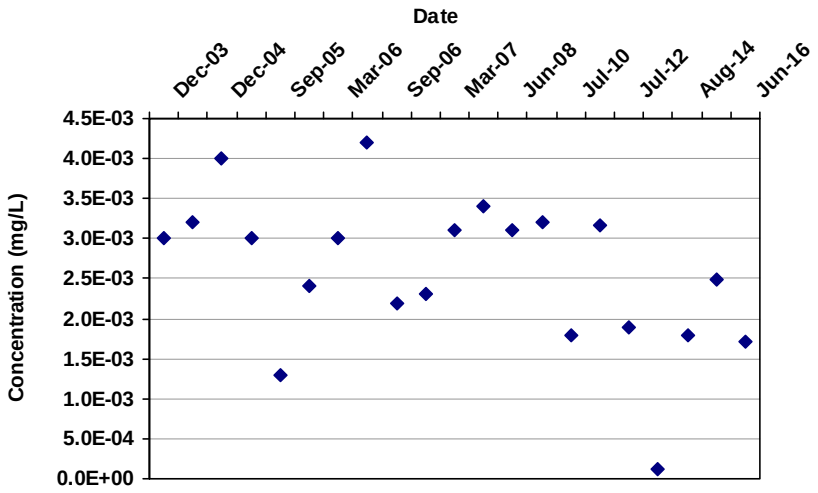
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-58

Confidence in Trend:

95.7%

Coefficient of Variation:

0.37

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
AEHA-09	S	12/15/2003	VINYL CHLORIDE	3.0E-03		1	1
AEHA-09	S	6/3/2004	VINYL CHLORIDE	3.2E-03		1	1
AEHA-09	S	12/1/2004	VINYL CHLORIDE	4.0E-03		1	1
AEHA-09	S	6/14/2005	VINYL CHLORIDE	3.0E-03		1	1
AEHA-09	S	9/20/2005	VINYL CHLORIDE	1.3E-03		1	1
AEHA-09	S	12/5/2005	VINYL CHLORIDE	2.4E-03		1	1
AEHA-09	S	3/11/2006	VINYL CHLORIDE	3.0E-03		1	1
AEHA-09	S	6/10/2006	VINYL CHLORIDE	4.2E-03		1	1
AEHA-09	S	9/10/2006	VINYL CHLORIDE	2.2E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
AEHA-09	S	12/1/2006	VINYL CHLORIDE	2.3E-03		1	1
AEHA-09	S	3/24/2007	VINYL CHLORIDE	3.1E-03		1	1
AEHA-09	S	6/7/2007	VINYL CHLORIDE	3.4E-03		1	1
AEHA-09	S	6/5/2008	VINYL CHLORIDE	3.1E-03		1	1
AEHA-09	S	7/28/2009	VINYL CHLORIDE	3.2E-03		1	1
AEHA-09	S	7/1/2010	VINYL CHLORIDE	1.8E-03		1	1
AEHA-09	S	7/6/2011	VINYL CHLORIDE	3.2E-03		1	1
AEHA-09	S	7/6/2012	VINYL CHLORIDE	1.9E-03		1	1
AEHA-09	S	7/3/2013	VINYL CHLORIDE	1.1E-04		1	1
AEHA-09	S	8/19/2014	VINYL CHLORIDE	1.8E-03		1	1
AEHA-09	S	7/20/2015	VINYL CHLORIDE	2.5E-03		1	1
AEHA-09	S	6/13/2016	VINYL CHLORIDE	1.7E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-19 **Time Period:** 12/15/2003 **to** 6/13/2016

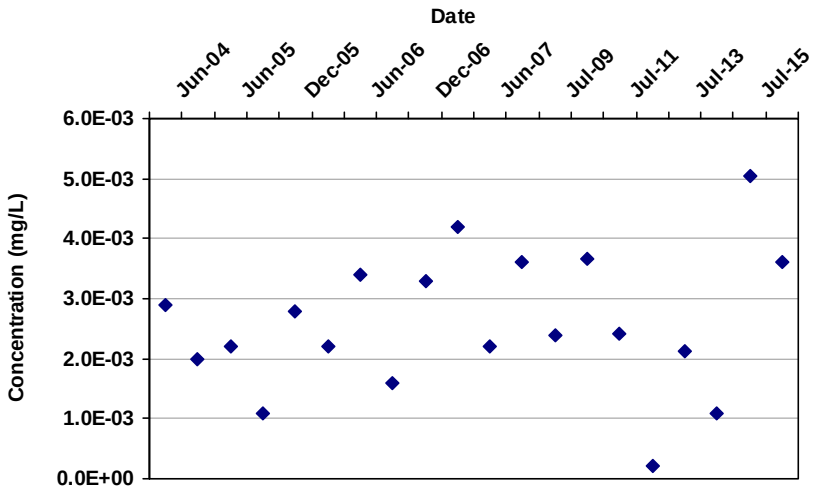
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

25

Confidence in Trend:

78.0%

Coefficient of Variation:

0.44

Mann Kendall Concentration Trend: (See Note)

NT

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-19	T	6/3/2004	VINYL CHLORIDE	2.9E-03		1	1
JMM-19	T	12/1/2004	VINYL CHLORIDE	2.0E-03		1	1
JMM-19	T	6/14/2005	VINYL CHLORIDE	2.2E-03		1	1
JMM-19	T	9/20/2005	VINYL CHLORIDE	1.1E-03		1	1
JMM-19	T	12/5/2005	VINYL CHLORIDE	2.8E-03		1	1
JMM-19	T	3/11/2006	VINYL CHLORIDE	2.2E-03		1	1
JMM-19	T	6/10/2006	VINYL CHLORIDE	3.4E-03		1	1
JMM-19	T	9/10/2006	VINYL CHLORIDE	1.6E-03		1	1
JMM-19	T	12/1/2006	VINYL CHLORIDE	3.3E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-19	T	3/24/2007	VINYL CHLORIDE	4.2E-03		1	1
JMM-19	T	6/7/2007	VINYL CHLORIDE	2.2E-03		1	1
JMM-19	T	6/5/2008	VINYL CHLORIDE	3.6E-03		1	1
JMM-19	T	7/28/2009	VINYL CHLORIDE	2.4E-03		1	1
JMM-19	T	7/1/2010	VINYL CHLORIDE	3.7E-03		1	1
JMM-19	T	7/6/2011	VINYL CHLORIDE	2.4E-03		1	1
JMM-19	T	7/6/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-19	T	7/3/2013	VINYL CHLORIDE	2.1E-03		1	1
JMM-19	T	8/19/2014	VINYL CHLORIDE	1.1E-03		1	1
JMM-19	T	7/20/2015	VINYL CHLORIDE	5.0E-03		1	1
JMM-19	T	6/13/2016	VINYL CHLORIDE	3.6E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-22 **Time Period:** 12/15/2003 **to** 6/13/2016

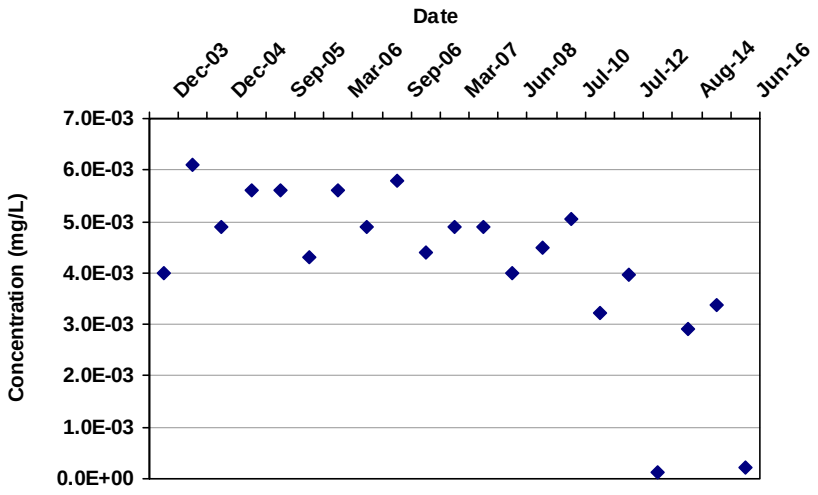
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-108

Confidence in Trend:

100.0%

Coefficient of Variation:

0.38

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-22	S	12/15/2003	VINYL CHLORIDE	4.0E-03		1	1
JMM-22	S	6/3/2004	VINYL CHLORIDE	6.1E-03		1	1
JMM-22	S	12/1/2004	VINYL CHLORIDE	4.9E-03		1	1
JMM-22	S	6/14/2005	VINYL CHLORIDE	5.6E-03		1	1
JMM-22	S	9/20/2005	VINYL CHLORIDE	5.6E-03		1	1
JMM-22	S	12/5/2005	VINYL CHLORIDE	4.3E-03		1	1
JMM-22	S	3/11/2006	VINYL CHLORIDE	5.6E-03		1	1
JMM-22	S	6/10/2006	VINYL CHLORIDE	4.9E-03		1	1
JMM-22	S	9/10/2006	VINYL CHLORIDE	5.8E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-22	S	12/1/2006	VINYL CHLORIDE	4.4E-03		1	1
JMM-22	S	3/24/2007	VINYL CHLORIDE	4.9E-03		1	1
JMM-22	S	6/7/2007	VINYL CHLORIDE	4.9E-03		1	1
JMM-22	S	6/5/2008	VINYL CHLORIDE	4.0E-03		1	1
JMM-22	S	7/28/2009	VINYL CHLORIDE	4.5E-03		1	1
JMM-22	S	7/1/2010	VINYL CHLORIDE	5.1E-03		1	1
JMM-22	S	7/6/2011	VINYL CHLORIDE	3.2E-03		1	1
JMM-22	S	7/6/2012	VINYL CHLORIDE	4.0E-03		1	1
JMM-22	S	7/3/2013	VINYL CHLORIDE	1.1E-04		1	1
JMM-22	S	8/19/2014	VINYL CHLORIDE	2.9E-03		1	1
JMM-22	S	7/20/2015	VINYL CHLORIDE	3.4E-03		1	1
JMM-22	S	6/13/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Linear Regression Statistics Summary

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Time Period: 12/15/2003 **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/Tail	Average Conc (mg/L)	Median Conc (mg/L)	Standard Deviation	All Samples "ND" ?	Ln Slope	Coefficient of Variation	Confidence in Trend	Concentration Trend
VINYL CHLORIDE									
1EW-03	S	8.4E-04	7.4E-04	6.8E-04	No	-4.6E-05	0.81	59.3%	S
1EW-04	S	1.1E-03	9.2E-04	8.9E-04	No	-4.7E-04	0.82	81.9%	S
1EW-12	S	2.2E-03	2.1E-03	8.8E-04	No	-1.4E-04	0.40	87.1%	S
AEHA-09	S	2.6E-03	3.0E-03	9.5E-04	No	-2.3E-04	0.37	97.3%	D
JMM-19	T	2.6E-03	2.4E-03	1.2E-03	No	-4.4E-05	0.44	64.2%	S
JMM-22	S	4.2E-03	4.5E-03	1.6E-03	No	-4.7E-04	0.38	99.9%	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Non-detect (ND); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); COV = Coefficient of Variation

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-03 **Time Period:** ######### **to** 6/13/2016

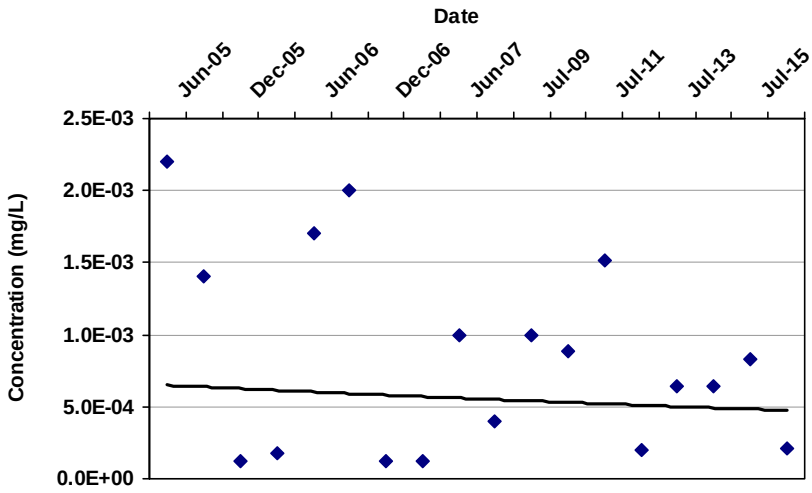
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.81

Confidence in Trend:

59.3%

Ln Slope:

-4.6E-05

LR Concentration Trend:

S

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-03	S	6/14/2005	VINYL CHLOR	2.2E-03		1	1
1EW-03	S	9/20/2005	VINYL CHLOR	1.4E-03		1	1
1EW-03	S	12/5/2005	VINYL CHLOR	1.2E-04		1	1
1EW-03	S	3/11/2006	VINYL CHLOR	1.8E-04		1	1
1EW-03	S	6/10/2006	VINYL CHLOR	1.7E-03		1	1
1EW-03	S	9/10/2006	VINYL CHLOR	2.0E-03		1	1
1EW-03	S	12/1/2006	VINYL CHLOR	1.2E-04		1	1
1EW-03	S	3/24/2007	VINYL CHLOR	1.2E-04		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-03	S	6/7/2007	VINYL CHLOR	1.0E-03		1	1
1EW-03	S	6/5/2008	VINYL CHLOR	4.0E-04		1	1
1EW-03	S	7/28/2009	VINYL CHLOR	1.0E-03		1	1
1EW-03	S	7/1/2010	VINYL CHLOR	8.8E-04		1	1
1EW-03	S	7/6/2011	VINYL CHLOR	1.5E-03		1	1
1EW-03	S	7/6/2012	VINYL CHLOR	2.0E-04		1	1
1EW-03	S	7/3/2013	VINYL CHLOR	6.4E-04		1	1
1EW-03	S	8/19/2014	VINYL CHLOR	6.4E-04		1	1
1EW-03	S	7/20/2015	VINYL CHLOR	8.3E-04		1	1
1EW-03	S	6/13/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-04 **Time Period:** ######### **to** 6/13/2016

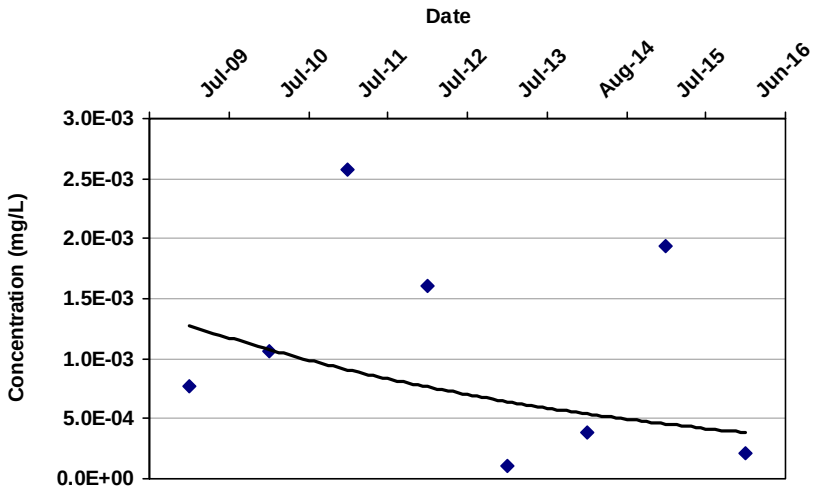
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.82

Confidence in Trend:

81.9%

Ln Slope:

-4.7E-04

LR Concentration Trend:

S

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-04	S	7/28/2009	VINYL CHLOR	7.7E-04		1	1
1EW-04	S	7/1/2010	VINYL CHLOR	1.1E-03		1	1
1EW-04	S	7/6/2011	VINYL CHLOR	2.6E-03		1	1
1EW-04	S	7/6/2012	VINYL CHLOR	1.6E-03		1	1
1EW-04	S	7/3/2013	VINYL CHLOR	1.1E-04		1	1
1EW-04	S	8/19/2014	VINYL CHLOR	3.8E-04		1	1
1EW-04	S	7/20/2015	VINYL CHLOR	1.9E-03		1	1
1EW-04	S	6/13/2016	VINYL CHLOR	2.1E-04		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

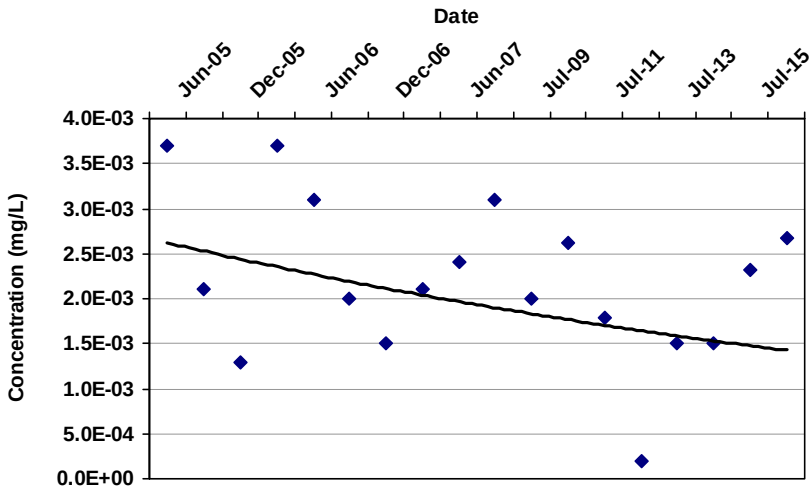
MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: 1EW-12
Well Type: S
COC: VINYL CHLORIDE

Time Period: ######### **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



COV:
0.40

Confidence in Trend:
87.1%

Ln Slope:
-1.4E-04

LR Concentration Trend:
S

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-12	S	6/14/2005	VINYL CHLOR	3.7E-03		1	1
1EW-12	S	9/20/2005	VINYL CHLOR	2.1E-03		1	1
1EW-12	S	12/5/2005	VINYL CHLOR	1.3E-03		1	1
1EW-12	S	3/11/2006	VINYL CHLOR	3.7E-03		1	1
1EW-12	S	6/10/2006	VINYL CHLOR	3.1E-03		1	1
1EW-12	S	9/10/2006	VINYL CHLOR	2.0E-03		1	1
1EW-12	S	12/1/2006	VINYL CHLOR	1.5E-03		1	1
1EW-12	S	3/24/2007	VINYL CHLOR	2.1E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
1EW-12	S	6/7/2007	VINYL CHLOR	2.4E-03		1	1
1EW-12	S	6/5/2008	VINYL CHLOR	3.1E-03		1	1
1EW-12	S	7/28/2009	VINYL CHLOR	2.0E-03		1	1
1EW-12	S	7/1/2010	VINYL CHLOR	2.6E-03		1	1
1EW-12	S	7/6/2011	VINYL CHLOR	1.8E-03		1	1
1EW-12	S	7/6/2012	VINYL CHLOR	2.0E-04		1	1
1EW-12	S	7/3/2013	VINYL CHLOR	1.5E-03		1	1
1EW-12	S	8/19/2014	VINYL CHLOR	1.5E-03		1	1
1EW-12	S	7/20/2015	VINYL CHLOR	2.3E-03		1	1
1EW-12	S	6/13/2016	VINYL CHLOR	2.7E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: AEHA-09 **Time Period:** ######### **to** 6/13/2016

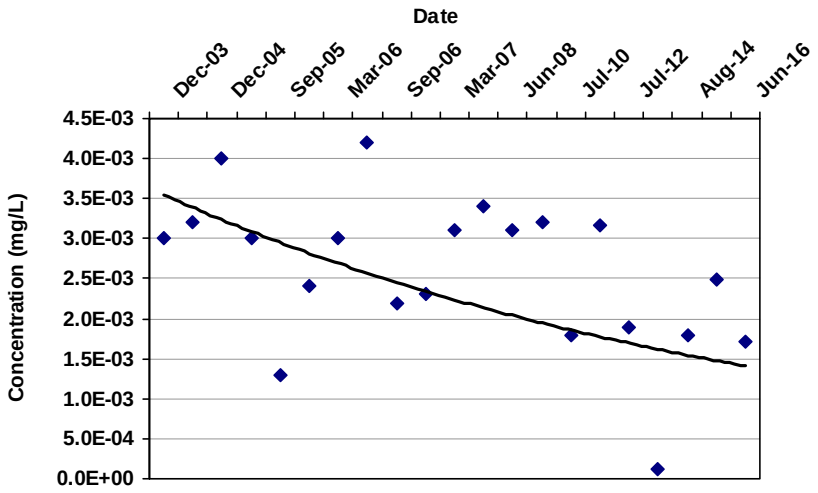
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.37

Confidence in Trend:

97.3%

Ln Slope:

-2.3E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
AEHA-09	S	12/15/2003	VINYL CHLOR	3.0E-03		1	1
AEHA-09	S	6/3/2004	VINYL CHLOR	3.2E-03		1	1
AEHA-09	S	12/1/2004	VINYL CHLOR	4.0E-03		1	1
AEHA-09	S	6/14/2005	VINYL CHLOR	3.0E-03		1	1
AEHA-09	S	9/20/2005	VINYL CHLOR	1.3E-03		1	1
AEHA-09	S	12/5/2005	VINYL CHLOR	2.4E-03		1	1
AEHA-09	S	3/11/2006	VINYL CHLOR	3.0E-03		1	1
AEHA-09	S	6/10/2006	VINYL CHLOR	4.2E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
AEHA-09	S	9/10/2006	VINYL CHLOR	2.2E-03		1	1
AEHA-09	S	12/1/2006	VINYL CHLOR	2.3E-03		1	1
AEHA-09	S	3/24/2007	VINYL CHLOR	3.1E-03		1	1
AEHA-09	S	6/7/2007	VINYL CHLOR	3.4E-03		1	1
AEHA-09	S	6/5/2008	VINYL CHLOR	3.1E-03		1	1
AEHA-09	S	7/28/2009	VINYL CHLOR	3.2E-03		1	1
AEHA-09	S	7/1/2010	VINYL CHLOR	1.8E-03		1	1
AEHA-09	S	7/6/2011	VINYL CHLOR	3.2E-03		1	1
AEHA-09	S	7/6/2012	VINYL CHLOR	1.9E-03		1	1
AEHA-09	S	7/3/2013	VINYL CHLOR	1.1E-04		1	1
AEHA-09	S	8/19/2014	VINYL CHLOR	1.8E-03		1	1
AEHA-09	S	7/20/2015	VINYL CHLOR	2.5E-03		1	1
AEHA-09	S	6/13/2016	VINYL CHLOR	1.7E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-19 **Time Period:** ######### **to** 6/13/2016

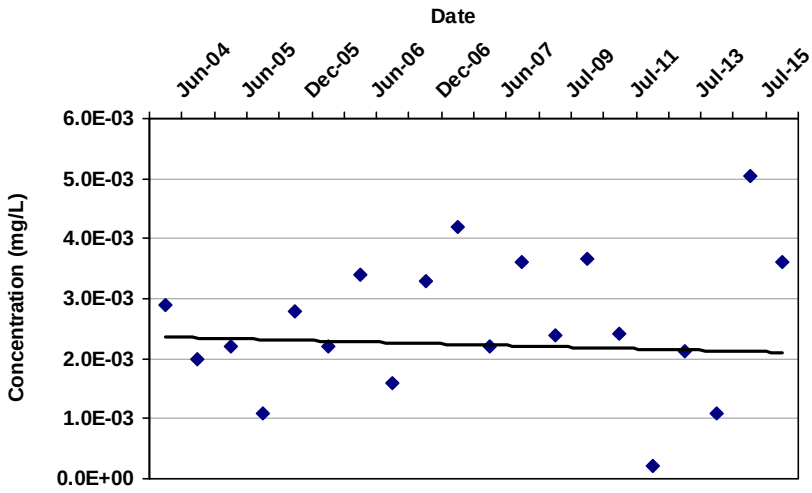
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.44

Confidence in Trend:

64.2%

Ln Slope:

-4.4E-05

LR Concentration Trend:

S

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-19	T	6/3/2004	VINYL CHLOR	2.9E-03		1	1
JMM-19	T	12/1/2004	VINYL CHLOR	2.0E-03		1	1
JMM-19	T	6/14/2005	VINYL CHLOR	2.2E-03		1	1
JMM-19	T	9/20/2005	VINYL CHLOR	1.1E-03		1	1
JMM-19	T	12/5/2005	VINYL CHLOR	2.8E-03		1	1
JMM-19	T	3/11/2006	VINYL CHLOR	2.2E-03		1	1
JMM-19	T	6/10/2006	VINYL CHLOR	3.4E-03		1	1
JMM-19	T	9/10/2006	VINYL CHLOR	1.6E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-19	T	12/1/2006	VINYL CHLOR	3.3E-03		1	1
JMM-19	T	3/24/2007	VINYL CHLOR	4.2E-03		1	1
JMM-19	T	6/7/2007	VINYL CHLOR	2.2E-03		1	1
JMM-19	T	6/5/2008	VINYL CHLOR	3.6E-03		1	1
JMM-19	T	7/28/2009	VINYL CHLOR	2.4E-03		1	1
JMM-19	T	7/1/2010	VINYL CHLOR	3.7E-03		1	1
JMM-19	T	7/6/2011	VINYL CHLOR	2.4E-03		1	1
JMM-19	T	7/6/2012	VINYL CHLOR	2.0E-04		1	1
JMM-19	T	7/3/2013	VINYL CHLOR	2.1E-03		1	1
JMM-19	T	8/19/2014	VINYL CHLOR	1.1E-03		1	1
JMM-19	T	7/20/2015	VINYL CHLOR	5.0E-03		1	1
JMM-19	T	6/13/2016	VINYL CHLOR	3.6E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-22 **Time Period:** ######### **to** 6/13/2016

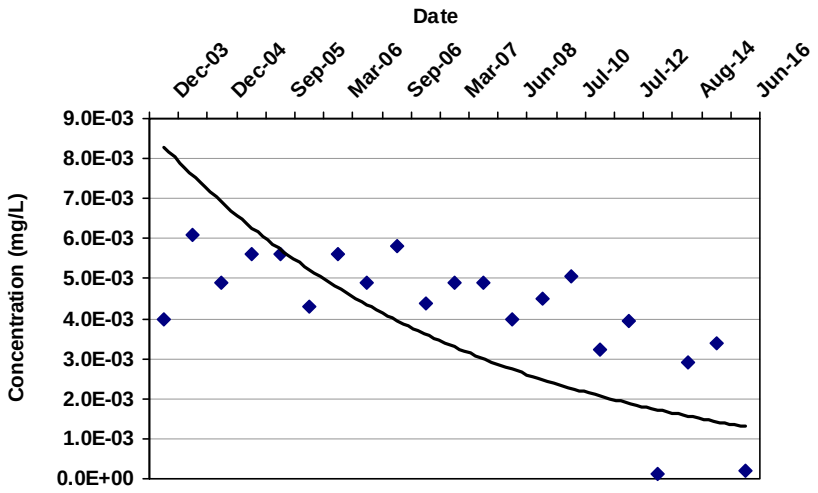
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.38

Confidence in Trend:

99.9%

Ln Slope:

-4.7E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-22	S	12/15/2003	VINYL CHLOR	4.0E-03		1	1
JMM-22	S	6/3/2004	VINYL CHLOR	6.1E-03		1	1
JMM-22	S	12/1/2004	VINYL CHLOR	4.9E-03		1	1
JMM-22	S	6/14/2005	VINYL CHLOR	5.6E-03		1	1
JMM-22	S	9/20/2005	VINYL CHLOR	5.6E-03		1	1
JMM-22	S	12/5/2005	VINYL CHLOR	4.3E-03		1	1
JMM-22	S	3/11/2006	VINYL CHLOR	5.6E-03		1	1
JMM-22	S	6/10/2006	VINYL CHLOR	4.9E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU1 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-22	S	9/10/2006	VINYL CHLOR	5.8E-03		1	1
JMM-22	S	12/1/2006	VINYL CHLOR	4.4E-03		1	1
JMM-22	S	3/24/2007	VINYL CHLOR	4.9E-03		1	1
JMM-22	S	6/7/2007	VINYL CHLOR	4.9E-03		1	1
JMM-22	S	6/5/2008	VINYL CHLOR	4.0E-03		1	1
JMM-22	S	7/28/2009	VINYL CHLOR	4.5E-03		1	1
JMM-22	S	7/1/2010	VINYL CHLOR	5.1E-03		1	1
JMM-22	S	7/6/2011	VINYL CHLOR	3.2E-03		1	1
JMM-22	S	7/6/2012	VINYL CHLOR	4.0E-03		1	1
JMM-22	S	7/3/2013	VINYL CHLOR	1.1E-04		1	1
JMM-22	S	8/19/2014	VINYL CHLOR	2.9E-03		1	1
JMM-22	S	7/20/2015	VINYL CHLOR	3.4E-03		1	1
JMM-22	S	6/13/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

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APPENDIX H

OU-4 STATISTICAL ANALYSIS

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MAROS Statistical Trend Analysis Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Time Period: 12/15/2003 **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source / Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
cis-1,2-DICHLOROETHYLENE								
JMM-08	S	24	24	7.4E-03	4.3E-03	No	D	D
JMM-09	S	24	24	1.8E-03	1.9E-03	No	PD	NT
VINYL CHLORIDE								
HS-08	T	25	25	1.5E-03	1.2E-03	No	D	D
JMM-08	S	25	25	2.5E-02	7.4E-04	No	D	D
JMM-09	S	25	25	2.2E-03	1.8E-03	No	D	D
JMM-57	T	25	25	5.3E-04	4.0E-04	No	D	D
JMM-64	T	25	25	4.2E-04	2.4E-04	No	D	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (ND)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Time Period: 12/15/2003 **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
cis-1,2-DICHLOROETHYLENE								
JMM-08	S	24	24	1.05	-167	100.0%	No	D
JMM-09	S	24	24	0.29	-61	93.1%	No	PD
VINYL CHLORIDE								
HS-08	T	25	25	0.71	-224	100.0%	No	D
JMM-08	S	25	25	1.38	-172	100.0%	No	D
JMM-09	S	25	25	0.59	-151	100.0%	No	D
JMM-57	T	25	25	0.72	-106	99.3%	No	D
JMM-64	T	25	25	0.97	-155	100.0%	No	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-08 **Time Period:** 12/15/2003 **to** 6/13/2016

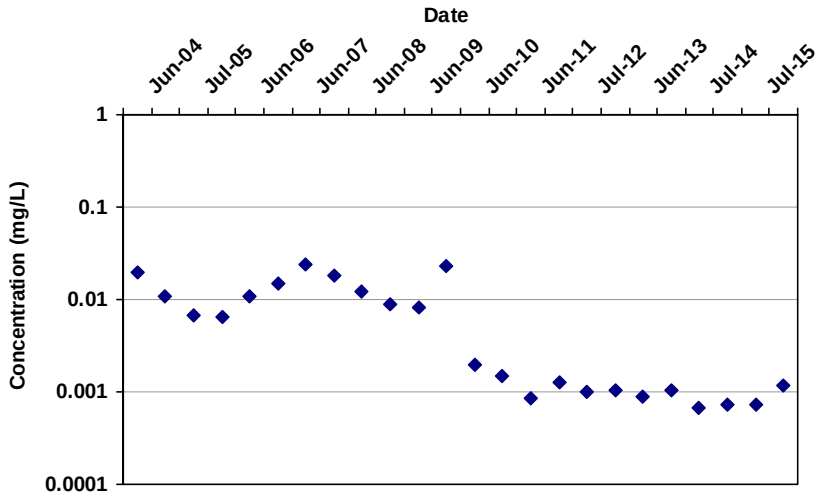
Well Type: S **Consolidation Period:** No Time Consolidation

COC: cis-1,2-DICHLOROETHYLENE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-167

Confidence in Trend:

100.0%

Coefficient of Variation:

1.05

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/8/2004	cis-1,2-DICHLOROET	2.0E-02		1	1
JMM-08	S	12/15/2004	cis-1,2-DICHLOROET	1.1E-02		1	1
JMM-08	S	7/8/2005	cis-1,2-DICHLOROET	6.8E-03		1	1
JMM-08	S	1/10/2006	cis-1,2-DICHLOROET	6.5E-03		1	1
JMM-08	S	6/6/2006	cis-1,2-DICHLOROET	1.1E-02		1	1
JMM-08	S	12/20/2006	cis-1,2-DICHLOROET	1.5E-02		1	1
JMM-08	S	6/12/2007	cis-1,2-DICHLOROET	2.4E-02		1	1
JMM-08	S	12/4/2007	cis-1,2-DICHLOROET	1.8E-02		1	1
JMM-08	S	6/19/2008	cis-1,2-DICHLOROET	1.2E-02		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	12/16/2008	cis-1,2-DICHLOROET	9.0E-03		1	1
JMM-08	S	6/9/2009	cis-1,2-DICHLOROET	8.3E-03		1	1
JMM-08	S	12/8/2009	cis-1,2-DICHLOROET	2.3E-02		1	1
JMM-08	S	6/14/2010	cis-1,2-DICHLOROET	2.0E-03		1	1
JMM-08	S	12/1/2010	cis-1,2-DICHLOROET	1.5E-03		1	1
JMM-08	S	6/26/2011	cis-1,2-DICHLOROET	8.6E-04		1	1
JMM-08	S	12/1/2011	cis-1,2-DICHLOROET	1.3E-03		1	1
JMM-08	S	7/1/2012	cis-1,2-DICHLOROET	1.0E-03		1	1
JMM-08	S	12/1/2012	cis-1,2-DICHLOROET	1.0E-03		1	1
JMM-08	S	6/1/2013	cis-1,2-DICHLOROET	8.8E-04		1	1
JMM-08	S	12/1/2013	cis-1,2-DICHLOROET	1.0E-03		1	1
JMM-08	S	7/1/2014	cis-1,2-DICHLOROET	6.8E-04		1	1
JMM-08	S	12/1/2014	cis-1,2-DICHLOROET	7.4E-04		1	1
JMM-08	S	7/1/2015	cis-1,2-DICHLOROET	7.4E-04		1	1
JMM-08	S	12/1/2015	cis-1,2-DICHLOROET	1.2E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-09 **Time Period:** 12/15/2003 **to** 6/13/2016

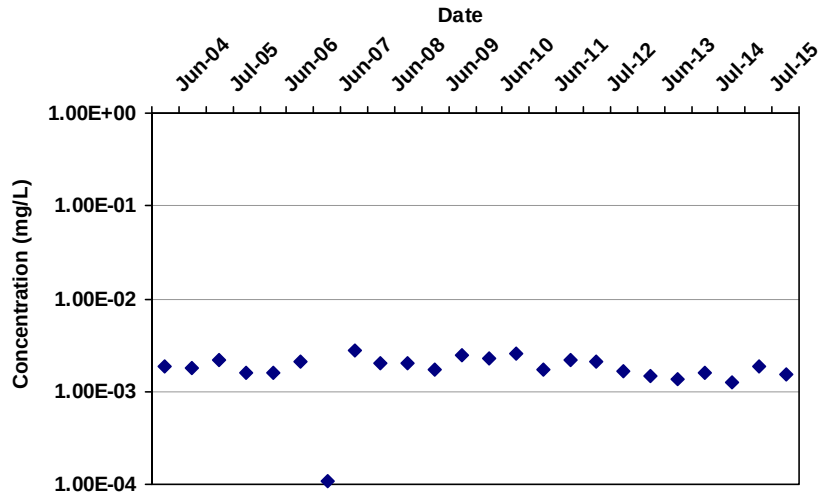
Well Type: S **Consolidation Period:** No Time Consolidation

COC: cis-1,2-DICHLOROETHYLENE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-61

Confidence in Trend:

93.1%

Coefficient of Variation:

0.29

Mann Kendall Concentration Trend: (See Note)

PD

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/8/2004	cis-1,2-DICHLOROET	1.9E-03		1	1
JMM-09	S	12/15/2004	cis-1,2-DICHLOROET	1.8E-03		1	1
JMM-09	S	7/8/2005	cis-1,2-DICHLOROET	2.2E-03		1	1
JMM-09	S	1/10/2006	cis-1,2-DICHLOROET	1.6E-03		1	1
JMM-09	S	6/6/2006	cis-1,2-DICHLOROET	1.6E-03		1	1
JMM-09	S	12/20/2006	cis-1,2-DICHLOROET	2.1E-03		1	1
JMM-09	S	6/12/2007	cis-1,2-DICHLOROET	1.1E-04		1	1
JMM-09	S	12/4/2007	cis-1,2-DICHLOROET	2.8E-03		1	1
JMM-09	S	6/19/2008	cis-1,2-DICHLOROET	2.0E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	12/16/2008	cis-1,2-DICHLOROET	2.0E-03		1	1
JMM-09	S	6/9/2009	cis-1,2-DICHLOROET	1.7E-03		1	1
JMM-09	S	12/8/2009	cis-1,2-DICHLOROET	2.5E-03		1	1
JMM-09	S	6/14/2010	cis-1,2-DICHLOROET	2.3E-03		1	1
JMM-09	S	12/1/2010	cis-1,2-DICHLOROET	2.5E-03		1	1
JMM-09	S	6/26/2011	cis-1,2-DICHLOROET	1.7E-03		1	1
JMM-09	S	12/1/2011	cis-1,2-DICHLOROET	2.2E-03		1	1
JMM-09	S	7/1/2012	cis-1,2-DICHLOROET	2.1E-03		1	1
JMM-09	S	12/1/2012	cis-1,2-DICHLOROET	1.7E-03		1	1
JMM-09	S	6/1/2013	cis-1,2-DICHLOROET	1.5E-03		1	1
JMM-09	S	12/1/2013	cis-1,2-DICHLOROET	1.4E-03		1	1
JMM-09	S	7/1/2014	cis-1,2-DICHLOROET	1.6E-03		1	1
JMM-09	S	12/1/2014	cis-1,2-DICHLOROET	1.3E-03		1	1
JMM-09	S	7/1/2015	cis-1,2-DICHLOROET	1.9E-03		1	1
JMM-09	S	12/1/2015	cis-1,2-DICHLOROET	1.5E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: HS-08 **Time Period:** 12/15/2003 **to** 6/13/2016

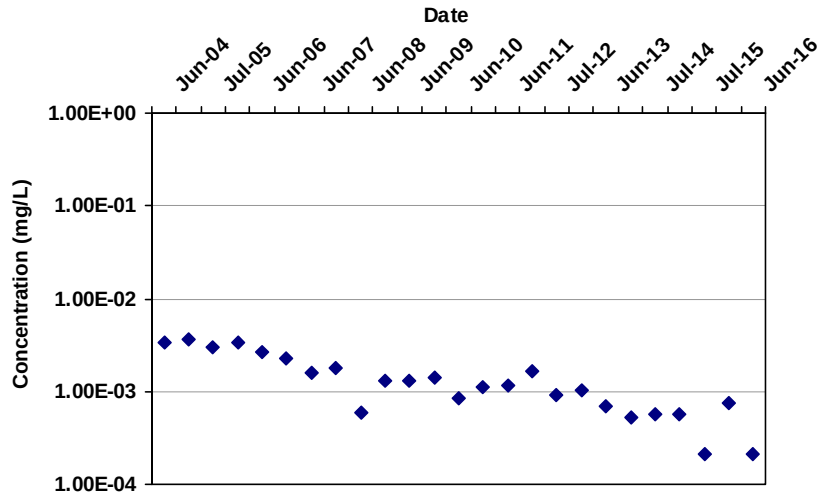
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-224

Confidence in Trend:

100.0%

Coefficient of Variation:

0.71

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
HS-08	T	6/8/2004	VINYL CHLORIDE	3.4E-03		1	1
HS-08	T	12/15/2004	VINYL CHLORIDE	3.7E-03		1	1
HS-08	T	7/8/2005	VINYL CHLORIDE	3.0E-03		1	1
HS-08	T	1/10/2006	VINYL CHLORIDE	3.4E-03		1	1
HS-08	T	6/6/2006	VINYL CHLORIDE	2.7E-03		1	1
HS-08	T	1/4/2007	VINYL CHLORIDE	2.3E-03		1	1
HS-08	T	6/12/2007	VINYL CHLORIDE	1.6E-03		1	1
HS-08	T	12/4/2007	VINYL CHLORIDE	1.8E-03		1	1
HS-08	T	6/19/2008	VINYL CHLORIDE	6.0E-04		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
HS-08	T	12/16/2008	VINYL CHLORIDE	1.3E-03		1	1
HS-08	T	6/9/2009	VINYL CHLORIDE	1.3E-03		1	1
HS-08	T	12/8/2009	VINYL CHLORIDE	1.4E-03		1	1
HS-08	T	6/14/2010	VINYL CHLORIDE	8.3E-04		1	1
HS-08	T	12/1/2010	VINYL CHLORIDE	1.1E-03		1	1
HS-08	T	6/26/2011	VINYL CHLORIDE	1.2E-03		1	1
HS-08	T	12/1/2011	VINYL CHLORIDE	1.7E-03		1	1
HS-08	T	7/1/2012	VINYL CHLORIDE	9.0E-04		1	1
HS-08	T	12/1/2012	VINYL CHLORIDE	1.0E-03		1	1
HS-08	T	6/1/2013	VINYL CHLORIDE	6.9E-04		1	1
HS-08	T	12/1/2013	VINYL CHLORIDE	5.3E-04		1	1
HS-08	T	7/1/2014	VINYL CHLORIDE	5.7E-04		1	1
HS-08	T	12/1/2014	VINYL CHLORIDE	5.7E-04		1	1
HS-08	T	7/1/2015	VINYL CHLORIDE	2.1E-04		1	1
HS-08	T	12/1/2015	VINYL CHLORIDE	7.5E-04		1	1
HS-08	T	6/1/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-08 **Time Period:** 12/15/2003 **to** 6/13/2016

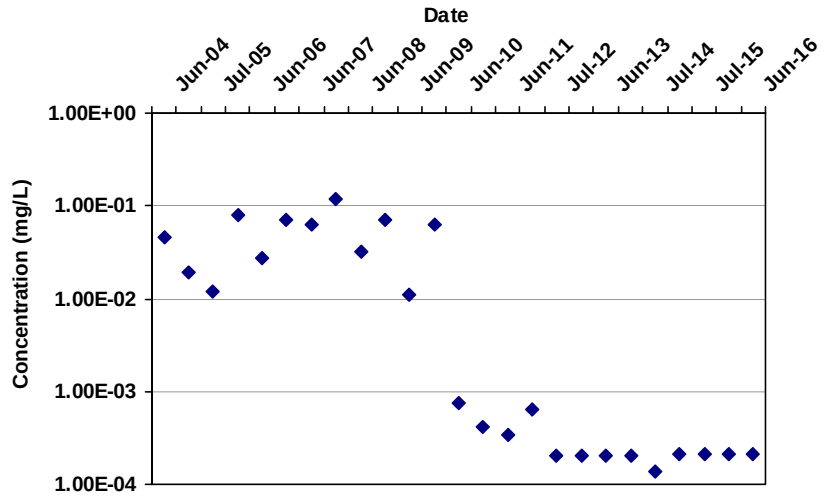
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-172

Confidence in Trend:

100.0%

Coefficient of Variation:

1.38

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/8/2004	VINYL CHLORIDE	4.5E-02		1	1
JMM-08	S	12/15/2004	VINYL CHLORIDE	1.9E-02		1	1
JMM-08	S	7/8/2005	VINYL CHLORIDE	1.2E-02		1	1
JMM-08	S	1/10/2006	VINYL CHLORIDE	8.0E-02		1	1
JMM-08	S	6/6/2006	VINYL CHLORIDE	2.7E-02		1	1
JMM-08	S	12/20/2006	VINYL CHLORIDE	7.0E-02		1	1
JMM-08	S	6/12/2007	VINYL CHLORIDE	6.4E-02		1	1
JMM-08	S	12/4/2007	VINYL CHLORIDE	1.2E-01		1	1
JMM-08	S	6/19/2008	VINYL CHLORIDE	3.2E-02		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	12/16/2008	VINYL CHLORIDE	7.1E-02		1	1
JMM-08	S	6/9/2009	VINYL CHLORIDE	1.1E-02		1	1
JMM-08	S	12/8/2009	VINYL CHLORIDE	6.2E-02		1	1
JMM-08	S	6/14/2010	VINYL CHLORIDE	7.4E-04		1	1
JMM-08	S	12/1/2010	VINYL CHLORIDE	4.2E-04		1	1
JMM-08	S	6/26/2011	VINYL CHLORIDE	3.4E-04		1	1
JMM-08	S	12/1/2011	VINYL CHLORIDE	6.3E-04		1	1
JMM-08	S	7/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-08	S	12/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-08	S	6/1/2013	VINYL CHLORIDE	2.0E-04		1	1
JMM-08	S	12/1/2013	VINYL CHLORIDE	2.0E-04		1	1
JMM-08	S	7/1/2014	VINYL CHLORIDE	1.4E-04		1	1
JMM-08	S	12/1/2014	VINYL CHLORIDE	2.1E-04		1	1
JMM-08	S	7/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-08	S	12/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-08	S	6/1/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-09 **Time Period:** 12/15/2003 **to** 6/13/2016

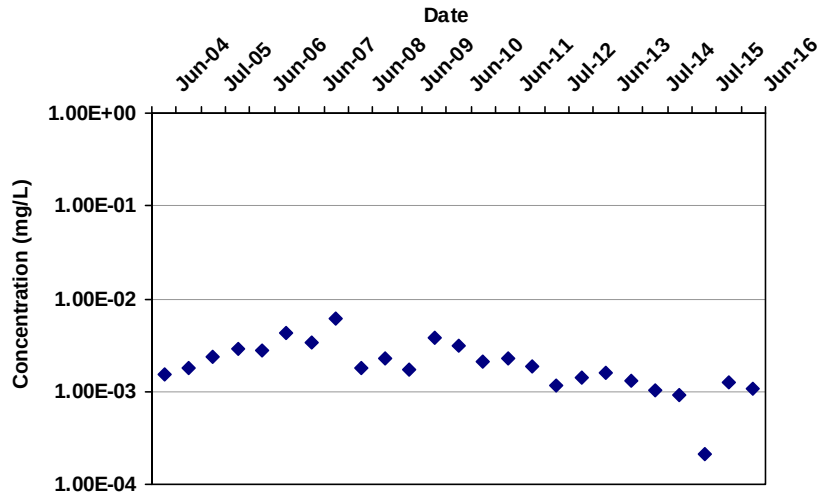
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-151

Confidence in Trend:

100.0%

Coefficient of Variation:

0.59

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/8/2004	VINYL CHLORIDE	1.5E-03		1	1
JMM-09	S	12/15/2004	VINYL CHLORIDE	1.8E-03		1	1
JMM-09	S	7/8/2005	VINYL CHLORIDE	2.4E-03		1	1
JMM-09	S	1/10/2006	VINYL CHLORIDE	2.9E-03		1	1
JMM-09	S	6/6/2006	VINYL CHLORIDE	2.8E-03		1	1
JMM-09	S	12/20/2006	VINYL CHLORIDE	4.3E-03		1	1
JMM-09	S	6/12/2007	VINYL CHLORIDE	3.4E-03		1	1
JMM-09	S	12/4/2007	VINYL CHLORIDE	6.1E-03		1	1
JMM-09	S	6/19/2008	VINYL CHLORIDE	1.8E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	12/16/2008	VINYL CHLORIDE	2.3E-03		1	1
JMM-09	S	6/9/2009	VINYL CHLORIDE	1.7E-03		1	1
JMM-09	S	12/8/2009	VINYL CHLORIDE	3.8E-03		1	1
JMM-09	S	6/14/2010	VINYL CHLORIDE	3.1E-03		1	1
JMM-09	S	12/1/2010	VINYL CHLORIDE	2.1E-03		1	1
JMM-09	S	6/26/2011	VINYL CHLORIDE	2.3E-03		1	1
JMM-09	S	12/1/2011	VINYL CHLORIDE	1.9E-03		1	1
JMM-09	S	7/1/2012	VINYL CHLORIDE	1.1E-03		1	1
JMM-09	S	12/1/2012	VINYL CHLORIDE	1.4E-03		1	1
JMM-09	S	6/1/2013	VINYL CHLORIDE	1.6E-03		1	1
JMM-09	S	12/1/2013	VINYL CHLORIDE	1.3E-03		1	1
JMM-09	S	7/1/2014	VINYL CHLORIDE	1.1E-03		1	1
JMM-09	S	12/1/2014	VINYL CHLORIDE	9.1E-04		1	1
JMM-09	S	7/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-09	S	12/1/2015	VINYL CHLORIDE	1.3E-03		1	1
JMM-09	S	6/1/2016	VINYL CHLORIDE	1.1E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-57 **Time Period:** 12/15/2003 **to** 6/13/2016

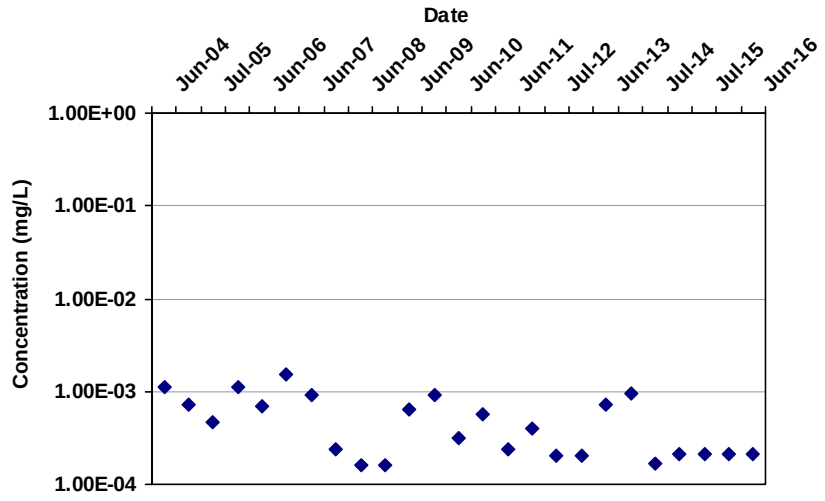
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-106

Confidence in Trend:

99.3%

Coefficient of Variation:

0.72

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-57	T	6/8/2004	VINYL CHLORIDE	1.1E-03		1	1
JMM-57	T	12/15/2004	VINYL CHLORIDE	7.3E-04		1	1
JMM-57	T	7/8/2005	VINYL CHLORIDE	4.6E-04		1	1
JMM-57	T	1/10/2006	VINYL CHLORIDE	1.1E-03		1	1
JMM-57	T	6/6/2006	VINYL CHLORIDE	6.9E-04		1	1
JMM-57	T	1/4/2007	VINYL CHLORIDE	1.5E-03		1	1
JMM-57	T	6/12/2007	VINYL CHLORIDE	9.0E-04		1	1
JMM-57	T	12/4/2007	VINYL CHLORIDE	2.4E-04		1	1
JMM-57	T	6/19/2008	VINYL CHLORIDE	1.6E-04		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-57	T	12/16/2008	VINYL CHLORIDE	1.6E-04		1	1
JMM-57	T	6/9/2009	VINYL CHLORIDE	6.3E-04		1	1
JMM-57	T	12/8/2009	VINYL CHLORIDE	9.2E-04		1	1
JMM-57	T	6/14/2010	VINYL CHLORIDE	3.1E-04		1	1
JMM-57	T	12/1/2010	VINYL CHLORIDE	5.8E-04		1	1
JMM-57	T	6/26/2011	VINYL CHLORIDE	2.4E-04		1	1
JMM-57	T	12/1/2011	VINYL CHLORIDE	4.0E-04		1	1
JMM-57	T	7/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-57	T	12/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-57	T	6/1/2013	VINYL CHLORIDE	7.1E-04		1	1
JMM-57	T	12/1/2013	VINYL CHLORIDE	9.4E-04		1	1
JMM-57	T	7/1/2014	VINYL CHLORIDE	1.7E-04		1	1
JMM-57	T	12/1/2014	VINYL CHLORIDE	2.1E-04		1	1
JMM-57	T	7/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-57	T	12/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-57	T	6/1/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-64 **Time Period:** 12/15/2003 **to** 6/13/2016

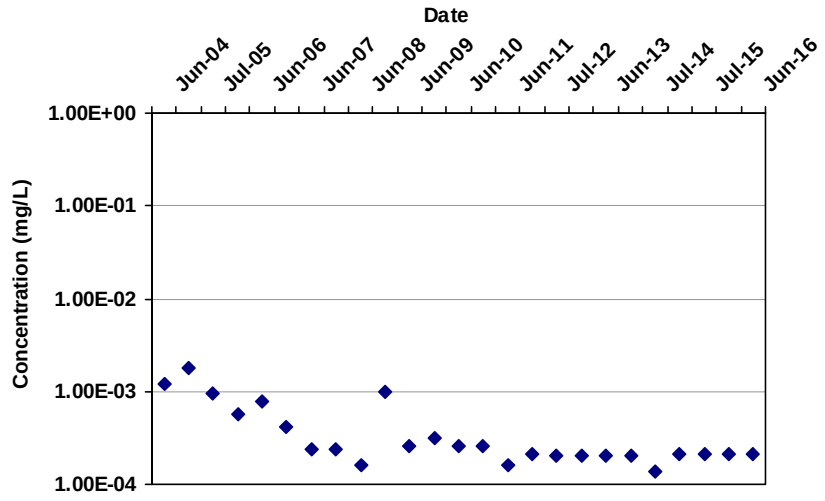
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

-155

Confidence in Trend:

100.0%

Coefficient of Variation:

0.97

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-64	T	6/8/2004	VINYL CHLORIDE	1.2E-03		1	1
JMM-64	T	12/15/2004	VINYL CHLORIDE	1.8E-03		1	1
JMM-64	T	7/8/2005	VINYL CHLORIDE	9.6E-04		1	1
JMM-64	T	1/10/2006	VINYL CHLORIDE	5.8E-04		1	1
JMM-64	T	6/6/2006	VINYL CHLORIDE	7.7E-04		1	1
JMM-64	T	1/4/2007	VINYL CHLORIDE	4.2E-04		1	1
JMM-64	T	6/12/2007	VINYL CHLORIDE	2.4E-04		1	1
JMM-64	T	12/4/2007	VINYL CHLORIDE	2.4E-04		1	1
JMM-64	T	6/19/2008	VINYL CHLORIDE	1.6E-04		1	1

MAROS Mann-Kendall Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-64	T	12/16/2008	VINYL CHLORIDE	1.0E-03		1	1
JMM-64	T	6/9/2009	VINYL CHLORIDE	2.6E-04		1	1
JMM-64	T	12/8/2009	VINYL CHLORIDE	3.1E-04		1	1
JMM-64	T	6/14/2010	VINYL CHLORIDE	2.6E-04		1	1
JMM-64	T	12/1/2010	VINYL CHLORIDE	2.6E-04		1	1
JMM-64	T	6/26/2011	VINYL CHLORIDE	1.6E-04		1	1
JMM-64	T	12/1/2011	VINYL CHLORIDE	2.1E-04		1	1
JMM-64	T	7/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-64	T	12/1/2012	VINYL CHLORIDE	2.0E-04		1	1
JMM-64	T	6/1/2013	VINYL CHLORIDE	2.0E-04		1	1
JMM-64	T	12/1/2013	VINYL CHLORIDE	2.0E-04		1	1
JMM-64	T	7/1/2014	VINYL CHLORIDE	1.4E-04		1	1
JMM-64	T	12/1/2014	VINYL CHLORIDE	2.1E-04		1	1
JMM-64	T	7/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-64	T	12/1/2015	VINYL CHLORIDE	2.1E-04		1	1
JMM-64	T	6/1/2016	VINYL CHLORIDE	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Linear Regression Statistics Summary

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Time Period: 12/15/2003 **to** 6/13/2016
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/Tail	Average Conc (mg/L)	Median Conc (mg/L)	Standard Deviation	All Samples "ND" ?	Ln Slope	Coefficient of Variation	Confidence in Trend	Concentration Trend
cis-1,2-DICHLOROETHYLENE									
JMM-08	S	7.4E-03	4.3E-03	7.7E-03	No	-8.9E-04	1.05	100.0%	D
JMM-09	S	1.8E-03	1.9E-03	5.3E-04	No	1.7E-05	0.29	56.6%	NT
VINYL CHLORIDE									
HS-08	T	1.5E-03	1.2E-03	1.0E-03	No	-5.2E-04	0.71	100.0%	D
JMM-08	S	2.5E-02	7.4E-04	3.4E-02	No	-1.7E-03	1.38	100.0%	D
JMM-09	S	2.2E-03	1.8E-03	1.3E-03	No	-3.1E-04	0.59	100.0%	D
JMM-57	T	5.3E-04	4.0E-04	3.8E-04	No	-3.0E-04	0.72	99.8%	D
JMM-64	T	4.2E-04	2.4E-04	4.1E-04	No	-4.0E-04	0.97	100.0%	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Non-detect (ND); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); COV = Coefficient of Variation

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-08 **Time Period:** ######### **to** 6/13/2016

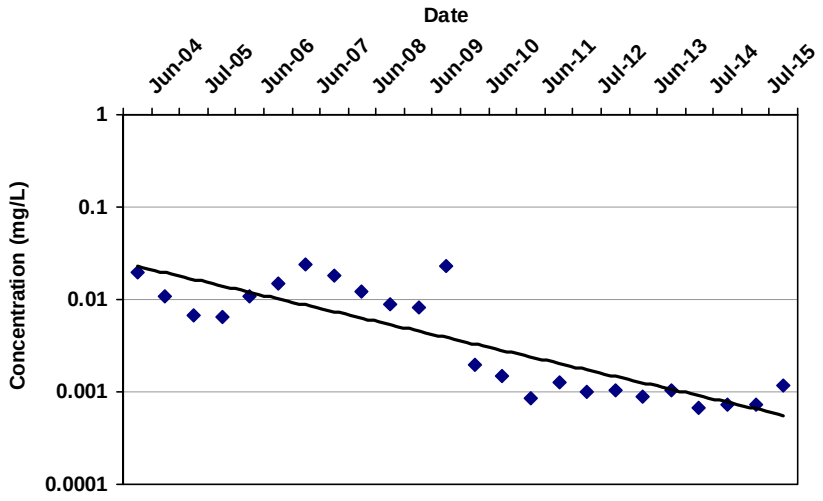
Well Type: S **Consolidation Period:** No Time Consolidation

COC: cis-1,2-DICHLOROETHYLENE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

1.05

Confidence in Trend:

100.0%

Ln Slope:

-8.9E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/8/2004	cis-1,2-DICHL	2.0E-02		1	1
JMM-08	S	12/15/2004	cis-1,2-DICHL	1.1E-02		1	1
JMM-08	S	7/8/2005	cis-1,2-DICHL	6.8E-03		1	1
JMM-08	S	1/10/2006	cis-1,2-DICHL	6.5E-03		1	1
JMM-08	S	6/6/2006	cis-1,2-DICHL	1.1E-02		1	1
JMM-08	S	12/20/2006	cis-1,2-DICHL	1.5E-02		1	1
JMM-08	S	6/12/2007	cis-1,2-DICHL	2.4E-02		1	1
JMM-08	S	12/4/2007	cis-1,2-DICHL	1.8E-02		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/19/2008	cis-1,2-DICHL	1.2E-02		1	1
JMM-08	S	12/16/2008	cis-1,2-DICHL	9.0E-03		1	1
JMM-08	S	6/9/2009	cis-1,2-DICHL	8.3E-03		1	1
JMM-08	S	12/8/2009	cis-1,2-DICHL	2.3E-02		1	1
JMM-08	S	6/14/2010	cis-1,2-DICHL	2.0E-03		1	1
JMM-08	S	12/1/2010	cis-1,2-DICHL	1.5E-03		1	1
JMM-08	S	6/26/2011	cis-1,2-DICHL	8.6E-04		1	1
JMM-08	S	12/1/2011	cis-1,2-DICHL	1.3E-03		1	1
JMM-08	S	7/1/2012	cis-1,2-DICHL	1.0E-03		1	1
JMM-08	S	12/1/2012	cis-1,2-DICHL	1.0E-03		1	1
JMM-08	S	6/1/2013	cis-1,2-DICHL	8.8E-04		1	1
JMM-08	S	12/1/2013	cis-1,2-DICHL	1.0E-03		1	1
JMM-08	S	7/1/2014	cis-1,2-DICHL	6.8E-04		1	1
JMM-08	S	12/1/2014	cis-1,2-DICHL	7.4E-04		1	1
JMM-08	S	7/1/2015	cis-1,2-DICHL	7.4E-04		1	1
JMM-08	S	12/1/2015	cis-1,2-DICHL	1.2E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-09 **Time Period:** ######### **to** 6/13/2016

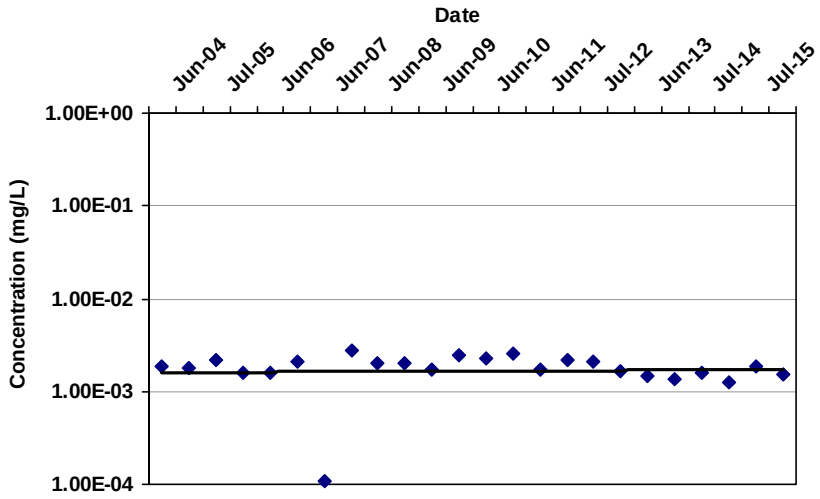
Well Type: S **Consolidation Period:** No Time Consolidation

COC: cis-1,2-DICHLOROETHYLENE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV: 0.29

Confidence in Trend: 56.6%

Ln Slope: 1.7E-05

LR Concentration Trend: NT

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/8/2004	cis-1,2-DICHL	1.9E-03		1	1
JMM-09	S	12/15/2004	cis-1,2-DICHL	1.8E-03		1	1
JMM-09	S	7/8/2005	cis-1,2-DICHL	2.2E-03		1	1
JMM-09	S	1/10/2006	cis-1,2-DICHL	1.6E-03		1	1
JMM-09	S	6/6/2006	cis-1,2-DICHL	1.6E-03		1	1
JMM-09	S	12/20/2006	cis-1,2-DICHL	2.1E-03		1	1
JMM-09	S	6/12/2007	cis-1,2-DICHL	1.1E-04		1	1
JMM-09	S	12/4/2007	cis-1,2-DICHL	2.8E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/19/2008	cis-1,2-DICHL	2.0E-03		1	1
JMM-09	S	12/16/2008	cis-1,2-DICHL	2.0E-03		1	1
JMM-09	S	6/9/2009	cis-1,2-DICHL	1.7E-03		1	1
JMM-09	S	12/8/2009	cis-1,2-DICHL	2.5E-03		1	1
JMM-09	S	6/14/2010	cis-1,2-DICHL	2.3E-03		1	1
JMM-09	S	12/1/2010	cis-1,2-DICHL	2.5E-03		1	1
JMM-09	S	6/26/2011	cis-1,2-DICHL	1.7E-03		1	1
JMM-09	S	12/1/2011	cis-1,2-DICHL	2.2E-03		1	1
JMM-09	S	7/1/2012	cis-1,2-DICHL	2.1E-03		1	1
JMM-09	S	12/1/2012	cis-1,2-DICHL	1.7E-03		1	1
JMM-09	S	6/1/2013	cis-1,2-DICHL	1.5E-03		1	1
JMM-09	S	12/1/2013	cis-1,2-DICHL	1.4E-03		1	1
JMM-09	S	7/1/2014	cis-1,2-DICHL	1.6E-03		1	1
JMM-09	S	12/1/2014	cis-1,2-DICHL	1.3E-03		1	1
JMM-09	S	7/1/2015	cis-1,2-DICHL	1.9E-03		1	1
JMM-09	S	12/1/2015	cis-1,2-DICHL	1.5E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: HS-08 **Time Period:** ######### **to** 6/13/2016

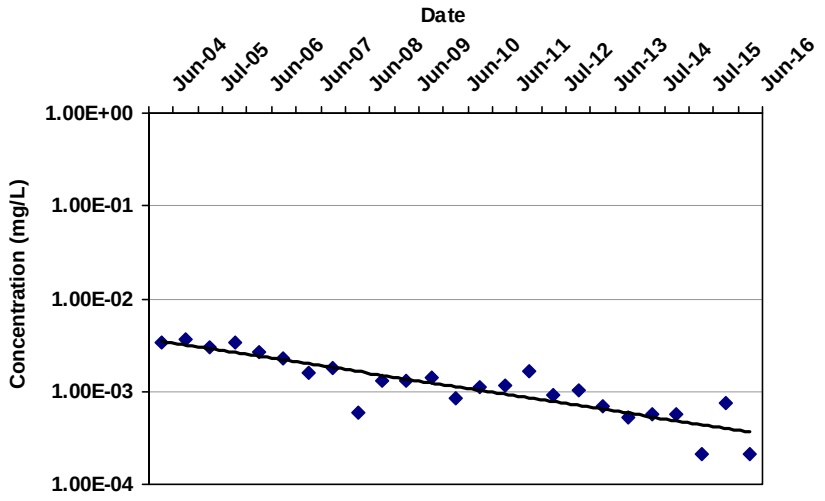
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV: 0.71

Confidence in Trend: 100.0%

Ln Slope: -5.2E-04

LR Concentration Trend: D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
HS-08	T	6/8/2004	VINYL CHLOR	3.4E-03		1	1
HS-08	T	12/15/2004	VINYL CHLOR	3.7E-03		1	1
HS-08	T	7/8/2005	VINYL CHLOR	3.0E-03		1	1
HS-08	T	1/10/2006	VINYL CHLOR	3.4E-03		1	1
HS-08	T	6/6/2006	VINYL CHLOR	2.7E-03		1	1
HS-08	T	1/4/2007	VINYL CHLOR	2.3E-03		1	1
HS-08	T	6/12/2007	VINYL CHLOR	1.6E-03		1	1
HS-08	T	12/4/2007	VINYL CHLOR	1.8E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
HS-08	T	6/19/2008	VINYL CHLOR	6.0E-04		1	1
HS-08	T	12/16/2008	VINYL CHLOR	1.3E-03		1	1
HS-08	T	6/9/2009	VINYL CHLOR	1.3E-03		1	1
HS-08	T	12/8/2009	VINYL CHLOR	1.4E-03		1	1
HS-08	T	6/14/2010	VINYL CHLOR	8.3E-04		1	1
HS-08	T	12/1/2010	VINYL CHLOR	1.1E-03		1	1
HS-08	T	6/26/2011	VINYL CHLOR	1.2E-03		1	1
HS-08	T	12/1/2011	VINYL CHLOR	1.7E-03		1	1
HS-08	T	7/1/2012	VINYL CHLOR	9.0E-04		1	1
HS-08	T	12/1/2012	VINYL CHLOR	1.0E-03		1	1
HS-08	T	6/1/2013	VINYL CHLOR	6.9E-04		1	1
HS-08	T	12/1/2013	VINYL CHLOR	5.3E-04		1	1
HS-08	T	7/1/2014	VINYL CHLOR	5.7E-04		1	1
HS-08	T	12/1/2014	VINYL CHLOR	5.7E-04		1	1
HS-08	T	7/1/2015	VINYL CHLOR	2.1E-04		1	1
HS-08	T	12/1/2015	VINYL CHLOR	7.5E-04		1	1
HS-08	T	6/1/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-08 **Time Period:** ######### **to** 6/13/2016

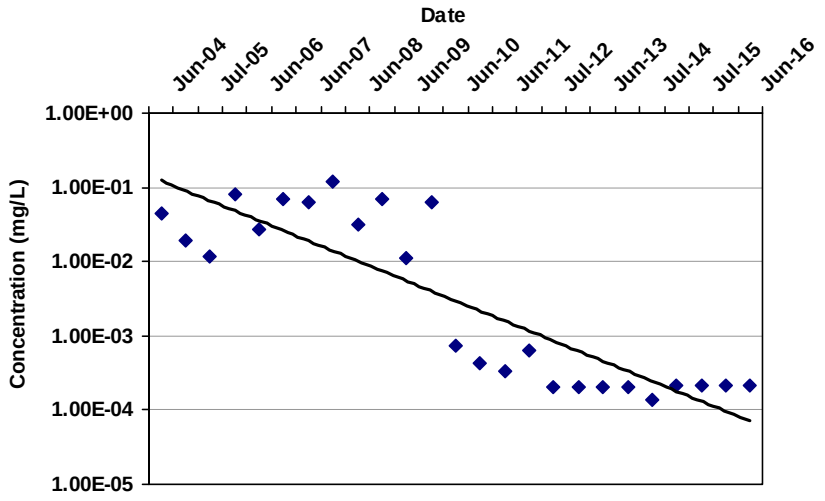
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

1.38

Confidence in Trend:

100.0%

Ln Slope:

-1.7E-03

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/8/2004	VINYL CHLOR	4.5E-02		1	1
JMM-08	S	12/15/2004	VINYL CHLOR	1.9E-02		1	1
JMM-08	S	7/8/2005	VINYL CHLOR	1.2E-02		1	1
JMM-08	S	1/10/2006	VINYL CHLOR	8.0E-02		1	1
JMM-08	S	6/6/2006	VINYL CHLOR	2.7E-02		1	1
JMM-08	S	12/20/2006	VINYL CHLOR	7.0E-02		1	1
JMM-08	S	6/12/2007	VINYL CHLOR	6.4E-02		1	1
JMM-08	S	12/4/2007	VINYL CHLOR	1.2E-01		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-08	S	6/19/2008	VINYL CHLOR	3.2E-02		1	1
JMM-08	S	12/16/2008	VINYL CHLOR	7.1E-02		1	1
JMM-08	S	6/9/2009	VINYL CHLOR	1.1E-02		1	1
JMM-08	S	12/8/2009	VINYL CHLOR	6.2E-02		1	1
JMM-08	S	6/14/2010	VINYL CHLOR	7.4E-04		1	1
JMM-08	S	12/1/2010	VINYL CHLOR	4.2E-04		1	1
JMM-08	S	6/26/2011	VINYL CHLOR	3.4E-04		1	1
JMM-08	S	12/1/2011	VINYL CHLOR	6.3E-04		1	1
JMM-08	S	7/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-08	S	12/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-08	S	6/1/2013	VINYL CHLOR	2.0E-04		1	1
JMM-08	S	12/1/2013	VINYL CHLOR	2.0E-04		1	1
JMM-08	S	7/1/2014	VINYL CHLOR	1.4E-04		1	1
JMM-08	S	12/1/2014	VINYL CHLOR	2.1E-04		1	1
JMM-08	S	7/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-08	S	12/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-08	S	6/1/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-09 **Time Period:** ######### **to** 6/13/2016

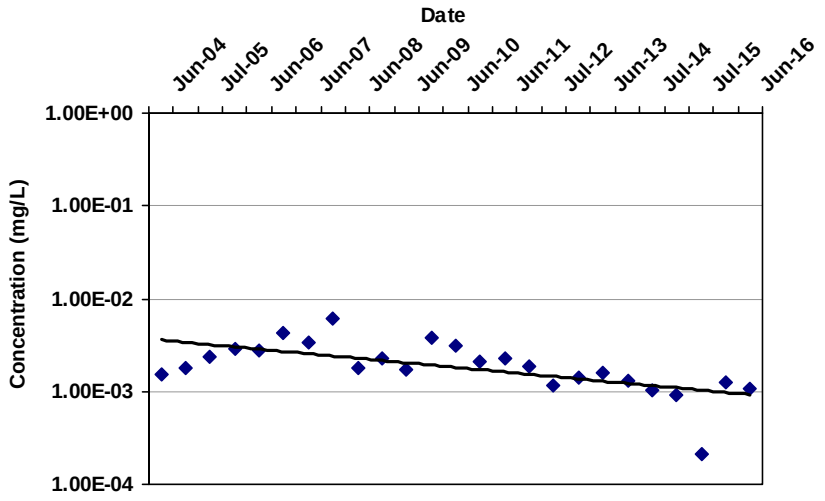
Well Type: S **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.59

Confidence in Trend:

100.0%

Ln Slope:

-3.1E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/8/2004	VINYL CHLOR	1.5E-03		1	1
JMM-09	S	12/15/2004	VINYL CHLOR	1.8E-03		1	1
JMM-09	S	7/8/2005	VINYL CHLOR	2.4E-03		1	1
JMM-09	S	1/10/2006	VINYL CHLOR	2.9E-03		1	1
JMM-09	S	6/6/2006	VINYL CHLOR	2.8E-03		1	1
JMM-09	S	12/20/2006	VINYL CHLOR	4.3E-03		1	1
JMM-09	S	6/12/2007	VINYL CHLOR	3.4E-03		1	1
JMM-09	S	12/4/2007	VINYL CHLOR	6.1E-03		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-09	S	6/19/2008	VINYL CHLOR	1.8E-03		1	1
JMM-09	S	12/16/2008	VINYL CHLOR	2.3E-03		1	1
JMM-09	S	6/9/2009	VINYL CHLOR	1.7E-03		1	1
JMM-09	S	12/8/2009	VINYL CHLOR	3.8E-03		1	1
JMM-09	S	6/14/2010	VINYL CHLOR	3.1E-03		1	1
JMM-09	S	12/1/2010	VINYL CHLOR	2.1E-03		1	1
JMM-09	S	6/26/2011	VINYL CHLOR	2.3E-03		1	1
JMM-09	S	12/1/2011	VINYL CHLOR	1.9E-03		1	1
JMM-09	S	7/1/2012	VINYL CHLOR	1.1E-03		1	1
JMM-09	S	12/1/2012	VINYL CHLOR	1.4E-03		1	1
JMM-09	S	6/1/2013	VINYL CHLOR	1.6E-03		1	1
JMM-09	S	12/1/2013	VINYL CHLOR	1.3E-03		1	1
JMM-09	S	7/1/2014	VINYL CHLOR	1.1E-03		1	1
JMM-09	S	12/1/2014	VINYL CHLOR	9.1E-04		1	1
JMM-09	S	7/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-09	S	12/1/2015	VINYL CHLOR	1.3E-03		1	1
JMM-09	S	6/1/2016	VINYL CHLOR	1.1E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-57 **Time Period:** ######### **to** 6/13/2016

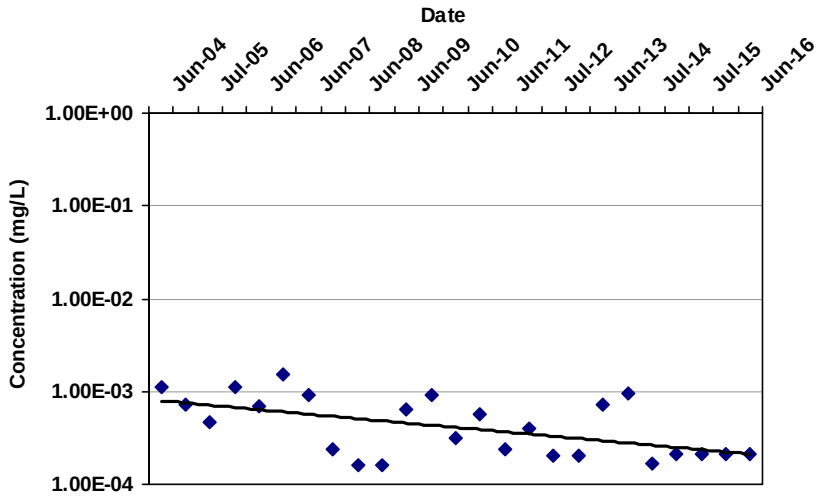
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.72

Confidence in Trend:

99.8%

Ln Slope:

-3.0E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-57	T	6/8/2004	VINYL CHLOR	1.1E-03		1	1
JMM-57	T	12/15/2004	VINYL CHLOR	7.3E-04		1	1
JMM-57	T	7/8/2005	VINYL CHLOR	4.6E-04		1	1
JMM-57	T	1/10/2006	VINYL CHLOR	1.1E-03		1	1
JMM-57	T	6/6/2006	VINYL CHLOR	6.9E-04		1	1
JMM-57	T	1/4/2007	VINYL CHLOR	1.5E-03		1	1
JMM-57	T	6/12/2007	VINYL CHLOR	9.0E-04		1	1
JMM-57	T	12/4/2007	VINYL CHLOR	2.4E-04		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-57	T	6/19/2008	VINYL CHLOR	1.6E-04		1	1
JMM-57	T	12/16/2008	VINYL CHLOR	1.6E-04		1	1
JMM-57	T	6/9/2009	VINYL CHLOR	6.3E-04		1	1
JMM-57	T	12/8/2009	VINYL CHLOR	9.2E-04		1	1
JMM-57	T	6/14/2010	VINYL CHLOR	3.1E-04		1	1
JMM-57	T	12/1/2010	VINYL CHLOR	5.8E-04		1	1
JMM-57	T	6/26/2011	VINYL CHLOR	2.4E-04		1	1
JMM-57	T	12/1/2011	VINYL CHLOR	4.0E-04		1	1
JMM-57	T	7/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-57	T	12/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-57	T	6/1/2013	VINYL CHLOR	7.1E-04		1	1
JMM-57	T	12/1/2013	VINYL CHLOR	9.4E-04		1	1
JMM-57	T	7/1/2014	VINYL CHLOR	1.7E-04		1	1
JMM-57	T	12/1/2014	VINYL CHLOR	2.1E-04		1	1
JMM-57	T	7/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-57	T	12/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-57	T	6/1/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Well: JMM-64 **Time Period:** ######### **to** 6/13/2016

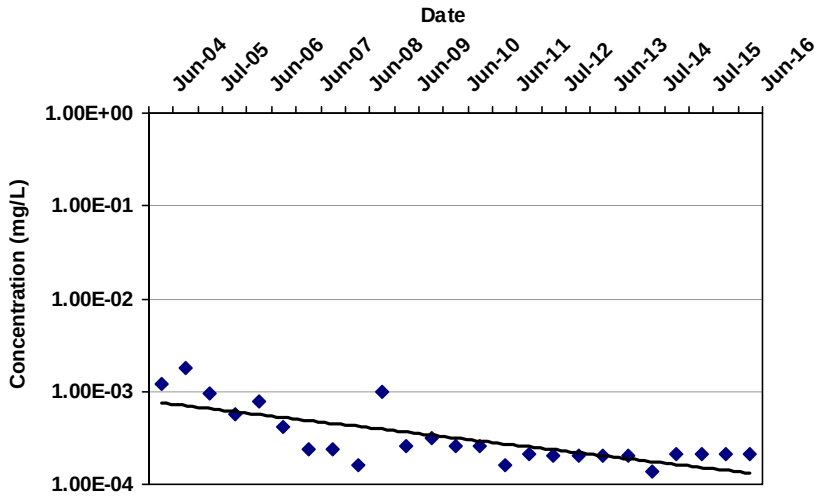
Well Type: T **Consolidation Period:** No Time Consolidation

COC: VINYL CHLORIDE **Consolidation Type:** Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



COV:

0.97

Confidence in Trend:

100.0%

Ln Slope:

-4.0E-04

LR Concentration Trend:

D

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-64	T	6/8/2004	VINYL CHLOR	1.2E-03		1	1
JMM-64	T	12/15/2004	VINYL CHLOR	1.8E-03		1	1
JMM-64	T	7/8/2005	VINYL CHLOR	9.6E-04		1	1
JMM-64	T	1/10/2006	VINYL CHLOR	5.8E-04		1	1
JMM-64	T	6/6/2006	VINYL CHLOR	7.7E-04		1	1
JMM-64	T	1/4/2007	VINYL CHLOR	4.2E-04		1	1
JMM-64	T	6/12/2007	VINYL CHLOR	2.4E-04		1	1
JMM-64	T	12/4/2007	VINYL CHLOR	2.4E-04		1	1

MAROS Linear Regression Statistics

Project: DDOU FYR 2017 OU4 **User Name:** USACE-SPK

Location: Ogden **State:** Utah

Consolidation Data Table:

Well	Well Type	Consolidation Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
JMM-64	T	6/19/2008	VINYL CHLOR	1.6E-04		1	1
JMM-64	T	12/16/2008	VINYL CHLOR	1.0E-03		1	1
JMM-64	T	6/9/2009	VINYL CHLOR	2.6E-04		1	1
JMM-64	T	12/8/2009	VINYL CHLOR	3.1E-04		1	1
JMM-64	T	6/14/2010	VINYL CHLOR	2.6E-04		1	1
JMM-64	T	12/1/2010	VINYL CHLOR	2.6E-04		1	1
JMM-64	T	6/26/2011	VINYL CHLOR	1.6E-04		1	1
JMM-64	T	12/1/2011	VINYL CHLOR	2.1E-04		1	1
JMM-64	T	7/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-64	T	12/1/2012	VINYL CHLOR	2.0E-04		1	1
JMM-64	T	6/1/2013	VINYL CHLOR	2.0E-04		1	1
JMM-64	T	12/1/2013	VINYL CHLOR	2.0E-04		1	1
JMM-64	T	7/1/2014	VINYL CHLOR	1.4E-04		1	1
JMM-64	T	12/1/2014	VINYL CHLOR	2.1E-04		1	1
JMM-64	T	7/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-64	T	12/1/2015	VINYL CHLOR	2.1E-04		1	1
JMM-64	T	6/1/2016	VINYL CHLOR	2.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = All Samples are Non-detect

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