Final Minutes
Former Fort Ord – Operable Unit (OU)-1
Groundwater Remediation, Well Destruction, and Treatment Plant Decommissioning
Marina, California
Base Closure Team Meeting
22 October 2014

OU-1 On-Post Activities for September 2014

Prepared by HydroGeoLogic, Inc., Roy Evans, Project Manager

Attendees: (to be revised after meeting)

Individual	Attended?	Individual	Attended?
James Specht, USACE	X	Grant Himebaugh, RWQCB	X
Teresa Rodgers, USACE	X	Edward Ticken, AMEC	
Alex Kan, USACE	X	Jeff Fenton, AMEC	X
Bonnie McNeil, USACE		Derek Lieberman, Ahtna	X
Cory Koger, USACE	X	Brad Clark, Ahtna	X
William Collins, BRAC	X	Holly Dillon, Ahtna	X
Tom Ghigliotto, Chenega[1]	X	Kevin Ghalambor, Burleson	
Melissa Broadston, Chenega[1]	X	Peter Kelsall, CB&I	X
Bart Kowalski, Chenega[1]	X	Steve Crane, Gilbane	X
Cary Stiebel, Chenega[1]	X	Erin Caruso, Gilbane	
Lewis Mitani, EPA	X	Lindsay Alexander, Gilbane	
Martin Hausladen, EPA	X	Thor Anderson, Burleson	X
Kimberly Gettman, DTSC		Kevin Siemann, Gilbane	
Franklin Mark, DTSC		Roy Evans, HGL	X
Min Wu, Ph.D., DTSC	X	Kevin Wierengo, HGL	
Edward Walker, DTSC	X	Sean McStay, UCSC	X
Steve Sterling, DTSC	X	David Eisen, USACE	X
X = attended in person or by telephone; blank indicates absent from the meeting			

[1]Chenega staff supporting the BRAC
Ahtna = Ahtna Engineering Services
BRAC = Base Realignment and Closure Fort Ord Office
CB&I = Chicago Bridge & Iron, Inc.
DTSC = California Department of Toxic Substances Control
EPA = U.S. Environmental Protection Agency
HGL = HydroGeoLogic, Inc.
RWQCB = Regional Water Quality Control Board
UCSC = University of California, Santa Cruz
USACE = U.S. Army Corps of Engineers

OU-1 Treatment Plant Operations

HGL reported the Northwest Treatment System (NWTS) operated continuously from 2 September 2014 through 14 October 2014. Extraction wells EW-OU1-60-A and EW-OU1-66-A were operating and total pumping from those wells is approximately 11.4 gallons per minute. EW-OU1-71-A, MW-OU1-87-A, and IW-OU1-10-A were temporarily restarted on 1 September 2014 to collect performance monitoring samples on 2 September 2014. Once samples were collected, EW-OU1-71-A, MW-OU1-87-A, and IW-OU1-10-A were shut down.

Since system startup in 2006, the NWTS has pumped approximately 212 million gallons of groundwater and removed approximately 6.0 pounds of total volatile organic compounds, primarily trichloroethene (TCE). An estimated 0.15 pound of TCE has been removed since the NWTS 18 September 2013 sampling event.

At approximately 1 a.m. on 15 October the system shut down because the PG&E meter apparently short-circuited, thereby cutting power to the NWTS. HGL and PG&E investigated and determined that a component of the Smart meter caused the short circuit. PG&E considers the meter to be HGL property and temporarily disconnected power to the meter (and the NWTS) pending repairs. The short-circuit, however, occurred in a portion of the meter where access is restricted to PG&E. HGL intends to file a claim for the cost of repairs. After power is restored HGL will determine if there was any damage to the NWTS electrical equipment and/or process control system. In the interim, the regulatory agencies agreed that the NWTS can remain offline pending review of the next round of groundwater sampling. HGL indicated that depending on the availability of replacement parts and the damage sustained, it may require 3 weeks to 4 weeks after notification to resume operation to bring the NWTS on line.

OU-1 Groundwater Quality Data

In accordance with the Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP), HGL collected the following samples from monitoring wells and the NWTS on 2 September 2014:

EW-OU1-60-A	MW-OU1-58-A	PZ-OU1-49-A1	EW-OU1-53-A
EW-OU1-66-A	MW-OU1-57-A	MW-OU1-88-A	NWTS-Influent
EW-OU1-71-A	MW-OU1-61-A	MW-OU1-26-A	NWTS Midpoint
MW-OU1-87-A	EW-OU1-72-A	PZ-OU1-10-A1	NWTS Effluent
IW-OU1-10-A	MW-OU1-86-A	EW-OU1-52-A	

Unvalidated sampling results were presented and discussed at the September Base Closure Team (BCT) meeting. Validated results have since been received and the results were unchanged. The validated results showed that TCE concentrations did not exceed the Aquifer Cleanup Level (ACL) of 5.0 micrograms per liter (μg/L) in any of the samples collected. The highest TCE concentration, 4.7 μg/L, was detected in the samples collected from wells MW-OU1-61-A and MW-OU1-88-A. Tables 1A and 1B show the validated TCE and cis-1,2-dichloroethene concentrations, respectively, found in the extraction wells and treatment system. All validated TCE results from the September 2014 sampling event are presented on Table 2. A Figure showing the September 2014 TCE concentrations is included for reference in Attachment 1. The next planned sampling event is in December 2014.

Reporting/Federal Facility Agreement Schedule

All scheduled submittals have been made for primary and secondary deliverables. The status of submitted and anticipated reports for 2014 is summarized in Table 3. The regulatory agencies indicated that the Draft Well Destruction and Treatment Plant Demolition Completion Report was accepted as written and there were no public comments by the response deadline.

Therefore the Draft is accepted as Final. Replacement pages were distributed on 25 September 2014, to indicate this change and to include copies of approved well destruction permits that were omitted from the Appendix.

The regulatory agencies accepted the draft September BCT meeting minutes as final.

OU-1 Weed Control and Rare Plant Monitoring

The U.S. Fish and Wildlife Service (USFWS) required that the third year of rare plant monitoring be completed at the former well destruction sites and this survey was completed between 25 April 2014 and 02 May 2014. Additional monitoring was performed in May and June during the well destruction effort at well sites destroyed within the Fort Ord Natural Reserve (FONR). The 2014 FONR Impact Assessment and Habitat and Rare Plant Species Survey Results Report was submitted to the Army on 10 October 2014 for distribution to the USFWS.

Site Exit/Closure Strategy

Based on data from the September sampling event, TCE concentrations have met the aquifer cleanup level at all OU-1 monitoring wells. The exit strategy is based on demonstrating that the cleanup objectives of the Record of Decision (ROD) regarding human health protectiveness have been met and, therefore, the ROD cleanup goals have been attained. The human health risk corresponding to Chemical of Concern concentrations observed at the site have met the human health protectiveness objectives for several years.

An OU-1 Exit Strategy Technical Memorandum is being prepared to present the case for OU-1 closure based on cleanup progress to date. The technical memorandum includes recommendations for performing attainment monitoring that incorporate existing data to the maximum extent. Selected pre-draft excerpts from the technical memorandum were included as Attachment 2 and discussed during the BCT meeting. The regulatory agencies also expressed concern that the compounds perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) may have been used during fire training activities at the OU-1 source area. These compounds may have been part of aqueous film-forming foam (also known as AFFF) and have been identified by the EPA as emerging contaminants. Although drinking water standards for these chemicals have not been established, EPA has developed Preliminary Health Advisory (PHA) standards for concentrations in groundwater (Attachment D). The PHAs for groundwater for PFOA and PFOS are 0.4 μg/L and 0.2 μg/L, respectively.

The proposed attainment monitoring well network is 8 wells located along the main axis of contaminant travel. The conclusions reached during the discussions were as follows:

- Four samples will be collected from each well in the attainment monitoring well network after pumping has ceased.
- The regulatory agencies will review the information presented to support excluding selected wells from further sampling (presented in Table 2 of Attachment 2) and determine if trend analysis is needed for any well.

- The regulatory agencies will review and comment on the list of wells proposed for the attainment monitoring network (presented in Table 3 of Attachment 2).

- The regulatory agencies indicated that they will require sampling for PFOA and PFOS as part of attainment monitoring to justify site closure.

- The Army noted that PFOA and PFOS are not included in the OU-1 Record of Decision and agreed to consider sampling for PFOA and PFOS.

The regulatory agencies agreed to provide comments on the proposed attainment well network within two weeks.

Well Destruction and Treatment Plant Demolition

As discussed at previous meetings, the right of entry (ROE) for the Armstrong Ranch property has not yet been obtained. The regulatory agencies stated that destruction of the Armstrong Ranch wells must be postponed until the presence or absence of PFOA and PFOS in OU-1 groundwater and the potential need for additional sampling have been determined.

Figure 1 in Attachment 1 shows the locations of the destroyed wells within OU-1. The Draft Well Destruction and Treatment Plant Demolition Completion Report was submitted on 11 August 2014 for regulatory agency and public review. No comments were received, therefore, the Draft is accepted as Final. Replacement pages were distributed on 25 September 2014.

Action Items:

- The Army will postpone destroying the OU-1 wells on Armstrong Ranch until the PFOA/PFOS issue has been resolved and the regulatory agencies re-approve the destruction effort.
- HGL will submit a Draft OU-1 Exit Strategy Technical Memorandum describing the attainment monitoring program.

Ongoing:

- Submit draft minutes for previous BCT meeting(s)—complete through September 2014.
- Submit approved final minutes for previous BCT meeting(s) — complete through August 2014.

Fort Ord HTW BCT Meeting
22 October 2014

Fort Ord Operable Unit 1
Groundwater Remediation, Well Destruction, and Treatment Plant Decommissioning

ATTACHMENT 1

Reference Table(s) and Figure(s)

Table 1A
TCE in OU-1 FONR Groundwater Remediation System – Performance Monitoring
BCT for Former Fort Ord – 22 October 2014

	FONR Extraction Well (listed from south to north)										Boundary Extraction Well (from west to east)								NWTS					
Began:	**Nov-10**		**Oct-07**								**Jul-06**													
Date	**IW-10**		**MW-87**		**EW-71**		**MW-85**		**MW-46AD**		**EW-63**		**EW-60**		**EW-66**		**EW-62**		**INFLUENT**		**MIDPOINT**		**EFFLUENT**	
TCE (µg/L)																								
11/9/07	Used as monitoring well until pump installed in October 2010. Pumping began 03 November 2010.		**16**		**13**		**19**		**14**		ND		ND		1.7		ND		**11**		ND		ND	
1/18/08			**11**		**11**		**8.9**		**8.2**		ND		ND		1.2		ND		**6.0**		ND		ND	
3/18/08			**11**		**14**		**6.7**		**5.8**		ND		0.29		1.5		ND		**5.6**		ND		ND	
5/27/08			**9.7**		**18**		2.5		**6.1**		ND		ND		1.8		ND		3.9		ND		ND	
7/21/08			**9.1**		**14**		4.4		3.4		ND		0.78		1.4		ND		3.6		ND		ND	
9/29/08			**9.3**	J	**15**	J	4.3	J	2.9	J	ND		0.90	J	1.7	J	ND		3.8	J	0.19	J	ND	
12/1/08			**5.8**		**11**		2.6		1.6		ND		0.82		0.91		ND		2.7		0.35	J	ND	
1/26/09			**5.9**		**10**		2.2		1.2		ND		0.48	J	0.78		ND		2.4		ND		ND	
3/9/09			**5.8**		**9.9**		2.1		1.2		ND		0.95		0.86		ND		2.7		ND		ND	
6/11/09			**6.9**		**11**		2.4		1.5		ND		0.88		1.7		ND		2.6		0.14	J	ND	
9/15/09			**6.8**		**9.4**		1.7		0.78		ND		inactive		1.1		0.036	J	2.3		0.35	J	ND	
12/14/09			**6.9**		**7.5**		0.84		not sampled		not sampled		inactive		0.94		not sampled		2.3		0.65	J	ND	
3/22/10			**7.2**		**8.5**		0.62		0.55		inactive		ND		0.90		inactive		2.3		ND		ND	
6/21/10			**7.4**		**6.5**		0.90		0.40	J	inactive		0.86		0.58		inactive		2.1		ND		ND	
9/20/10			**7.7**		**6.6**		0.83		0.35	J	discontinued		0.63		0.49	J	inactive		2.3		not sampled		ND	
12/16/10	**5.2**		**6.9**		**5.2**		0.58		0.28	J	discontinued		0.72		0.42	J	inactive		2.6		0.18	J	ND	
3/7/11	**5.1**		**6.0**		4.6		0.55		0.60		discontinued		0.87		0.42	J	inactive		2.5		0.59		ND	
6/7/11	4.2		**6.1**		4.0		0.78		0.63		discontinued		0.76		0.36	J	inactive		2.6		1.0		ND	
9/20/11	4.5		**6.2**		4.2		1.10		0.38	J	discontinued		0.57		0.36	J	inactive		2.5		1.7		ND	
12/7/11	3.8		**5.1**		3.7		not sampled				discontinued		inactive		0.27	J	inactive		1.8		2.1		0.13	J
3/15/12	3.7		**5.5**		3.8		0.70		0.23	J	discontinued		inactive		0.38	J	inactive		0.81		0.32	J	ND	
9/25/12	--		**5.3**		4.4		--		--		discontinued		inactive		0.19	J	inactive		1.8		0.72	J	ND	
1/8/13	--		**5.4**		--		--		--		discontinued		ND		0.19	J	inactive		1.5		--		ND	
3/27/13	--		4.8		--		--		--		discontinued		ND		0.23	J	inactive		1.5		--		ND	
6/26/13	--		4.4		--		--		--		discontinued		--		--		inactive		1.7		--		ND	
9/18/13	--		4.7		1.9		--		--		discontinued		0.17	J	0.31	J	inactive		2.0		--		ND	
12/17/13	2.8		4.2		--		--		--		discontinued		--		--		inactive		2.1		--		--	
3/27/14	--		3.4	A	0.89	A	--		--		discontinued		0.22	J/A	0.29	J/A	inactive		1.7		0.92	J/A	ND	A
6/27/14	--		3.7		--		--		--		discontinued		--		--		inactive		0.28		0.39	J	ND	
9/2/14	2.2		4.2		0.88		--		--		discontinued		0.25	J	0.26	J	inactive		1.0		0.41	J	ND	

Notes:

Italics (if used) indicate data not yet validated

Bold font indicates concentration > ACL

ACL - aquifer cleanup level

-- - Not sampled

µg/L - micrograms per liter

J - Data qualified as estimated

ND - nondetect

TCE - trichloroethene

NWTS - Northwest Treatment System

FONR - Fort Ord Natural Reserve

Blue font indicates the concentration is calculated using the weighted average of the active pumping wells.

Table 1B

cis-1,2-DCE in OU-1 FONR Groundwater Remediation System – Performance Monitoring

BCT for Former Fort Ord – 22 October 2014

	FONR Extraction Well (listed from south to north)										Boundary Extraction Well (from west to east)										NWTS					
Began:	**Nov-10**		**Oct-07**								**Jul-06**															
Date	**IW-10**		**MW-87**		**EW-71**		**MW-85**		**MW-46AD**		**EW-63**		**EW-60**		**EW-66**		**EW-62**		**INFLUENT**		**MIDPOINT**		**EFFLUENT**	
cis-1,2-DCE (µg/L)																										
11/09/07	Used as monitoring well until pump installed in October 2010. Pumping began 03 November 2010.		1.9		1.6		2.3		1.70		ND		ND		ND		ND		1.3		ND		ND			
01/18/08			1.20		1.40		1.00		1.20		ND		ND		0.11		ND		0.66		ND		ND			
03/18/08			1.20		1.50		0.74		0.63		ND		ND		ND		ND		0.59		0.11		ND			
05/27/08			0.88		2.10		0.26		0.74		ND		ND		ND		ND		0.36		0.21		ND			
07/21/08			0.80		1.50		0.52		0.37		ND		ND		ND		ND		0.41		0.34		ND			
09/29/08			0.99		1.60		0.54		0.30		ND		ND		0.13		ND		0.42		0.42		0.12			
12/01/08			0.67		1.30		0.33		0.21	J	ND		ND		ND		ND		0.27	J	0.37	J	0.19	J		
01/26/09			0.63		1.20		0.29	J	0.12	J	ND		ND		ND		ND		0.26	J	0.24	J	ND			
03/09/09			0.62		1.20		0.29	J	0.13	J	ND		ND		ND		ND		0.23	J	0.26	J	ND			
06/11/09			0.71		1.10		0.30	J	0.13	J	ND		ND		0.14	J	ND		0.24	J	0.28	J	ND			
09/15/09			0.80		1.00		0.22	J	0.08	J	ND		inactive		0.03	J	ND		0.22	J	0.37	J	0.03	J		
12/14/09			0.67		0.65		0.10	J	not sampled		not sampled		inactive		ND	J	not sampled		0.21	J	0.30	J	0.11	J		
03/22/10			0.67		0.79		ND		ND		inactive		ND		ND		inactive		0.20	J	0.11	J	0.13	J		
06/21/10			0.67		0.53		0.14	J	ND		inactive		ND		ND		inactive		0.20	J	0.23	J	ND			
9/20/10			0.66		0.46	J	ND		ND		discontinued		ND		ND		inactive		0.23	J	not sampled		ND			
12/16/10	0.55		0.66		0.35	J	ND	J	ND		discontinued		ND		ND		inactive		0.27	J	0.28	J	ND			
3/7/11	0.37	J	0.52		0.28	J	0.11	J	ND		discontinued		ND		ND		inactive		0.23	J	0.30	J	ND			
6/7/11	0.35	J	0.55		0.29	J	ND		ND		discontinued		ND		ND		inactive		0.18	J	0.31	J	0.15	J		
9/20/11	0.25	J	0.46	J	0.21	J	ND		ND		discontinued		ND		ND		inactive		0.17	J	0.19	J	0.30	J		
12/7/11	0.27	J	0.48	J	0.19	J	not sampled				discontinued		inactive		ND		inactive		0.16	J	0.17	J	0.23	J		
3/15/12	0.15	J	0.40	J	0.22	J	0.15	J	ND		discontinued		inactive		ND		inactive		ND		0.24	J	ND			
9/25/12	--		0.39	J	0.23	J	--		--		discontinued		inactive		ND		inactive		ND		0.24	J	ND			
1/8/13	--		0.35	J	--		--		--		discontinued		ND		ND		inactive		0.12		--		--			
3/27/13	--		0.34	J	--		--		--		discontinued		ND		ND		inactive		0.12		--		--			
6/26/13	--		0.31	J	--		--		--		discontinued		--		--		inactive		0.27		--		--			
9/18/13	--		ND		ND		--		--		discontinued		ND		ND		inactive		ND		--		ND			
12/17/13	ND		0.19	J	--		--		--		discontinued		--		--		inactive		0.23		--		--			
3/27/14	--		0.16	J/A	--		--		--		discontinued		ND	A	ND	A	inactive		0.21		ND	A	ND	A		
6/27/14	--		ND		--		--		--		discontinued		--		--		inactive		ND		0.43	J	0.17	J		
9/2/14	ND		0.21	J	ND		--		--		discontinued		ND		ND		inactive		ND		0.48	J	ND			

Notes:

Italics (if used) indicate data not yet validated

Bold font indicates concentration > ACL

ACL - aquifer cleanup level

-- - Not sampled

µg/L - micrograms per liter

J - Data qualified as estimated

ND - nondetect

TCE - trichloroethene

NWTS - Northwest Treatment System

FONR - Fort Ord Natural Reserve

NA - Not Available

Blue font indicates the concentration is calculated using the weighted average of the active pumping wells.

Table 2
Validated OU-1 Sampling Results for September 2014

Sample Point	Location	TCE	
		µg/L	Qualifier
Treatment plant			
NWTS-Influent	Treatment Plant	1.0	
NWTS-Midpoint	Treatment Plant	0.41	J
NWTS-Effluent	Treatment Plant	ND	
Extraction wells			
EW-OU1-60-A*	NW Boundary	0.25	J
EW-OU1-66-A*	NW Boundary	0.26	J
EW-OU1-71-A*	Central FONR	0.88	
MW-OU1-87-A*	Central FONR	4.2	
IW-OU1-10-A*	Central FONR	2.2	
Monitoring wells			
MW-OU1-58-A	NW Boundary	ND	
MW-OU1-57-A	NW Boundary	ND	
MW-OU1-61-A	NW Boundary	4.7	
MW-OU1-61-A	Duplicate	4.0	
EW-OU1-72-A	Central FONR	0.78	
MW-OU1-86-A	Central FONR	0.42	J
PZ-OU1-49-A1	Central FONR	1.2	
MW-OU1-88-A	Central FONR	4.7	
MW-OU1-26-A	Central FONR	2.7	
PZ-OU1-10-A1	Central FONR	2.4	
EW-OU1-52-A	Central FONR	2.9	
EW-OU1-53-A	Central FONR	1.9	

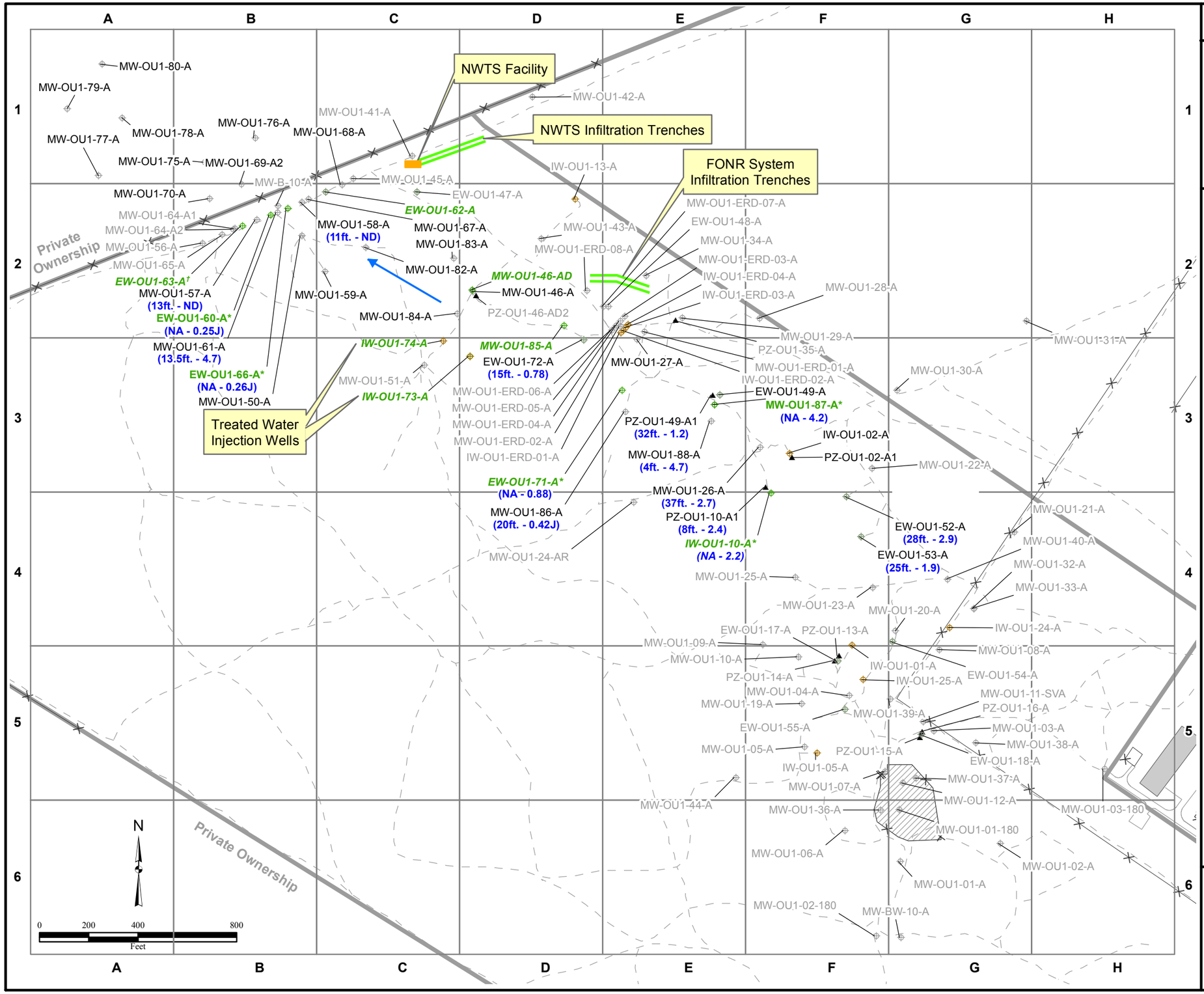
* Operating extraction well - samples collected from port on discharge pipe.
µg/L = micrograms per liter
FONR = Fort Ord Natural Reserve
ND = nondetect
TCE = trichloroethene

Table 3
Current Deliverable Schedule
Former Fort Ord, Marina, CA – 22 October 2014

Deliverable Title	Submittal	Review Comments Due	Status/Remarks
Primary Deliverables			
Final UFP-QAPP	May 2014	Received	Submitted 29 May 2014
Secondary Deliverables			
Final 2014 Semiannual Groundwater Monitoring Report	June 2014	August 2014[1]	Submitted 25 June 2014
Draft 2014 Annual Groundwater Monitoring Report	November 2014	December 2014	In progress.
Draft Exit Strategy Technical Memorandum	October 2014	December 2014	In progress
Site Safety and Health Plan Update	September 2014	TBD	
UFP-QAPP 2014 Update	TBD	TBD	To be scheduled after determination of cleanup verification sampling requirements
Completed Recent Submittals			
Preliminary Draft Health & Safety Plan – OU-1 O&M / LTM	5 November 2013	19 November 2013	Army comments addressed
Draft 2013 Annual and 3rd Quarter Groundwater Monitoring Report	January 2014	March 2014	Submitted 17 January 2014.
Draft UFP-QAPP	March 2014	May 2014	Submitted 04 March 2014
Draft Work Plan for Well Destruction and Treatment Plant Demolition	February 2014	April 2014	Submitted 11 February 2014
Final 2013 Annual and 3rd Quarter Groundwater Monitoring Report	April 2014	NA	Submitted 04 April 2014
Final Work Plan for Well Destruction and Treatment Plant Demolition	April 2014	NA	Submitted 04 April 2014
Draft Health & Safety Plan – OU-1 O&M/LTM	May 2014	Received	Draft accepted as Final.
Draft Well Destruction and Treatment Plant Demolition Completion Report	August 2014	September 2014	Draft accepted as Final Submitted 03 October 2014

[1] The Semiannual Groundwater Monitoring Report is submitted as a final document but review comments are accepted. Any comments are addressed in the Annual Groundwater Monitoring Report.

Figure 1
OU-1 FONR A-Aquifer
TCE Concentration in Groundwater
September 2014
Former Fort Ord, CA



Legend

- Well
- Extraction Well
- Injection Well
- Piezometer or 2-Inch Well
- Groundwater Flow Direction
- MW-OU1-21-A — Well Destroyed
- MW-OU1-61-A — Location with September 2014 TCE Concentrations at or above ACL (5 µg/L)
- (13.5ft. - 13) — September 2014 TCE Result (µg/L); Sample Elevation (feet above mean sea level)
- 5 — TCE contour based on September 2014 Data
- Trail/Unimproved Road
- Fence
- Treated Water Infiltration Trench
- Property Boundary
- Building
- Former Fire Drill Area

Notes:
Units of TCE concentration are in micrograms per liter.
FONR = Fort Ord Natural Reserve
NWTS = Northwest Treatment System
ACL = Aquifer Cleanup Level
ND = nondetect
NA = Depth is not applicable - sample is from pumping well
µg/L = micrograms per liter
Wells shown with an asterisk were not used to develop contour boundaries.
Wells for which no data are posted were not sampled.
J = Estimated value
Green font indicates extraction or injection well.
Italicized font shows pumping suspended.
† = Disconnected extraction well. No longer operable.

\\gst-srv-01\HGLGIS\Ft_Ord_MSIW\OU-1 Exit Startegy Technical Memorandum\ Fig. 1-1 FONR A-Aquifer TCE Groundwater Concentration.mxd
9/26/2014 SS
Source: HGL

HGL HydroGeoLogic, Inc

Fort Ord HTW BCT Meeting
22 October 2014

Fort Ord Operable Unit 1
Groundwater Remediation, Well Destruction, and Treatment Plant Decommissioning

ATTACHMENT 2

Pre-Draft Sections of Exit Strategy Technical Memorandum

PRELIMINARY DRAFT TECHNICAL MEMORANDUM
OPERABLE UNIT 1 EXIT STRATEGY
FORMER FORT ORD, CALIFORNIA

Introduction

HydroGeoLogic, Inc. (HGL) has prepared this technical memorandum on behalf of the U.S. Army Corps of Engineers, Sacramento District to develop an exit strategy to reach final site closeout of Operable Unit (OU)-1. Based on the results of the September 2014 groundwater sampling event, cleanup objectives and human health risks levels identified in the Record of Decision (ROD) have been achieved and remediation activities are complete. This technical memorandum also includes a verification sampling program that will be conducted to verify that the ROD cleanup goals are met following the termination of the groundwater extraction and treatment operation.

ROD Cleanup Goals

Several statements in the ROD are relevant to determining when the cleanup goals have been met for OU-1:

- The following excerpt is from Section 2.5 of the ROD:

  > The primary remedial objectives for the A-aquifer are hydraulic control and containment of contaminated groundwater in the A-aquifer, and extraction and treatment of groundwater exceeding aquifer cleanup levels. Remedial actions for these two components are intended to be final remedial solutions to risks posed by contaminants present within these units. The risks are described in Section 2.7.

- The following excerpts are from Section 2.7.2 of the ROD:

  > A post cleanup human health risk assessment (HHRA) was performed for the groundwater at the FDA…Although it is unlikely that onsite groundwater will be used as a drinking water source, the exposure pathway evaluated was a child and adult receptor that might be exposed to the COCs through ingestion of tapwater (groundwater).
  >
  > The resulting excess cancer risk estimated for site conditions at the time that Aquifer Cleanup Goals are achieved is 2×10^{-6} to 3×10^{-5}….These excess cancer risks are within the 10^{-4} to 10^{-6} identified in the NCP [National Contingency Plan] as acceptable residual risks for Federal Superfund sites.
  >
  > In summary, even if unlimited use occurred at this site, the resultant risks from exposure to soils and groundwater at remediation would be no greater than that described above for groundwater, and no institutional controls (i.e., deed restrictions) are needed. However, actual or threatened releases of hazardous substances for this site, if not addressed by continued implementation of the

> groundwater remedy, may present an imminent and substantial endangerment to public health, welfare, and the environment.

In the first paragraph above, "FDA" refers to the Fire Drill Area, the OU-1 contaminant of concern (COC) source area.

- The following excerpts are from Section 2.9 of the ROD:

> To protect human health and comply with federal and state applicable or relevant and appropriate requirements (ARARs), groundwater must be returned through cleanup to a condition that will allow beneficial uses to occur, including future potential use as a drinking water source, without unacceptable risks to the users. Thus, the remedial cleanup goals for groundwater include cleaning up the contaminated groundwater to at least maximum contaminant levels (MCLS), as shown on Table 1.
>
> The estimated maximum total aggregate excess cancer risk for all chemicals at their respective remediation goals is 3×10^{-5}. This cumulative risk is within acceptable range, and is health protective.

The rationale expressed throughout the ROD is that the Aquifer Cleanup Levels (ACLs) were set to achieve a groundwater quality that would allow beneficial uses to occur, including future potential use of the groundwater as a drinking water source, without unacceptable risks to the users. The U.S. Environmental Protection Agency (EPA) MCLs for each of the COCs were established as target ACL values that would be used to determine when remediation is complete.

ROD Cleanup Goals Achieved in OU-1

Results of the September 2014 sampling event indicate that all ACLs established for OU-1 have been met. Historical groundwater sampling results from the OU-1 groundwater long term monitoring (LTM) network are summarized in Table 1. The data in Table 1 is organized by well function with extraction wells presented first, followed by the treatment plant samples and then the monitoring well data. As shown in Table 1, trichloroethene (TCE) is the only COC that has exceeded the ACL within the OU-1 LTM network since March 2008. TCE concentrations did not exceed the ACL of 5.0 micrograms per liter (μg/L) in any of the samples collected in September 2014. The maximum TCE concentration detected during the September 2014 sampling effort was 4.7 μg/L in wells MW-OU1-61-A and MW-OU1-88-A. The September 2014 sampling results for TCE are also presented graphically on Figure 1.

In Table 1 the "MW-" prefix for monitoring wells, "EW-" prefix for extraction wells, and "IW-" prefix for injection wells do not correspond to well function in all cases. The boundaries of the contaminated groundwater zone in OU-1 were refined as the remedial design progressed. The evaluation of design alternatives showed that the most effective OU-1 remedy required that some wells be used for different purposes than originally intended. Consequently, some wells that were intended and named as monitoring wells when constructed became extraction wells in the final remedial design, specifically MW-OU1-46-AD, MW-OU1-85-A, and MW-OU1-87-A. Conversely, well EW-OU1-72-A is used only for monitoring groundwater quality. Several wells were named as potential injection well sites but only two, IW-OU1-73-A and IW-OU1-74-A, were connected to the Northwest Treatment System

(NWTS) for this purpose. The rest of the "IW-" prefix wells are used only for monitoring groundwater quality, with one exception: well IW-OU1-10-A was converted to an extraction well in October 2010.

The decreasing TCE concentration throughout OU-1 has resulted in a corresponding decrease in the amount of total volatile organic compounds, primarily TCE, being removed by the active extraction wells each year. For example, at the two extraction wells located near MW-OU1-61-A (one of the two wells with residual TCE concentrations of 4.7 μg/L), TCE has not been detected above 0.5 μg/L since September 2011. The ACL for TCE (5.0 μg/L) is 10 times greater than the maximum detected TCE concentration at these wells during this interval. TCE concentrations have not exceeded the ACL in any extraction well since March 2013.

Human Health Risk Calculations

To verify that current site conditions are protective of site receptors and allow for future beneficial use to occur, human health risks were calculated based on exposure to site groundwater using the most recent sample results from September 2014. The excess carcinogenic human health risk corresponding to the September 2014 sampling results is 1 x 10^{-5} (calculations are presented in Attachment A). For these calculations, the detected TCE concentration of 4.7 μg/L was used as the TCE exposure point concentration (EPC) and the limit of detection (LOD) was used as the EPC for the nine COCs that were not detected or were detected below their reporting limit. The excess carcinogenic human health risk under current conditions is less than the 3 x 10^{-5} value in the ROD corresponding to attainment of the ACLs.

In addition to risks associated with current site conditions, the maximum concentration of TCE that would result in a cumulative cancer risk equal to that established in the ROD (3 x 10^{-5}) was calculated. The resulting concentration, 6.5 μg/L, will be useful during verification sampling to evaluate whether unacceptable risks occur if the TCE concentration increases during the verification period. In calculating the maximum acceptable TCE concentration, the LODs were used as the EPCs for the remaining nine COCs. The following provides additional details regarding the risk calculations conducted in support of this evaluation.

Exposure Assumptions and Toxicity Assessment

Exposure assumptions were obtained in accordance with EPA Risk Assessment Guidance for Superfund (RAGS) Guidance and incorporate the exposure factor revisions issued by EPA in February 2014 (EPA, 2014). All exposure assumptions (ingestion rate, exposure duration, etc.) are summarized in Tables A.1.1 and A.1.2 of Attachment A. Toxicity values were obtained in accordance with the Office of Solid Waste and Emergency Response Directive 9285.7-53 (EPA, 2003) and are summarized in Tables A.1.3, A.1.4, A.1.5, and A.1.6 of Attachment A. Toxicity values for the dermal exposure route were estimated from the oral reference doses and cancer slope factors in accordance with RAGS, Part E (EPA, 2004). Exposure parameters and toxicity values used for all risk scenarios are provided in Attachment A.1.

Risk Characterization

The cancer risk estimates for the child and adult resident receptors presented in the ROD considered only the ingestion and dermal contact exposure pathways. The ROD identified the cumulative cancer risk associated with exposure to the ten COCs at the ACLs to be 3×10^{-5}. The ROD did not consider potential non-cancer effects of the COCs.

Current risk assessment guidance requires evaluation of the inhalation exposure pathway in addition to the ingestion and dermal contact pathways. In addition, current guidance also requires the evaluation of cancer risks using the age-adjusted resident receptor. For comparison purposes, the cumulative cancer risks and non-cancer hazards associated with residential exposure to groundwater were calculated using both the ACLs (Attachment A.2) and the September 2014 sampling results (Attachment A.3). The results are summarized below:

Exhibit 1

Inputs to Risk Calculations	Cumulative Cancer Risk (Age-Adjusted Resident)	Cumulative Non-Cancer Hazard Index (Child Resident)	Cumulative Non-Cancer Hazard Index (Adult Resident)	Attachment A Reference
ACLs	$3x10^{-5}$	3	2	Tables A.2.4, A.2.5, A.2.6
September 2014 Sampling Results	$1x10^{-5}$	2	1	Tables A.3.4, A.3.5, A.3.6

As indicated above, the overall cumulative cancer risk and non-cancer hazard indices using the September 2014 sampling results are all below the corresponding risks based on the use of ACLs, indicating that current conditions meet or exceed risk-reduction objectives that are consistent with the ROD.

Risk calculations used to estimate the maximum allowable TCE concentrations that would be equivalent to the ACL-based risk levels are presented in Attachment A.4. In these calculations, LODs were used for the remaining nine COCs to calculate the cumulative cancer risk. The maximum TCE concentration that would result in a cumulative cancer risk and a non-cancer hazard index consistent with those calculated for the ACLs is 6.5 μg/L. Based on these calculations, as long as the TCE concentration is less than 6.5 μg/L and no additional COCs are detected during verification sampling, site risks would be equivalent to those associated with the ACLs. TCE concentrations at OU-1 have been below this equivalent concentration since December 2013, when the highest concentration detected was 6.3 μg/L in monitoring well MW-OU1-61-A. This analysis may be used during the verification sampling phase to evaluate the need for additional verification sampling, or further response actions, as appropriate, based on results of initial verification sampling.

Remediation and Health Risk Summary

As outlined above, all ten COCs were below ACLs during the September 2014 sampling event, indicating remediation is complete at OU-1. To verify that current site conditions are protective of site receptors, human health risks were calculated based on exposure to site groundwater using the most recent sample results (from September 2014). The associated cancer and non-cancer risks were below target levels and the risk levels established in the ROD, further indicating that current groundwater does not pose a threat to future site receptors.

The human health risk calculations, described above, demonstrate that current site conditions do not pose a threat to future site receptors. Assuming the remaining nine COCs remain at non-detect levels, a TCE concentration of 6.5 μg/L was calculated to be the maximum TCE concentration at which site risks remain consistent with the revised ROD risk calculations. This concentration will be useful within the verification sampling period to evaluate whether unacceptable risks occur if an increase of TCE is observed.

No future or threatened releases exist from the source area that would potentially impact these risk calculations. The results of the 1993 Remediation Confirmation Study field investigation and subsequent risk assessment indicated that the chemicals remaining in soil do not present an unacceptable risk to human health or to ecological receptors under the proposed land use and do not threaten groundwater quality; therefore, the ROD states that soil remediation at OU-1 is considered complete, and no further action is required (U.S. Army, 1995).

In addition, the Rebound Evaluation Report (HGL, 2011) evaluated TCE concentrations in monitoring wells in the source area based on 18 months of monitoring after remediation pumping in the source area was terminated. The rebound evaluation sampling results did not show a significant rebound, and the regulatory agencies concurred with the report conclusion that remediation was complete in the capture zone of the original groundwater treatment system (HGL, 2011).

Based on the fact that no risk was identified for future site receptors and no additional contaminant sources exist within the source area, the requirements of the OU-1 ROD have been met and remediation of OU-1 groundwater may be considered complete.

Exit Strategy

The proposed exit strategy actions will be performed in the order presented below and are summarized as follows:

1. Suspend operation of the current pump and treat system.
2. Initiate periodic verification sampling (described below).
3. Decommission the NWTS (including well abandonment) upon successful, approved completion of the verification sampling.
4. Prepare site closure documents upon successful completion of the verification sampling and NWTS decommissioning.

Exit Strategy Implementation

If the proposed exit strategy is approved and implemented, remedial pumping and groundwater treatment operations for OU-1 groundwater will be discontinued in November 2014. To ensure that the remediation goals are met after the groundwater extraction and treatment operation is discontinued, verification sampling will be initiated as described below.

There are 27 remaining monitoring wells or piezometers within OU-1. For 19 of these monitoring wells or piezometers, past sample results or other factors indicate that no further monitoring is needed to verify that remediation is complete. The relevant sampling results or factors are summarized in Table 2. Where sample results are used to justify no further monitoring, there have been at least 4 consecutive sample results below the ACL for all COCs.

The proposed verification monitoring well network, consisting of eight monitoring wells, is presented in Table 3 and shown on Figure 2. A statistical analysis using the Mann-Kendall method (discussed below) was performed for the wells in Table 3 and none of these wells showed an increasing trend for TCE. The verification wells were selected based on the following criteria:

1. One or more of the 4 most recent consecutive samples has exceeded the ACL. One or two additional samples will be collected as needed to show a minimum of 4 consecutive samples with COC concentrations lees than their respective ACL. This criteria applies to the following wells:

MW-OU1-52-A	MW-OU1-53-A	MW-OU1-61-A
MW-OU1-88-A	PZ-OU1-10-A1	

2. The well is located along the historic main axis of plume migration and the most recent sample showed TCE present and greater than 1 μg/L. The 4 most recent consecutive samples at these wells has been less than the ACL, however, a confirmation sample after pumping has ceased is included in the verification program. This criteria applies to the following wells:

IW-OU1-02-A	MW-OU1-26-A	PZ-OU1-49-A1

Based on historical sample results below the ACL, only one or two additional rounds of sampling are potentially required at seven of the eight monitoring wells. A minimum of four sampling events are proposed at well MW-OU1-61-A because all samples from this well (except one sample in 2006—see Table 1) showed TCE concentrations exceeded the ACL until the September 2014 sample event. Although the last three sample events at MW-OU1-88-A have shown TCE concentrations below the ACL, two additional samples are proposed. The rationale for the additional sample is that the TCE concentration has been only slightly below the ACL in the last three samples. The proposed sampling frequency for each well in the verification monitoring network is presented in Table 3.

TCE concentration trend graphs for the eight monitoring wells to be included in the verification monitoring well network are presented in Attachment B. Statistical analyses (Mann-Kendall) were conducted on analytical data from these eight monitoring wells to determine whether TCE concentrations are statistically decreasing, increasing, or indeterminate. As shown in Attachment C, TCE concentrations are statistically decreasing in monitoring wells MW-OU1-26-A, PZ-OU1-49-A1, EW-OU1-53-A, and MW-OU1-88-A. Although the TCE concentrations in the remaining four monitoring wells (IW-OU1-02-A, PZ-OU1-10-A1, EW-OU1-52-A, MW-OU1-61-A) appear to be trending lower (as shown in Attachment B), the Mann-Kendall analysis did not have sufficient evidence at present to show a statistically significant trend in TCE concentrations. None of the eight wells in the verification monitoring network was shown to have an increasing TCE concentration trend.

Verification sampling will be conducted on a bi-monthly basis beginning in December 2014 and samples will be analyzed for the 10 identified site COCs. If COCs in all wells within the verification monitoring well network are below the ACLs for four consecutive sampling events and TCE concentration trends are not increasing, remediation will be determined to be complete. If one or more samples contain COC(s) exceeding the ACL(s), the data will be reviewed to determine if verification sampling period should be extended or if additional treatment actions are warranted. Once the remediation is determined to be complete, the site closure process will be initiated, including decommissioning the treatment facility and abandoning the OU-1 monitoring and extraction wells and piezometers and preparation of site closure documents.

REFERENCES

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U.S. Army, 1995. Record of Decision, Operable Unit 1, Fritzsche Army Airfield Fire Drill Area, Fort Ord, California. July. Administrative Record Series Number OU1-362*.

U.S. Environmental Protection Agency (EPA), 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December.

EPA, 2004. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final. Office of Superfund Remediation and Technology Innovation. EPA/540/R/99/005. July.

EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120.

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TABLES

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Table 1
Analytical Results Summary
OU-1, Former Fort Ord, California

Table 1 was intentionally not included in the Meeting Minutes because of the size of the table. Please refer to 2014 Annual and Third Quarter Groundwater Monitoring Report, Table 5.1 and Appendix B, for Table 1 data.

Table 2
Wells Excluded from the Verification Monitoring Well Network
OU-1, Former Fort Ord, California

Existing Monitoring Well Identification	Year Installed	Sample Results Summary	Most Recent TCE Concentration			Initial Sample	Total Number of Samples Collected	Number Samples with TCE > ACL
			µg/L	Qualifier	Sample Date			
Verification Complete Based on Previous Sampling								
EW-OU1-49-A	2004	Sampling was suspended in 2008 due to the proximity to PZ-OU1-49-A1 (these locations are 30 feet apart), which consistently had higher TCE concentrations than EW-OU1-49-A. PZ-OU1-49-A1 is included in the verification network.	8.5		3/14/2007	3/15/2006	6	6
EW-OU1-72-A	2006	Last 11 samples ND or < 1 µg/L.	0.78		9/2/2014	11/8/2006	16	3
IW-OU1-73-A	2006	Injection well installed outside of the TCE plume.	NA		NA	NA	NA	NA
IW-OU1-74-A	2006	Injection well installed outside of the TCE plume.	NA		NA	NA	NA	NA
MW-OU1-27-A	1998	Samples have been < ACL and < 1 µg/L since 2008.	0.33	J	3/8/2011	6/7/2006	11	3
MW-OU1-46-A	2001	Well does not fully penetrate A-Aquifer.	NA		NA	NA	NA	NA
MW-OU1-50-A	2004	Samples have been ND since March 2010.	ND		9/18/2013	5/18/2006	30	16
MW-OU1-56-A	2004	All COCs have been ND or < RL in all historical samples.	ND		5/22/2007	3/16/2006	10	0
MW-OU1-57-A	2004	All COCs have been ND since January 2007.	ND		9/2/2014	3/16/2006	34	8
MW-OU1-58-A	2004	All COCs have been ND or < RL since June 2008.	0.15	J	1/8/2013	5/18/2006	34	0
MW-OU1-59-A	2004	Quarterly sampling from 2006 through 2008 contained all ND results.	ND		9/30/2008	3/16/2006	8	0
MW-OU1-67-A	2006	Decreasing trend observed since March 2007.	0.63		9/20/2011	5/18/2006	22	0
MW-OU1-68-A	2006	Last 15 samples have been ND (2006 through 2009).	ND		3/10/2009	5/18/2006	20	0
MW-OU1-82-A	2006	Last 9 samples have been < 1.4 µg/L .	0.61		9/22/2011	11/8/2006	15	0
MW-OU1-83-A	2006	Last 6 samples have been ND or < RL (2008 through 2011).	0.15	J	9/22/2011	11/8/2006	12	0
MW-OU1-84-A	2006	Last 5 samples have been ND (2008 through 2011).	ND		9/22/2011	11/8/2006	12	4
MW-OU1-86-A	2006	Last 5 samples have been < 1 µg/L.	0.42	J	9/2/2014	11/7/2006	19	0
PZ-OU1-02-A1	2004	Piezometer adjacent to IW-OU1-02-A.	NA		NA	NA	NA	NA
PZ-OU1-46-AD2	2005	Piezometer at extraction well MW-OU1-46-AD.	NA		NA	NA	NA	NA

Notes:

µg/L = micrograms per liter
< = less than
> = greater than
ACL = Aquifer Cleanup Level
COC = contaminant of concern
EW = extraction well
IW = injection well
J = Data qualified as estimated.
MW = monitoring well
NA = not available, location has not been sampled
ND = nondetect
OU1 = Operable Unit 1
PZ = piezometer
RL = reporting limit
TCE = trichloroethene

Table 3
Verification Monitoring Well Network
OU-1, Former Fort Ord, California

Existing Monitoring Well Identification	Year Installed	Sample Results Summary	Most Recent TCE Concentration			Proposed Verification Sampling			
			µg/L	Qualifier	Sample Date	December 2014	February 2015	April 2015	June 2015
Proposed Monitoring Well Verification Network									
EW-OU1-52-A	2004	Last 3 samples < ACL (collected in 2012, 2013, & 2014)	2.9		09/02/2014		X		
EW-OU1-53-A	2004	Last 2 samples <ACL (collected in 2012 & 2014)	1.9		09/02/2014	X	X		
IW-OU1-02-A	2004	Last 5 consecutive samples < ACL (collected in 2010 & 2011)	3.8		09/21/2011		X		
MW-OU1-26-A	1998	Last 5 consecutive samples < ACL (collected in 2010 & 2011)	2.7		09/02/2014		X		
MW-OU1-61-A	2006	Last sample collected was < ACL	4.7		09/02/2014	X	X	X	X
MW-OU1-88-A	2006	Last 3 samples below the ACL (4.5 µg/L - 4.7 µg/L)	4.7		09/02/2014	X	X		
PZ-OU1-10-A1	2005	Last 3 samples < ACL (collected in 2012, 2013, & 2014)	2.4		09/02/2014		X		
PZ-OU1-49-A1	2004	Last 11 Consecutive samples< ACL (collected in 2012, 2013, & 2014). Note: Located next to EW-OU1-49-A - see Table 2.	1.2		09/02/2014		X		

Notes:
< = less than
µg/L = micrograms per liter
ACL = Aquifer Cleanup Level
EW = extraction well
IW = injection well
MW = monitoring well
OU1 = Operable Unit 1
PZ = piezometer
TCE = trichloroethene

FIGURES

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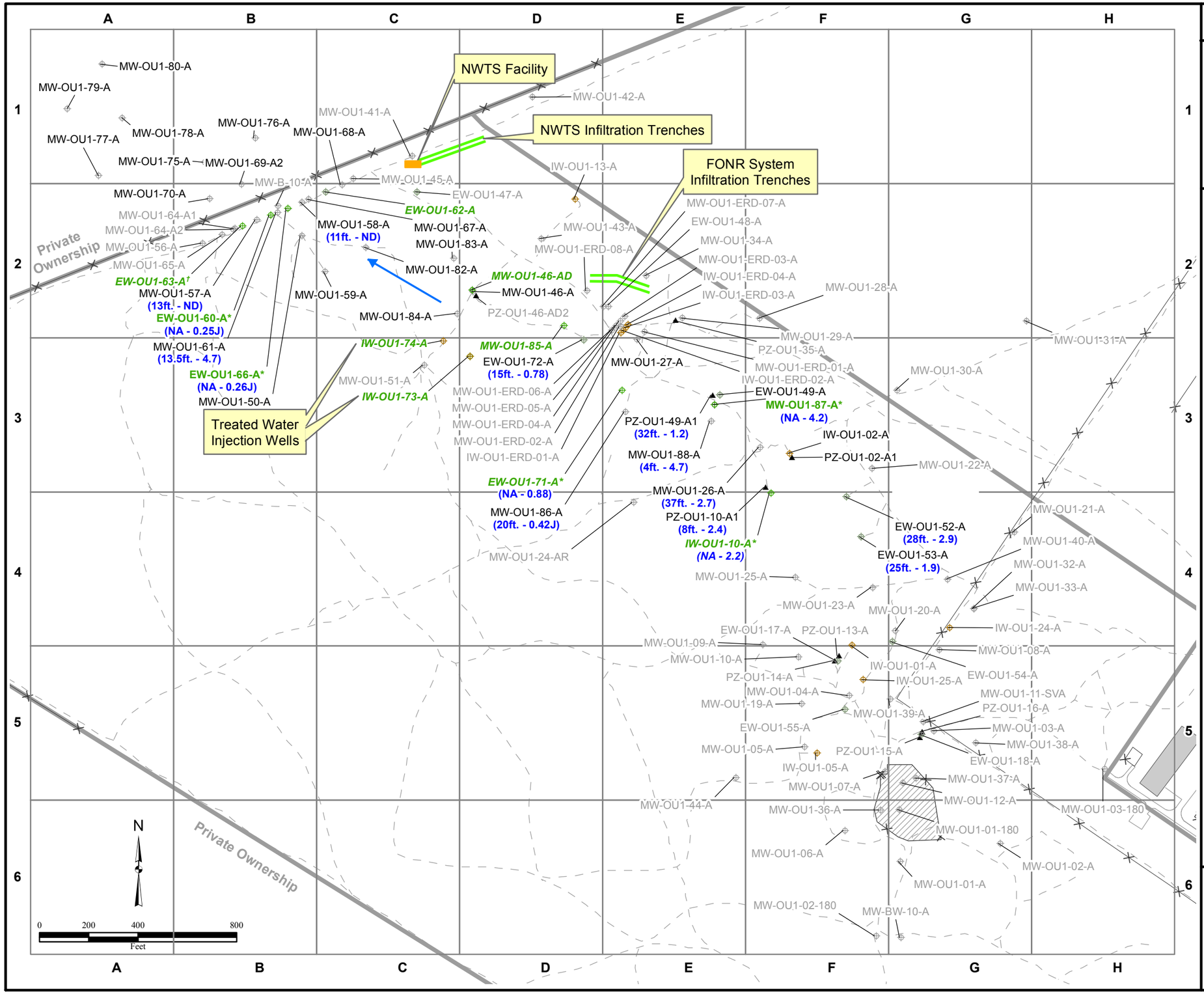
Figure 1
OU-1 FONR A-Aquifer
TCE Concentration in Groundwater
September 2014
Former Fort Ord, CA



Legend

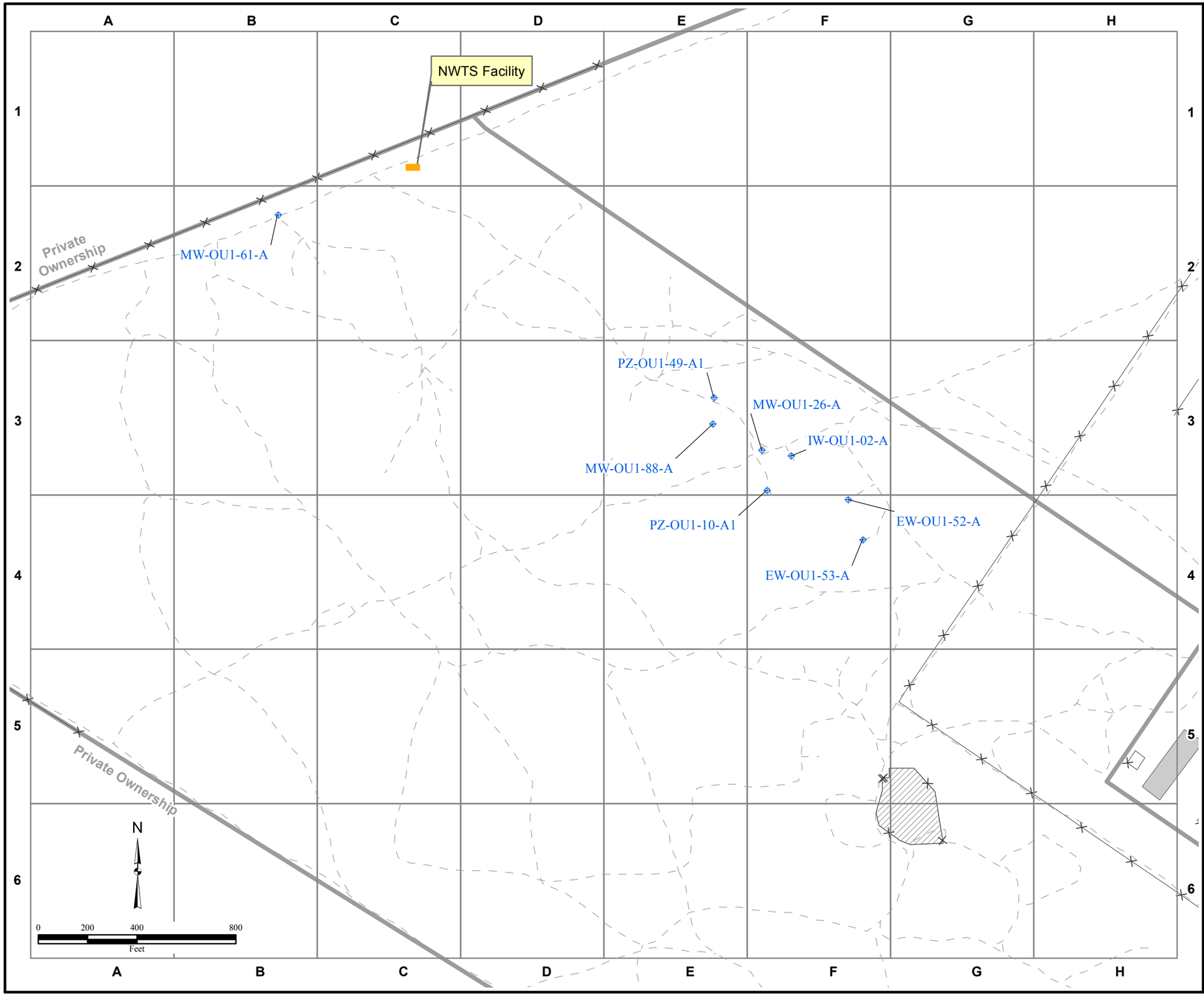
- Well
- Extraction Well
- Injection Well
- Piezometer or 2-Inch Well
- Groundwater Flow Direction
- MW-OU1-21-A — Well Destroyed
- MW-OU1-61-A — Location with September 2014 TCE Concentrations at or above ACL (5 µg/L)
- (13.5ft. - 13) — September 2014 TCE Result (µg/L); Sample Elevation (feet above mean sea level)
- 5 — TCE contour based on September 2014 Data
- Trail/Unimproved Road
- Fence
- Treated Water Infiltration Trench
- Property Boundary
- Building
- Former Fire Drill Area

Notes:
Units of TCE concentration are in micrograms per liter.
FONR = Fort Ord Natural Reserve
NWTS = Northwest Treatment System
ACL = Aquifer Cleanup Level
ND = nondetect
NA = Depth is not applicable - sample is from pumping well
µg/L = micrograms per liter
Wells shown with an asterisk were not used to develop contour boundaries.
Wells for which no data are posted were not sampled.
J = Estimated value
Green font indicates extraction or injection well.
Italicized font shows pumping suspended.
† = Disconnected extraction well. No longer operable.

\\gst-srv-01\HGLGIS\Ft_Ord_MSIW\OU-1 Exit Startegy Technical Memorandum\ Fig. 1-1 FONR A-Aquifer TCE Groundwater Concentration.mxd
9/26/2014 SS
Source: HGL

HGL HydroGeoLogic, Inc

Figure 2
OU-1 Monitoring Well Verification Network Location
Former Fort Ord, CA



Legend

- Well
- Trail/Unimproved Road
- Fence
- Property Boundary
- Building
- Former Fire Drill Area

Note:
NWTS = Northwest Treatment System

\\gst-srv-01\HGLGIS\Ft_Ord_MSW\OU-1 Exit Startegy Technical Memorandum
Fig. 1-2 OU-1 Monitoring Well Verification Network Location.mxd
9/25/2014 SS
Source: HGL

HGL HydroGeoLogic, Inc