DEPARTMENT OF THE AIR FORCE
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AUG 10 2016

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FROM: AFCEC/CIBW
3411 Olson Street
McClellan, CA 95652-1003

SUBJECT: Final Explanation of Significant Differences (ESD) for Hexavalent Chromium in Groundwater, Former McClellan Air Force Base, California (DSR# 2288-5)

Attached is the *Final ESD for Hexavalent Chromium in Groundwater, Former McClellan Air Force Base, California* (DSR# 2288-5). This ESD amends the cleanup level for hexavalent chromium contained in the Non-VOC Amendment to the Basewide VOC Groundwater ROD. It is required because of the State of California's recent adoption of a more restrictive maximum contaminant level for hexavalent chromium.

This ESD is based on two Technical Memorandums: The Background Concentration for Hexavalent Chromium in Groundwater, and the Hexavalent Chromium Findings Report.

If you have any questions or concerns, please contact Steve Mayer at (916) 643-0830, ext. 224.

PHILIP H. MOOK, JR., P.E.
Chief, Western Execution Branch

Attachment:
Final ESD for Hexavalent Chromium in Groundwater (CH2MHill, 2016)

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Final

Explanation of Significant Differences for Hexavalent Chromium in Groundwater

Former McClellan Air Force Base, California

Prepared for

Air Force Civil Engineer Center

June 2016

Contents

Acronyms and Abbreviations

µg/L	microgram(s) per liter
AFCEC	Air Force Civil Engineer Center
AFRPA	Air Force Real Property Agency
Air Force	U.S. Air Force
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
BTV	background threshold value
Cal/EPA	California Environmental Protection Agency
CDPH	California Department of Public Health
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
McClellan	Former McClellan Air Force Base
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
Non-VOC	non-volatile organic compound
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
PHG	public health goal
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
UTL	upper tolerance limit
VOC	volatile organic compound

SECTION 1

Introduction and Statement of Purpose

1.1 Site Name and Location

The Former McClellan Air Force Base (McClellan) is located in Sacramento County, 7 miles northeast of downtown Sacramento, California. It comprises approximately 3,000 acres and is bounded by the City of Sacramento on the west and southwest, and the unincorporated areas of Antelope on the north, Rio Linda on the northwest, and North Highlands on the east. A location map is shown on Figure 1-1.

Air Force Civil Engineer Center/CIBW
3411 Olson Street
McClellan, California 95652-1003
CERCLIS Identification Number: CA 4570024337
Superfund Site ID Number: 0902759

1.2 Statement of Purpose

This Explanation of Significant Differences (ESD) adds a cleanup level for hexavalent chromium to the Non-Volatile Organic Compound (Non-VOC) Amendment to the Basewide VOC Groundwater Record of Decision (ROD) for Former McClellan Air Force Base (Air Force Real Property Agency [AFRPA], 2009). Signed on September 10, 2009, the Non-VOC Amendment to the Basewide VOC Groundwater ROD selected groundwater extraction and treatment as the remedy to address non-VOCs, including hexavalent chromium, in groundwater. In the Non-VOC Amendment to the Basewide VOC Groundwater ROD, a cleanup level of 50 micrograms per liter (µg/L) was selected for total chromium (including hexavalent chromium) based on the State maximum contaminant level (MCL). In 2009, there was no State or Federal MCL specific to hexavalent chromium; however, California has recently promulgated an MCL of 10 µg/L for hexavalent chromium. A protectiveness evaluation was conducted to assess the protectiveness of the selected remedy in light of the change of the promulgated standard for hexavalent chromium (see Appendix B). As determined in the protectiveness evaluation, a cleanup level specific to hexavalent chromium needs to be added to the selected remedy. This ESD also documents that under the revised remedy, treated water may be used for industrial purposes and landscape irrigation at McClellan.

The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA, 42 United States Code Section 9601-9675), and with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] Part 300). The decisions documented herein are based on information contained in the Administrative Record (AR) file. In accordance with CERCLA Section 117(c) and NCP Sections 300.435(c)(2)(i) and 300.825(a)(2), the ESD will become part of the AR file and a notice that briefly summarizes the ESD will be published in the *Sacramento Bee*. The AR file is available for review at the Air Force Civil Engineer Center (AFCEC)/CIBW office (located at 3411 Olson Street, McClellan Park, California; appointments available from 8:00 a.m. to 3:00 p.m. Monday through Friday) and is available on the U.S. Air Force's (Air Force's) online AR at http://afcec.publicadmin-record.us.af.mil/.

The Air Force is the lead agency for conducting CERCLA response actions at McClellan. The primary regulatory agencies overseeing the McClellan cleanup are the U.S. Environmental Protection Agency (EPA) and the State of California Environmental Protection Agency (Cal/EPA), represented by the Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board (Central Valley Water Board) (collectively, the "State"). The Air Force and EPA jointly select the remedies, with concurrence from the State.

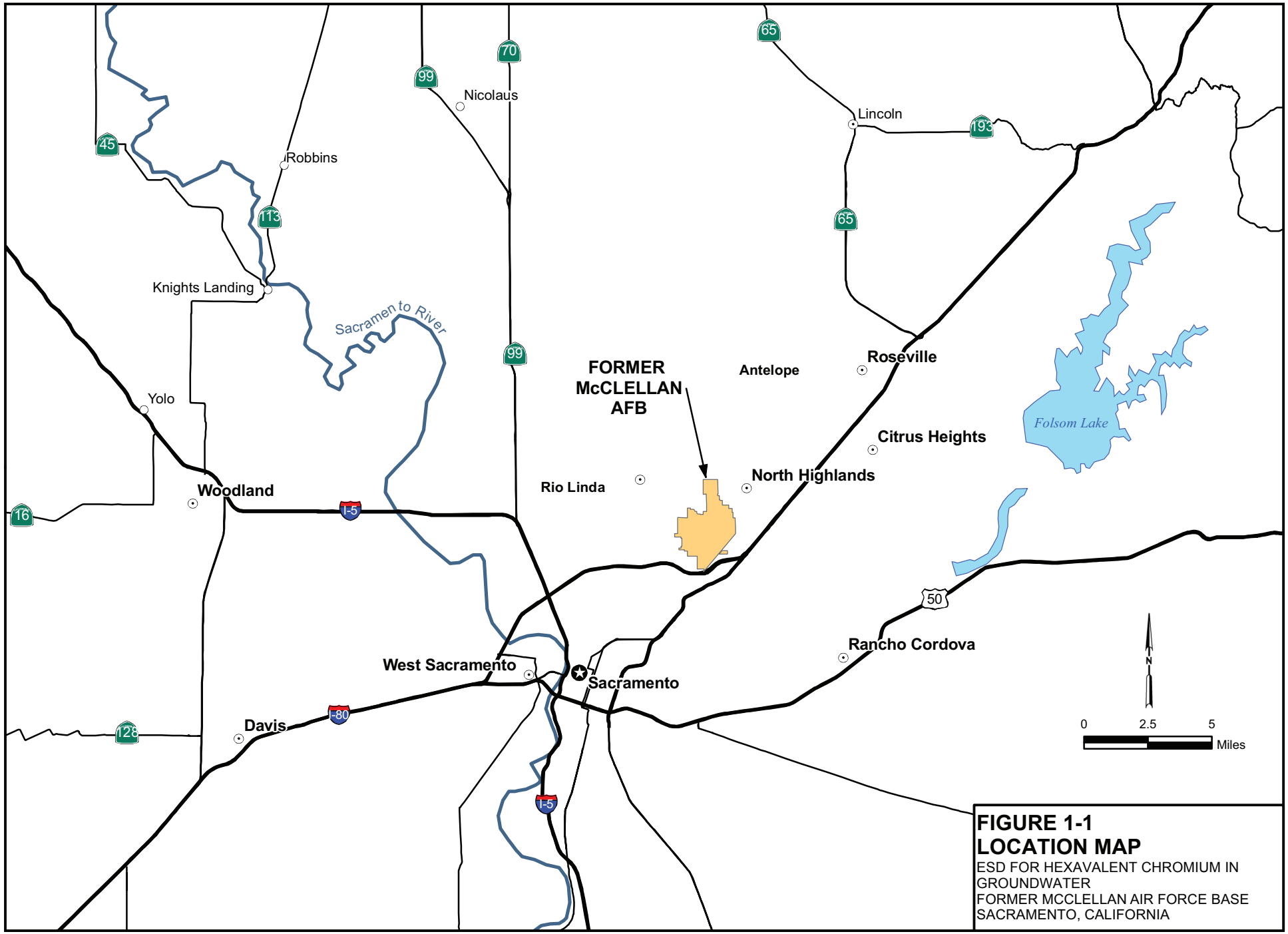

FIGURE 1-1
LOCATION MAP
ESD FOR HEXAVALENT CHROMIUM IN GROUNDWATER
FORMER MCCLELLAN AIR FORCE BASE
SACRAMENTO, CALIFORNIA

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SECTION 2

Site History, Contamination, and Selected Remedy

2.1 Site History and Contamination

Founded in 1936, McClellan was an aircraft repair depot and supply base. McClellan's mission was to provide logistics and maintenance support for aircraft, communications, and electronic systems. During operation, the Air Force used a wide range of toxic and hazardous chemicals at McClellan. These chemicals were mostly industrial solvents and cleaners, aviation fuels, and a variety of oils and lubricants. There were also several plating shops operating at the base. Hexavalent chromium is a heavy metal used in paint pigments, chrome plating, anodizing aluminum, and as a corrosion inhibitor in cooling tower water. Sources of hexavalent chromium include plating shops, paint spray booths, and associated segments of the IWL, as well as disposal pits. Past disposal practices, spills, releases, and leaking tanks and pipelines resulted in soil and groundwater contamination at McClellan. The groundwater is contaminated with VOCs and non-VOCs (including hexavalent chromium).

The existing groundwater extraction and treatment system used to remediate VOCs and non-VOCs has been in operation since 1987. Soil vapor extraction systems were installed as removal actions to address VOCs in the vadose zone that could potentially migrate to groundwater and prolong the groundwater cleanup process. The groundwater treatment system was modified under a time-critical removal action to address hexavalent chromium in 2003 by installing an ion exchange system designed to meet the system's discharge requirement. One groundwater treatment plant and approximately 96 extraction wells are currently operational and are pumping and treating groundwater contaminated with VOCs and non-VOCs (including hexavalent chromium).

2.2 Selected Remedy

As documented in the Non-VOC Amendment to the Basewide VOC Groundwater ROD (AFRPA, 2009), the selected remedy to address non-VOCs, including hexavalent chromium, in groundwater consists of groundwater extraction and treatment, monitoring, and institutional controls. Treatment of hexavalent chromium will continue under the selected remedy until cleanup levels are achieved throughout the contaminated plumes. Based on the most stringent State MCL at the time, a cleanup level of 50 µg/L for total chromium (including hexavalent chromium) was selected in the Non-VOC Amendment to the Basewide VOC Groundwater ROD.

The existing groundwater extraction and treatment system operating to address VOCs per the Basewide VOC Groundwater ROD (AFRPA, 2007) was applied to meet remedial goals for non-VOCs. Under the selected remedy, air stripping and an ion exchange system are used as necessary to meet the substantive requirements for discharge of the treated water to surface water as presented in the Basewide VOC Groundwater ROD (AFRPA, 2007) and the Non-VOC Amendment to the Basewide VOC Groundwater ROD (AFRPA, 2009). The substantive requirements are listed in Appendix G of the Operations and Maintenance Manual for the Groundwater Treatment Plant (URS, 2014). Treated groundwater is discharged to Magpie Creek and Beaver Pond, which drains into adjacent Don Julio Creek.

The selected remedy also includes institutional controls initially established in the Basewide VOC Groundwater ROD (AFRPA, 2007), which remain unchanged. These institutional controls, described in detail in Section 2.11.3 of the Basewide VOC Groundwater ROD, are designed to prevent human exposure to non-VOCs at concentrations above cleanup levels and to protect the integrity of the remedial systems and associated monitoring systems. Groundwater use prohibition zones were created downgradient of the base,

and residents were connected to municipal water supplies in the 1980s. A 2,000-foot consultation zone was created around the contaminant plumes to trigger a review of well application permits.

The Air Force monitors the non-VOC groundwater plumes and contaminants of concern (COCs) throughout the remediation process in accordance with the *Groundwater Monitoring Plan, Update 2* (URS, 2009). The decision logic for non-VOCs (and specifically for hexavalent chromium) currently provided in the *Groundwater Monitoring Plan, Update 2* (URS, 2009) will be updated as appropriate to reflect the new cleanup level for hexavalent chromium.

SECTION 3

Basis for ESD

3.1 Differences from the Selected Remedy

In the Non-VOC Amendment to the Basewide VOC Groundwater ROD, a cleanup level of 50 µg/L was selected for total chromium (including hexavalent chromium) based on the State MCL. Since the submittal of the Non-VOC Amendment to the Basewide VOC Groundwater ROD, a new regulatory standard specific to hexavalent chromium has been promulgated by the State. In 2011, the Office of Environmental Health Hazard Assessment (OEHHA) established a public health goal (PHG) of 0.02 µg/L for hexavalent chromium. The PHG represents a de minimis lifetime cancer risk from exposure to hexavalent chromium in drinking water. Based on the establishment of the PHG, the California Department of Public Health (CDPH) established the MCL for hexavalent chromium at 10 µg/L in 2014. An MCL is the legal threshold limit on the amount of a substance that is allowed in public water systems under the Safe Drinking Water Act whereas a PHG is a more conservative estimated concentration of a drinking water contaminant that poses no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods. An MCL is legally enforceable.

As recommended in the most recent five-year review (MWH, 2014), a "protectiveness evaluation" was conducted per the guidance found in EPA Office of Solid Waste and Emergency Response (OSWER) No. 9355.7-03B-P, Comprehensive Five-Year Review Guidance, June 2001, Section 4.0 – Assessing the Protectiveness of the Remedy, including Appendix G – Methods and Examples for Evaluating Changes in Standards and Toxicity, to assess the protectiveness of the selected remedy in light of the change of the promulgated standards for hexavalent chromium. The protectiveness evaluation is documented in Appendix B. With an estimated excess lifetime carcinogenic risk of 3×10^{-3}, the old cleanup level (50 µg/L) is no longer considered protective; therefore, a cleanup level needs to be adopted to ensure that the remedy achieves protectiveness. This ESD documents the addition of a groundwater cleanup level specific to hexavalent chromium. Regardless of the cleanup level, the selected remedy has remained protective because institutional controls prevent exposure to groundwater.

Under the revised remedy, some portion of the treated water may be used with approval of the regulatory agencies for industrial purposes and landscape irrigation at McClellan. The amount of treated water discharged to the specified alternate locations is expected to vary seasonally. For example, uses may include the following:

- The Office of the Secretary of Defense/Defense MicroElectronics Activity (DMEA) has proposed utilizing a portion of the treated groundwater from the McClellan GWTP for industrial purposes. Specifically, the treated groundwater is proposed to be used in their semiconductor fabrication laboratory.
- Dust suppression for construction projects.
- Firefighting (CalFire proposes offsite seasonal use of treated groundwater in batches mixed with fire retardant delivered to fires via air tankers.
- Water for construction site cleanup.
- Landscape irrigation.

Other compatible and appropriate industrial uses at McClellan Park require notification and approval by the regulatory agencies before implementation. Once the Air Force has treated the groundwater to the applicable or relevant and appropriate requirements (ARARs) including, but not limited to, the Central Valley Water Board's Order Nos. R5-2014-0055 and R5-2015-0012 (the Air Force recognizes the substantive provisions) and any future revisions, as well as the revised Groundwater Treatment Plant's Operations and

Maintenance Manual (URS, 2014), the Air Force has met its CERCLA requirements for discharging treated groundwater. The end users of the treated groundwater are also responsible to comply with all applicable federal, state, and local regulations related to their use and discharge of said water.

3.2 Development of Hexavalent Chromium Cleanup Level

To support development of a cleanup level for hexavalent chromium, a local background value was established (see Appendix A). Under CERCLA in accordance with OSWER 9285.6-07P, April 2002, the "Role of Background in the CERCLA Cleanup Program," cleanup levels are generally not set at concentrations below natural background values. The background value for hexavalent chromium is based on samples collected from extraction wells outside the influence of suspected hexavalent chromium source areas. Using the selected background data set, a background threshold value (BTV), specifically a 95 percent upper confidence limit of the 95th percentile, known as a 95/95 upper tolerance limit (UTL), of 14 µg/L was calculated. A 95/95 UTL is designed to contain, but not exceed, 95 percent of the possible background concentrations with 95 percent confidence, thus providing a reasonable upper limit on what is likely to be observed in background. For hexavalent chromium, the California MCL of 10 µg/L is less than the BTV of 14 µg/L; therefore, the selected cleanup level for hexavalent chromium is 14 µg/L.

SECTION 4

Description of Significant Differences

4.1 Significant Differences

The selected remedy presented in the Non-VOC Amendment to the Basewide VOC Groundwater ROD has been revised to add the California MCL as a chemical-specific ARAR for hexavalent chromium and include a cleanup level of 14 µg/L for hexavalent chromium. The areas impacted with hexavalent chromium above the cleanup level based on available data are presented on Figures 4-1 and 4-2. As presented in the *Hexavalent Chromium Findings Report* (see Appendix B) and the *Groundwater and SVE Annual Remediation Monitoring Report – Fourth Quarter 2015* (URS, 2016), wells with the most recent and/or penultimate result greater than the cleanup level of 14 µg/L (including wells with elevated method detection limits) are recommended for further evaluation. This includes the following wells:

- EW-299
- EW-320
- EW-447
- EW-487
- MW-1002
- MW-1009
- MW-1011
- MW-1017
- MW-1020
- MW-1049
- MW-1053
- MW-1054
- MW-107
- MW-1088
- MW-120
- MW-128
- MW-131
- MW-15
- MW-158
- MW-159
- MW-17D
- MW-1003
- MW-222
- MW-235
- MW-241
- MW-347
- MW-355
- MW-360
- MW-362
- MW-365
- MW-366
- MW-397
- MW-413
- MW-41S
- MW-428
- MW-44S
- MW-49S
- MW-580
- MW-60
- MW-622
- MW-623
- MW-629
- MW-630
- MW-633
- MW-640
- MW-65
- MW-7
- PZ-737
- PZ-758
- EW-384
- MW-1010
- MW-1038
- MW-108
- MW-109
- MW-143
- MW-165
- MW-173
- MW-183
- MW-18D
- MW-195
- MW-198
- MW-201
- MW-204
- MW-211
- MW-213
- MW-220
- MW-223
- MW-225
- MW-315
- MW-407
- MW-424
- MW-63
- MW-71
- PZ-743
- PZ-92
- MW-196
- MW-221
- MW-232

Note that wells MW-196 (C zone), MW-221 (C zone), and MW-232 (E zone) are not shown on Figures 4-1 and 4-2 because they are not A or B zone wells.

The existing groundwater extraction and treatment system will continue to operate to address VOCs per the Basewide VOC Groundwater ROD and non-VOCs (including hexavalent chromium) per the Non-VOC Amendment to the Basewide VOC Groundwater ROD. Under the revised remedy, the groundwater treatment system, which includes air stripping and an ion exchange system, will continue to be used as necessary to meet the substantive requirements for treatment plant discharge as presented in the Basewide VOC Groundwater ROD and the Non-VOC Amendment to the Basewide VOC Groundwater ROD. The substantive requirements are listed in Appendix G of the Operations and Maintenance Manual for the Groundwater Treatment Plant (URS, 2014). As described in the Central Valley Water Board's February 25, 2016, Technical Memorandum [*Diversion of McClellan Treated Groundwater for Alternate Uses*] provided as Appendix C, the treated groundwater meets the substantive requirements of the Central Valley Water Board's Order Nos. R5-2014-0055 and R5-2015-0012. Because the treated water will meet all regulatory

requirements as described above and as described further in the Technical Memorandum, it will be protective of human health and the environment to use the treated water for the uses listed in Section 3.1.

The selected remedy also includes institutional controls initially established in the Basewide VOC Groundwater ROD, which remain unchanged. The decision logic for non-VOCs (and specifically for hexavalent chromium) currently provided in the *Groundwater Monitoring Plan, Update 2* (URS, 2009) will be updated as appropriate to reflect the new cleanup level for hexavalent chromium. The Air Force will monitor the non-VOC groundwater plumes and COCs throughout the remediation process in accordance with the updated groundwater monitoring plan. Further evaluation of the existing and any additional data collected will be conducted in accordance with the updated decision logic for hexavalent chromium. If necessary, plume delineations can be adjusted based on the additional evaluation. This will be addressed as part of the ongoing groundwater monitoring program.

4.2 Expected Outcomes

Other than significantly increasing remedy performance by specifying a cleanup level for hexavalent chromium, the ESD will not result in significant changes to the expected outcomes of the selected remedy. As presented in Appendix B, the proposed cleanup level will result in the addition or expansion of several hexavalent chromium plumes; however, based on the existing data, all of the wells that represent contamination are effectively being captured (or contamination is flowing towards a capture zone) by the existing groundwater extraction and treatment system. Because the hexavalent chromium plumes are already being treated by the groundwater extraction and treatment system and the overall time to achieve cleanup levels is driven by VOCs, the time required to achieve cleanup levels for all contaminants and the associated cost for groundwater extraction of the plumes are not expected to increase. Costs for monitoring of hexavalent chromium plumes will increase because of the new cleanup level, and costs will be incurred for installation of additional monitoring wells to further evaluate groundwater conditions. Table 4-1 lists estimated costs for installation of five additional monitoring wells ($203,000). Table 4-2 lists costs for monitoring of hexavalent chromium ($532,000). Costs are highest in the first year when samples are collected from a number of wells that have had sporadic exceedances of the cleanup level. Costs then decrease through time as the cleanup proceeds and the size of the hexavalent chromium plumes decrease. Based on evaluation of concentration trends in impacted wells, it is estimated that the hexavalent chromium cleanup level will be reached at all locations within 30 years. This represents an increase of 28 years and an increased cost of approximately $300,000 for the longer duration of monitoring.

The alternate uses of treated water defined in Section 3.1 will not result in significant changes to the expected outcomes of the selected remedy. There is no additional cost to the Air Force, and no additional ARARs are triggered with the alternate uses of the treated water defined in Section 3.1.

TABLE 4-1

Unit Costs and Assumptions for Installation of Monitoring Wells

ESD for Hexavalent Chromium in Groundwater, Former McClellan Air Force Base, Sacramento, California

Task	Quantity	Unit Cost	Unit	Estimated Cost	Assumptions
Component: Project Management					
Project Management	1	$11,530	lump sum	$11,530	10% of total well construction cost
Admin/Reporting	1	$5,765	lump sum	$5,765	5% of total well construction cost
Meetings	1	$1,730	lump sum	$1,730	1.5% of total well construction cost
Procurement	1	$5,765	lump sum	$5,765	5% of total well construction cost
Total Project Management Cost	**-**	**-**	**-**	**$24,800**	
Component: Planning and Reporting					
Work Plan	1	$5,765	lump sum	$5,765	5% of total well construction cost
Health and Safety Plan	1	$2,883	lump sum	$2,883	2.5% of total well construction cost
Construction QC Plan	1	$1,730	lump sum	$1,730	1.5% of total well construction cost
Total Planning and Reporting Cost				**$10,400**	
Component: Monitoring Well Construction					
Permitting	1	$300	well	$300	Obtaining well permits & permit fees
Drilling/Well Development/Well Construction	5	$18,000	boring	$90,000	Includes utility locating and analysis/disposal of IDW soil and water. Based on vendor quote.
Surveying	1	$2,500	lump sum	$2,500	Assumes one full day with a one-man crew
As-Built	1	$4,500	lump sum	$4,500	5% of drilling/well development/well construction
Mobilization and Demobilization	1	$4,500	lump sum	$4,500	5% of drilling/well development/well construction
Construction Oversight	1	$13,500	lump sum	$13,500	15% of drilling/well development/well construction
Total Monitoring Well Construction Cost	**-**	**-**	**-**	**$115,300**	
Component: Project Closeout					
Closeout	1	$5,765	lump sum	$5,765	5% of total well construction cost
Total Project Closeout	**-**	**-**	**-**	**$5,765**	
			Total Capital Cost	**$156,265**	
			General Contingency (30% of Capital Cost)	$46,900	
			Total Cost of Monitoring Wells	**$203,000**	

TABLE 4-2

Costs for Annual Groundwater Monitoring

ESD for Hexavalent Chromium in Groundwater, Former McClellan Air Force Base, Sacramento, California

Task	Quantity	Unit Cost	Unit	Annual Estimated Cost	Assumptions
Annual Cost for Sampling and Monitoring Total and Hexavalent Chromium (Year 1)					
Component: Labor					
Field Activities					
Field Sampling	330	$73	hour	$24,090	Assumes 6 wells sampled per day. Total of 33 field days per year
Sample Coordination	20	$53	hour	$1,060	
H&S and Chemist support	22	$105	hour	$2,310	
Data Quality Assurance and Reporting					
Chemist	32	$105	hour	$3,360	
GIS	16	$105	hour	$1,680	
Environmental Engineer	32	$73	hour	$2,336	
Hydrologist	16	$105	hour	$1,680	
Senior Review	4	$157	hour	$628	
Delivery Order Management					
Project Management	16	$157	hour	$2,512	
Contracts	8	$105	hour	$840	
Project Coordination	8	$105	hour	$840	
Total Labor Cost	**-**	**-**	**-**	**$41,300**	
Component: Equipment & Supplies					
Equipment rentals and supplies	8	$1,400	week	$11,200	
Total Equipment & Supplies Cost	**-**	**-**	**-**	**$11,200**	
Component: Laboratory Analytical Costs					
Hexavalent Chromium	200	$50	each	$10,000	Assumes 50 wells sampled quarterly.
Total Laboratory Analytical Cost	**-**	**-**	**-**	**$10,000**	
			Total Annual Cost	**$62,500**	
Annual Cost for Sampling and Monitoring Total and Hexavalent Chromium (Years 2-10)					
Component: Labor					
Field Activities					
Field Sampling	90	$73	hour	$6,570	Assumes 6 wells sampled per day. Total of 8 field days per year
Sample Coordination	10	$53	hour	$530	
H&S and Chemist support	12	$105	hour	$1,260	
Data Quality Assurance and Reporting					
Chemist	16	$105	hour	$1,680	
GIS	8	$105	hour	$840	
Environmental Engineer	16	$73	hour	$1,168	
Hydrologist	8	$105	hour	$840	
Senior Review	2	$157	hour	$314	
Delivery Order Management					
Project Management	8	$157	hour	$1,256	
Contracts	4	$105	hour	$420	
Project Coordination	4	$105	hour	$420	
Total Labor Cost	**-**	**-**	**-**	**$15,300**	
Component: Equipment & Supplies					
Equipment rentals and supplies	4	$1,400	week	$5,600	
Total Equipment & Supplies Cost	**-**	**-**	**-**	**$5,600**	
Component: Laboratory Analytical Costs					
Hexavalent Chromium	50	$50	each	$2,500	Assumes 25 wells sampled semiannually.
Total Laboratory Analytical Cost	**-**	**-**	**-**	**$2,500**	
			Total Annual Cost	**$23,400**	

TABLE 4-2

Costs for Annual Groundwater Monitoring

ESD for Hexavalent Chromium in Groundwater, Former McClellan Air Force Base, Sacramento, California

Task	Quantity	Unit Cost	Unit	Annual Estimated Cost	Assumptions
Annual Cost for Sampling and Monitoring Total and Hexavalent Chromium (Years 11-30)					
Component: Labor					
Field Activities					
Field Sampling	40	$73	hour	$2,920	Assumes 6 wells sampled per day. Total of 3 field days per year
Sample Coordination	5	$53	hour	$265	
H&S and Chemist support	6	$105	hour	$630	
Data Quality Assurance and Reporting					
Chemist	8	$105	hour	$840	
GIS	4	$105	hour	$420	
Environmental Engineer	8	$73	hour	$584	
Hydrologist	4	$105	hour	$420	
Senior Review	1	$157	hour	$157	
Delivery Order Management					
Project Management	4	$157	hour	$628	
Contracts	2	$105	hour	$210	
Project Coordination	2	$105	hour	$210	
Total Labor Cost	**-**	**-**	**-**	**$7,300**	
Component: Equipment & Supplies					
Equipment rentals and supplies	2	$1,400	week	$2,800	
Total Equipment & Supplies Cost	**-**	**-**	**-**	**$2,800**	
Component: Laboratory Analytical Costs					
Hexavalent Chromium	20	$50	each	$1,000	Assumes 10 wells sampled semiannually.
Total Laboratory Analytical Cost	**-**	**-**	**-**	**$1,000**	
			Total Annual Cost	**$11,100**	
O&M of The NVOC GWM Network					
Periodic Well Redevelopment	2	$3,000	well	$6,000	Assume 2 wells at year 20.
Periodic Well Replacement	2	$40,000	well	$80,000	Assume 2 wells at year 20. Includes abandonment of old well, installation of a new well, development, surveying, and waste disposal.
Annual O&M	1	$1,000	lump sum	$2,000	ion exchange unit. Annual cost, all years
			Present Value Total Cost	**$532,000**	

Other Assumptions

- Present value of the costs were calculated using a discount rate of 1.5% based on Appendix C of the Office of Management and Budget Circular A-94 (November 2015).

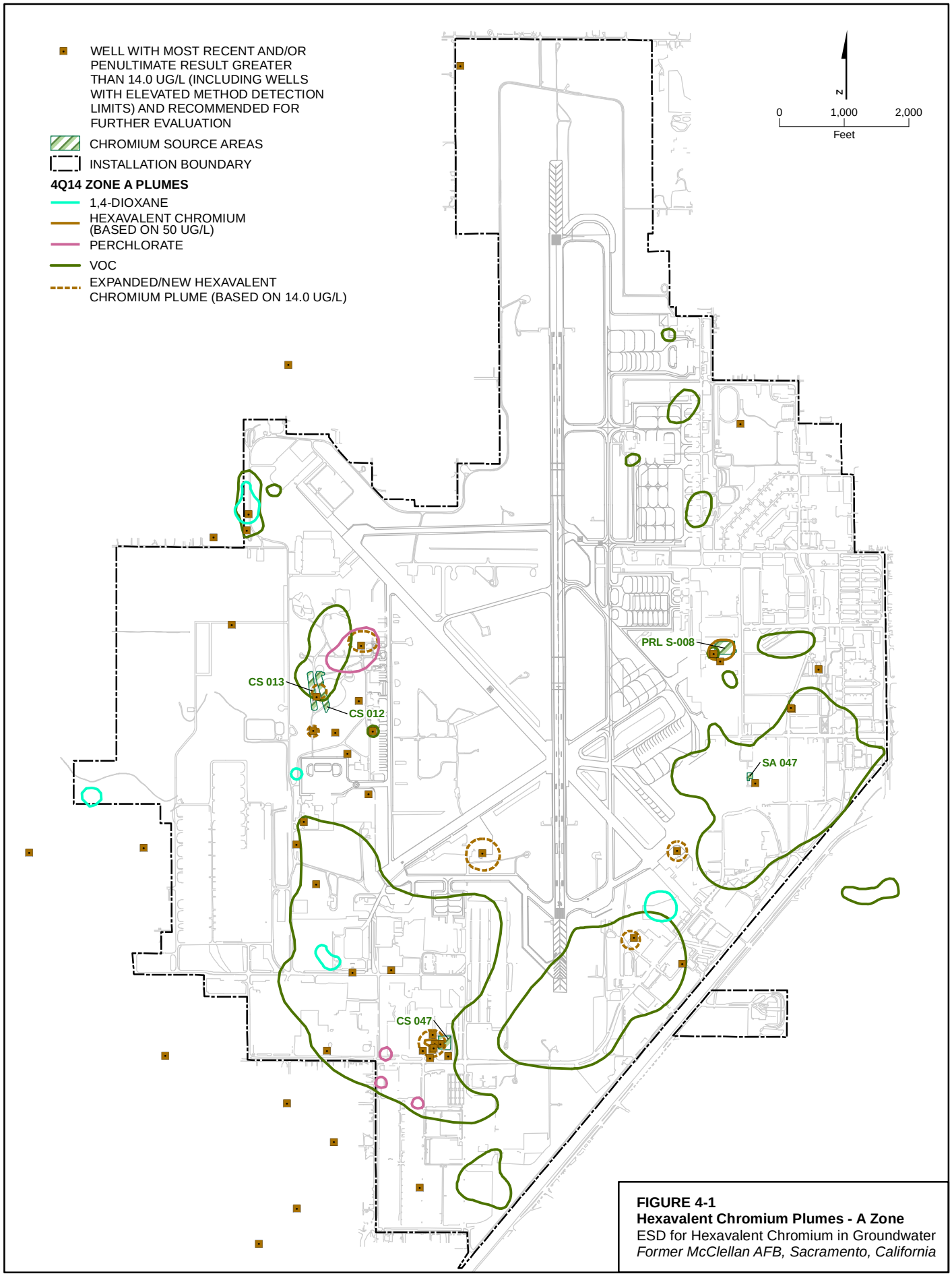


FIGURE 4-1
Hexavalent Chromium Plumes - A Zone
ESD for Hexavalent Chromium in Groundwater
Former McClellan AFB, Sacramento, California

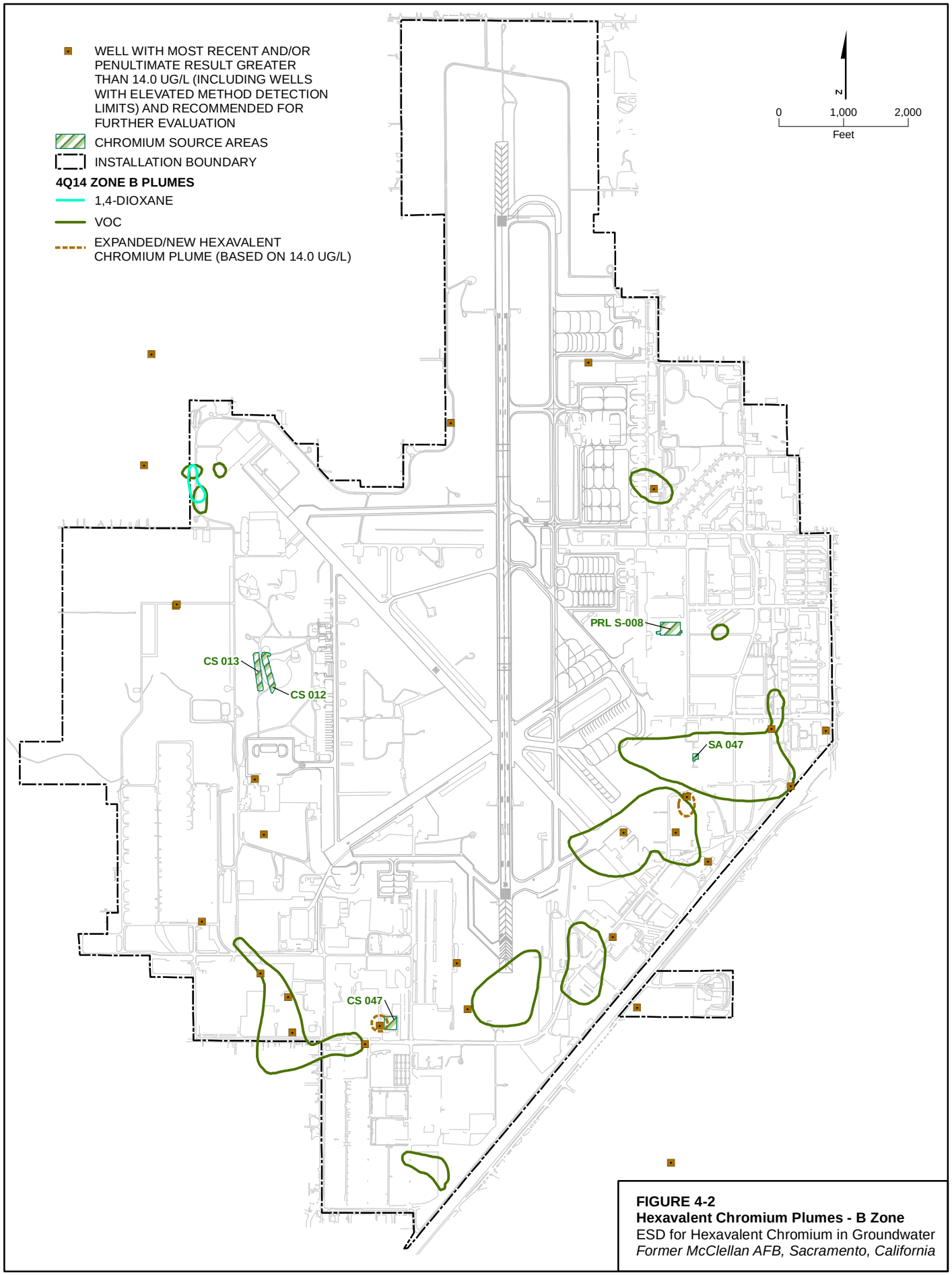


FIGURE 4-2
Hexavalent Chromium Plumes - B Zone
ESD for Hexavalent Chromium in Groundwater
Former McClellan AFB, Sacramento, California

SECTION 5

Support Agency Comments

At McClellan, the Air Force and EPA jointly select the remedies, with review and comment from the State. The State concurs with the selected remedy.

SECTION 6

Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs, are cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against offsite disposal of untreated wastes. The selected remedy with the addition of the California MCL as a chemical specific ARAR meets the statutory requirements. ARARs for the Basewide VOC Groundwater ROD and the Non-VOC Amendment to the Basewide VOC Groundwater ROD also apply to this ESD. The chemical-specific ARAR for hexavalent chromium is the California MCL (Title 22 California Code of Regulations Section 64431).

SECTION 7

Public Participation Compliance

In accordance with CERCLA Section 117(c) and NCP Sections 300.435(c)(2)(i) and 300.825(a)(2), the ESD will become part of the AR file and a notice that announces and briefly summarizes the ESD will be published in the *Sacramento Bee*.

SECTION 8

Signatures

This is the signature sheet for the ESD for Hexavalent Chromium in Groundwater. The Air Force and EPA jointly selected the remedies described in this ESD.

APPROVED BY: JUN 29 2016 Date

ROBERT E. MORIARTY, P.E., SES, DAF
Director
Installations Directorate
Air Force Civil Engineer Center

APPROVED BY: July 27, 2016 Date

ANGELES HERRERA
Assistant Director, Federal Facilities and Site Cleanup Branch
U.S. Environmental Protection Agency, Region 9

8/8/2016 Date

The Department of Toxic Substances Control and the Central Valley Regional Water Quality Control Board (the State) had an opportunity to review and comment on the ESD for Hexavalent Chromium in Groundwater, and their concerns have been addressed.

CHARLES RIDENOUR
Branch Chief, Sacramento Office Cleanup Program
Sacramento Office Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
California Environmental Protection Agency

SECTION 9

References

Air Force Real Property Agency (AFRPA). 2009. *Non-VOC Amendment to the Basewide VOC Groundwater Record of Decision.* Prepared for the former McClellan Air Force Base, California. Final. September.

Air Force Real Property Agency (AFRPA). 2007. *Basewide VOC Groundwater Record of Decision.* Prepared for the former McClellan Air Force Base, California. Final. August.

MWH. 2014. *Five-Year Review, Fourth Five-Year Review Report.* Prepared for the former McClellan Air Force Base, California. Final. September.

URS. 2016. *Groundwater and SVE Annual Remediation Monitoring Report – Fourth Quarter 2015*. February.

URS. 2014. *Operation and Maintenance Manual, Groundwater Monitoring Program, Groundwater Treatment Plant.* Final. September.

URS. 2009. *Groundwater Monitoring Plan, Update 2.* March.

Appendix A
Final Technical Memorandum: Background Concentration for Hexavalent Chromium in Groundwater at Former McClellan Air Force Base

Final Background Concentration for Hexavalent Chromium in Groundwater at Former McClellan Air Force Base

PREPARED FOR:	Ken Smarkel/Noblis
COPY TO:	Steve Mayer/AFCEC Andy Cramer/CH2M HILL Brian Schroth/CH2M HILL
PREPARED BY:	Nikki Carlton/CH2M HILL
DATE:	September 21, 2015
PROJECT NUMBER:	654608.02.04.90.04

Introduction

This Technical Memorandum has been prepared by CH2M HILL for the Air Force Civil Engineer Center (AFCEC) under Contract FA8903-08-D-8769-0380.

The purpose of this Hexavalent Chromium Background Technical Memorandum is to establish a local background concentration for hexavalent chromium based on existing groundwater data. This Hexavalent Chromium Background Technical Memorandum describes the methodology for determining the background data set and developing a background concentration.

Background Data Selection and Evaluation

Methods similar to those used in the *Remedial Investigation/Feasibility Study for Non-VOCs in Groundwater* (RI/FS for Non-VOCs in Groundwater) (CH2M HILL, 2008) were used to evaluate the existing hexavalent chromium data set and develop a local background concentration. The background concentration for hexavalent chromium is based on samples collected from extraction wells outside the influence of suspected chromium source areas.

As presented in the RI/FS for Non-VOCs in Groundwater (CH2M HILL, 2008), stainless steel well corrosion in monitoring wells affects the reported concentrations of chromium, iron, manganese, and nickel. For the RI/FS for Non-VOCs in Groundwater, it was therefore determined that background values calculated using data from extraction wells provide a more reasonable estimate of true background concentrations for chromium, iron, manganese, and nickel than do the background values calculated using data from monitoring wells with stainless steel well screens. Hexavalent chromium is stable in groundwater at the levels of ORP and pH found at McClellan. Consequently, the hexavalent chromium concentration is typically equal to the filtered (dissolved) total chromium concentration, as it should be in this type of environment (CH2M HILL, 2008). Although corrosion of stainless steel well screens does not affect hexavalent chromium concentrations in monitoring well samples, this evaluation focuses on data from extraction wells because they are considered to be sufficiently conservative and most closely represent a production well. The background data set therefore includes extraction well data regardless of operational status.

Chromium contamination in groundwater has been confirmed near two former plating shops (CS 047 and PRL S-008), two disposal pits (CS 012 and CS 013), and near the wash racks at SA 047 (see Figure 1). As presented in the RI/FS for Non-VOCs in Groundwater and shown on Figure 1, the following 97 extraction wells were considered to be outside the influence of suspected chromium source areas:

EW-63	EW-310	EW-366	EW-443
EW-83	EW-314	EW-367	EW-444

EW-84	EW-315	EW-377	EW-445
EW-85	EW-321	EW-378	EW-446
EW-86	EW-322	EW-379	EW-447
EW-137	EW-323	EW-380	EW-448
EW-140	EW-324	EW-383	EW-449
EW-141	EW-330	EW-412	EW-450
EW-144	EW-333	EW-414	EW-451
EW-246	EW-335	EW-415	EW-452
EW-247	EW-336	EW-417	EW-453
EW-284	EW-337	EW-424	EW-454
EW-296	EW-338	EW-425	EW-455
EW-297	EW-339	EW-431	EW-456
EW-299	EW-340	EW-432	EW-457
EW-300	EW-341	EW-433	EW-458
EW-301	EW-342	EW-434	EW-459
EW-302	EW-343	EW-435	EW-460
EW-303	EW-344	EW-436	EW-461
EW-304	EW-359	EW-437	EW-462
EW-305	EW-360	EW-438	EW-463
EW-306	EW-361	EW-439	EW-464
EW-307	EW-362	EW-440	
EW-308	EW-363	EW-441	
EW-309	EW-364	EW-442	

An additional screening of the existing data for these 97 wells was performed to identify potential low-level source areas that should be excluded from the background data set. Based on this screening, the following wells were not retained for use in the background calculations:

- Results for samples from EW-299 are consistently high relative to other wells with a decreasing trend. EW-299 is located at CS T-057 (former jet engine testing facility [Building 431]) which has a history of hexavalent chromium use. Data indicate there may be a low-level plume in this area.
- EW-436 is located immediately adjacent to EW-299 and results exhibit an increasing trend. As stated above, data indicate there may be a low-level plume in this area.
- Results for EW-303, EW-304, and EW-363 exhibit a slight decreasing trend. These wells are located west of the old plating shop (CS 047). Data indicate there may be a low-level plume in this area.
- EW-361 is located in an area that may have been influenced by the chromium source area at CS 047.
- Results for EW-305 exhibit a slight decreasing trend. EW-305 is located west of the industrial wastewater treatment plant (IWTP). Data indicate there may be a low-level plume in this area.
- EW-434 is located in an area that may have been influenced by the chromium source area at SA 047.

- EW-379 is located in an area that may have been influenced by the chromium source area at the disposal pits (CS 012 and CS 013).
- Results for EW-447 are somewhat elevated relative to other wells with a decreasing trend. This well is located south of the disposal pits (CS 012 and CS 013).
- Results for EW-306 and EW-451 exhibit a slight increasing trend.
- EW-84 appears to be located in a chromium reducing region.

No new extraction wells with associated hexavalent chromium data have been installed outside the influence of suspected chromium source areas since the RI/FS for Non-VOCs for Groundwater was completed. The data for all 97 wells and summary of the screening is provided in Attachment 1.

The existing data set for the remaining 84 wells was further evaluated as follows:

- Non-detects without associated detection limit and reporting limit information or non-detects with elevated detection limits were not retained for use in the background calculations.
- In cases where both a normal sample and a field duplicate were collected, the average of the result for the normal sample and the result for the field duplicate was used in the background calculations.
- For non-detect (U flagged) results, a value equal to the method detection limit was assigned for use in the background calculations.

The data set used for the evaluation is provided in Attachment 1. The retained data points were collected between September 2001 and January 2008. The data were averaged for each of these 84 wells to provide the final data set for use in the background calculations. The final background data set is provided in Table 1. It should be noted that background data set includes limited data for the C and D zones (5 wells and 1 well, respectively). Although it is more representative of the A and B zones, the background value will be applied to the A through D zones.

TABLE 1
Background Data Set for Hexavalent Chromium in Groundwater
Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, California

Extraction Well	Monitoring Zone	Average Concentration (µg/L)	Extraction Well	Monitoring Zone	Average Concentration (µg/L)
EW-137	B	10.6	EW-380	A	8.2
EW-140	B	10.2	EW-383	A	8.3
EW-141	C	7.9	EW-412	A/B	8.1
EW-144	A/B	10.8	EW-414	A/B	9.5
EW-246	A/B	12.8	EW-415	B	11.8
EW-247	C	8.8	EW-417	B	14.3
EW-284	A	11.6	EW-424	A/B	6.6
EW-296	A	10.3	EW-425	A/B	7.0
EW-297	B	8.6	EW-431	A/B	8.2
EW-300	A	2.1	EW-432	B	12.3
EW-301	A/B	9.8	EW-433	B	11.3
EW-302	A/B	7.5	EW-435	A/B	13.7
EW-307	C	8.8	EW-437	A/B	7.1
EW-308	C	6.7	EW-438	A/B	10.1
EW-309	D	4.4	EW-439	A/B	6.3

TABLE 1
Background Data Set for Hexavalent Chromium in Groundwater
Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, California

Extraction Well	Monitoring Zone	Average Concentration (µg/L)	Extraction Well	Monitoring Zone	Average Concentration (µg/L)
EW-310	B	10.0	EW-440	A/B	9.4
EW-314	A	11.7	EW-441	A	10.7
EW-315	A	4.3	EW-442	A/B	11.3
EW-321	A/B	10.0	EW-443	A	8.1
EW-322	B	11.6	EW-444	A	9.7
EW-323	A/B	8.0	EW-445	A	12.7
EW-324	A/B	6.9	EW-446	A	10.7
EW-330	A	7.5	EW-448	A	4.1
EW-333	A/B	4.7	EW-449	A/B	8.9
EW-335	A/B	5.2	EW-450	B	8.2
EW-336	A/B	4.6	EW-452	A/B	9.5
EW-337	A	9.8	EW-453	A/B	12.0
EW-338	A	12.2	EW-454	A/B	7.4
EW-339	A	6.4	EW-455	A/B	4.8
EW-340	A/B	10.1	EW-456	A/B	11.5
EW-341	A	11.2	EW-457	A/B	12.5
EW-342	A	6.9	EW-458	A	7.7
EW-343	A/B	7.1	EW-459	A	8.4
EW-344	A	9.5	EW-460	A/B	12.3
EW-359	A	8.4	EW-461	A/B	8.4
EW-360	A	8.9	EW-462	A/B	8.6
EW-362	A	11.8	EW-463	A	12.0
EW-364	B/C	9.1	EW-464	A	8.3
EW-366	B	7.4	EW-63	B	13.2
EW-367	A/B	8.7	EW-83	A/B	11.2
EW-377	A	10.3	EW-85	A/B	10.0
EW-378	C	11.0	EW-86	A/B	12.0

Note:
The data were averaged for each of the 84 wells with retained data points to provide the final data set for use in the background calculations. The individual data points for all 97 evaluated wells are provided in Attachment 1.

µg/L = micrograms per liter

Calculation of Background Concentration

A mathematical outlier test, Rosner's, was applied to the 84 well averages and did not identify any values as mathematical outliers. All of these data were then used to calculate a background threshold value (BTV), specifically a 95 percent upper confidence limit of the 95th percentile, known as a 95/95 upper tolerance limit (UTL). A 95/95 UTL is designed to contain, but not exceed, 95% of the possible background concentrations with 95% confidence, thus providing a reasonable upper limit on what is likely to be observed in background. Algorithms in ProUCL, version 5.0 (United States Environmental Protection Agency [USEPA], 2013) were used for this calculation, with the results presented in Table 2. For these data, this UTL was calculated using the assumption of a normal distribution. The ProUCL algorithms include distributional

checks and suggested the assumption of a normal distribution. The ProUCL output is provided in Attachment 2 along with a normal probability plot of the 84 well averages.

TABLE 2
Background Threshold Value (BTV) for Hexavalent Chromium
Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, California

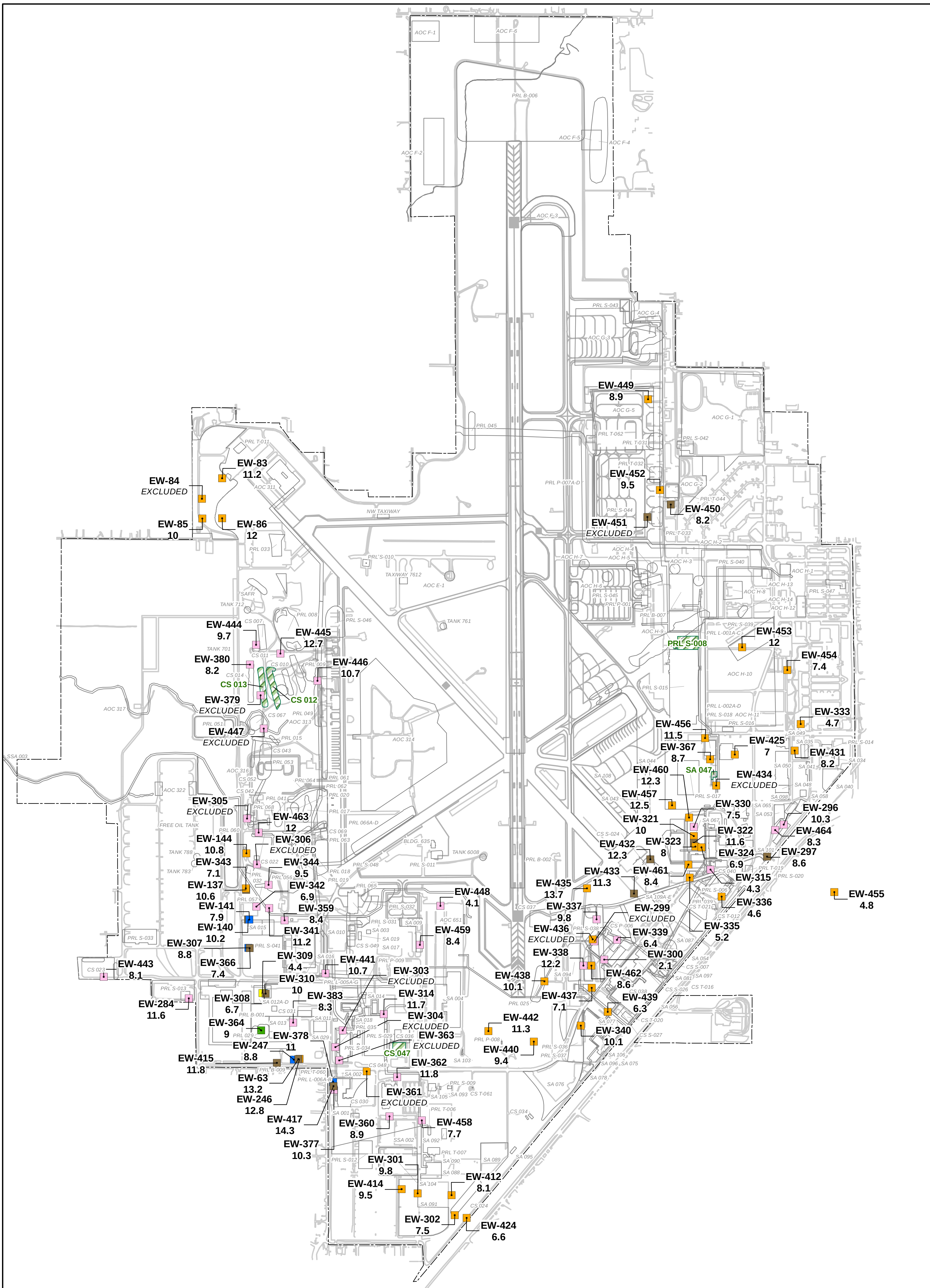
Constituent	Number of Results	Units	Minimum Value	Maximum Value	BTV	BTV Basis
Hexavalent chromium	84	µg/L	2.14	14.3	14.0	Normal 95/95 UTL

The calculated 95/95 UTL of 14.0 µg/L will serve as a background value for comparisons to groundwater monitoring data.

References

CH2M HILL. 2008. *Remedial Investigation/Feasibility Study for Non-VOCs in Groundwater.* Prepared for the former McClellan Air Force Base, California. Final. June.

United States Environmental Protection Agency (USEPA). 2013. *ProUCL Version 5.0.00, Technical Guide, Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations.* Office of Research and Development.



LEGEND

- ZONE A EXTRACTION WELL
- ZONE A/B EXTRACTION WELL
- ZONE B EXTRACTION WELL
- ZONE B/C EXTRACTION WELL
- ZONE C EXTRACTION WELL
- ZONE D EXTRACTION WELL
- CHROMIUM SOURCE AREAS
- IRP SITE
- INSTALLATION BOUNDARY

EW-458 — WELL ID
7.7 — AVERAGE HEXAVALENT CHROMIUM CONCENTRATION (ug/L)

N

0 700 1,400
Feet

FIGURE 1
Background Data Set for Hexavalent Chromium in Groundwater
Hexavalent Chromium Background Technical Memorandum
Former McClellan AFB, Sacramento, California

CH2MHILL

SAC \\SACFPP02\SACGIS\PROJ\MCCLELLAN\654608_TO380\MAPFILES\HEXCHROM_TECHMEM_REPORT\FIGURE1_BACKGROUNDDATA_HEXCHROMGW.MXD SSCOPES 8/18/2015 4:08:19 PM

Attachment 1

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GSAP	1Q89	EW-137	B	1/12/1989	NS1	SW7196	Chromium, Hexavalent	20			UG/L	NR	NR	No	No MDL or RL.
GSAP	2Q89	EW-137	B	4/12/1989	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6SEP01	EW-137	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-137	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-137	B	5/21/2002	NS1	SW7199	Chromium, Hexavalent	12	J-		UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q04	EW-137	B	4/20/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Online per 2Q04.
GWTP	M0604	EW-137	B	6/3/2004	NS1	E218.6	Chromium, Hexavalent	8.6			UG/L	0.08	0.2	Yes	Online per 3Q04.
GSAP	2Q05	EW-137	B	5/9/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	1Q89	EW-140	B	1/12/1989	NS1	SW7196	Chromium, Hexavalent	0		ND	UG/L	NR	NR	No	No MDL or RL.
GSAP	2Q89	EW-140	B	4/12/1989	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6SEP01	EW-140	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-140	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-140	B	6/10/2002	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-140	B	6/23/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-140	B	4/19/2004	AVG	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-140	B	5/10/2005	AVG	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	1Q89	EW-141	C	1/12/1989	NS1	SW7196	Chromium, Hexavalent	20			UG/L	NR	NR	No	No MDL or RL.
GSAP	2Q89	EW-141	C	4/12/1989	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6NOV01	EW-141	C	11/7/2001	NS1	SW7196	Chromium, Hexavalent	15			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-141	C	6/12/2002	NS1	SW7199	Chromium, Hexavalent	3.3			UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	2Q03	EW-141	C	6/23/2003	NS1	SW7199	Chromium, Hexavalent	2.9			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-141	C	4/19/2004	NS1	SW7199	Chromium, Hexavalent	6.3			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-141	C	5/10/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	1Q89	EW-144	A/B	1/18/1989	NS1	SW7196	Chromium, Hexavalent	0		ND	UG/L	NR	NR	No	No MDL or RL.
GSAP	2Q89	EW-144	A/B	4/18/1989	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6SEP01	EW-144	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-144	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q03	EW-144	A/B	6/23/2003	NS1	SW7199	Chromium, Hexavalent	9.8			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-144	A/B	4/22/2004	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-144	A/B	5/9/2005	AVG	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-246	A/B	9/5/2001	AVG	SW7196	Chromium, Hexavalent	12.5			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-246	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-246	A/B	6/13/2002	AVG	SW7199	Chromium, Hexavalent	13			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-246	A/B	6/23/2003	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-246	A/B	4/20/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-246	A/B	5/11/2005	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-247	C	9/5/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-247	C	11/7/2001	AVG	SW7196	Chromium, Hexavalent	9.5			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-247	C	6/13/2002	NS1	SW7199	Chromium, Hexavalent	8.4			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-247	C	6/23/2003	NS1	SW7199	Chromium, Hexavalent	9			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-247	C	4/20/2004	NS1	SW7199	Chromium, Hexavalent	9			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-247	C	5/11/2005	NS1	SW7199	Chromium, Hexavalent	9.1			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	2Q02	EW-284	A	6/10/2002	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Not yet converted to EW.
GSAP	2Q03	EW-284	A	6/5/2003	AVG	SW7196A	Chromium, Hexavalent	12.5			UG/L	2	2	Yes	Not yet converted to EW.
GSAP	2Q04	EW-284	A	4/28/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-284	A	5/18/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-296	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	3			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-296	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-296	A	11/20/2002	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-296	A	11/20/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-296	A	11/30/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 4Q04.
GSAP	4Q05	EW-296	A	11/17/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GWTP	Cr6SEP01	EW-297	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	9			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-297	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	9			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-297	B	11/20/2002	AVG	SW7199	Chromium, Hexavalent	8.85			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-297	B	11/20/2003	NS1	SW7199	Chromium, Hexavalent	7.7			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-297	B	11/30/2004	NS1	SW7199	Chromium, Hexavalent	8.4			UG/L	0.092	0.5	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-299	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	26			UG/L	2	2	No	Results are consistently high with decreasing trend. Located at CS T-057.
GWTP	Cr6NOV01	EW-299	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	23			UG/L	2	2	No	Results are consistently high with decreasing trend. Located at CS T-057.
GSAP	4Q02	EW-299	A	11/19/2002	NS1	SW7199	Chromium, Hexavalent	25			UG/L	0.5	0.5	No	Results are consistently high with decreasing trend. Located at CS T-057.
GSAP	4Q03	EW-299	A	12/10/2003	NS1	SW7199	Chromium, Hexavalent	31			UG/L	0.19	0.5	No	Results are consistently high with decreasing trend. Located at CS T-057.
GSAP	4Q04	EW-299	A	11/11/2004	NS1	SW7199	Chromium, Hexavalent	23			UG/L	0.092	0.5	No	Results are consistently high with decreasing trend. Located at CS T-057.
GSAP	4Q05	EW-299	A	10/26/2005	NS1	SW7196A	Chromium, Hexavalent	16			UG/L	0.5	2	No	Results are consistently high with decreasing trend. Located at CS T-057.
GWTP	Cr6NOV01	EW-300	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	2		ND	UG/L	2	2	Yes	Offline per 4Q01.
GSAP	4Q03	EW-300	A	12/10/2003	NS1	SW7199	Chromium, Hexavalent	1.5			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-300	A	11/22/2004	AVG	SW7199	Chromium, Hexavalent	2.35			UG/L	0.096	0.53	Yes	Online per 4Q04.
GSAP	1Q06	EW-300	A	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	2.7			UG/L	0.5	2	Yes	Online per 1Q06.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GWTP	Cr6SEP01	EW-301	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-301	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	3Q02	EW-301	A/B	9/12/2002	AVG	SW7199	Chromium, Hexavalent	9.5			UG/L	1	1	Yes	Online per 3Q02.
GSAP	3Q03	EW-301	A/B	9/24/2003	NS1	SW7199	Chromium, Hexavalent	9.9			UG/L	0.19	0.5	Yes	Online per 3Q03.
GSAP	3Q04	EW-301	A/B	8/11/2004	NS1	SW7199	Chromium, Hexavalent	9.6			UG/L	0.054	0.5	Yes	Online per 3Q04.
GWTP	Cr6SEP01	EW-302	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-302	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	3Q02	EW-302	A/B	9/12/2002	NS1	SW7199	Chromium, Hexavalent	7.3			UG/L	1	1	Yes	Online per 3Q02.
GSAP	3Q03	EW-302	A/B	9/24/2003	NS1	SW7199	Chromium, Hexavalent	7.7			UG/L	0.19	0.5	Yes	Online per 3Q03.
GSAP	3Q04	EW-302	A/B	8/11/2004	NS1	SW7199	Chromium, Hexavalent	6.3			UG/L	0.054	0.5	Yes	Online per 3Q04.
GWTP	Cr6SEP01	EW-303	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 3Q01.
GWTP	Cr6NOV01	EW-303	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	15			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 4Q01.
GSAP	2Q02	EW-303	A	6/17/2002	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.092	1	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q02.
GSAP	2Q03	EW-303	A	6/23/2003	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.19	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q03.
GSAP	2Q04	EW-303	A	4/26/2004	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.054	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q04.
GSAP	2Q05	EW-303	A	5/16/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q05.
GWTP	Cr6SEP01	EW-304	A	9/5/2001	AVG	SW7196	Chromium, Hexavalent	17			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 3Q01.
GWTP	Cr6NOV01	EW-304	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 4Q01.
GSAP	2Q02	EW-304	A	6/17/2002	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	1	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q02.
GSAP	2Q03	EW-304	A	6/23/2003	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.19	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q03.
GSAP	2Q04	EW-304	A	4/26/2004	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.054	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q04.
GSAP	2Q05	EW-304	A	5/16/2005	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.092	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q05.
GWTP	Cr6SEP01	EW-305	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	No	Slight decreasing trend. Located at IWTP. Online per 3Q01.
GWTP	Cr6NOV01	EW-305	A	11/7/2001	AVG	SW7196	Chromium, Hexavalent	12			UG/L	2	2	No	Slight decreasing trend. Located at IWTP. Online per 4Q01.
GSAP	2Q02	EW-305	A	6/13/2002	NS1	SW7199	Chromium, Hexavalent	3.5			UG/L	0.092	1	No	Slight decreasing trend. Located at IWTP. Offline per 2Q02.
GSAP	2Q03	EW-305	A	6/25/2003	NS1	SW7199	Chromium, Hexavalent	2.2			UG/L	0.19	0.5	No	Slight decreasing trend. Located at IWTP. Offline per 2Q03.
GSAP	2Q04	EW-305	A	4/22/2004	AVG	SW7199	Chromium, Hexavalent	14			UG/L	0.054	0.5	No	Slight decreasing trend. Located at IWTP. Online per 2Q04.
GSAP	2Q05	EW-305	A	5/9/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	No	Slight decreasing trend. Located at IWTP. Online per 2Q05.
GSAP	4Q09	EW-305	A	12/15/2009	NS1	SW7196A	Chromium, Hexavalent	2		ND	UG/L	2	10	No	Slight decreasing trend. Located at IWTP. Online per 4Q09.
GWTP	Cr6SEP01	EW-306	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	7			UG/L	2	2	No	Slight increasing trent. Online per 3Q01.
GWTP	Cr6NOV01	EW-306	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	No	Slight increasing trent. Online per 4Q01.
GSAP	2Q02	EW-306	A	6/10/2002	NS1	SW7199	Chromium, Hexavalent	9			UG/L	0.092	1	No	Slight increasing trent. Online per 2Q02.
GSAP	2Q03	EW-306	A	6/24/2003	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.19	0.5	No	Slight increasing trent. Online per 2Q03.
GSAP	2Q04	EW-306	A	4/22/2004	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.054	0.5	No	Slight increasing trent. Online per 2Q04.
GSAP	2Q05	EW-306	A	5/9/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	No	Slight increasing trent. Online per 2Q05.
GWTP	Cr6SEP01	EW-307	C	9/5/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-307	C	11/7/2001	NS1	SW7199	Chromium, Hexavalent	8.2			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-307	C	11/7/2001	NS1	SW7196	Chromium, Hexavalent	9			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-307	C	5/15/2002	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	2Q03	EW-307	C	6/26/2003	NS1	SW7199	Chromium, Hexavalent	8.7			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-307	C	4/26/2004	NS1	SW7199	Chromium, Hexavalent	8.7			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	1Q05	EW-307	C	2/23/2005	NS1	SW7199	Chromium, Hexavalent	8.1			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-307	C	5/10/2005	AVG	SW7199	Chromium, Hexavalent	8.05			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-308	C	9/5/2001	NS1	SW7196	Chromium, Hexavalent	4			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-308	C	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-308	C	6/11/2002	AVG	SW7199	Chromium, Hexavalent	7.85			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-308	C	6/26/2003	NS1	SW7199	Chromium, Hexavalent	5.7			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-308	C	4/28/2004	NS1	SW7199	Chromium, Hexavalent	7.2			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-308	C	5/12/2005	NS1	SW7199	Chromium, Hexavalent	7.3			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-309	D	9/5/2001	NS1	SW7196	Chromium, Hexavalent	2		ND	UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-309	D	11/7/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-309	D	5/15/2002	NS1	SW7199	Chromium, Hexavalent	2.7			UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	4Q02	EW-309	D	11/21/2002	AVG	SW7199	Chromium, Hexavalent	4.8			UG/L	0.5	0.5	Yes	Offline per 4Q02.
GSAP	2Q03	EW-309	D	6/26/2003	NS1	SW7199	Chromium, Hexavalent	4.4			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	4Q03	EW-309	D	12/11/2003	NS1	SW7199	Chromium, Hexavalent	5.5			UG/L	0.054	0.5	Yes	Offline per 4Q03.
GSAP	2Q04	EW-309	D	4/28/2004	NS1	SW7199	Chromium, Hexavalent	4.6			UG/L	0.054	0.5	Yes	Offline per 2Q04.
GSAP	2Q05	EW-309	D	5/12/2005	NS1	SW7199	Chromium, Hexavalent	5.1			UG/L	0.092	0.5	Yes	Offline per 2Q05.
GWTP	Cr6SEP01	EW-310	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-310	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-310	B	6/11/2002	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	2Q03	EW-310	B	6/26/2003	AVG	SW7199	Chromium, Hexavalent	0.19		ND	UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-310	B	4/28/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-310	B	5/12/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	3Q05	EW-314	A	8/26/2005	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Extraction not begin until Sept 2005.
GSAP	4Q05	EW-314	A	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-314	A	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 1Q06.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GWTP	Cr6SEP01	EW-315	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	7			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-315	A	11/7/2001	NS1	SW7199	Chromium, Hexavalent	3.9			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-315	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-315	A	11/21/2002	NS1	SW7199	Chromium, Hexavalent	2.8			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-315	A	12/11/2003	AVG	SW7199	Chromium, Hexavalent	3.2			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-315	A	11/30/2004	NS1	SW7199	Chromium, Hexavalent	3			UG/L	0.092	0.5	Yes	Online per 4Q04.
DO27	1DO27	EW-321	A/B	2/5/1996	NS1	SW7196	Chromium, Hexavalent	0			UG/L	0	0	No	No MDL or RL.
GWTP	Cr6SEP01	EW-321	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-321	A/B	11/7/2001	AVG	SW7196	Chromium, Hexavalent	11.5			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-321	A/B	11/21/2002	NS1	SW7199	Chromium, Hexavalent	9.8			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-321	A/B	12/11/2003	NS1	SW7199	Chromium, Hexavalent	9.3			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-321	A/B	11/22/2004	NS1	SW7199	Chromium, Hexavalent	8.4			UG/L	0.096	0.53	Yes	Online per 4Q04.
DO27	1DO27	EW-322	B	2/7/1996	NS1	SW7196	Chromium, Hexavalent	0			UG/L	0	0	No	No MDL or RL.
GWTP	Cr6SEP01	EW-322	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-322	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q03	EW-322	B	12/11/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-322	B	11/29/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 4Q04.
GSAP	4Q05	EW-322	B	12/6/2005	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 4Q05.
DO27	1DO27	EW-323	A/B	2/7/1996	AVG	SW7196	Chromium, Hexavalent	0			UG/L	0	0	No	No MDL or RL.
GWTP	Cr6NOV01	EW-323	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-323	A/B	11/21/2002	NS1	SW7199	Chromium, Hexavalent	8.1			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-323	A/B	12/11/2003	NS1	SW7199	Chromium, Hexavalent	7.9			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-323	A/B	11/29/2004	AVG	SW7199	Chromium, Hexavalent	7.95			UG/L	0.092	0.5	Yes	Online per 4Q04.
DO27	1DO27	EW-324	A/B	2/5/1996	NS1	SW7196	Chromium, Hexavalent	0			UG/L	0	0	No	No MDL or RL.
GWTP	Cr6SEP01	EW-324	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-324	A/B	11/7/2001	NS1	SW7199	Chromium, Hexavalent	5.6			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-324	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-324	A/B	11/21/2002	NS1	SW7199	Chromium, Hexavalent	6.4			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-324	A/B	12/11/2003	NS1	SW7199	Chromium, Hexavalent	7			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-324	A/B	11/29/2004	NS1	SW7199	Chromium, Hexavalent	6.4			UG/L	0.092	0.5	Yes	Online per 4Q04.
GSAP	3Q03	EW-330	A	9/23/2003	NS1	SW7196A	Chromium, Hexavalent	4			UG/L	0.9	0.9	Yes	Not yet converted to EW.
GSAP	4Q03	EW-330	A	12/4/2003	NS1	SW7196A	Chromium, Hexavalent	6			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	1Q04	EW-330	A	2/17/2004	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	2Q04	EW-330	A	4/16/2004	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	3Q04	EW-330	A	8/11/2004	NS1	SW7196A	Chromium, Hexavalent	5			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	4Q04	EW-330	A	12/1/2004	NS1	SW7196A	Chromium, Hexavalent	8.1			UG/L	0.5	2	Yes	Not yet converted to EW.
GSAP	1Q06	EW-330	A	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	8.3			UG/L	0.5	2	Yes	Offline per 1Q06.
GSAP	3Q02	EW-333	A/B	8/27/2002	NS1	SW7196A	Chromium, Hexavalent	2			UG/L	2	2	Yes	Not yet converted to EW.
GSAP	3Q03	EW-333	A/B	9/23/2003	NS1	SW7196A	Chromium, Hexavalent	4			UG/L	0.9	0.9	Yes	Not yet converted to EW.
GSAP	3Q04	EW-333	A/B	8/11/2004	NS1	SW7196A	Chromium, Hexavalent	4			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	1Q06	EW-333	A/B	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	8.8			UG/L	0.5	2	Yes	Online per 1Q06.
GWTP	Cr6SEP01	EW-335	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-335	A/B	11/7/2001	NS1	SW7199	Chromium, Hexavalent	4.9			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-335	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-335	A/B	11/20/2002	NS1	SW7199	Chromium, Hexavalent	5.3			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-335	A/B	12/10/2003	NS1	SW7199	Chromium, Hexavalent	5.5			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-335	A/B	11/22/2004	NS1	SW7199	Chromium, Hexavalent	3.7			UG/L	0.096	0.53	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-336	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	7			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-336	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-336	A/B	11/20/2002	NS1	SW7199	Chromium, Hexavalent	7.4			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-336	A/B	12/11/2003	AVG	SW7199	Chromium, Hexavalent	2.55			UG/L	0.054	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-336	A/B	11/30/2004	NS1	SW7199	Chromium, Hexavalent	0.092		ND	UG/L	0.092	0.5	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-337	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-337	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-337	A	11/19/2002	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-337	A	12/10/2003	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-337	A	11/22/2004	NS1	SW7199	Chromium, Hexavalent	9.9			UG/L	0.096	0.53	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-338	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-338	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-338	A	11/19/2002	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-338	A	12/11/2003	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-338	A	11/22/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.096	0.53	Yes	Online per 4Q04.
GSAP	4Q05	EW-338	A	11/14/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GWTP	Cr6SEP01	EW-339	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-339	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-339	A	11/19/2002	AVG	SW7199	Chromium, Hexavalent	7.35			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-339	A	12/11/2003	NS1	SW7199	Chromium, Hexavalent	7.4			UG/L	0.054	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-339	A	11/22/2004	NS1	SW7199	Chromium, Hexavalent	3.2			UG/L	0.096	0.53	Yes	Online per 4Q04.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GWTP	Cr6SEP01	EW-340	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-340	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-340	A/B	11/19/2002	NS1	SW7199	Chromium, Hexavalent	9.8			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	4Q03	EW-340	A/B	12/10/2003	NS1	SW7199	Chromium, Hexavalent	9.6			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-340	A/B	11/29/2004	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	0.5	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-341	A	9/5/2001	AVG	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-341	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-341	A	5/21/2002	NS1	SW7199	Chromium, Hexavalent	11	J-		UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-341	A	6/24/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-341	A	4/26/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-341	A	5/10/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-342	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-342	A	11/7/2001	NS1	SW7199	Chromium, Hexavalent	7			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-342	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	9			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-342	A	6/12/2002	NS1	SW7199	Chromium, Hexavalent	0.19	J	<QL,J	UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	2Q03	EW-342	A	6/24/2003	NS1	SW7199	Chromium, Hexavalent	0.7	J	<QL	UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-342	A	4/26/2004	NS1	SW7199	Chromium, Hexavalent	9			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-342	A	5/10/2005	NS1	SW7199	Chromium, Hexavalent	9.5			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-343	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	6			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-343	A/B	11/7/2001	AVG	SW7196	Chromium, Hexavalent	7			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-343	A/B	5/21/2002	NS1	SW7199	Chromium, Hexavalent	7.2	J-		UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-343	A/B	6/11/2003	NS1	SW7199	Chromium, Hexavalent	6.4			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-343	A/B	4/28/2004	NS1	SW7199	Chromium, Hexavalent	8.4			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-343	A/B	5/9/2005	NS1	SW7199	Chromium, Hexavalent	7.5			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-344	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-344	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-344	A	6/12/2002	NS1	SW7199	Chromium, Hexavalent	7.8			UG/L	0.092	1	Yes	Offline per 2Q02.
GSAP	2Q03	EW-344	A	6/24/2003	NS1	SW7199	Chromium, Hexavalent	4.2			UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-344	A	4/28/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-344	A	5/9/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	2Q02	EW-359	A	5/15/2002	NS1	SW7199	Chromium, Hexavalent	8.9			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-359	A	6/25/2003	AVG	SW7199	Chromium, Hexavalent	8.6			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-359	A	4/26/2004	NS1	SW7199	Chromium, Hexavalent	8.2			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-359	A	5/11/2005	NS1	SW7199	Chromium, Hexavalent	7.9			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-360	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GSAP	2Q02	EW-360	A	5/15/2002	NS1	SW7199	Chromium, Hexavalent	9.3			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-360	A	6/25/2003	NS1	SW7199	Chromium, Hexavalent	7.1			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-360	A	5/4/2004	NS1	SW7199	Chromium, Hexavalent	8.3			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-360	A	5/18/2005	NS1	SW7199	Chromium, Hexavalent	8.9			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-361	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	No	May have been influenced by CS 047 source area. Online per 3Q01.
GWTP	Cr6NOV01	EW-361	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	No	May have been influenced by CS 047 source area. Online per 4Q01.
GSAP	2Q02	EW-361	A/B	6/10/2002	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	1	No	May have been influenced by CS 047 source area. Online per 2Q02.
GSAP	2Q03	EW-361	A/B	6/25/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	No	May have been influenced by CS 047 source area. Online per 2Q03.
GSAP	2Q04	EW-361	A/B	4/26/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	No	May have been influenced by CS 047 source area. Online per 2Q04.
GSAP	2Q05	EW-361	A/B	5/18/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	No	May have been influenced by CS 047 source area. Online per 2Q05.
GWTP	Cr6SEP01	EW-362	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-362	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-362	A	6/17/2002	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-362	A	6/25/2003	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-362	A	4/29/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-362	A	5/18/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-363	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 3Q01.
GWTP	Cr6NOV01	EW-363	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	No	Slight decreasing trend. Located west of old plating shop. Online per 4Q01.
GSAP	2Q02	EW-363	A	6/19/2002	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	1	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q02.
GSAP	2Q03	EW-363	A	6/26/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q03.
GSAP	2Q04	EW-363	A	4/29/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q04.
GSAP	2Q05	EW-363	A	5/16/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	No	Slight decreasing trend. Located west of old plating shop. Online per 2Q05.
GWTP	Cr6SEP01	EW-364	B/C	9/5/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-364	B/C	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-364	B/C	6/10/2002	NS1	SW7199	Chromium, Hexavalent	9.1			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-364	B/C	6/26/2003	NS1	SW7199	Chromium, Hexavalent	8.9			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-364	B/C	4/29/2004	NS1	SW7199	Chromium, Hexavalent	8.8			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-364	B/C	5/11/2005	NS1	SW7199	Chromium, Hexavalent	7.5			UG/L	0.092	0.5	Yes	Online per 2Q05.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GWTP	Cr6SEP01	EW-366	B	9/5/2001	AVG	SW7196	Chromium, Hexavalent	4			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-366	B	11/7/2001	NS1	SW7199	Chromium, Hexavalent	9.3			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-366	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q03	EW-366	B	6/26/2003	NS1	SW7199	Chromium, Hexavalent	0.19		ND	UG/L	0.19	0.5	Yes	Offline per 2Q03.
GSAP	2Q04	EW-366	B	5/4/2004	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-366	B	5/10/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-367	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-367	A/B	11/7/2001	AVG	SW7196	Chromium, Hexavalent	12.5			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-367	A/B	11/20/2002	NS1	SW7199	Chromium, Hexavalent	2.3			UG/L	0.5	0.5	Yes	Offline per 4Q02.
GSAP	4Q03	EW-367	A/B	12/11/2003	NS1	SW7199	Chromium, Hexavalent	8.7			UG/L	0.19	0.5	Yes	Online per 4Q03.
GSAP	4Q04	EW-367	A/B	11/29/2004	NS1	SW7199	Chromium, Hexavalent	8.8			UG/L	0.092	0.5	Yes	Online per 4Q04.
GWTP	Cr6SEP01	EW-377	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-377	A	11/7/2001	NS1	SW7199	Chromium, Hexavalent	10			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-377	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	11			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-377	A	6/11/2002	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-377	A	6/25/2003	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	3Q04	EW-377	A	8/10/2004	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.054	0.5	Yes	Online per 3Q04.
GSAP	2Q05	EW-377	A	5/17/2005	NS1	SW7199	Chromium, Hexavalent	9.9			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-378	C	9/5/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-378	C	11/7/2001	NS1	SW7199	Chromium, Hexavalent	11			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-378	C	11/7/2001	NS1	SW7196	Chromium, Hexavalent	10			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-378	C	6/11/2002	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-378	C	6/25/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-378	C	5/4/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-378	C	5/17/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GWTP	Cr6SEP01	EW-379	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	No	May have been influenced by disposal pit source area. Online per 3Q01.
GWTP	Cr6NOV01	EW-379	A	11/7/2001	NS1	SW7199	Chromium, Hexavalent	12			ug/L		1	No	May have been influenced by disposal pit source area. Online per 4Q01.
GWTP	Cr6NOV01	EW-379	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	No	May have been influenced by disposal pit source area. Online per 4Q01.
GSAP	3Q02	EW-379	A	9/12/2002	NS1	SW7199	Chromium, Hexavalent	15			UG/L	1	1	No	May have been influenced by disposal pit source area. Online per 3Q02.
GSAP	3Q03	EW-379	A	9/24/2003	NS1	SW7199	Chromium, Hexavalent	15			UG/L	0.19	0.5	No	May have been influenced by disposal pit source area. Online per 3Q03.
GSAP	3Q04	EW-379	A	8/10/2004	NS1	SW7199	Chromium, Hexavalent	14			UG/L	0.054	0.5	No	May have been influenced by disposal pit source area. Online per 3Q04.
GSAP	3Q05	EW-379	A	8/25/2005	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.5	2	No	May have been influenced by disposal pit source area. Online per 3Q05.
GSAP	1Q07	EW-379	A	1/26/2007	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.5	2	No	May have been influenced by disposal pit source area. Online per 1Q07.
GSAP	1Q08	EW-379	A	1/14/2008	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.6	2	No	May have been influenced by disposal pit source area. Online per 1Q08.
GSAP	1Q09	EW-379	A	1/15/2009	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.8	2	No	May have been influenced by disposal pit source area. Online per 1Q09.
GWTP	Cr6SEP01	EW-380	A	9/5/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-380	A	11/7/2001	NS1	SW7199	Chromium, Hexavalent	7.8			ug/L		1	Yes	Online per 4Q01.
GWTP	Cr6NOV01	EW-380	A	11/7/2001	NS1	SW7196	Chromium, Hexavalent	8			UG/L	2	2	Yes	Online per 4Q01.
GSAP	3Q02	EW-380	A	9/12/2002	NS1	SW7199	Chromium, Hexavalent	8.3			UG/L	1	1	Yes	Online per 3Q02.
GSAP	3Q03	EW-380	A	9/24/2003	AVG	SW7199	Chromium, Hexavalent	8.7			UG/L	0.19	0.5	Yes	Online per 3Q03.
GSAP	3Q04	EW-380	A	8/10/2004	NS1	SW7199	Chromium, Hexavalent	8.5			UG/L	0.054	0.5	Yes	Online per 3Q04.
GSAP	2Q02	EW-383	A	6/5/2002	NS1	SW7196	Chromium, Hexavalent	5			UG/L	2	2	Yes	Not yet converted to EW.
GSAP	2Q03	EW-383	A	5/15/2003	NS1	SW7196A	Chromium, Hexavalent	6			UG/L	2	2	Yes	Not yet converted to EW.
GSAP	4Q03	EW-383	A	12/3/2003	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	2Q04	EW-383	A	4/16/2004	AVG	SW7196A	Chromium, Hexavalent	8			UG/L	0.9	2	Yes	Not yet converted to EW.
GSAP	4Q04	EW-383	A	10/26/2004	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	1	2	Yes	Not yet converted to EW.
GSAP	2Q05	EW-383	A	5/4/2005	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Not yet converted to EW.
GSAP	1Q06	EW-383	A	3/1/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
GSAP	3Q04	EW-412	A/B	7/1/2004	AVG	SW7199	Chromium, Hexavalent	7.15			UG/L	0.054	0.5	Yes	Extraction not begin until Dec 2004.
GSAP	4Q04	EW-412	A/B	10/11/2004	NS1	SW7199	Chromium, Hexavalent	7.8			UG/L	0.054	0.5	Yes	Offline per 4Q04.
GSAP	1Q05	EW-412	A/B	2/16/2005	NS1	SW7199	Chromium, Hexavalent	8.7			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-412	A/B	5/17/2005	NS1	SW7199	Chromium, Hexavalent	8.6			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	3Q04	EW-414	A/B	6/30/2004	NS1	SW7199	Chromium, Hexavalent	7			UG/L	0.054	0.5	Yes	Not yet operational.
GSAP	4Q04	EW-414	A/B	10/11/2004	AVG	SW7199	Chromium, Hexavalent	10			UG/L	0.054	0.5	Yes	Offline per 4Q04.
GSAP	1Q05	EW-414	A/B	2/16/2005	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-414	A/B	5/17/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	3Q04	EW-415	B	6/29/2004	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.054	0.5	Yes	Not yet operational.
GSAP	4Q04	EW-415	B	10/12/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Offline per 4Q04.
GSAP	1Q05	EW-415	B	2/16/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-415	B	5/17/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	3Q04	EW-417	B	7/1/2004	NS1	SW7199	Chromium, Hexavalent	15			UG/L	0.054	0.5	Yes	Extraction not begin until Dec 2004.
GSAP	4Q04	EW-417	B	10/12/2004	NS1	SW7199	Chromium, Hexavalent	14			UG/L	0.054	0.5	Yes	Offline per 4Q04.
GSAP	1Q05	EW-417	B	2/16/2005	NS1	SW7199	Chromium, Hexavalent	14			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-417	B	5/17/2005	NS1	SW7199	Chromium, Hexavalent	14			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	3Q04	EW-424	A/B	6/30/2004	NS1	SW7199	Chromium, Hexavalent	5.1			UG/L	0.054	0.5	Yes	Not yet operational.
GSAP	4Q04	EW-424	A/B	10/12/2004	NS1	SW7199	Chromium, Hexavalent	5.5			UG/L	0.054	0.5	Yes	Offline per 4Q04.
GSAP	1Q05	EW-424	A/B	2/17/2005	NS1	SW7199	Chromium, Hexavalent	8			UG/L	0.092	0.5	Yes	Online per 1Q05.
GSAP	2Q05	EW-424	A/B	5/17/2005	NS1	SW7199	Chromium, Hexavalent	7.9			UG/L	0.092	0.5	Yes	Online per 2Q05.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
GSAP	3Q04	EW-425	A/B	6/30/2004	NS1	SW7199	Chromium, Hexavalent	9.9			UG/L	0.054	0.5	Yes	Extraction not begin until Sept 2005.
GSAP	4Q04	EW-425	A/B	10/13/2004	NS1	SW7199	Chromium, Hexavalent	7			UG/L	0.054	0.5	Yes	Extraction not begin until Sept 2005.
GSAP	1Q05	EW-425	A/B	2/23/2005	AVG	SW7199	Chromium, Hexavalent	5.35			UG/L	0.092	0.5	Yes	Extraction not begin until Sept 2005.
GSAP	2Q05	EW-425	A/B	5/25/2005	NS1	SW7199	Chromium, Hexavalent	5.9			UG/L	0.092	0.5	Yes	Extraction not begin until Sept 2005.
P3	BASELINE	EW-431	A/B	8/26/2005	NS1	SW7199	Chromium, Hexavalent	4.7			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-431	A/B	12/6/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-431	A/B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-432	B	8/23/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-432	B	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-432	B	1/18/2006	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-433	B	8/23/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-433	B	11/15/2005	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-433	B	2/8/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-434	A/B	8/17/2005	NS1	SW7199	Chromium, Hexavalent	21			UG/L	0.092	0.5	No	May have been influenced by SA 047 source area. Offline per 3Q05.
GSAP	4Q05	EW-434	A/B	12/7/2005	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.5	2	No	May have been influenced by SA 047 source area. Online per 4Q05.
GSAP	1Q06	EW-434	A/B	2/9/2006	AVG	SW7196A	Chromium, Hexavalent	16			UG/L	0.5	2	No	May have been influenced by SA 047 source area. Online per 1Q06.
GSAP	1Q08	EW-434	A/B	1/23/2008	AVG	SW7196A	Chromium, Hexavalent	15			UG/L	0.6	2	No	May have been influenced by SA 047 source area. Online per 1Q08.
GSAP	3Q08	EW-434	A/B	7/23/2008	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.8	2	No	May have been influenced by SA 047 source area. Online per 3Q08.
GSAP	1Q09	EW-434	A/B	1/22/2009	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.8	2	No	May have been influenced by SA 047 source area. Online per 1Q09.
P3	BASELINE	EW-435	A/B	8/25/2005	NS1	SW7199	Chromium, Hexavalent	14			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-435	A/B	10/28/2005	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-435	A/B	1/18/2006	NS1	SW7196A	Chromium, Hexavalent	14			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-436	A/B	8/25/2005	NS1	SW7199	Chromium, Hexavalent	8.4			UG/L	0.092	0.5	No	Immediately adjacent to EW-299. Increasing trend. Offline per 3Q05.
GSAP	4Q05	EW-436	A/B	10/26/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	No	Immediately adjacent to EW-299. Increasing trend. Online per 4Q05.
GSAP	1Q06	EW-436	A/B	1/17/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	No	Immediately adjacent to EW-299. Increasing trend. Online per 1Q06.
P3	BASELINE	EW-437	A/B	8/19/2005	NS1	SW7199	Chromium, Hexavalent	1.7			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-437	A/B	11/9/2005	AVG	SW7196A	Chromium, Hexavalent	9.5			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-437	A/B	2/7/2006	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-438	A/B	8/31/2005	NS1	SW7199	Chromium, Hexavalent	9.3			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-438	A/B	10/25/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-438	A/B	1/17/2006	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-439	A/B	8/19/2005	NS1	SW7199	Chromium, Hexavalent	1.9			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-439	A/B	11/9/2005	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-439	A/B	2/7/2006	AVG	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-440	A/B	8/22/2005	AVG	SW7199	Chromium, Hexavalent	9.1			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-440	A/B	10/25/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-440	A/B	1/17/2006	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-441	A	8/17/2005	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-441	A	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-441	A	2/1/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-442	A/B	8/31/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-442	A/B	10/25/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-442	A/B	1/17/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-443	A	8/31/2005	NS1	SW7199	Chromium, Hexavalent	8.1			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-443	A	10/28/2005	NS1	SW7196A	Chromium, Hexavalent	7.2			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-443	A	2/1/2006	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-444	A	8/22/2005	NS1	SW7199	Chromium, Hexavalent	8.2			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-444	A	11/2/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-444	A	1/18/2006	AVG	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-445	A	8/22/2005	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-445	A	11/2/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-445	A	1/18/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-446	A	8/22/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-446	A	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-446	A	1/18/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-447	A	8/22/2005	NS1	SW7199	Chromium, Hexavalent	25			UG/L	0.092	0.5	No	Somewhat elevated results with decreasing trend. Located south of disposal pits. Offline per 3Q05.
GSAP	4Q05	EW-447	A	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	16			UG/L	0.5	2	No	Somewhat elevated results with decreasing trend. Located south of disposal pits. Online per 4Q05.
GSAP	1Q06	EW-447	A	1/18/2006	NS1	SW7196A	Chromium, Hexavalent	15			UG/L	0.5	2	No	Somewhat elevated results with decreasing trend. Located south of disposal pits. Online per 1Q06.
P3	BASELINE	EW-448	A	8/18/2005	NS1	SW7199	Chromium, Hexavalent	4.2			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-448	A	10/24/2005	AVG	SW7196A	Chromium, Hexavalent	4			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-448	A	1/17/2006	NS1	SW7196A	Chromium, Hexavalent	4			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-449	A/B	9/2/2005	NS1	SW7199	Chromium, Hexavalent	7.7			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-449	A/B	11/16/2005	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-449	A/B	2/13/2006	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-450	B	9/2/2005	AVG	SW7199	Chromium, Hexavalent	8.55			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-450	B	11/16/2005	NS1	SW7196A	Chromium, Hexavalent	7			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-450	B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.

ATTACHMENT 1

Evaluation of Existing Hexavalent Chromium Data Set for Extraction Wells

Hexavalent Chromium Background Technical Memorandum, Former McClellan AFB, Sacramento, Californic

PROJECT	EVENT	LOCATION	MONITORING ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	ANALYTE	RESULT	EPA FLAGS	DATA FLAGS	UNIT	DETECTION LIMIT	REPORTING LIMIT	RETAIN	NOTES
P3	BASELINE	EW-451	B	9/2/2005	NS1	SW7199	Chromium, Hexavalent	7.4			UG/L	0.092	0.5	No	Slight increasing trent. Offline per 3Q05.
GSAP	4Q05	EW-451	B	11/16/2005	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	No	Slight increasing trent. Online per 4Q05.
GSAP	1Q06	EW-451	B	2/14/2006	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	No	Slight increasing trent. Online per 1Q06.
P3	BASELINE	EW-452	A/B	9/2/2005	NS1	SW7199	Chromium, Hexavalent	9.4			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-452	A/B	11/16/2005	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-452	A/B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-453	A/B	8/31/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-453	A/B	11/16/2005	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-453	A/B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-454	A/B	8/31/2005	NS1	SW7199	Chromium, Hexavalent	7.2			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-454	A/B	12/6/2005	NS1	SW7196A	Chromium, Hexavalent	7			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-454	A/B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-455	A/B	8/31/2005	NS1	SW7199	Chromium, Hexavalent	4.5			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-455	A/B	11/4/2005	NS1	SW7196A	Chromium, Hexavalent	5.1			UG/L	0.5	2	Yes	Online per 4Q05.
P3	BASELINE	EW-456	A/B	9/6/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	No	Online per 3Q05. No other "Baseline P3" retained.
GSAP	4Q05	EW-456	A/B	12/6/2005	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-456	A/B	2/15/2006	NS1	SW7196A	Chromium, Hexavalent	11			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-457	A/B	8/29/2005	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-457	A/B	12/6/2005	AVG	SW7196A	Chromium, Hexavalent	12.5			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-457	A/B	2/9/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-458	A	8/23/2005	NS1	SW7199	Chromium, Hexavalent	10			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-458	A	11/9/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-458	A	2/13/2006	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Online per 1Q06.
GSAP	1Q07	EW-458	A	1/25/2007	NS1	SW7196A	Chromium, Hexavalent	0.5		ND	UG/L	0.5	2	Yes	Online per 1Q07.
GSAP	1Q08	EW-458	A	1/23/2008	NS1	SW7196A	Chromium, Hexavalent	10	J-		UG/L	0.6	2	Yes	Online per 1Q08.
P3	BASELINE	EW-459	A	8/18/2005	NS1	SW7199	Chromium, Hexavalent	8.3			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-459	A	11/7/2005	NS1	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-459	A	2/1/2006	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-460	A/B	8/29/2005	AVG	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-460	A/B	11/15/2005	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-460	A/B	2/8/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-461	A/B	8/29/2005	NS1	SW7199	Chromium, Hexavalent	8.3			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-461	A/B	11/15/2005	NS1	SW7196A	Chromium, Hexavalent	9			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-461	A/B	2/8/2006	AVG	SW7196A	Chromium, Hexavalent	8			UG/L	0.5	2	Yes	Online per 1Q06.
P3	BASELINE	EW-462	A/B	8/19/2005	NS1	SW7199	Chromium, Hexavalent	2.7			UG/L	0.092	0.5	Yes	Offline per 3Q05.
GSAP	4Q05	EW-462	A/B	11/10/2005	NS1	SW7196A	Chromium, Hexavalent	10			UG/L	0.5	2	Yes	Online per 4Q05.
GSAP	1Q06	EW-462	A/B	2/7/2006	NS1	SW7196A	Chromium, Hexavalent	13			UG/L	0.5	2	Yes	Online per 1Q06.
GSAP	1Q06	EW-463	A	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	12			UG/L	0.5	2	Yes	Online per 1Q06.
GSAP	1Q06	EW-464	A	3/16/2006	NS1	SW7196A	Chromium, Hexavalent	8.3			UG/L	0.5	2	Yes	Online per 1Q06.
GWTP	Cr6SEP01	EW-63	B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-63	B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	14			UG/L	2	2	Yes	Online per 4Q01.
GSAP	2Q02	EW-63	B	6/13/2002	AVG	SW7199	Chromium, Hexavalent	13			UG/L	0.092	1	Yes	Online per 2Q02.
GSAP	2Q03	EW-63	B	6/26/2003	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.19	0.5	Yes	Online per 2Q03.
GSAP	2Q04	EW-63	B	5/4/2004	AVG	SW7199	Chromium, Hexavalent	13			UG/L	0.054	0.5	Yes	Online per 2Q04.
GSAP	2Q05	EW-63	B	5/11/2005	AVG	SW7199	Chromium, Hexavalent	13			UG/L	0.092	0.5	Yes	Online per 2Q05.
GSAP	4Q89	EW-83	A/B	10/5/1989	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6SEP01	EW-83	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-83	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 4Q01.
GSAP	1Q03	EW-83	A/B	2/27/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 1Q03.
GSAP	1Q04	EW-83	A/B	2/12/2004	AVG	SW7199	Chromium, Hexavalent	8.75			UG/L	0.054	0.5	Yes	Online per 1Q04.
GSAP	1Q05	EW-83	A/B	2/15/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 1Q05.
GWTP	Cr6SEP01	EW-84	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	2			UG/L	2	2	No	Appears to be located in a chromium reducing region. Online per 3Q01.
GWTP	Cr6NOV01	EW-84	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	2		ND	UG/L	2	2	No	Appears to be located in a chromium reducing region. Online per 4Q01.
GSAP	3Q02	EW-84	A/B	9/12/2002	NS1	SW7199	Chromium, Hexavalent	2.3			UG/L	1	1	No	Appears to be located in a chromium reducing region. Online per 3Q02.
GSAP	2Q03	EW-84	A/B	6/25/2003	NS1	SW7199	Chromium, Hexavalent	0.19		ND	UG/L	0.19	0.5	No	Appears to be located in a chromium reducing region. Offline per 2Q03.
GSAP	1Q04	EW-84	A/B	2/5/2004	NS1	SW7199	Chromium, Hexavalent	0.9	J	<QL	UG/L	0.054	0.5	No	Appears to be located in a chromium reducing region. Online per 1Q04.
GSAP	1Q05	EW-84	A/B	2/15/2005	AVG	SW7199	Chromium, Hexavalent	0.092		ND	UG/L	0.092	0.5	No	Appears to be located in a chromium reducing region. Online per 1Q05.
GSAP	1Q90	EW-85	A/B	1/23/1990	NS1	SW7196	Chromium, Hexavalent	20		ND	UG/L	20	20	No	High/questionable MDL/RL.
GWTP	Cr6SEP01	EW-85	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	12			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-85	A/B	11/7/2001	AVG	SW7196	Chromium, Hexavalent	12.5			UG/L	2	2	Yes	Online per 4Q01.
GSAP	4Q02	EW-85	A/B	11/19/2002	NS1	SW7199	Chromium, Hexavalent	13			UG/L	0.5	0.5	Yes	Online per 4Q02.
GSAP	3Q04	EW-85	A/B	8/4/2004	NS1	SW7199	Chromium, Hexavalent	1.4			UG/L	0.054	0.5	Yes	Offline per 3Q04.
GSAP	1Q05	EW-85	A/B	2/15/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 1Q05.
GWTP	Cr6SEP01	EW-86	A/B	9/5/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 3Q01.
GWTP	Cr6NOV01	EW-86	A/B	11/7/2001	NS1	SW7196	Chromium, Hexavalent	13			UG/L	2	2	Yes	Online per 4Q01.
GSAP	1Q03	EW-86	A/B	2/27/2003	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.19	0.5	Yes	Online per 1Q03.
GSAP	1Q04	EW-86	A/B	2/5/2004	NS1	SW7199	Chromium, Hexavalent	12			UG/L	0.054	0.5	Yes	Online per 1Q04.
GSAP	1Q05	EW-86	A/B	2/15/2005	NS1	SW7199	Chromium, Hexavalent	11			UG/L	0.092	0.5	Yes	Online per 1Q05.

Attachment 2

Background Statistics for Uncensored Full Data Sets

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
New or Future K Observations	1
Number of Bootstrap Operations	2000

Hexavalent Chromium

General Statistics

Total Number of Observations	84	Number of Distinct Observations	77
Minimum	2.138	First Quartile	7.646
Second Largest	13.67	Median	9.208
Maximum	14.25	Third Quartile	11.15
Mean	9.169	SD	2.463
Coefficient of Variation	0.269	Skewness	-0.388
Mean of logged Data	2.172	SD of logged Data	0.322

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	1.952	d2max (for USL)	3.149

Normal GOF Test

Shapiro Wilk Test Statistic	0.975	**Normal GOF Test**
5% Shapiro Wilk P Value	0.37	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0513	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0967	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	95% Coverage	13.98	90% Percentile (z)	12.32
	95% UPL (t)	13.29	95% Percentile (z)	13.22
	95% USL	16.92	99% Percentile (z)	14.9

Gamma GOF Test

A-D Test Statistic	1.223	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0869	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0974	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	11.45	k star (bias corrected MLE)	11.05
Theta hat (MLE)	0.801	Theta star (bias corrected MLE)	0.83
nu hat (MLE)	1923	nu star (bias corrected)	1856
MLE Mean (bias corrected)	9.169	MLE Sd (bias corrected)	2.759

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	14.17	90% Percentile	12.83
95% Hawkins Wixley (HW) Approx. Gamma UPL	14.34	95% Percentile	14.13
95% WH Approx. Gamma UTL with 95% Coverage	15.2	99% Percentile	16.77
95% HW Approx. Gamma UTL with 95% Coverage	15.45		
95% WH USL	20.24	95% HW USL	20.97

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.6342E-7	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0967	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	16.44	90% Percentile (z)	13.25
95% UPL (t)	15.03	95% Percentile (z)	14.89
95% USL	24.17	99% Percentile (z)	18.55

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	82	95% UTL with 95% Coverage	13.17
Approximate f	1.439	Confidence Coefficient (CC) achieved by UTL	0.797
95% Percentile Bootstrap UTL with 95% Coverage	13.52	95% BCA Bootstrap UTL with 95% Coverage	13.17
95% UPL	12.73	90% Percentile	12.12
90% Chebyshev UPL	16.6	95% Percentile	12.64
95% Chebyshev UPL	19.97	99% Percentile	13.77
95% USL	14.25		

Note: The use of USL to estimate a BTV is recommended only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Full Precision OFF

Rosner's Outlier Test for Hexavalent Chromium

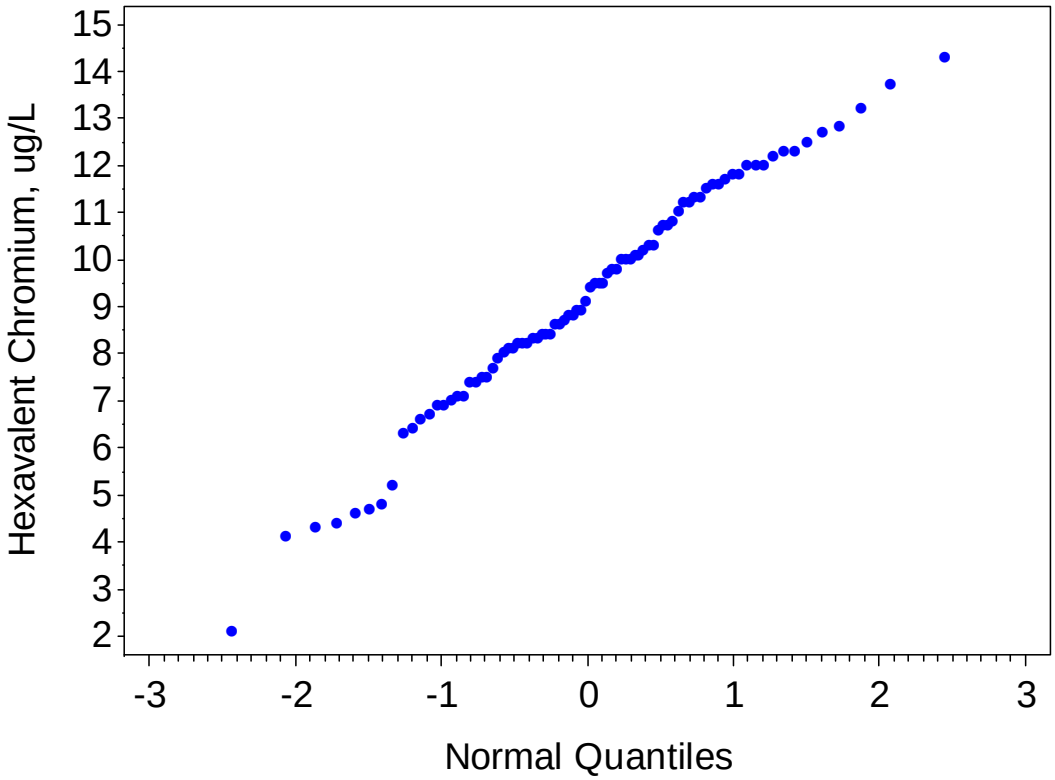
Mean	**9.169**
Standard Deviation	**2.463**
Number of data	**84**
Number of suspected outliers	**10**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	9.169	2.448	2.138	10	2.873	3.326	3.69
2	9.254	2.351	4.067	65	2.206	3.316	3.686
3	9.317	2.293	4.317	18	2.18	3.316	3.68
4	9.379	2.238	4.388	15	2.23	3.31	3.676
5	9.441	2.18	4.608	26	2.217	3.306	3.67
6	9.502	2.124	4.7	24	2.261	3.304	3.669
7	9.564	2.065	4.8	71	2.306	3.302	3.668
8	9.626	2.005	14.25	48	2.306	3.3	3.668
9	9.565	1.945	5.233	25	2.227	3.298	3.667
10	9.623	1.892	13.67	54	2.138	3.296	3.666

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Normal Probability Plot for Hexavalent Chromium



Appendix B
Final Technical Memorandum: Hexavalent Chromium Findings Report for Former McClellan Air Force Base

Final Hexavalent Chromium Findings Report for Former McClellan Air Force Base

PREPARED FOR:	Ken Smarkel/Noblis
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DATE:	April 22, 2016
PROJECT NUMBER:	654608.02.04.91.04

Introduction

This Technical Memorandum has been prepared by CH2M HILL for the Air Force Civil Engineer Center (AFCEC) under Contract FA8903-08-D-8769-0380.

In the Non-Volatile Organic Compound (Non-VOC) Amendment to the Basewide VOC Groundwater Record of Decision (ROD) for McClellan (Air Force Real Property Agency [AFRPA], 2009), a cleanup level of 50 micrograms per liter (µg/L) was selected for total chromium (including hexavalent chromium) based on the Federal maximum contaminant level (MCL). Since the submittal of the Non-VOC Amendment to the Basewide VOC Groundwater ROD, a new regulatory standard for hexavalent chromium has been promulgated by the State. In 2011, Office of Environmental Health Hazard Assessment (OEHHA) established a public health goal (PHG) of 0.02 µg/L for hexavalent chromium. The PHG represents a de minimis lifetime cancer risk from exposure to hexavalent chromium in drinking water. Based on the establishment of the PHG, California Department of Public Health (CDPH) established the MCL for hexavalent chromium at 10 µg/L in 2014. Therefore, a cleanup level specific to hexavalent chromium needs to be added to the selected remedy.

To support development of a cleanup level for hexavalent chromium, a background value for Former McClellan Air Force Base (McClellan) was established as presented in the Hexavalent Chromium Background Technical Memorandum (CH2M HILL, 2015). The purpose of this Hexavalent Chromium Findings Report Technical Memorandum is to evaluate existing groundwater data for hexavalent chromium relative to the proposed cleanup level to determine the impact on the current delineation of the groundwater plumes at McClellan. This Hexavalent Chromium Findings Report Technical Memorandum also satisfies the requirements of a "protectiveness evaluation" per the guidance found in OSWER No. 9355.7-03B-P, Comprehensive Five-Year Review Guidance, June 2001, Section 4.0 - Assessing the Protectiveness of the Remedy, including Appendix G - Methods and Examples for Evaluating Changes in Standards and Toxicity, as stated in the Non-VOC Amendment to the Basewide VOC Groundwater ROD. An Explanation of Significant Difference (ESD) will be prepared to document addition of a cleanup level specific to hexavalent chromium.

Hexavalent Chromium Cleanup Level

As presented in the Hexavalent Chromium Background Technical Memorandum (CH2M HILL, 2015), the background value for hexavalent chromium is based on samples collected from extraction wells located outside the influence of suspected source area. Using the selected background data set, a background threshold value (BTV), specifically a 95 percent upper confidence limit of the 95th percentile, known as a 95/95 upper tolerance limit (UTL) of 14.0 µg/L was calculated. A 95/95 UTL is designed to contain, but not exceed, 95% of the possible background concentrations with 95% confidence, thus providing a reasonable

upper limit on what is likely to be observed in background (i.e., 5% of the background population will exceed this value).

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), cleanup levels are generally not set at concentrations below natural background values. For hexavalent chromium, the California MCL of 10 µg/L is less than the BTV of 14.0 µg/L; therefore, the proposed cleanup level for hexavalent chromium is 14.0 µg/L.

Plume Evaluation

The groundwater at McClellan is contaminated with volatile organic compounds (VOCs) and non-VOCs (including hexavalent chromium). As documented in the Non-VOC Amendment to the Basewide VOC Groundwater ROD (AFRPA, 2009), the selected remedy to address non-VOCs, including hexavalent chromium, in groundwater consists of groundwater extraction and treatment, monitoring, and institutional controls. Treatment of hexavalent chromium will continue under the selected remedy until cleanup levels are achieved throughout the contaminated plumes.

A groundwater extraction and treatment system used to remediate VOCs and non-VOCs has been in operation since 1987, and has been expanded several times. The treatment system was modified under a time-critical removal action to address hexavalent chromium in 2003 by installing an ion exchange system designed to meet the system's discharge requirement. The Air Force monitors the non-VOC groundwater plumes and COCs throughout the remediation process in accordance with the *Groundwater Monitoring Plan, Update 2* (URS, 2009). The decision logic for non-VOCs (and specifically for hexavalent chromium) currently provided in the *Groundwater Monitoring Plan, Update 2* (URS, 2009) will be updated as appropriate to reflect the new cleanup level for hexavalent chromium.

Existing groundwater data (i.e., data collected through fourth quarter 2014) for hexavalent chromium were compared to the proposed cleanup level to determine the impact on the current delineation of the groundwater plumes at McClellan. The current groundwater plume delineations and estimated capture extents are based on the *Groundwater and Soil Vapor Extraction Performance-based Remediation, Annual Remediation Monitoring Report, Fourth Quarter 2014* (URS, 2015). Multiple lines of evidence (including predictive numerical modeling, analysis of interpolated contoured groundwater surfaces, analytical chemical results, and interpreted hydrogeology) are used to determine if each well is within the capture zone of existing operating extraction wells.

The data used in the evaluation are provided in Attachment 1 (provided electronically). The most recent concentrations detected in each well analyzed for hexavalent chromium are presented on Figure 1. The most recent concentrations for 32 of the 686 wells analyzed for hexavalent chromium exceed the proposed cleanup level of 14.0 µg/L (highlighted red on Figure 1). These locations relative to the fourth quarter 2014 plume delineations and estimated capture extents (URS, 2015), are presented on Figures 2 (A zone) and 3 (B zone). None of the most recent concentrations for C or D zone wells exceed the proposed cleanup level of 14.0 µg/L and no non-VOC plumes (including hexavalent chromium plumes) have been identified in the C or D zone.

An evaluation of each well with the most recent hexavalent chromium result greater than the proposed cleanup level of 14.0 µg/L is provided in Table 1. As presented in Table 1, the 32 wells fall into the following general categories:

- **Wells within an existing hexavalent chromium plume (3 wells)** – This includes EW-487, MW-235, and MW-622.
- **Wells near the boundary of an existing hexavalent chromium plume (4 wells)** – This includes EW-320, MW-158, MW-159, and MW-366. The plume boundaries have been expanded to include these wells (see Figure 2).

- **Wells that indicate a newly delineated plume (7 wells)** – This includes EW-299, EW-447, MW-222, MW-225, MW-315, MW-355, and MW-640. The highest concentration recently detected in these low-level plumes is 20 µg/L. EW-299 is located within an existing VOC plume and is being captured. The EW-447 plume was likely connected to the MW-355 plume but concentrations have decreased to nearly background. EW-447 is being captured. MW-355 is located within a previously delineated hexavalent chromium plume but concentrations have decreased to less than the current cleanup level of 50 µg/L. MW-640 is located within an existing perchlorate plume and is being captured. MW-222, MW-225, and MW-315 are not located within an existing VOC or non-VOC plume but are being captured. Plumes boundaries have been added to include these seven wells (see Figures 2 and 3).
- **Wells with sporadic/slight exceedances within an existing VOC plume (3 wells)** – This includes MW-211, MW-360, and MW-623. These wells are all being captured. The most recent result for these wells exceeds the proposed cleanup level of 14.0 µg/L; therefore, these wells are recommended for further evaluation. These wells are not shown as being located within a hexavalent chromium plume on Figures 2 and 3.
- **Wells with sporadic/slight exceedances not within an existing plume but being captured (9 wells)** – This includes MW-1054, MW-108, MW-109, MW-183, MW-195, MW-204, MW-407, PZ-743, and PZ-758. The most recent result for these wells exceeds the proposed cleanup level of 14.0 µg/L; therefore, these wells are recommended for further evaluation. Concentrations for MW-1054, MW-108, MW-109, MW-183, and MW-195 are generally only slightly greater than background and there is no potential source identified. MW-204 and MW-407 have had elevated results in the past but concentrations have decreased to less than or slightly greater than background. Previous concentrations at PZ-743 and PZ-758 were less than background and the most recent concentrations only slightly exceed background. . These wells are not shown as being located within a hexavalent chromium plume on Figures 2 and 3.
- **Wells with sporadic/slight exceedances outside the estimated capture extent (1 well)** – This includes MW-1038. Concentrations for MW-1038 are generally only slightly greater than background and there is no potential source identified. The most recent result for MW-1038 exceeds the proposed cleanup level of 14.0 µg/L; therefore, MW-1038 is recommended for further evaluation. This well is not shown as being located within a hexavalent chromium plume on Figure 2.

In addition, as presented in Table 1, the most recent result for five decommissioned wells (MW-165, MW-17D, MW-365, MW-413, and MW-580) exceeds 14.0 µg/L. MW-365 is located near the CS 047 source and the plume boundary has been expanded to include this well. Data for MW-413 indicated that area was impacted but concentrations were decreasing at the time the well was decommissioned. A plume boundary has been added to include MW-413. The most recent result for MW-165, MW-17D, and MW-580 exceeds the proposed cleanup level of 14.0 µg/L; therefore, these wells are recommended for further evaluation.

For sixteen wells (MW-1002, MW-1009, MW-1011, MW-1017, MW-107, MW-120, MW-128, MW-131, MW-18D, MW-41S, MW-44S, MW-60, MW-63, MW-65, MW-7, and MW-71), the most recent result (from 1989) was nondetect but the method detection limit was elevated (20 µg/L). All of these well have since been decommissioned. Considering that the method detection limit for the most recent result from these wells exceeds the proposed cleanup level of 14.0 µg/L, these wells are recommended for further evaluation. These wells are not shown as being located within a hexavalent chromium plume on Figures 2 and 3.

In addition to the 32 wells with the most recent concentration greater than the proposed cleanup level of 14.0 µg/L, the penultimate result for 29 wells is greater than the proposed cleanup level of 14.0 µg/L (highlighted yellow on Figure 1). This includes EW-384 (decommissioned), MW-1010 (decommissioned), MW-1020, MW-1049, MW-1053 (decommissioned), MW-1088, MW-143, MW-15, MW-173, MW-196, MW-198, MW-201, MW-213, MW-220, MW-221, MW-223, MW-232 (decommissioned), MW-241

(decommissioned), MW-347, MW-362, MW-397, MW-424, MW-428, MW-49S, MW-629, MW-630, MW-633, PZ-737, and PZ-92. Although the most recent concentration for these wells is not greater than 14.0 µg/L, these wells are recommended for further evaluation.

Further evaluation of the existing and any additional data collected will be conducted in accordance with the updated decision logic for hexavalent chromium to be provided in an update to the *Groundwater Monitoring Plan, Update 2* (URS, 2009). If necessary, plume delineations can be adjusted based on the additional evaluation. This will be addressed as part of the ongoing groundwater monitoring program.

As indicated above, the proposed cleanup level will result in the addition or expansion of several hexavalent chromium plumes; however, all of the wells that likely represent contamination are effectively being captured by the existing groundwater extraction and treatment system. It is expected that additional evaluation of monitoring data will confirm that all of the wells with the last reported concentration greater than 14.0 µg/L located outside of the estimated capture extent represent natural variations in background and do not require remediation.

Protectiveness Evaluation

A "protectiveness evaluation" was conducted per the guidance found in OSWER No. 9355.7-03B-P, Comprehensive Five-Year Review Guidance, June 2001, Section 4.0 - Assessing the Protectiveness of the Remedy, including Appendix G - Methods and Examples for Evaluating Changes in Standards and Toxicity, to assess the protectiveness of the selected remedy in light of the change of the promulgated standards for hexavalent chromium.

Per the guidance, the protectiveness evaluation answers the following questions:

- Question A: Is the remedy functioning as intended by the decision documents?
  Yes. Based on the existing data, the system is effectively capturing the identified hexavalent chromium plumes. The selected remedy also includes institutional controls initially established in the Basewide VOC Groundwater ROD. These institutional controls are designed to prevent human exposure to non-VOCs at concentrations above cleanup levels and to protect the integrity of the remedial systems and associated monitoring systems.
- Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?
  No. In 2011, OEHHA established a PHG of 0.02 ppb for hexavalent chromium. The PHG represents a de minimis lifetime cancer risk from exposure to hexavalent chromium in drinking water. Based on the establishment of the PHG, CDPH established the MCL for hexavalent chromium at 10 ppb in 2014.
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
  No.

In accordance with the guidance, the flowchart presented in Figure 4 was used to evaluate the change in the MCL for hexavalent chromium. The results of the evaluation specific to hexavalent chromium in groundwater at McClellan are presented in Figure 5. With an estimated excess lifetime carcinogenic risk of 3 x 10^{-3}, the old cleanup level (50 µg/L) is no longer considered protective.

In examining the existing groundwater data for hexavalent chromium and the estimated capture of the groundwater extraction and treatment system, it was determined that the system is effectively capturing the hexavalent chromium plumes. Ongoing groundwater monitoring is conducted in accordance with the *Groundwater Monitoring Plan, Update 2* (URS, 2009) to evaluate the effectiveness of the remedy. Institutional controls are also in place to prevent human exposure to non-VOCs at concentrations above cleanup levels and to protect the integrity of the remedial systems and associated monitoring systems. Since the old standard (50 µg/L) is no longer considered protective, further action needs to be taken to ensure that the remedy achieves protectiveness. This action includes the adoption of a protective cleanup level.

Therefore, this protectiveness evaluation recommends that the proposed cleanup level (14.0 µg/L) be adopted through an ESD. Based on the existing data, the physical remedy does not have to be modified because it was determined that it could achieve the 14.0 µg/L level. In addition, the RAOs would also be achieved and would not require any modification.

Based on comments received on the Hexavalent Chromium Findings Report Technical Memorandum, an ESD is being prepared. It is anticipated that the Final ESD will be submitted in May 2016.

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Table

TABLE 1

Wells with Most Recent Hexavalent Chromium Result Greater than Proposed Cleanup Level (14.0 µg/L)

Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, Californic

LOCATION	ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	RESULT (µg/L)	CAPTURE EVALUATION SUMMARY	COMMENTS	RECOMMENDATIONS
EW-299	A	9/5/2001	NS1	SW7196	**26**	New plume within VOC plume. Captured.	Located at CS T-057 which may have been a source of chromium contamination. Concentrations are all greater than background.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		11/7/2001	NS1	SW7196	**23**			
		11/19/2002	NS1	SW7199	**25**			
		12/10/2003	NS1	SW7199	**31**			
		11/11/2004	NS1	SW7199	**23**			
		10/26/2005	NS1	SW7196A	**16**			
EW-320	A	9/5/2001	FD1	SW7196	**29**	Near the boundary of existing hexavalent chromium plume. Captured.	Located near CS 047 source area.	Expand plume boundary to include this well. Ongoing evaluation under groundwater monitoring program.
		9/5/2001	NS1	SW7196	**29**			
		11/7/2001	NS1	SW7196	**29**			
		6/19/2002	NS1	SW7199	**97**			
		6/25/2003	NS1	SW7199	**580**			
		9/24/2003	NS1	SW7199	**140**			
		4/28/2004	NS1	SW7199	**200**			
		5/18/2005	NS1	SW7199	**250**			
		2/7/2006	NS1	SW7196A	**390**			
		1/25/2007	NS1	SW7196A	**280**			
		1/16/2008	NS1	SW7196A	**66**			
		1/14/2009	NS1	SW7196A	**140**			
		1/28/2010	NS1	SW7196A	**120**			
		1/13/2011	NS1	SW7196A	**45**			
		1/16/2012	NS1	SW7196	**37**			
		1/15/2013	NS1	SW7196	**26**			
EW-447	A	8/22/2005	NS1	SW7199	**25**	New plume. Captured.	Located south of CS 012/CS 013 source area. Was likely connected to MW-355 plume but concentrations have decreased to nearly background.	Add plume including this well. Ongoing evaluation under groundwater monitoring program.
		11/7/2005	NS1	SW7196A	**16**			
		1/18/2006	NS1	SW7196A	**15**			
EW-487	A	4/13/2009	NS1	SW7196A	14	Within existing hexavalent chromium plume. Captured.	Located near PRL S-008 source area. EW-487 has been an active extraction well for the PRL S-008 plume.	None; already within existing plume. Ongoing evaluation under groundwater monitoring program.
		7/30/2009	NS1	SW7196A	**41**			
		10/14/2009	NS1	SW7196A	**42**			
		1/21/2010	NS1	SW7196A	**36**			
		10/7/2010	NS1	SW7196A	**36**			
		10/18/2011	NS1	SW7196A	**37**			
		10/9/2012	NS1	SW7196	**36**			
		10/23/2013	NS1	SW7196	**30**			
		10/22/2014	NS1	SW7196	**34**			
		10/22/2014	FD1	SW7196	**36**			
MW-1038	B	10/11/1989	NS1	SW7196	ND	Outside estimated capture extent.	Located southeast of Base. Concentrations are generally less than background. Most recent concentration is only slightly greater than background.	Last result above cleanup level and recommend further evaluation.
		9/4/2003	NS1	SW7196A	5			
		11/4/2004	NS1	SW7196A	7.3			
		3/4/2005	NS1	SW7196A	**15**			
MW-1054	A	5/21/2002	NS1	SW7196	**17**	Flows toward capture zone.	Located southwest of Base. All but one of the concentrations are greater than background. Most recent concentration is only slightly greater than background.	Above cleanup level and recommend further evaluation. Additional data were recently collected as part of the offbase sampling.
		6/2/2003	NS1	SW7196A	**18**			
		4/13/2004	NS1	SW7196A	**21**			
		4/25/2005	NS1	SW7196A	13			
		1/30/2006	NS1	SW7196A	**15**			
MW-108	B	7/30/2003	NS1	SW7196A	14	Flows toward capture zone.	Located west of SAFR and CS 007. No potential source identified. Only most recent concentration exceeds background. No elevated concentrations between this well and potential source areas.	Last result above cleanup level and recommend further evaluation.
		7/25/2005	NS1	SW7196A	**18**			
MW-109	B	7/31/2003	NS1	SW7196A	**16**	Flows toward capture zone.	Located west of SAFR and CS 007. No potential source identified. Concentrations are at or slightly greater than background. No elevated concentrations between this wells and potential source areas.	Last result above cleanup level and recommend further evaluation.
		7/25/2005	NS1	SW7196A	14			
		7/25/2005	FD1	SW7196A	**15**			

TABLE 1

Wells with Most Recent Hexavalent Chromium Result Greater than Proposed Cleanup Level (14.0 µg/L)

Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, Californic

LOCATION	ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	RESULT (µg/L)	CAPTURE EVALUATION SUMMARY	COMMENTS	RECOMMENDATIONS
MW-158	A	6/11/2003	NS1	SW7196A	**16**	Near the boundary of existing hexavalent chromium plume. Captured.	Located near CS 047 source area.	Expand plume boundary to include this well. Ongoing evaluation under groundwater monitoring program.
		5/20/2005	NS1	SW7196A	10			
		2/14/2007	NS1	SW7196A	9.9			
		1/15/2009	NS1	SW7196A	13			
		1/26/2011	NS1	SW7196A	**18**			
MW-159	A	6/12/2002	NS1	SW7196	**18**	Near the boundary of existing hexavalent chromium plume. Captured.	Located near CS 047 source area.	Expand plume boundary to include this well. Ongoing evaluation under groundwater monitoring program.
		6/18/2003	NS1	SW7196A	**20**			
		4/23/2004	NS1	SW7196A	14			
		4/28/2005	NS1	SW7196A	**21**			
		2/7/2006	NS1	SW7196A	**25**			
		1/30/2007	NS1	SW7196A	**40**			
		1/16/2008	NS1	SW7196A	**71**			
		7/15/2008	NS1	SW7196A	**40**			
		1/14/2009	NS1	SW7196A	**52**			
		1/18/2010	NS1	SW7196A	**38**			
		1/13/2011	FD1	SW7196A	**33**			
		1/13/2011	NS1	SW7196A	**33**			
		1/15/2013	NS1	SW7196	**19**			
MW-165	B	6/12/2002	NS1	SW7196	9	Within VOC plume. Captured.	Located at SA 012C. Only two results slightly greater than background. Adjacent B zone extraction well EW-310 has been sampled six times since 2001 with no results greater than background. Well has been decommissioned.	Last result before decommissioning above cleanup level and recommend further evaluation.
		6/9/2003	NS1	SW7196A	**15**			
		4/21/2004	NS1	SW7196A	10			
		5/12/2005	NS1	SW7196A	**16**			
MW-17D	A	8/5/2003	FD1	SW7196A	**15**	Outside estimated capture extent.	Located near AOC F-1. No nearby source. Results only slightly greater than background. Well has been decommissioned.	Results before decommissioning slightly above cleanup level and recommend further evaluation.
		8/5/2003	NS1	SW7196A	**15**			
		8/5/2005	NS1	SW7196A	**15**			
MW-183	B	5/8/2003	NS1	SW7196A	**25**	Flows toward capture zone.	Located east of PRL S-033. Most recent result is only slightly greater than background and previous result is less than background. Adjacent A and C zone wells are less than background. No identified source.	Last result above cleanup level and recommend further evaluation.
		4/19/2005	NS1	SW7196A	10			
		3/7/2006	NS1	SW7196A	**16**			
MW-195	B	9/11/2003	NS1	SW7196A	**19**	Flows toward capture zone.	Located near AOC G-3. Most recent result is only slightly greater than background. Adjacent A and C zone wells are less than background. No identified source.	Above cleanup level and recommend further evaluation.
		8/18/2005	NS1	SW7196A	**16**			
MW-204	B	10/16/2003	FD1	SW7196A	**21**	Captured.	Located near CS S-026. Concentrations are generally decreasing. Previous result is less than background. Adjacent A zone well is less than background. No identified source.	Above cleanup level and recommend further evaluation.
		10/16/2003	NS1	SW7196A	**53**			
		11/14/2005	NS1	SW7196A	12			
		3/10/2006	NS1	SW7196A	**15**			
MW-211	B	10/30/2002	NS1	SW7196A	**32**	Within VOC plume. Captured.	Located near SA 049. Concentrations are generally decreasing. Previous result is less than background. No identified source.	Above cleanup level and recommend further evaluation.
		12/1/2003	FD1	SW7196A	**25**			
		12/1/2003	NS1	SW7196A	**20**			
		11/19/2004	NS1	SW7196A	12			
		11/21/2005	NS1	SW7196A	**15**			
MW-222	A	11/13/2002	NS1	SW7196A	**21**	New plume. Captured.	Located north of SA 073 and west of PRL T-010. Concentrations are consistently greater than background; however, a specific source has not been identified. Most recent result for adjacent B zone well is less than background.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		11/25/2003	NS1	SW7196A	**15**			
		11/15/2004	NS1	SW7196A	**24**			
		11/8/2005	NS1	SW7196A	**20**			
		11/8/2005	FD1	SW7196A	**19**			
MW-225	B	11/13/2002	NS1	SW7196A	**22**	New plume. Captured.	Located near SA 067. Concentrations are generally decreasing to near background but the area has clearly been impacted. Adjacent A zone wells are less than background.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		12/2/2003	FD1	SW7196A	**96**			
		12/2/2003	NS1	SW7196A	**89**			
		11/30/2004	NS1	SW7196A	**18**			
		11/22/2005	NS1	SW7196A	**16**			
		11/22/2005	FD1	SW7196A	**17**			
		2/22/2006	NS1	SW7196A	**15**			

TABLE 1

Wells with Most Recent Hexavalent Chromium Result Greater than Proposed Cleanup Level (14.0 µg/L)

Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, Californic

LOCATION	ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	RESULT (µg/L)	CAPTURE EVALUATION SUMMARY	COMMENTS	RECOMMENDATIONS
MW-235	A	6/11/2002	NS1	SW7196	**17**	Within existing hexavalent chromium plume. Captured.	Located near CS 047 source area.	None; already within existing plume. Ongoing evaluation under groundwater monitoring program.
		6/16/2003	NS1	SW7196A	**47**			
		4/27/2004	NS1	SW7196A	**40**			
		5/19/2005	NS1	SW7196A	**580**			
		5/19/2005	FD1	SW7196A	**550**			
		2/7/2006	NS1	SW7196A	**370**			
		1/25/2007	FD1	SW7196A	**180**			
		1/25/2007	NS1	SW7196A	**180**			
		7/17/2007	NS1	SW7196A	**150**			
		7/17/2007	FD1	SW7196A	**160**			
		2/7/2008	NS1	SW7196A	**140**			
		1/14/2009	NS1	SW7196A	**50**			
		1/18/2010	NS1	SW7196A	**90**			
		1/26/2011	NS1	SW7196A	**120**			
		1/16/2012	FD1	SW7196	**110**			
		1/16/2012	NS1	SW7196	**110**			
		1/15/2013	NS1	SW7196	**68**			
		1/30/2014	NS1	SW7196	**92**			
MW-315	B	5/21/2003	NS1	SW7196A	**17**	New plume. Captured.	Located near CS 047 source area. Not within an existing B zone plume but within the footprint of the overlying A zone plume at CS 047.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		5/19/2005	NS1	SW7196A	14			
		2/8/2006	NS1	SW7196A	13			
		1/17/2008	NS1	SW7196A	**15**			
		7/15/2008	NS1	SW7196A	14			
		1/14/2009	NS1	SW7196A	14			
		1/18/2010	NS1	SW7196A	**16**			
		1/26/2011	NS1	SW7196A	**15**			
		1/16/2012	NS1	SW7196	**16**			
		1/17/2013	NS1	SW7196	14			
		1/30/2014	FD1	SW7196	**15**			
		1/30/2014	NS1	SW7196	**15**			
MW-355	A	8/26/2002	NS1	SW7196A	**50**	New plume within VOC plume. Captured.	Located near CS 012/CS 013 source area. Located within a previously delineated chromium plume but concentrations have decreased to less than the current cleanup level of 50 µg/L.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		2/24/2003	NS1	SW7196A	**57**			
		9/18/2003	FD1	SW7196A	**77**			
		9/18/2003	NS1	SW7196A	**32**			
		7/27/2004	NS1	SW7196A	**68**			
		7/27/2004	FD1	SW7196A	**67**			
		7/27/2005	NS1	SW7196A	**100**			
		1/26/2007	NS1	SW7196A	**85**			
		5/3/2007	NS1	SW7199	**66**			
		1/14/2008	NS1	SW7196A	**100**			
		1/15/2009	NS1	SW7196A	**40**			
		1/15/2009	FD1	SW7196A	**41**			
		1/28/2010	NS1	SW7196A	**35**			
		1/24/2011	NS1	SW7196A	**34**			
		1/15/2013	FD1	SW7196	**20**			
		1/15/2013	NS1	SW7196	**20**			
MW-360	A	7/28/2003	NS1	SW7196A	14	Within VOC plume. Captured.	Located near IWL. Concentrations are at or slightly greater than background. The IWL could represent a potential source.	Last result above cleanup level and recommend further evaluation.
		7/28/2005	NS1	SW7196A	**15**			

TABLE 1

Wells with Most Recent Hexavalent Chromium Result Greater than Proposed Cleanup Level (14.0 µg/L)

Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, Californic

LOCATION	ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	RESULT (µg/L)	CAPTURE EVALUATION SUMMARY	COMMENTS	RECOMMENDATIONS
MW-365	A	6/18/2002	NS1	SW7196	9	Near the boundary of existing hexavalent chromium plume. Captured.	Located near CS 047 source area. Well has been decommissioned. Area is sufficiently characterized by other wells (such as MW-366 and EW-233).	Expand plume boundary to include this well. Ongoing evaluation under groundwater monitoring program.
		6/17/2003	NS1	SW7196A	**15**			
		12/1/2003	NS1	SW7196A	**16**			
		4/27/2004	NS1	SW7196A	12			
		4/27/2004	FD1	SW7196A	13			
		11/2/2004	NS1	SW7196A	**18**			
		5/26/2005	NS1	SW7196A	**15**			
		10/31/2005	NS1	SW7196A	**50**			
		2/9/2006	NS1	SW7196A	**42**			
		1/30/2007	NS1	SW7196A	**18**			
		1/30/2007	FD1	SW7196A	**19**			
		7/17/2007	NS1	SW7196A	**23**			
MW-366	A	6/9/2003	NS1	SW7196A	13	Near the boundary of existing hexavalent chromium plume. Captured.	Located near CS 047 source area.	Expand plume boundary to include this well. Ongoing evaluation under groundwater monitoring program.
		5/23/2005	NS1	SW7196A	12			
		2/7/2008	NS1	SW7196A	**15**			
		1/29/2009	NS1	SW7196A	**20**			
		1/21/2010	NS1	SW7196A	**22**			
		1/26/2011	NS1	SW7196A	**21**			
		1/16/2012	NS1	SW7196	**16**			
		1/15/2013	NS1	SW7196	**15**			
		1/30/2014	NS1	SW7196	**15**			
MW-407	B	5/5/2003	NS1	SW7196A	**350**	Captured.	Located north of PRL 068 along IWL (PRL L-007B). Was impacted but concentrations have decreased to less than or slightly greater than background.	Above cleanup level and recommend further evaluation.
		4/18/2005	NS1	SW7196A	10			
		3/7/2006	FD1	SW7196A	**15**			
		3/7/2006	NS1	SW7196A	**15**			
MW-413	A	5/25/2005	NS1	SW7196A	**41**	New plume. Captured.	Located at PRL S-011. Was impacted but concentrations were decreasing at the time the well was decommissioned. Well has been decommissioned. Well MW-409 is a downgradient A zone well.	Add new plume including this well. Ongoing evaluation under groundwater monitoring program.
		5/25/2006	NS1	SW7196A	**38**			
		8/3/2006	NS1	SW7196A	**18**			
MW-580	A	6/29/2005	NS1	SW7199	7	Captured.	Located at Consolidation Unit. Only one of four results greater than background. Most recent results for nearby A zone wells MW-358, MW-357, and MW-671 are all less than background. Results for MW-357 and MW-671 have never exceeded background. MW-358 only slightly exceeded background in one of nine samples with a concentration of 15 µg/L. Well has been decommissioned.	Last result before decommissioning above cleanup level and recommend further evaluation.
		8/25/2005	NS1	SW7196A	9			
		12/1/2005	NS1	SW7196A	8.6			
		2/23/2006	NS1	SW7196A	**19**			
MW-622	A	5/16/2006	NS1	SW7196	**42**	Within existing hexavalent chromium plume. Captured.	Located near PRL S-008 source area.	None; already within existing plume. Ongoing evaluation under groundwater monitoring program.
		11/15/2006	NS1	SW7196A	**250**			
		12/21/2006	NS1	SW7196A	**120**			
		1/29/2007	NS1	SW7196A	**82**			
		4/24/2007	NS1	SW7199	**52**			
		8/22/2007	NS1	SW7196A	**150**			
		1/21/2008	NS1	SW7196A	**360**			
		7/22/2008	NS1	SW7196A	**29**			
		1/14/2009	NS1	SW7196A	**160**			
		10/14/2009	NS1	SW7196A	**200**			
		10/14/2009	FD1	SW7196A	**190**			
		10/6/2010	NS1	SW7196A	**78**			
		10/17/2011	NS1	SW7196A	**90**			
		10/17/2011	FD1	SW7196A	**90**			
		5/17/2012	NS1	SW7196A	**78**			
		10/10/2012	NS1	SW7196	**85**			
		10/23/2013	NS1	SW7196	**110**			
		10/22/2014	NS1	SW7196	**120**			

TABLE 1

Wells with Most Recent Hexavalent Chromium Result Greater than Proposed Cleanup Level (14.0 µg/L)

Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, Californic

LOCATION	ZONE	SAMPLE DATE	SAMPLE CODE	ANALYTICAL METHOD	RESULT (µg/L)	CAPTURE EVALUATION SUMMARY	COMMENTS	RECOMMENDATIONS
MW-623	A	1/24/2007	NS1	SW7196A	12	Within VOC plume.	Located at CS 042 near IWL. Limited data.	Last result above cleanup level and recommend
		4/24/2007	NS1	SW7199	**21**	Captured.		further evaluation.
MW-640	A	11/15/2007	FD1	SW7196A	**20**	New plume within	Located west of PRL S-046 near release from IWL (PRL L-007D). Concentrations are consistently greater	Add new plume including this well. Ongoing
		11/15/2007	NS1	SW7196A	**22**	perchlorate plume.	than background.	evaluation under groundwater monitoring
		1/14/2008	NS1	SW7196A	**21**	Captured.		program.
		4/10/2008	NS1	SW7196A	**22**			
		7/15/2008	NS1	SW7196A	**31**			
		7/15/2008	FD1	SW7196A	**31**			
		7/31/2013	NS1	SW7199	**42**			
		7/31/2013	NS1	SW7199	**42**			
		1/30/2014	NS1	SW7199	**42**			
		4/10/2014	NS1	SW7199	**42**			
		7/9/2014	NS1	SW7199	**42**			
		10/14/2014	NS1	SW7199	**37**			
PZ-743	B	6/28/2005	NS1	SW7199	14	Captured.	No nearby source. Most recent concentration is only slightly greater than background. Adjacent A zone	Last result above cleanup level and recommend
		5/2/2006	NS1	SW7196A	**15**		well (PZ-742) and nearby A and A/B zone wells (MW-474 and EW-442) are less than background.	further evaluation.
							Concentrations likely represent natural variation in background.	
PZ-758	A	6/23/2005	FD1	SW7199	12	Captured.	No nearby source. Most recent concentration is only slightly greater than background. Adjacent B zone	Last result above cleanup level and recommend
		6/23/2005	NS1	SW7199	11		well (PZ-759) and nearby A, B, and A/B zone wells (EW-454, MW-429, MW-560, and MW-561) are less	further evaluation.
		9/2/2005	NS1	SW7196A	**15**		than background. Concentrations likely represent natural variation in background.	

µg/L = micrograms per liter

FD1 = field duplicate

NS1 = normal sample

Notes:

Results shown in **bold** indicate hexavalent chromium concentrations greater than background (14.0 µg/L).

Wells highlighted in grey have been decommissioned.

Figures

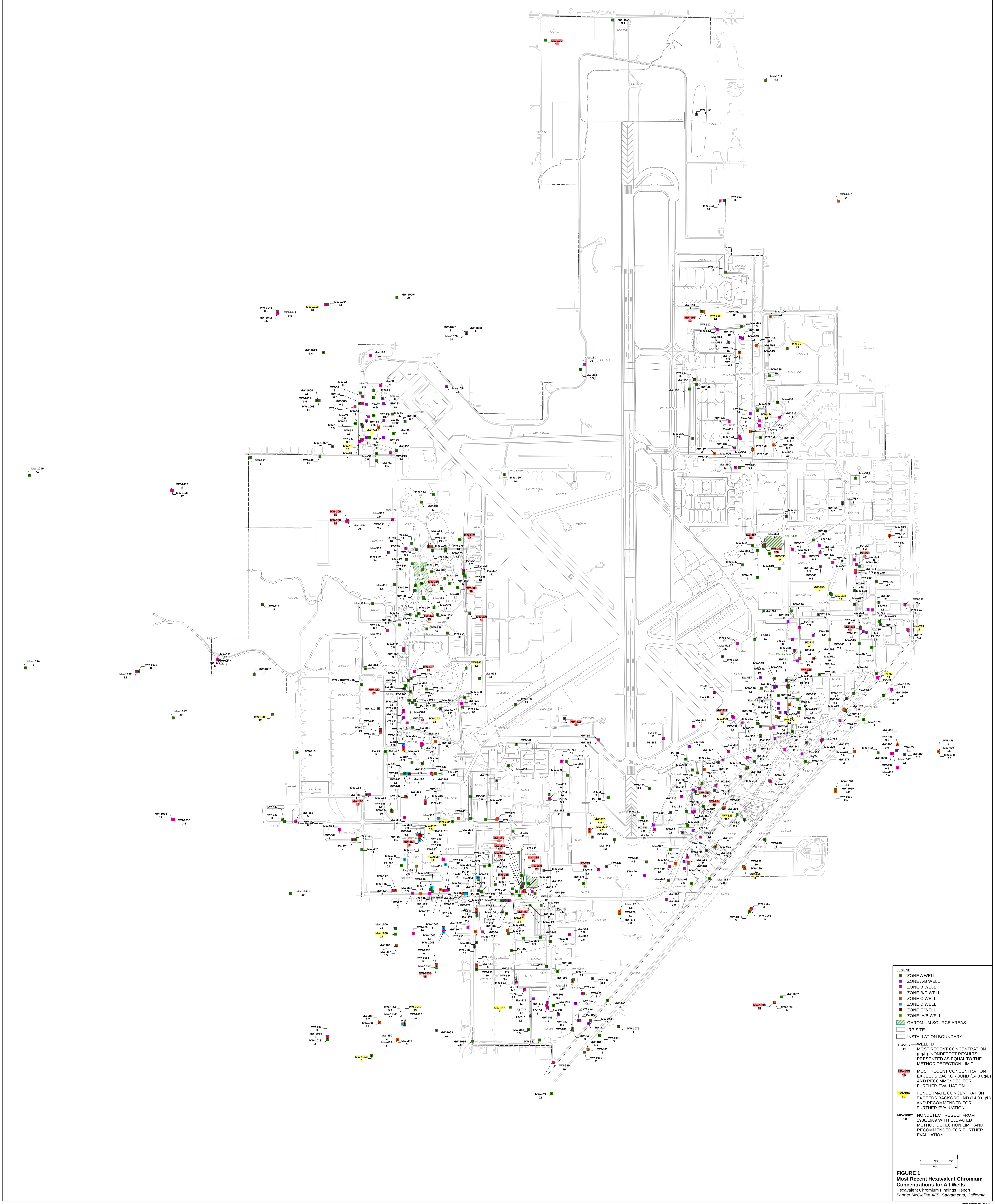
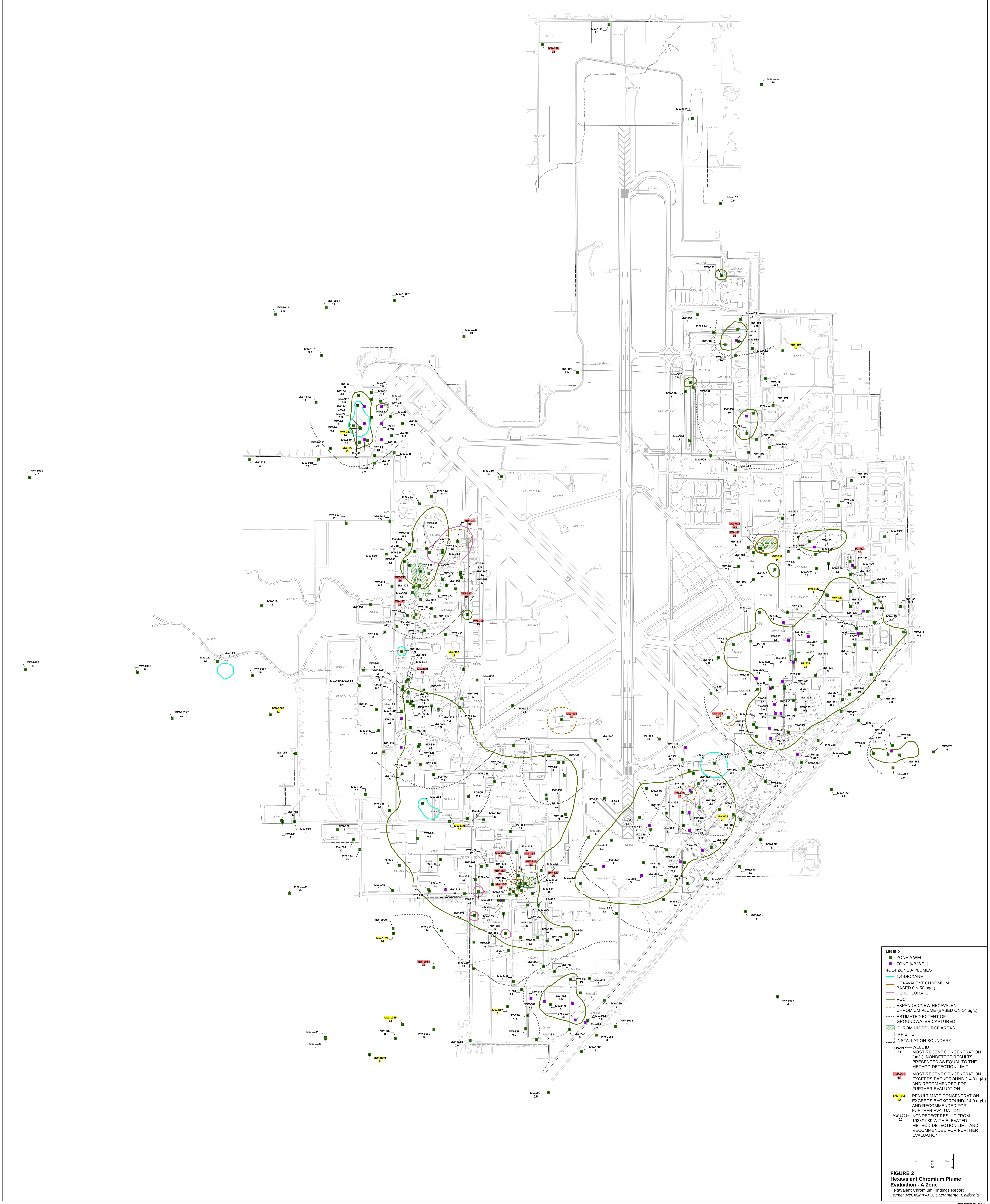


FIGURE 1
Most Recent Hexavalent Chromium Concentrations for All Wells
Hexavalent Chromium Findings Report
Former McClellan AFB, Sacramento, California

CH2MHILL



LEGEND

- ZONE A WELL
- ZONE A/B WELL

4Q14 ZONE A PLUMES

- 1,4-DIOXANE
- HEXAVALENT CHROMIUM BASED ON 50 ug/L)
- PERCHLORATE
- VOC
- EXPANDED/NEW HEXAVALENT CHROMIUM PLUME (BASED ON 14 ug/L)
- ESTIMATED EXTENT OF GROUNDWATER CAPTURED
- CHROMIUM SOURCE AREAS
- IRP SITE
- INSTALLATION BOUNDARY

EW-137 — WELL ID
11 — MOST RECENT CONCENTRATION (ug/L), NONDETECT RESULTS PRESENTED AS EQUAL TO THE METHOD DETECTION LIMIT

EW-299 16 — MOST RECENT CONCENTRATION EXCEEDS BACKGROUND (14.0 ug/L) AND RECOMMENDED FOR FURTHER EVALUATION

EW-384 12 — PENULTIMATE CONCENTRATION EXCEEDS BACKGROUND (14.0 ug/L) AND RECOMMENDED FOR FURTHER EVALUATION

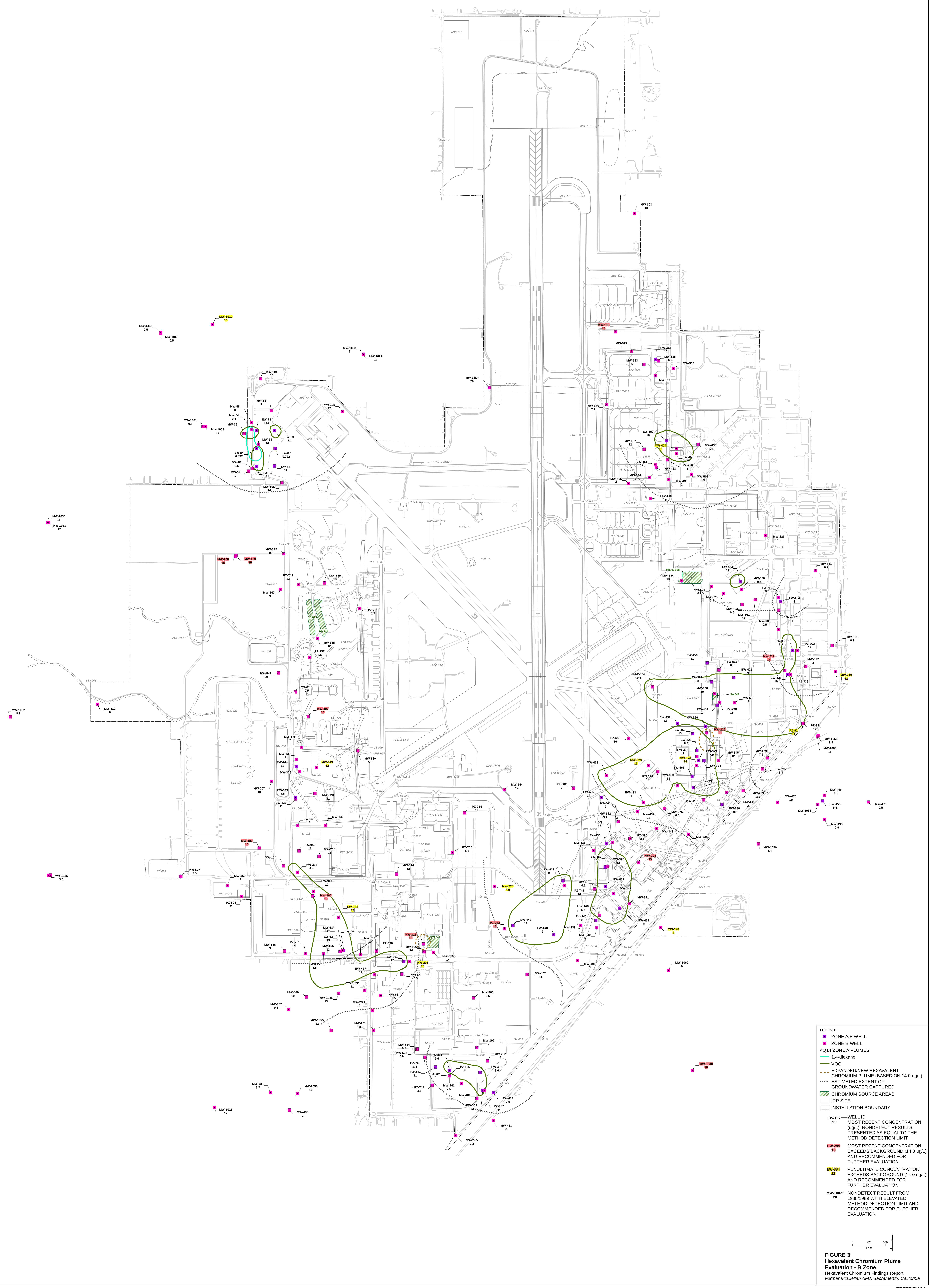
MW-1002* 20 — NONDETECT RESULT FROM 1988/1989 WITH ELEVATED METHOD DETECTION LIMIT AND RECOMMENDED FOR FURTHER EVALUATION

0 275 550 Feet

N

FIGURE 2
Hexavalent Chromium Plume Evaluation - A Zone
Hexavalent Chromium Findings Report
Former McClellan AFB, Sacramento, California

CH2MHILL



LEGEND

ZONE A/B WELL

ZONE B WELL

4Q14 ZONE A PLUMES

1,4-dioxane

VOC

EXPANDED/NEW HEXAVALENT CHROMIUM PLUME (BASED ON 14.0 ug/L)

ESTIMATED EXTENT OF GROUNDWATER CAPTURED

CHROMIUM SOURCE AREAS

IRP SITE

INSTALLATION BOUNDARY

EW-137 — WELL ID
11 — MOST RECENT CONCENTRATION (ug/L), NONDETECT RESULTS PRESENTED AS EQUAL TO THE METHOD DETECTION LIMIT

EW-299 16 — MOST RECENT CONCENTRATION EXCEEDS BACKGROUND (14.0 ug/L) AND RECOMMENDED FOR FURTHER EVALUATION

EW-384 12 — PENULTIMATE CONCENTRATION EXCEEDS BACKGROUND (14.0 ug/L) AND RECOMMENDED FOR FURTHER EVALUATION

MW-1002* 20 — NONDETECT RESULT FROM 1988/1989 WITH ELEVATED METHOD DETECTION LIMIT AND RECOMMENDED FOR FURTHER EVALUATION

0 275 550
Feet
N

FIGURE 3
Hexavalent Chromium Plume Evaluation - B Zone
Hexavalent Chromium Findings Report
Former McClellan AFB, Sacramento, California

CH2MHILL

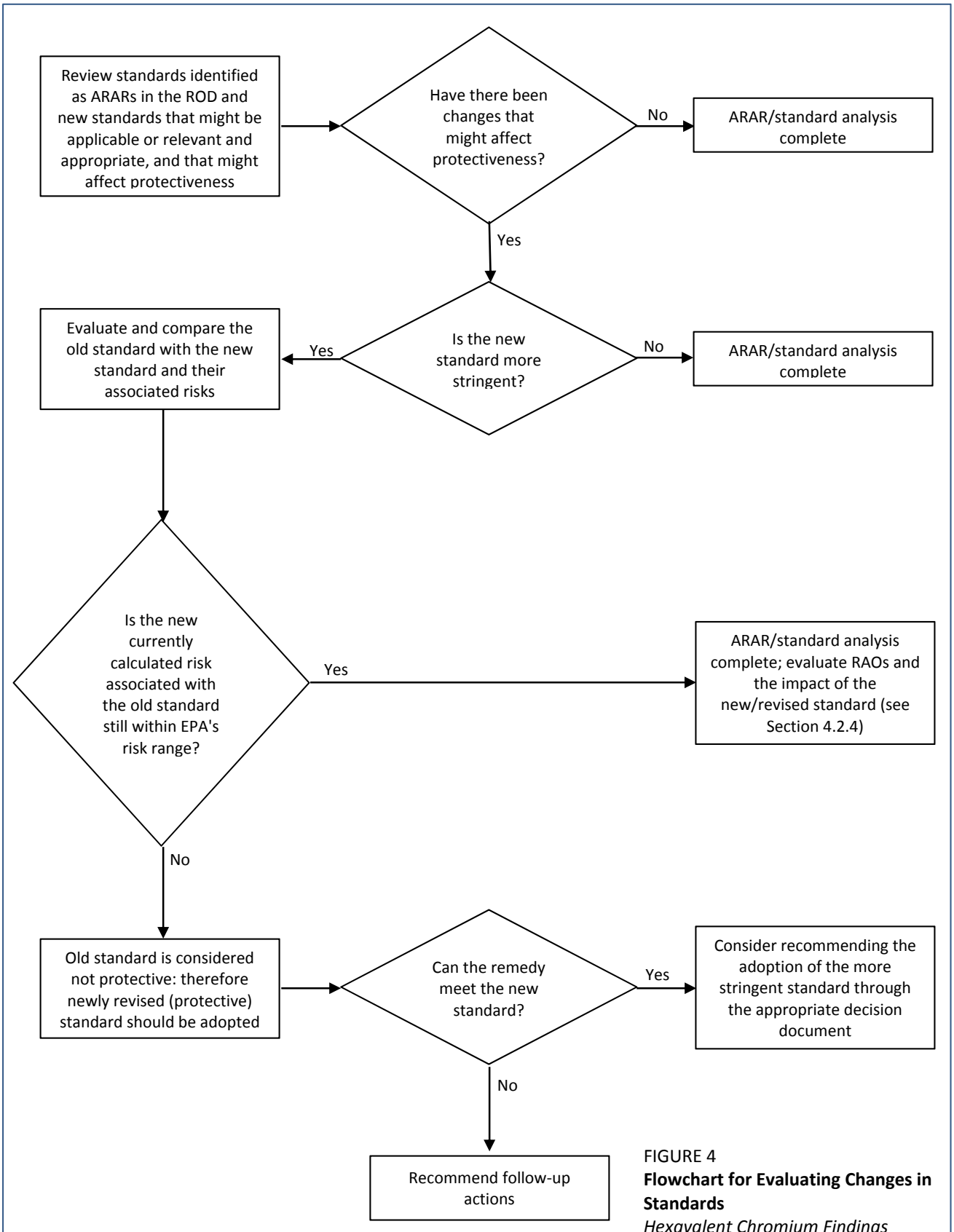


FIGURE 4
Flowchart for Evaluating Changes in Standards
Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, California

Source: OSWER No. 9355.7-03B-P, Comprehensive Five-Year Review Guidance, June 2001, Appendix G - Methods and Examples for Evaluating Changes in Standards and Toxicity

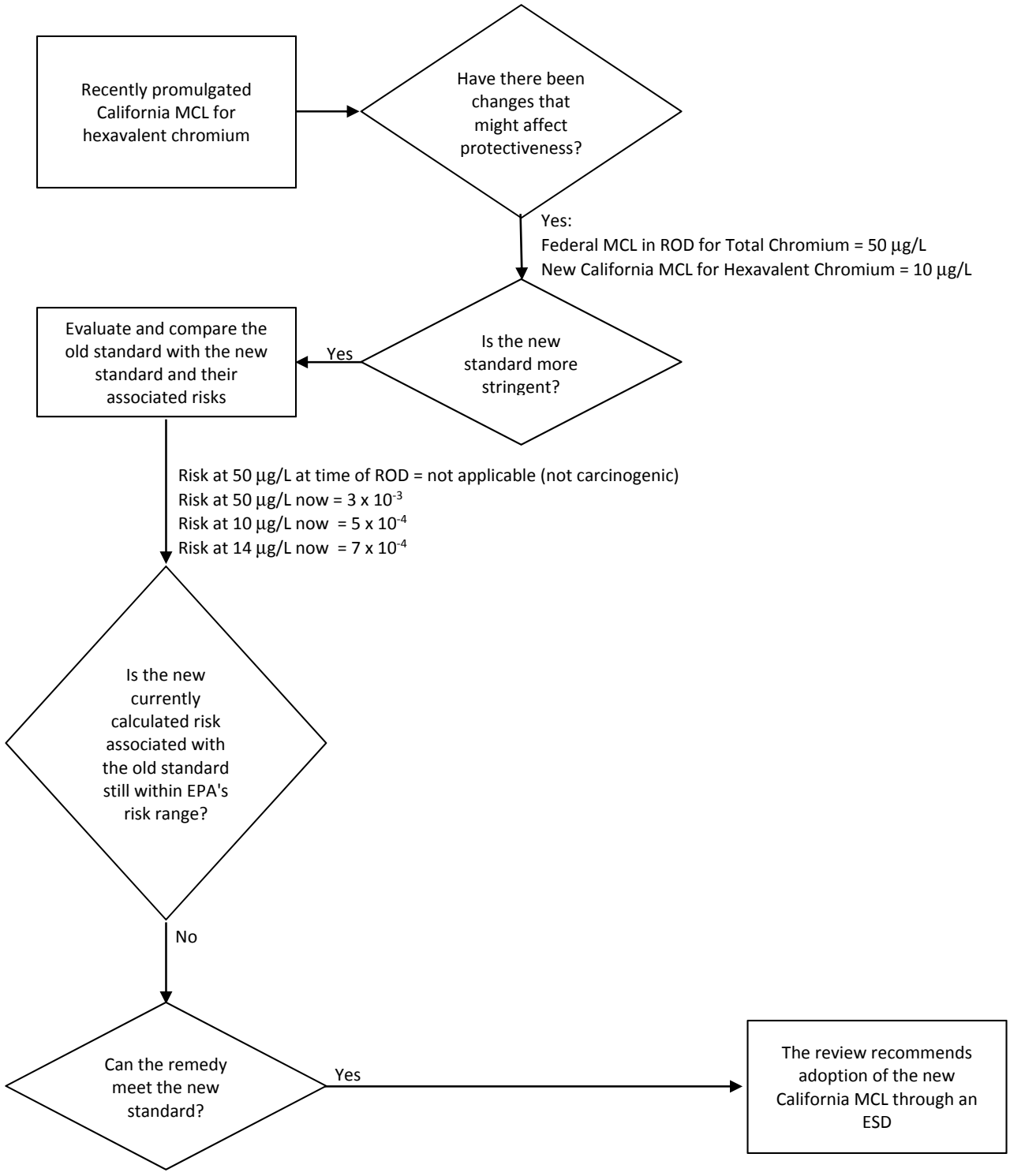


FIGURE 5
Decision Process for Hexavalent Chromium MCL
Hexavalent Chromium Findings Report Technical Memorandum, Former McClellan AFB, Sacramento, California

Attachment 1

Attachment 1

Attachment 1 (Existing Hexavalent Chromium Data Set) provided electronically.

Appendix C
Final Technical Memorandum: Diversion of McClellan Treated Groundwater for Alternate Uses

California Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

Central Valley Regional Water Quality Control Board

25 February 2016

Mr. Steven K. Mayer, P.E.
AFCEC/CIBW
3411 Olson Street
McClellan, CA 95652

TECHNICAL MEMORANDUM: DIVERSION OF McCLELLAN TREATED GROUNDWATER FOR ALTERNATE USES, FORMER McCLELLAN AIR FORCE BASE (AFB), SACRAMENTO COUNTY

Attached for your information is the *Technical Memorandum: Diversion of McClellan Treated Groundwater for Alternate Uses* (Technical Memorandum) dated 24 February 2016. The purpose of the Technical Memorandum is to document the diversion of a portion of the treated groundwater at the former McClellan AFB from discharge to surface water to alternate uses. The Technical Memorandum identifies specific alternate uses for the treated groundwater, and also identifies additional substantive requirements for the alternate water uses that the Air Force will incorporate into the McClellan Groundwater Extraction and Treatment System's Operation and Maintenance Manual (O&M Manual). Once the O&M Manual is revised and approved by the regulatory agencies, the alternate water uses can be implemented.

The alternate uses of the treated groundwater are expected to be beneficial and reduce the demands on local water supplies during the current drought. Any new proposed alternate uses of treated groundwater not included in the Technical Memorandum requires notification and approval by the Central Valley Water Board. The alternate uses of the treated groundwater must comply with all applicable federal, state, and local regulations.

If you have any questions, please contact me at (916) 464-4669 or email me at james.taylor@waterboards.ca.gov.

JAMES D. TAYLOR, P.G.
Senior Engineering Geologist (Spec)
Federal Facilities Unit

cc: Mr. Ken Smarkel, AFCEC/CIBW, McClellan
Mr. Milton Walser, AFCEC/CIBW, McClellan
Mr. Charnjit Bhullar, U.S. Environmental Protection Agency, San Francisco
Mr. Stephen Pay, Department of Toxic Substances Control, Sacramento
Mr. David Green, Defense Microelectronics Activity, McClellan
Mr. Alan Hersh, McClellan Business Park, LLC, McClellan

JDT/jt c:\mcclellan\McCl_GWTP_AltWaterUse_TM_CoverLtr.doc

TO: Stewart Black
Site Cleanup Program Manager

FROM: James D. Taylor
Senior Engineering Geologist (Spec)
Central Valley Regional Water Quality Control Board

DATE: 25 February 2016

SUBJECT: ***TECHNICAL MEMORANDUM: DIVERSION OF McCLELLAN TREATED GROUNDWATER FOR ALTERNATE USES, FORMER McCLELLAN AIR FORCE BASE (AFB), SACRAMENTO COUNTY***

REFERENCE: WASTE DISCHARGE REQUIREMENTS FOR THE UNITED STATES DEPARTMENT OF THE AIR FORCE, AIR FORCE REAL PROPERTY AGENCY, FORMER McCLELLAN AIR FORCE BASE, GROUNDWATER EXTRACTION AND TREATMENT SYSTEM, SACRAMENTO COUNTY, ORDER R5-2014-0055, NPDES NO. CA0081850

PURPOSE

The purpose of this technical memorandum is to document the diversion of a portion of the treated groundwater at the former McClellan AFB from discharge to surface water to alternate uses.

BACKGROUND

Currently, the McClellan groundwater treatment plant (GWTP) provides treatment for volatile organic compounds (VOCs) and hexavalent chromium at a rate of approximately 1,400 gallons per minute (gpm) for a total daily discharge of 2.02 million gallons per day.
The treated groundwater is discharged into Magpie Creek under Central Valley Regional Water Quality Control Board (Central Valley Water Board) Order R5-2014-0055 (NPDES No. CA0081850). McClellan is a federal superfund site operating under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and as such the Air Force does not recognize the Central Valley Water Board permit, but incorporates the substantive requirements of the permit into a CERCLA equivalent document, in this case the CERCLA required GWTP Operations and Maintenance Manual (O&M Manual).

PROPOSAL NO. 1 FOR USE OF TREATED GROUNDWATER

Because of the current drought and the desire to utilize the treated groundwater at McClellan to minimize the impact on local water supply sources, the Office of the Secretary of Defense Defense MicroElectronics Activity (DMEA), has proposed utilizing a portion of the treated groundwater from the McClellan GWTP for industrial purposes and meet Basin Plan preferences for discharge of water (wastewater reuse policy). Specifically, the treated groundwater is proposed to be used in their semiconductor fabrication laboratory. The proposal from DMEA would provide for the construction of conveyance piping from the McClellan GWTP to the DMEA Building 2 located at McClellan Business Park, and utilize approximately 250 gpm of the treated groundwater (estimated at 360,000 gallons per day or 6 to 9 million gallons per month). DMEA estimates potential future needs will require the operations to expand to a new building that may increase the request for McClellan treated groundwater by approximately 350 gpm. If the DMEA operations expand to their peak, use of treated groundwater could eventually reach approximately 600 gpm (or 864,000 gpd, 25 to 27 million gallons per month). The water used in the semiconductor operation is currently, and will continue to be, discharged to the sanitary sewer under permit with the regional waste water treatment plant (Note: DMEA currently operates at McClellan in a building that utilizes Sacramento Suburban Water District water).

PROPOSAL NO. 2 FOR USE OF TREATED GROUNDWATER

The property manager at McClellan (McClellan Business Park, LLC) and the Air Force (represented by the Air Force Civil Engineer Center, AFCEC) also propose utilizing the treated groundwater from the McClellan GWTP for the following purposes:

1. Dust suppression for construction projects (via water trucks);

2. firefighting (CalFire proposes offsite seasonal use of treated groundwater in batches mixed with fire retardant delivered to fires via air tankers, treated water is proposed to be delivered from the GWTP to the CalFire mixing site via a new conveyance line);

3. water for construction site cleanup (via water trucks);

4. landscape irrigation for established plantings (via water trucks); and,

5. other compatible and appropriate uses at McClellan Park (See Other Substantive Requirements (No. 2 on page 4) of this Technical Memorandum (unspecified compatible and appropriate uses at McClellan Park require notification and approval by Central Valley Water Board staff before implementation).

Of these proposed uses, landscape irrigation for established plantings has the most immediate need. For the irrigation proposal, treated groundwater would be conveyed to planted median strips and local area trees via a water truck on an as needed basis. For the alternate uses of treated groundwater to be delivered to sites via water truck, the number of loads needed could be as few as 1 or 2 truckloads per day (e.g., for irrigation) to as many loads that could be hauled in the course of a normal 8-hour work day for dust control at future construction projects. The amount of treated groundwater diverted from the GWTP discharge of 1,400 gpm for these alternate uses would have minimal impact to the overall discharge into the receiving waters of Magpie Creek.

WATER QUALITY OF TREATED GROUNDWATER

The treated groundwater at McClellan meets all discharge limits required by Central Valley Water Board Order R5-2014-0055 (NPDES No. CA0081850). The treated groundwater meets all California Toxic Rule requirements, VOCs are treated to non-detectable concentrations, and hexavalent chromium is treated to below 10 ug/L to meet effluent limits of 11 ug/L (monthly average) and 12 ug/L (daily maximum). Depth to groundwater is approximately 110 feet below ground surface. The treated groundwater poses no threat to surface water or groundwater quality. The reduction in the volume of treated groundwater discharged to Magpie Creek is not anticipated to impact downstream beneficial uses.

The use of treated groundwater under the proposed alternatives described above will substantively meet the requirements of Central Valley Water Board's *Order No. R5-2015-0012, Waste Discharge Requirements, General Order for In-Situ Groundwater Remediation and Discharge of Treated Groundwater to Land* (General Order). The General Order is provided as an attachment to this technical memorandum. To assure that the use of treated groundwater substantively complies with the General Order, the Air Force will update the GWTP O&M Manual to document the proposed use alternatives and incorporate the substantive requirements of the General Order.

SUBSTANTIVE REQUIREMENTS OF THE GENERAL ORDER

The following substantive requirements from the General Order apply to the proposed alternative uses of treated groundwater:

1. As required by the General Order, Section E.4: *"In the cases where treated groundwater as part of a groundwater extraction and treatment system is discharged, or as part of an in-situ treatment project discharge outside of the plume, then the discharge shall not contain pollutants, for which the Discharger is responsible for, in excess of the values found in Table 1."*

   Table 1: Effluent Limits for groundwater discharged to land (above or below ground surface:

Constituent	Effluent Limit
trichloroethene	0.5 µg/L
tetrachlorethene	0.5 µg/L
vinyl chloride	0.5 µg/L
cis 1,2-dichlorethene	0.5 µg/L
1,2-dichlorethene	0.5 µg/L
1,2-dichloroethane	0.4 µg/L
1,1-dichloroethene	0.5 µg/L
1,1-dichloroethane	0.5 µg/L
1,2,3-trichloropropane	0.5µg/L
1,2-dichloropropane	0.5 µg/L
1-chloropropane	0.5 µg/L
propene	28 µg/L
perchlorate	6 ug/L
carbon tetrachloride	0.5 µg/L
cyanide	10 µg/L
dieldrin	0.0022 µg/L

2. As required by the General Order, Section G.9: *"In the event of a violation of the order, or any material change in the character, location, or volume of the discharge, or if the Discharger is unable to comply with any of the conditions of this Order due to:*

   a. *breakdown of any facility or control system or monitoring equipment installed by the Discharger to achieve compliance with this Order;*

   b. *migration or application of amendments, pollutants or byproducts outside the specified treatment and transition areas;*

   c. *accidents caused by human error or negligence; or*

   d. *other causes such as acts of nature;*

   the Discharger shall notify the Regional Water Board by telephone within 24-hours after he or his agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring. The reporting of migration or application of amendments, waste constituents or byproducts outside the specified treatment and transition areas shall include an assessment of and schedule for implementation of the contingency plans required in the Notice of Applicability."

OTHER SUBSTANTIVE REQUIREMENTS

In addition to substantive compliance with the General Order provisions identified above, the following other substantive requirements are identified that are specific to the proposed alternative uses of treated groundwater at the former McClellan AFB:

1. With the exception of use of treated groundwater for firefighting purposes (delivered via air tankers to offsite fires), the treated groundwater will only be used within the boundary of the former McClellan AFB.

2. Any unspecified compatible and appropriate uses of treated groundwater at McClellan Park require notification and approval by Central Valley Water Board staff before implementation. The Discharger shall notify Central Valley Water Board staff of any proposed use of treated groundwater that is not specifically identified in this Technical Memorandum or the revised Air Force O&M Manual.

3. The alternate uses of treated groundwater should be controlled such that run off into storm drain inlets and surface water bodies (e.g., creeks, drainage swales, and vernal pools is prevented.

4. The Air Force will revise the GWTP O&M Manual to identify any alternative uses of treated groundwater and include the substantive requirements of the General Order, Sections E.4. and G.9, and the other substantive requirements identified above.

EXPECTED OUTCOMES

The proposed diversion of treated groundwater at the former McClellan AFB for alternate uses is not anticipated to impact the beneficial uses of surface water or groundwater. The diversion of treated groundwater for the proposed alternate uses will provide local water purveyors an overall benefit from reduced use of limited groundwater supplies from public water supply wells and systems. If managed properly, the use of treated groundwater for irrigation purposes should not cause discharges to drain inlets or surface water bodies. Central Valley Water Board staff will continue to provide oversight of the GWTP discharge of treated groundwater under the active NPDES Permit and any alternate uses of treated groundwater in the future by the Air Force or McClellan Business Park entities.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2015-0012

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR IN-SITU GROUNDWATER REMEDIATION AND DISCHARGE OF TREATED GROUNDWATER TO LAND

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

1. On 6 December 2008 the Regional Water Board adopted General Order No. R5-2008-0149, General Order for In-Situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds, Hexavalent Chromium and/or Petroleum Hydrocarbons. Between 2008 and 2014, over 50 Notices of Applicability (NOA) were issued for coverage under Order R5-2008-0149. It was apparent that some improvements to the order were warranted. The significant improvements consist primarily of additions to the pollutants covered under the order, specifying effluent limitations if an ex-situ treatment system is utilized, adding discharge of treated groundwater as part of a pump and treat system, and incorporating several modifications to the monitoring and reporting program to increase its functionality and versatility.

2. Order R5-2008-0149 and the NOAs issued pursuant to that Order are still in effect. No additional NOAs will be issued under that Order. The Order will be proposed for rescission once all of the projects under that Order are completed and the NOAs issued have been terminated. This updated version of the Order is not more restrictive to the projects covered under Order No. R5-2008-0149 and thus it is not necessary to enroll them under this Order.

3. Pursuant to Section 13263, subdivision (i) of the California Water Code (CWC), the Regional Water Quality Control Board may prescribe general waste discharge requirements (WDRs) for discharges produced by similar operations, involving similar types of wastes, and requiring similar treatment standards.

4. Discharges of volatile organic compunds (VOCs), perchlorate, nitrogen, pesticides, semi-volatile compounds, hexavalent chormium, sulfate and petroleum hydrocarbons have degraded groundwater at numerous sites within the Central Valley Region and cause or threaten to cause pollution or nuisance and adversely affect existing and potential beneficial uses of groundwater resources. Remediation of groundwater at these sites includes the use and application of in-situ biological, chemical, and/or physical treatments to degrade pollutants, or change them to less toxic or less mobile forms.

5. In-Situ remediation processes include adding amendments to create oxidizing or reducing conditions in the groundwater. Examples of such amendments include oxygen, alcohols, sugars, permanganate, ozone and lactate. Amendments may also be added to enhance bacteria populations. Examples of those amendments include nutrients (phosphorous,

nitrogen, potassium) and microbes. The amendments are usually injected into the treatment area or are added to extracted groundwater and recharged into the treatment area followed by extraction in a recirculation mode. The remediation may include extraction and treatment of groundwater, with the discharge of the treated groundwater back to the aquifer, applied to the land surface or injected into the vadose zone.The remediation processes can include groundwater extraction, treatment, and recirculation or discharge of treated groundwater to ground within the area undergoing treatment. For example, amendments may be injected into the treatment zone, or actively circulated through the treatment zone with groundwater recirculation. Treated groundwater may be discharged and further treated by land application. Pollutants other than those listed above, amendments, and treatment processess other than those listed, may also be considered for use under this Order. For those instances the applicability of the technology to the pollutant must be demonstrated, such as in a pilot test. Additional details are supplied in the Information Sheet, attached to this Order.

6. Adoption of general WDRs for the these processes would: a) simplify the application process for dischargers, b) prevent regulatory delays to groundwater remediation activities, c) reduce time needed for Regional Water Board staff to prepare and the Regional Water Board to adopt WDRs for common remedial activities in the Central Valley Region, d) enhance protection of surface water quality by eliminating some discharges of treated groundwater to surface water, and e) provide a comparable level of water quality protection to individual, site-specific WDRs.

7. This Order regulates the use and application of in-situ biological, chemical, and physical treatments to clean up waste constituents in groundwater. The dischargers regulated by this Order are more appropriately regulated by general WDRs than individual WDRs because the Regional Water Board regulates many sites using this type of process, the cleanup of these type of sites is of high priority and the issuance of individual WDRs is time-consuming without providing additional benefit, and the types of treatment used have similar effects that can reasonably be regulated with general WDRs. This Order does not preclude the adoption of individual WDRs where appropriate.

8. The amendments that can be used to remediate groundwater pollution at a site in the Central Valley Region under this Order are limited to those listed in the CONDITIONS OF ELIGIBILITY, listed below. This Order is not intended for use and application of other materials to remediate groundwater pollution or for remediation of waste constituents in groundwater other than VOCs, perchlorate, nitrogen compounds (nitrate, ammonia, etc.), some selected pesticides and semi-volatile organic compounds, sulfate and petroleum hydrocarbons, unless it is demonstrated in a bench test that the technology is likely to be effective on the particular pollutant under site specific conditions.

9. The application of any material to groundwater may result in unintended adverse effects to groundwater quality. To comply with this Order, any potential adverse water quality effects that may occur must be localized, of short-term duration, and may not affect existing or potential beneficial uses of groundwater. Groundwater quality will be monitored before and after addition of any materials to verify both the effectiveness of the remediation and that no long-term adverse affect on beneficial uses of groundwater has occurred.

10. The addition of materials to remediate groundwater may require bench-scale and/or small-scale pilot testing prior to design and implementation of full-scale remediation. The addition of amendments to conduct pilot studies is also covered under this Order.

REGULATORY CONSIDERATIONS

11. *The Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins, Fourth Edition* and *The Water Quality Control Plan, Second Addition, for the Tulare Lake Basin* (hereafter Basin Plans) designate beneficial uses, establishes water quality objectives (WQOs), contains prohibitions, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Water Board). Pursuant to ¶ 13263(a) of the California Water Code (CWC), waste discharge requirements must implement the Basin Plans.

12. The designated beneficial uses of underlying groundwater include, but are not limited to:

    a. Municipal and domestic water supply (MUN);
    b. Agricultural water supply (AGR);
    c. Industrial service supply (IND); and
    d. Industrial process supply (PRO).

13. The Basin Plans establish numerical and narrative water quality objectives for surface water and groundwater within the basin, and recognizes that water quality objectives are achieved primarily through the Board's adoption of waste discharge requirements and enforcement orders. Where numerical water quality objectives are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative water quality objectives is required, the Board will, on a case-by-case basis, adopt numerical limits in orders, which will implement the narrative objectives to protect beneficial uses of the waters of the state. Finding No. 18 lists those numerical limits for compliance with the narrative objectives for this Order.

14. The Basin Plans identify numerical water quality objectives for waters designated as municipal supply. These are the maximum contaminant levels (MCLs) specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) of Section 64449. The Basin Plans' incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plans recognize that the Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.

15. The Basin Plans contain narrative water quality objectives for chemical constituents, tastes and odors, and toxicity. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological

responses in humans, plants or animals. The chemical constituent objective requires that groundwater shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The tastes and odors objective requires that groundwater shall not contain tastes or odors producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

16. State Water Board Resolution No. 92-49 (hereafter Resolution No. 92-49) requires the Regional Board to require actions for cleanup and abatement of discharges that cause or threaten to cause pollution or nuisance to conform to the provisions of State Water Board Resolution No. 68-16 (hereafter Resolution No. 68-16) and the Basin Plan. Pursuant to Resolution No. 92-49, the Regional Board shall ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality, or if background levels of water quality cannot be restored, the best water quality which is reasonable and which complies with the Basin Plan including applicable WQOs.

17. Resolution No. 68-16 requires the Regional Board in regulating discharges to maintain high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses, and will not result in water quality less than that described in plans and policies (e.g., quality that exceeds WQOs). Temporal degradation of groundwater may occur at sites subject to this Order within the defined treatment zone due to the amended groundwater injection. The temporary degradation allowed by this Order is consistent with Resolution No. 68-16 since (1) the purpose is to accelerate and enhance remediation of groundwater pollution and such remediation will benefit the people of the State; (2) the discharge facilitates a project to evaluate the effectiveness of cleanup technology in accord with Resolution No. 92-49; (3) the degradation is limited in scope and duration; (4) best practicable treatment and control, including adequate monitoring and a contingency plan to assure protection of water quality are required; and (5) the discharge will not cause WQOs to be exceeded beyond the transition zone and it is expected that increases in concentrations above WQOs caused by the treatment will be reduced over time. If the background concentration of a not-targeted-for-remediation constituent already exceeds the WQO listed in Finding 18, then the concentration of the constituent in the amendment as added to groundwater cannot exceed the WQO for that constituent. A slight residual increase in salts may occur at some sites subject to this Order but will be limited to a maximum 20 percent increase over background and less than the WQO listed below in Finding No. 18**.** See Groundwater Limitation E.3.

18. This Order addresses water quality as it relates to the amendments being injected, as well as the byproducts and breakdown products produced by the reactions of the injectants, pollutants being treated and native geological materials. Cleanup criteria for groundwater are established in an appropriate enforcement document such as a Record of Decision, Cleanup and Abatement Order, or Remedial Action Plan and are not discussed further as a part of this Order. As discussed above, amendments are injected to groundwater to stimulate reduction in concentrations of the target waste constituent and the target waste constituent may undergo a series of transformations to other constituents as it degrades.

The injected chemical itself may leave residuals of its constituent components, as well as cause changes in groundwater chemistry that liberate metals found in the formation geo-materials. Background/baseline concentrations of metals and total dissolved solids will be established pursuant to the attached Monitoring and Reporting Program. The applicable WQOs are the narrative toxicity objective, Primary and Secondary Maximum Contaminant Levels, and the narrative taste and odor objective as found in the Basin Plan. Numerical limits in this Order implement those WQOs. The following Table presents the numerical WQOs for potential waste constituents of concern at the site:

Constituent	WQO	Reference
trichloroethene	0.8 µg/L	California Public Health Goal
tetrachlorethene	0.06 µg/L	California Public Health Goal
vinyl chloride	0.05 µg/L	California Public Health Goal
cis 1,2-dichlorethene	6 µg/L	Primary Maximum Contaminant Level
1,2-dichlorethene	10 µg/L	Primary Maximum Contaminant Level
1,2-dichloroethane	0.4 µg/L	California Public Health Goal
1,1-dichloroethene	6 µg/L	Primary Maximum Contaminant Level
1,1-dichloroethane	3 µg/L	California Public Health Goal
1,2,3-trichloropropane	0.0007 µg/L	Draft California Public Health Goal
1,2-dichloropropane	0.5 µg/L	California Public Health Goal
1-chloropropane	280 µg/L	IRIS
propene	28 µg/L	Taste and Odor
iron	300 µg/L	Secondary Maximum Contaminant Level
manganese	50 µg/L	Secondary Maximum Contaminant Level
hexavalent chromium	10 µg/L	California Maximum Contaminant Level
total chromium	50 µg/L	Primary Maximum Contaminant Level
total dissolved solids	500 mg/L	Secondary Maximum Contaminant Level
sulfate	250,000 µg/L	Secondary Maximum Contaminant Level
sodium	20,000 µg/L	USEPA Health Advisory
bromate	10 µg/L	Primary Maximum Contaminant Level
chloride	106,000 µg/L	Agricultural Water Quality Goal – Food and Ag
Nitrate-N	10,000 ug/L	Primary Maximum Contaminant Level
Ammonium	1,500 ug/L	Taste and Odor
Perchlorate	6 ug/L	Primary Maximum Contaminant Level
Petroleum Hydrocarbons (gasoline)	5 ug/L	Taste and Odor
Diesel Oil	100 ug/L	Taste and Odor
Cyanide	150 µg/L	California Maximum Contaminant Level

19. Some amendments used to stimulate degradation of waste constituents in groundwater have a salt component (generally sodium or potassium). Upon completion of the intended degradation process, the salt component remains. The groundwater in the Central Valley is severely degraded by salts and the Regional Water Board is intent on minimizing the discharge of salts to the groundwater. The use of non salt-containing injectants is preferred, and the Discharger is required to demonstrate that there are no non salt-containing injectant alternatives that will cost-effectively promote the degradation of the target constituent before being allowed to use a salt-containing injectant. See Discharge Specification D.3. Furthermore, the Discharger is required to establish background salt concentrations (total dissolved solids) and monitor the groundwater for changes in salt

concentrations during the life of the project. Increases in salt concentrations in ground water are restricted by Groundwater Limitation E.3, below.

20. On 6 February 2015, the Regional Water Board adopted a Mitigated Negative Declaration for this Order pursuant to the f the California Environmental Quality Act (Public Resources Code Section 21000, et seq.).

21. The discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* set forth in the Title 27, California Code of Regulations (CCR), section 20005 *et seq*. (hereafter Title 27), which allows a conditional exemption from some or all of the provisions of Title 27. The exemption, pursuant to Title 27 CCR Section 20090(b), is based on the following:

a. The Regional Water Board is issuing waste discharge requirements.
b. The discharge is in compliance with the applicable Basin Plans.
c. The wastewater does not need to be managed according to Title 22CCR, Division 4.5 and Chapter 11 as a hazardous waste.

Section 20090(d) allows exemption for a project to cleanup a condition of pollution that resulted from an unauthorized discharge of waste based on the following:

d. The application of amendments to groundwater is at the direction of the Regional Water Board to cleanup and abate conditions of pollution or nuisance resulting from the unauthorized discharge of waste.
e. Wastes removed from the immediate place of release must be discharged according to the Title 27 regulations; and
f. The cleanup actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.

22. Section 13267(b) of the California Water Code provides that:

"In conducting an investigation specified in subdivision (a), the Regional Board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste outside of its region that could affect the quality of the waters of the state within its region shall furnish under penalty of perjury, technical or monitoring program reports which the Regional Board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring these reports, the Regional Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports."

The technical reports required by this Order and the attached Monitoring and Reporting Program are necessary to assure compliance with this Order. The Discharger operates the facility that discharges the waste subject to this Order.

23. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells, as described in *California Well Standards Bulletin No. 74-90* (June 1991) and *Water Well Standards: State of California Bulletin No. 94-81* (December 1981). These standards, and any more stringent standards implemented by the Regional Water Board or adopted by the local county where the site is located pursuant to California Water Code Section 13801 apply to all monitoring and injection wells.

24. Section 3020(b)(2) of the Resource Conservation and Recovery Act (RCRA) states that prior to injection into or above an underground source of drinking water, contaminated groundwater shall be "…treated to substantially reduce hazardous constituents prior to such injection." In a letter dated 10 December 1999, the United States Environmental Protection Agency, Office of Solid Waste and Emergency Response (OSWER) states, "if extracted groundwater is amended at the surface (i.e., "treated") before reinjection, and the subsequent in-situ bioremediation achieves a substantial reduction of hazardous constituents the remedy would satisfy Section 3020(b)(2)." The injection of groundwater within the treatment zone in compliance with this Order, with or without the treatment for the constituents of concern, complies with Section 3020(2)(b) of RCRA.

25. Section 13304.1(b) of the California Water Code requires that the Regional Board shall consult with the affected groundwater management entity, if any, affected public water systems, and the State Department of Public Health prior to setting applicable water quality standards to be achieved at groundwater cleanup sites that are associated with an aquifer that is used as a drinking water source. Prior to issuing a Notice of Applicability under this Order for a specified project, the Regional Board will consult with the appropriate interested agencies.

26. Section 13307.5 of the California Water Code requires specific public participation actions if the site cleanup is being undertaken pursuant to a cleanup and abatement order. When applying this Order to sites subject to a cleanup and abatement order, the required public participation will be adhered to.

OTHER

27. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

28. All the above and the supplemental data and information and details in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge.

29. The Discharger and interested agencies and persons were notified of the intent to prescribe waste discharge requirements for this discharge and provided with an opportunity for a public hearing and an opportunity to submit written comments.

30. In a public meeting, all comments pertaining to this Order were heard and considered.

IT IS HEREBY ORDERED that, pursuant to Sections 13263 and 13267 of the California Water Code, Dischargers, in order to meet the provisions contained in Division 7 of the California Water Code, and regulations and guidelines adopted thereunder, shall comply with the following:

A. CONDITIONS OF ELIGIBILITY

1. A discharger may seek coverage under this Order to:

    a. Add specific amendments directly to groundwater or indirectly through the soil column for the purpose of facilitating in situ remediation of waste constituents. The Discharger must demonstrate the effectiveness of the selected amendment(s), and demonstrate control of side reactions and breakdown products under site conditions.

2. To be covered under this Order, a discharger must provide the following:

    a. A Notice of Intent/Report of Waste Discharge (Attachment A) following the instructions included in Attachment B, including additional information as required in Attachment 1 to the Notice of Intent;

    b. A Regional Water Board approved Work Plan, Work Plan Addendums (if applicable), and/or a Remedial Action Plan or Cleanup Plan which includes application of an amendment that qualifies for coverage under this Order (The approval for the Work Plan or Remedial Action Plan needs to be dated within 24 months of the date of the Notice of Intent);

    c. A proposed Monitoring and Reporting Program, based on Attachment C, incorporated herein by reference;

    d. The first annual fee in accordance with the current version of the California Code of Regulation, Title 23, Division 7, Chapter 9, Waste Discharge Report and Requirements Article 1 -- fees for a discharge. The check or money order shall be made payable to the “State Water Resources Control Board”.

    e. A Contingency Plan to be implemented to correct unacceptable water quality effects.

3. This Order covers the following actions:

a. Pilot studies of limited extent and duration:

    i. When the amendments have previously been demonstrated (previous pilot tests or full-scale operations) to achieve the desired results and side reactions, byproducts, breakdown products, and residuals are understood.
    ii. When processes to remove byproducts, breakdown products, and residuals are identified and discussed in the Remedial Action Work Plan or Report of Waste Discharge.

b. Full-scale applications:

    i. When it has been demonstrated in a pilot study, or full-scale application at this site or a similar site, that the desired results can be achieved and side reactions, breakdown products, and residuals do not result in long-term adverse water quality effects.

4. Coverage under this Order applies to the following groups of amendments, except as specifically excluded in A5 below, provided the conditions in A1, A2, and A3 are satisfied:

    a. Amendments that create reducing conditions (i.e., amendments that provide carbon, energy, electrons and/or macronutrients). Examples include:

        i. Zero valent metals such as iron or zinc
        ii. Easily degradable carbon sources such as glucose, acetate, citric acid, acetic acid, ethanol, methanol and others
        iii. Slowly degradable carbon sources such as edible oils, poly-lactate, and other hydrogen release compounds
        iv. Polysulfides
        v. Macro nutrients such as nitrate, phosphate, and potassium
        vi. Microorganisms cultured on site materials.

    b. Amendments that create oxidizing conditions (i.e., amendments that provide oxygen or otherwise gain electrons). Examples include:

        i. Air
        ii. Oxygen
        iii. Ozone
        iv. Potassium or sodium permanganate
        v. Oxygen release compounds
        vi. Hydrogen peroxide

c. Multiple amendments (includes application of reducing agents or oxidizing agents or both applied concurrently or over time as proposed in an approved Work Plan and the Notice of Intent). Examples include:

   i. Establishing a reducing zone immediately downgradient of an oxidizing zone to reduce hexavalent chromium that may be produced under oxidizing conditions
   ii. Providing a slowly degradable carbon source along with polysulfides to precipitate sulfates as metal sulfides.

d. Tracer compounds as discussed in Attachments A and B (Notice of Intent/Report of Waste Discharge).

e. Biofouling control agents such as chlorine dioxide, chlorine and bleach.

5. Amendments specifically excluded from coverage under this Order:

   a. Amendments that may cause violent exothermic reactions, such as Fenton's reagent.

B. NOTIFICATION OF COVERAGE

Project coverage under this Order shall not take effect until the Executive Officer notifies the Discharger in writing, by issuance of a Notice of Applicability which shall be a part of this Order, that coverage has been issued. The Executive Officer will not issue notification of project coverage under this Order prior to providing notice and a 30-day public comment period on the proposed issuance of coverage. Notification of project coverage under this Order shall not be issued if the Executive Officer finds that there may be significant effects on water quality, or finds that significant public controversy has arisen or will likely arise from the issuance of project coverage by this Order and that individual Waste Discharge Requirements should be considered at a regularly scheduled Regional Water Board meeting.

C. DISCHARGE PROHIBITIONS

1. The discharge of any amendment or other materials not specifically regulated by this Order is prohibited. These amendments and materials are those listed in the approved Work Plan required in A.2.b and the Notice of Applicability, as listed above.

2. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.

3. The discharge of amendments or wastes to surface water or surface water drainage courses is prohibited.

4. The discharge of amendments to land or groundwater in areas other than that proposed for remediation is prohibited.

5. Discharge of waste classified as 'hazardous' under Section 2521, Chapter 15 of Title 23 or 'designated', as defined in Section 13173 of California Water Code is prohibited.

6. The discharge of amendments to property that is not under the control of the Discharger is prohibited. The “area under the control” of the Discharger is considered to be at the horizontal borders of the application area and owned by the Discharger and/or where the Discharger holds an agreement with the property owner for purposes of investigation and remediation.

7. If background groundwater contains concentrations of a constituent found in the amendment, above its WQO as listed in Finding 18, then the concentration of the consituent in the amendment as added cannot be greater than its WQO.

D. DISCHARGE SPECIFICATIONS

1. The Discharger shall not inject any amendments into the aquifer prior to receiving the Notice of Applicability nor prior to the construction of all necessary monitor wells listed in the Monitoring and Reporting Progam.

2. The groundwater shall not be amended with materials other than those approved in the Notice of Applicability.

3. The Discharger will minimize the amount of amendments injected to the extent practicable.

E. GROUNDWATER DISCHARGE SPECIFICATIONS

1. The discharge from a groundwater treatment plant shall be only to those locations shown on Attachment E as provided with each individual Notice of Applicability.

2. The discharge flow from the groundwater treatment system shall not exceed that specified in the Notice of Applicablility.

3. In the cases where treated or amended groundwater is recirculated back into the contaminant plume as part of in-situ treatment, non-target pollutants in the injectant must meet the limitations in Table 1 below or background concentrations as determined under Monitoring and Reporting Program R5-2015-0012.

4. In the cases where treated groundwater as part of a groundwater extraction and treatment system is discharged, or as part of an in-situ treatment project discharge outside of the plume, then the discharge shall not contain pollutants, for which the

Discharger is responsible for, in excess of the values found in Table 1. For constituents that are not the responsibility of the Discharger, the concentrations shall not exceed background values as established under Monitoriing and Reporting Program R5-2015-0012.

Table 1: Effluent Limits for groundwater discharged to land (above or below ground surface:

Constituent	Effluent Limit
trichloroethene	0.5 µg/L
tetrachlorethene	0.5 µg/L
vinyl chloride	0.5 µg/L
cis 1,2-dichlorethene	0.5 µg/L
1,2-dichlorethene	0.5 µg/L
1,2-dichloroethane	0.4 µg/L
1,1-dichloroethene	0.5 µg/L
1,1-dichloroethane	0.5 µg/L
1,2,3-trichloropropane	0.5µg/L
1,2-dichloropropane	0.5 µg/L
1-chloropropane	0.5 µg/L
propene	28 µg/L
perchlorate	6 ug/L
carbon tetrachloride	0.5 µg/L
cyanide	10 µg/L
dieldrin	0.0022 µg/L

5. In the case of application of extracted groundwater to land as part of a phytoremediation project, then the discharge shall not contain concentrations of pollutants that are not targeted for phytoremediation in excess of those in Table 1. For pollutants not found in Table 1, the concentrations shall not exceed background concentrations as established under Monitoring and Reporting Program R5-2015-0012. In addition, if the phytoremediation project is for the remediation of nitrogen, then the discharge shall not be excess of the value detemined to be needed for plant growth as specified in the Notice of Applicablity.

F. GROUNDWATER LIMITATIONS

1. The discharge shall not cause the pH of the groundwater at the compliance points, downgradient and outside the treatment and transition zones, to shift outside the range of 6.5 to 8.5.

2. The release, injection, discharge, or addition of amendments from a remediation system shall not cause the groundwater at the compliance wells listed in Table 1 of the Monitoring and Reporting Program, which is attached to the Notice of Applicability, and any revisions thereto, to contain concentrations of chemical constituents, including the amendments and by-products of the in-situ treament process, in amounts that exceed the Water Quality Objectives listed in Finding No. 18.

3. The release, injection, discharge or addition of amendments from a remediation system shall not cause the groundwater at the compliance wells listed in Table 1 of the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto, to contain concentrations of metals, total dissolved solids, or electrical conductivity that are more than 20% greater than their respective background concentrations, as established by the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto.

4. The release, injection, discharge or addition of amendments from a remediation system shall not cause the groundwater to contain taste or odor producing substances that cause nuisance or adversely affect beneficial uses at the compliance monitor points designated in Table 1 of the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto.

G. PROVISIONS

1. The Discharger shall comply with all applicable Standard Provisions and Reporting Requirements for Waste Discharge Requirements, dated 1 March 1991, which are attached hereto and by reference a part of this Order. This attachment and its individual paragraphs are commonly referenced as Standard Provisions.

2. The Discharger shall comply with the Monitoring and Reporting Program, attached to the Notice of Applicability, and any revisions thereto, as ordered by the Executive Officer.

3. If an aboveground groundwater treatment system is used, then **at least 15 days prior to the commencement of operation** the Discharger shall submit an Operation and Maintenance (O&M) Plan for the groundwater treatment facilities. The O&M Plan shall instruct field personnel on how to manage the day-to-day discharge operations to comply with the terms and conditions of this Order and how to make field adjustments, as necessary. A copy of the O&M Plan shall be kept at the facility for reference by operating personnel. Key personnel shall be familiar with its contents. The O&M plan shall be modified as needed to respond to changes in system operations.

4. The Discharger may be required to submit technical reports pursuant to California Water Code Section 13267 as directed by the Executive Officer. The technical reports required by this Order are necessary to assure compliance with this Order.

5. All technical reports required herein that involve planning, investigation, evaluation, or design or other work requiring interpretation or proper application of engineering or geologic sciences, shall be prepared by, or under the direction of, persons registered to practice in California pursuant to California Business and Professions Code, sections 6735, 7835 and 7835.1. To demonstrate compliance with Title 16, CCR, Sections 415 and 3065, all technical reports must contain a statement of the

qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

6. A copy of this Order shall be maintained at the project site and be available at all times to operating personnel.

7. Provisions of this Order are severable. If any provision of these requirements is found invalid, the remainder of this Order shall not be affected.

8. The Discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed by the discharger to achieve compliance withthis Order.

9. In the event of a violation of the order, or any material change in the character, location, or volume of the discharge, or if the Discharger is unable to comply with any of the conditions of this Order due to:

   a. breakdown of any facility or control system or monitoring equipment installed by the Discharger to achieve compliance with this Order;

   b. migration or application of amendments, pollutants or byproducts outside the specified treatment and transition areas;

   c. accidents caused by human error or negligence; or

   d. other causes such as acts of nature;

   the Discharger shall notify the Regional Water Board by telephone within 24-hours after he or his agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring. The reporting of migration or application of amendments, waste constituents or byproducts outside the specified treatment and transition areas shall include an assessment of and schedule for implementation of the contingency plans required in the Notice of Applicability.

10. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharger shall notify the succeeding owner or operator of the following items by letter, in advance of the transfer of ownership or control, a copy of the notice must be forwarded to the Regional Water Board:

a. existence of this Order; and
b. the status of the discharger's annual fee account

11. This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the discharger from his liability under Federal, State, or Local laws, nor create a vested right for the discharger to continue the waste discharge.

12. Chemical, bacteriological, and bioassay analyses must be conducted at a laboratory certified for such analyses by the State Department of Public Health.

13. All reports, Notice of Intent, or other documents required by this Order, and other information requested by the Regional Water Board shall be signed by a person described below or by a duly authorized representative of that person.

    a. for a corporation: by a responsible corporate officer such as: (a) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; (b) any other person who performs similar policy or decision making functions for the corporation; or (c) the manager of one or more manufacturing, production, or operating facilities if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

    b. Reports required by this Order, other information requested by the Regional Water Board, and Notices of Intent may be signed by a duly authorized representative provided:

        i. the authorization is made in writing by a person described in paragraph (a) of this provision;

        ii. the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and

        iii. the written authorization is submitted to the Regional Water Board prior to or together with any reports, information, or applications signed by the authorized representative.

    c. Any person signing a document under paragraph (a) or (b) of this provision shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly

gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

14. The Discharger shall permit authorized staff of the Regional Water Board:

    a. entry to the project site covered by this Order or in which any required records are kept;

    b. access to copy any records required to be kept under terms and conditions of this Order;

    c. inspection of monitoring equipment or records; and

    d. sampling of groundwater or any discharge .

15. The Regional Water Board may review this Order periodically and may revise requirements when necessary. In addition, the discharger shall file a report of waste discharge with the Executive Officer at least 120 days before making any material change or proposed change in the character, location, or volume of the discharge.

16. This Order is in effect until terminated by the Executive Officer. Project coverage under this Order may be terminated by the Executive Officer at any time upon giving reasonable notice to the discharger.

I, Pamela C. Creedon, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 6 February 2015.

_Original Signed by:_____
PAMELA C. CREEDON, Executive Officer

9/30/2014: AMM-AST-MLP

Volatile organic compounds (VOCs), petroleum hydrocarbons, perchlorate and fumigants have impacted groundwater at numerous sites within the Central Valley Region and cause or threaten adverse impacts to existing and potential beneficial uses of groundwater resources. Those sites are being required to clean up the pollution and restore the beneficial uses of the groundwater. This cleanup can take many forms. The two most common methods of cleanup of groundwater pollution are pump and treat, and in-situ remediation. The operation and discharge of a pump and treat system is generally regulated under site-specific or general waste discharge requirements. Prior to this General Order, General Order No. R5-2008-0149 was adopted in December 2008 and this Order updates that Order. Before Order No. R5-2008-0149, in-situ groundwater remediation projects have had site-specific waste discharge requirements issued. The process to develop and adopt site-specific waste discharge requirements can be lengthy. Many in-situ treatment processes have common components and issues that can be regulated under general waste discharge requirements.

In-situ remediation of groundwater pollution at most sites includes the use and application of biological, chemical, and/or physical treatment processes. These processes include addition of oxygen, chemical oxidation/reduction, and the addition of nutrients, carbon and/or bacteria to enhance biodegradation. The method of delivery can be via injection to soil or groundwater in-situ, or via groundwater recirculation (extraction and treatment with return of treated groundwater to the impacted aquifer zone). In most instances the in-situ remediation processes will cause reducing or oxidizing conditions within the aquifer in order to either reduce or oxidize the target pollutant. The remediation processes can result in exceedances of water quality objectives that are generally limited in duration and/or in a relatively small portion of the aquifer. These waste discharge requirements allow exceedances of water quality objectives to occur while oxidation/reduction processes are taking place, but only within the treatment zone.

Oxidation/reduction reactions take place when an electron is transferred from one compound to another. The electron donor becomes oxidized, and the electron receptor becomes reduced. These are always coupled reactions. If a compound is reduced, another must necessarily be oxidized to provide the electron. Reducing environments are typified by the absence of oxygen and are can also be referred to as anaerobic environments. Oxidative environments contain oxygen and are also referred to as aerobic environments.

Reducing Environment Processes

The primary reduction processes that are effective on perchlorate, nitrate, sulfate and VOCs are anaerobic in nature as aerobic processes are generally not effective on most highly chlorinated VOCs. Aerobic dechlorination or aerobic cometabolism of perchloroethylene (PCE) and trichloroethylene (TCE) has not

been successful at most sites. Therefore, reductive dechlorination of VOCs requires development of anaerobic conditions within the groundwater contaminant plume. PCE can be sequentially reduced to TCE, thence to cis1,2-dichloroethylene, vinyl chloride and finally to ethane. Along the way the rate of reduction, consortium of bacteria involved in the process, and groundwater conditions may change. Reduction of VOCs may even stall at a stage if the correct conditions and bacteria are not present. Perchlorate reduction appears to occur more readily than VOCs and stalling at a particular stage in the dechlorination process does not occur.

In order to develop a reducing environment to achieve reduction of chlorinated hydrocarbons and perchlorate, concentrations of oxygen and nitrate need to be significantly depleted. Oxygen and nitrate are more easily reduced than the chlorinated compounds and will utilize the electrons preferentially over the chlorinated compounds. Elevated concentrations of dissolved iron and manganese may also inhibit reduction of the chlorinated hydrocarbons by being electron acceptors.

There are three types of anaerobic reduction that may be occurring:

- **Direct Anaerobic Reductive Dechlorination** is a biological reaction in which bacteria gain energy and grow as one or more chlorine atoms on the chlorinated hydrocarbon molecule are replaced with hydrogen. In this reaction, the chlorinated compound serves as the electron acceptor, and the hydrogen serves directly as the electron donor (USEPA, 2000a).

- **Cometabolic Anaerobic Reductive Dechlorination** is a reaction in which a chlorinated compound is reduced by a non-specific enzyme or co-factor produced during microbial metabolism of another compound (i.e., the primary substrate) in an anaerobic environment. For the cometabolic process to be sustained, sufficient primary substrate is required to support growth of the transforming microorganisms.

- **Abiotic Reductive Dechlorination** is a chemical degradation reaction, not associated with biological activity in which a chlorinated hydrocarbon is reduced by a reactive compound. Addition of an organic substrate and creation of an anaerobic environment may create reactive compounds, such as metal sulfides, that can degrade chlorinated aromatic hydrocarbons (ITRC, 2007).

Of those three, direct anaerobic reductive dechlorination is the primary process for biological reduction of VOCs. In order to accomplish the complete reduction to ethane, the appropriate species of bacteria must be present. Lacking the complete consortium of bacteria could cause the process to stall at cis-1,2-DCE and vinyl chloride. If this condition occurs, adding bacteria that are known to

effectively reduce cis-1,2-DCE and vinyl chloride is an option to correct the problem.

Hydrogen has a lead role as a direct electron donor in the anaerobic dechlorination of chlorinated aromatic hydrocarbons. Hydrogen is generated by fermentation of non-chlorinated organic substrates, including naturally occurring organic carbon, accidental releases of anthropogenic carbon (fuel), or introduced substrates such as carbohydrates (sugars), alcohols, and low-molecular-weight fatty acids (lactates, acetates, etc.). As hydrogen is produced by fermentative organisms, it is rapidly consumed by other bacteria, including denitrifiers, iron-reducers, sulfate-reducers, methanogens, and dechlorinating microorganisms. For anaerobic reductive dechlorination to occur, dechlorinators must successfully compete against other microorganisms that also utilize hydrogen (ITRC, 2007).

Generally, there are not sufficient numbers of bacteria naturally present to conduct an effective anaerobic dehalogenation process. To increase the concentration of bacteria biostimulation is implemented by injecting a carbon source or substate into the groundwater. For the degradation of chlorinated ethenes, the injected carbon source provides for cell growth and ferments to produce products like hydrogen, providing an electron donor for the reductive dechlorination process. By adding electron donors, methanogenic and/or sulfate-reducing conditions can be achieved at a site, which can be used to dechlorinate cis-1,2-DCE and vinyl chloride. Complete reductive dechlorination to ethene without the accumulation of cis-1,2-DCE and vinyl chloride is most likely to occur under these strongly-reducing conditions (ITRC, 2007).

Biostimulation also may include injecting limiting nutrients, such as phosphorus or nitrogen. The advantage of biostimulation is that native populations present in the subsurface are already acclimated to the site, so enhancements such as the addition of nutrients will increase their biodegradation capacity. The disadvantage is that subsurface geology of a site may interfere with the introduction of nutrients, including the formation of preferential flow patterns due to fractures and impermeable lithology affecting the distribution of additives. Important subsurface characteristics to consider for biostimulation include velocity of the groundwater, and hydraulic conductivity of the soil. Pilot studies are usually conducted to provide additional site-specific information before full-scale implementation (ITRC, 2007).

Substrates added to promote reductive dechlorination come in many forms and may be soluble, low viscosity, high viscosity or solid. Soluble substrates, such as sugars, citric acid and lactic acid, may be applied in an aqueous phase offering uniform distribution throughout the aquifer. These dissolved substrates travel with advective groundwater flow and are typically applied continuously or periodically. The soluble substrates are consumed rather quickly and must be frequently replenished.

Substrates that are viscous are less mobile than soluble substrates, but they tend to last longer in the subsurface. Slow release materials such as vegetable oil or HRC™, which are intended to be long lasting, may require a single or limited number of injections. The low mobility of viscous substrates may lead to non-uniform distribution and require different application mechanisms to achieve the desired distributions. These substrates are relatively immobile and rely on advective and dispersive qualities of soluble compounds (lactic acid for the HRC and metabolic acids for the oil) to deliver them throughout the subsurface (ITRC, 2007).

Moderate viscosity fluids such as emulsions of vegetable oil have a relatively high mobility as compared to solid or highly viscous materials that allows more uniform distribution within the aquifer. Emulsified oils slowly release hydrogen through fermentation of fatty acids. Other moderate viscosity substrates that could be used include, chitin, whey and oleate.

Oxidative Environment Processes

As with reductive processes, oxidation processes can be either chemically or biologically induced. A chemical oxidant removes electrons from constituents in the vicinity of the oxidant and the oxidant becomes reduced. In a biological oxidation process, one compound is the electron donor and another compound is the electron acceptor. An example of biological oxidation happens with fuel contaminants in groundwater. In an aerobic environment, fuel can provide the carbon and the electrons for microbial metabolism, and the oxidizing agent is oxygen, which is the electron acceptor. In the absence of oxygen, nitrate also serves as an electron acceptor. The fuel becomes degraded as it is oxidized.

Remediation of groundwater pollution, including VOCs, benzene, toluene, ethylbenzene, xylenes, organic pesticides, munitions (i.e., HMX, RDX), petroleum hydrocarbons or MTBE can potentially be achieved using chemical or biological oxidation processes. This involves injecting oxidants directly into the source and the downgradient plume, or delivering oxidants by means of a groundwater recirculation system. The oxidant reacts with the pollutants, producing innocuous substances such as carbon dioxide, water, and chloride. The four main chemical oxidants used are permanganate, peroxide, persulfate and ozone.

The ability of the oxidant to react with a certain contaminant in the field depends on kinetics, stoichiometry, thermodynamics and delivery of the oxidant. On a microscale, kinetics or reaction rates are the most important. The rates of oxidation reactions are dependent on many variables, such as, pH, temperature, concentration of the reactants, catalysts, reaction by-products, and impurities

(oxidant scavengers, organic matter, etc.) that all must be taken into consideration.

The oxidant needs to be delivered in such a manner that the oxidant comes into the contact with the pollutant to be oxidized. The delivery goal is to ensure that the oxidant is dispersed evenly throughout the groundwater needing to be remediated. The solubility and rate of reaction of the oxidant need to be considered when developing the method of delivery of the oxidant.

Treatment Zone

The treatment zone is the area where the oxidation/reduction processes take place. During oxidation, several changes in water quality parameters can occur. The oxidation process can cause trivalent chromium present in formation materials and dissolved in the aquifer to be converted to hexavalent chromium, a much more toxic form of chromium. In addition, chlorides will be liberated if the pollutants being oxidized are chlorinated compounds. Increases in salts can occur if the oxidant being used has a salt component such as sodium or potassium.

Reduction processes have similar concerns with chlorides and salts. Reducing conditions will remove dissolved oxygen from the water, and can liberate excess concentrations of dissolved iron and manganese from formation materials, and generate methane, causing secondary water quality problems. These waste discharge requirements recognize that water quality objectives for some parameters may be exceeded within the treatment zone. However, water quality objectives are not allowed to be exceeded outside of the treatment zone. Monitor wells are established downgradient of the treatment zone for use as compliance wells. The monitor wells are used to measure compliance with water quality objectives and groundwater limitations.

The size of the treatment zone should be made as small as feasible, but in most cases will be driven by the plume configuration and design of the treatment system. The treatment zone could include a transition zone where ambient groundwater mixes with the treatment zone, reestablishing ambient oxidative conditions. In contact with the oxygen of ambient groundwater, the elevated concentrations of ferrous iron and dissolved manganese are oxidized, removing them from solution. Methane concentrations return to ambient concentrations much more slowly, and travel further than other reduced species. Therefore, the formation of methane should be avoided to the extent practicable by minimizing the degree of reducing conditions generated by the project. It is not appropriate to significantly increase the size of the treatment zone to simply allow for methane concentrations to reduce back to ambient levels.

Amendment Delivery

The in-situ treatment system is usually one of three types. One type utilizes a groundwater recirculation consisting of extraction and injection wells and provides control of the injectants and treatment zone. The extracted groundwater is amended aboveground and the amended water recharged upgradient of the extraction well. The second type injects the amendments into the groundwater and allows the groundwater to flow though the treatment zone. The third type uses extraction and injection wells to create a barrier with the treatment zone being established within and downgradient of the capture zone of the injection well(s). In this type of system the injection tends to occur downgradient of the extraction wells. The use of extraction and recharge systems is preferred as it provides greater flexibility and control of the treatment zone, and can be operated to help restore the treatment zone to pre-project conditions after remediation of the initial pollution has been completed.

Amendments

These waste discharge requirements require that the injectant materials be analyzed to determine the suitability of the materials to be used for in-situ remediation. Past analyses of various amendments, including corn syrup, molasses, HRC^{TM} and edible oils have shown elevated concentrations of sodium and other salts, and trace metals in some of them. As the groundwater in the Central Valley is in many places adversely impacted by salts, the use of salt-containing amendments is discouraged. A project that proposes using a salt-containing amendment is required to demonstrate that there is no cost-effective, salt-free amendment that can be utilized to achieve adequate remediation of the pollution before allowing the salt-containing amendment to be used. In addition, amendments containing other pollutants such as metals could contribute to exceedances of water quality objectives and/or degradation of the groundwater.

Basin Plan, Beneficial Uses, Background Groundwater Quality and Water Quality Objectives

The *Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition* (Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin. Beneficial uses often determine the water quality objectives that apply to a water body. For example, waters designated as municipal and domestic supply must meet the maximum contaminant levels (MCLs) for drinking waters. The Basin Plan sets forth the applicable beneficial uses (industrial, agricultural, and domestic supply in this instance) of groundwater, procedure for application of water quality objectives, and the process for and factors to consider in allocating waste assimilation capacity.

The antidegradation directives of Section 13000 of the California Water Code require that waters of the State that are better in quality than established water quality objectives be maintained "consistent with the maximum benefit to the people of the State." Waters can be of high quality for some constituents or beneficial uses and not others. Policies and procedures for complying with this directive are set forth in the Basin Plan (including by reference State Water Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality Waters in California," or "Antidegradation" Policy).

Resolution 68-16 is applied on a case-by-case, constituent-by-constituent basis in determining whether a certain degree of degradation can be justified. It is incumbent upon the Discharger to provide technical information for the Board to evaluate that fully characterizes:

- All waste constituents to be discharged;
- The background quality of the uppermost layer of the uppermost aquifer;
- The background quality of other waters that may be affected;
- The underlying hydrogeologic conditions;
- Waste treatment and control measures;
- How treatment and control measures are justified as best practicable treatment and control;
- The extent the discharge will impact the quality of each aquifer; and
- The expected degradation to water quality objectives.

In allowing a discharge, the Board must comply with CWC section 13263 in setting appropriate conditions. The Board is required, relative to the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Board need not authorize the full utilization of the waste assimilation capacity of the groundwater (CWC 13263(b)) and must consider other waste discharges and factors that affect that capacity.

The project proponent is required to determine background groundwater quality. The background data is used to determine compliance with water quality limitations at the points of compliance downgradient from the treatment zone. As stated above, salts can increase due to the dehalogenation of volatile organics or other pollutants or from salts present in amendments. Metals can be solubilized from aquifer materials by the reduction process, be released from amendments during reactions, or change to more toxic states during the oxidation process. These waste discharge requirements allow a slight increase (20% over background) in metals and salts, as long as water quality objectives are met. A value of less than 20% would be within the error of duplicate analysis

comparability criteria and an exceedance not always verifiable. Water quality objectives for the anticipated pollutants that are found at these remediation projects are established in the Findings. The water quality objectives are established based on the numerical and narrative standards found in the Basin Plan.

Coverage Under the Order

To obtain coverage under the order, the project proponent must submit a Notice of Intent (NOI) and supplemental information listed in Attachment A. The information requirements are significant as these projects are complex and require a great deal of knowledge about the project site and remediation processes. Though the requirement for submittal of information is substantial, it should be information that has already been developed by the project in order to justify the remediation project to the appropriate regulatory agency.

In order for coverage to occur, the project proponent needs to demonstrate through laboratory-scale tests that the proposed project will adequately promote remediation of the pollution. The laboratory-scale tests will also be used to identify potential adverse water quality impacts with the project and help establish monitoring parameters. If there are data from projects sufficiently similar to the proposed project, the proponent can use that information in lieu performing the laboratory-scale testing, as appropriate. Once the project is completed, the project proponent will file for termination of coverage under the general order.

Updates to Previous General Order R5-2008-0149

This General Order updates Order R5-2008-0149 in several ways. First, it establishes effluent limitations for discharges from groundwater treatment systems to ground. There are times when in-situ remediation systems extract groundwater, amend it and inject or infiltrate the amended water back into the groundwater. There can be some pollutants that that are not targeted by the in-situ remediation system and those pollutants may be required to be removed prior to discharge. The effluent limits are set at best available technology for removal of VOCs (effluent limit is 0.5 µg/L), at water quality objectives or background, whichever is greater, for pollutants such as perchlorate, chloride, TDS and other non-volatiles. This Order adds sulfate specifically to the list of pollutants that are covered and affirms that other pollutants can be considered once sufficient information has been supplied that verifies the efficacy of the proposed treatment method on the pollutant in the groundwater. Other changes were made to the monitoring program to improve its functionality and coverage of potential monitoring options.

There have been over 50 projects utilizing Order No. R5-2008-0149. All the projects operating under that Order will remain under the Order. Subsequent applicants will be issued coverage under this Order. Order No. R5-2008-0149 will be rescinded once all Notices of Applicability are terminated upon the completion of their specific projects.

AMM\AST\MLP

ATTACHMENT A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF
GENERAL WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2015-0012
IN-SITU GROUNDWATER REMEDIATION
AND DISCHARGE OF TREATED GROUNDWATER TO LAND

1. RESPONSIBLE PARTY INFORMATION

Owner Name:				
Mailing Address:				
City/Locale:	County:	State:	Zip:	Telephone Number:
Operator Name (if different than above):				
Mailing Address:	County:	State:	Zip:	Telephone Number:
Contact Person:		Title:		Telephone Number:
Owner Type: (check one) Individual ☐ Corporation ☐ Partnership ☐ Other:				

2. TREATMENT SITE INFORMATION

Site Name:				
Physical Address:				
City/Locale:	County:	State:	Zip:	Telephone Number:

3. LOCATION OF FACILITY

Assessor's Parcel #:	Closest Surface Water: (e.g. Sacramento River)
Township/Range/Section: T ____ R ____ S _____ _____B&M	

4. REASON FOR FILING

☐ New Pilot Study	☐ Changes in Ownership/Operator
☐ New Full-Scale Treatment	☐ Other
☐ Update Plot Study	
☐ Update Full-Scale Treatment	

5. LOCAL PERMITS

Has an agency issued permits or other entitlements (e.g., conditional use permit, building permit, hazardous materials storage permit, air permit, well permit) for the site? ☐ Yes ☐ No
For each permit or entitlement, list the type, issuing agency, and date of issuance:

6. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Has a CEQA determination been made by an agency? ☐ Yes ☐ No	Name of agency:
Type of Determination:	Date of Determination:
If the CEQA determination was made after the date of adoption of this General WDR, then include a copy of the CEQA determination with this NOI.	

7. PROCESS

☐ Single-Injection Points ☐ Continuous Injection ☐ Recirculation System

Amendments to be added:	Volumes of Amendments per Month:	Storage on Site? ☐ Yes ☐ No
Pollutants to be treated:	Rates of amendment additions:	Max rate of amendment addition:

Extraction and Injection Rates (give units) Average: _____ Maximum: _____	Treatment Methods and flows (give units): Average: _____ Maximum: _____

8. WASTES GENERATED

Check All That Apply:

☐ Treatment Wastewater ☐ Domestic Wastewater (separate system)

☐ Stormwater ☐ Solid waste - Type_____

9. AMENDMENT STORAGE

Describe the type(s) of storage vessels, including capacity of each, that will be used to store amendments:
How will liquid be stored and monitored to prevent spillage?

10. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print Name: _____ Title: _____

Signature: _____ Date: _____

ATTACHMENT B

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

INSTRUCTIONS

FOR COMPLETING THE **NOTICE OF INTENT** TO COMPLY WITH THE TERMS OF GENERAL WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2015-0012 FOR IN-SITU GROUNDWATER REMEDIATION AND DISCHARGE OF TREATED GROUNDTWATER TO LAND

The Notice of Intent is to be submitted by responsible parties that elect to obtain coverage under the above General Order. If you have any questions regarding the completion of any part of the following form, please contact your Regional Board representative, as described on page 3. Much of the information needed to complete this form may be available from County Use Permit engineering reports or county records. Any additional information supplied, as detailed in Attachment 1, should be included on attached sheets and list all attachments with the titles and dates in the spaces provided.

1. RESPONSBILE PARTY INFORMATION

You must provide the information listed below for ALL persons or entities that hold legal interests associated with the facility or real property on which it is located. These may include, but are not limited to, owners, leaseholders, lessees, and operators.

Under *Owner Name/Address*, include the legal name of the business entities and/or persons who own the facility undergoing remedial activities, the owner's mailing address, and phone number.

Under *Operator Name*, include the name of the business entities or persons who actually operate the facility only if different than the owner.

Under *Mailing Address*, include the mailing address where legal notices may be received by the operator if it is different form the physical facility address. You may specify another contact person at the mailing address if desired.

Check the appropriate Owner type. Both the Owner and the Operator will be named in the Notice of Applicability and will receive legal notices and invoices at these addresses.

2. TREATMENT SITE INFORMATION:

Provide the Facility name, the physical address of the treatment location, the facility contact person (preferably a responsible employee with offices at the facility), and phone number at the facility. Do not use a P.O. Box number in this section. If there is no street address, use closest street and nearest cross street.

3. LOCATION OF FACILITY

Enter the Assessor's Parcel Number(s) (APN). This number is located on the property tax bill and can also be obtained from the County Assessor's Office. Indicate the APN for both the facility and any land discharge areas owned by the Discharger. Specify the closest surface water body in the vicinity of the facility, such as a creek, canal, or river.

4. REASON FOR FILING
Check the appropriate box or boxes.

5. LOCAL PERMITS
Construction and operation of some types of facilities usually involves permits or entitlements from a local agency, such as a City or County. These permits or entitlements may include discretionary or ministerial permits such as conditional use permits, hazardous waste storage permits, air permits, well permits, and building permits. Documents and information should be available from the issuing agency, in most cases the City/County planning department. For each permit or entitlement, identify the issuing agency, the date of issuance, and provide a copy of associated documentation.

6. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)
Compliance with the California Environmental Quality Act (CEQA) is required prior to enrollment under the General WDRs. The CEQA lead agency must either determine that your project is exempt from CEQA, or must prepare an environmental document (either an Environmental Impact Report, Mitigated Negative Declaration, or Negative Declaration).

Has a public agency made a CEQA determination for the facility? If YES, give the name, date, and type of determination (This could be a Notice of Exemption, Notice of Determination, Negative Declaration, etc.). Enclose a copy of the CEQA documentation. If NO, fill in the expected type and date of completion. For the date of completion, list the date that the CEQA documentation will be completed. If not known, write "Unknown".

7. PROCESS
Provide summary information here. Much of the descriptive and technical information will be submitted to comply with the information needs specified in Attachment B.

8. WASTES GENERATED
Check all types of wastes that exist at your facility.

9. AMENDMENT STORAGE
Provide the requested information, and attach additional sheets as necessary. An above ground or underground tank may be used to contain the amendments; in either case, the tank must be constructed of materials suitable for the intended use.

10. CERTIFICATION
Certification by the operator of the facility is required. The appropriate person must sign the application form. Acceptable signatures are:

a. For a corporation, a principal executive officer of at least the level of senior vice-president;
b. For a partnership or individual (sole proprietorship), a general partner or the proprietor;

11. ADDITIONAL INFORMATION
Attach the required information detailed in Attachment 1.

12. SUBMITTAL

Submit the complete NOI, supplemental information, and the first annual fee in the form a check payable to *State Water Resources Control Board* to the appropriate Regional Board office. The fee shall be that required by the current version of the California Code of Regulation, Title 23, Division 7, Chapter 9, Waste Discharge Report and Requirements, Article 1**, fees for discharge for a Threat to Water Quality and Complexity ranking of 3B.**

For projects within Alameda, Alpine, Amador, Calaveras, Colusa, Contra Costa, El Dorado, Glenn Lake, Napa, Nevada, Placer, Sacramento, San Joaquin, Sierra, Solano, Stanislaus, Sutter, Yolo, and Yuba Counties, submit the NOI and filing fee to:

Regional Water Quality Control Board, Central Valley Region
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114
(916) 464-4625

For projects within Fresno, Kern, Kings, Madera, Mariposa, Merced, Tulare and Tuolumne Counties, submit the NOI and filing fee to:

Regional Water Quality Control Board, Central Valley Region
1685 "E" Street
Fresno, CA 93706
(559) 445-5116

For projects within Butte, Lassen, Modoc, Plumas, Shasta, and Tehama Counties, submit the NOI and filing fee to:

Regional Water Quality Control Board, Central Valley Region
415 Knollcrest Drive, Suite 100
Redding, CA 96002
(530) 224-4845

Attachment 1 to NOI
Notice of Intent Additional Information Requirements

A Final Approved Work Plan and CEQA document for the project. Any of the information required below that is contained in the work plan need not be reproduced separately from the work plan.

B Final Approved Remedial Action Plan or Cleanup Plan. If a Remedial Action Plan has been approved, a copy of the Remedial Action Plan should also be provided.

C Location:

i) USGS Quad Sheet delineating location.
ii) Another figure showing a closer view of the site.
iii) A description of the remediation area and area surrounding the remediation area.

D Bench Scale/Pilot Scale Testing:

i) Results from bench scale or pilot-scale testing that demonstrates that the proposed project is likely to be successful at the site. If the data provided is from a different project location, the provided information needs to support that the tested site is substantially similar to the proposed project site in regards to soil properties and makeup.

E Geology/Hydrogeology:

i) A description of the geology/hydrogeology of the site and surrounding area within ¼ mile of the site.
ii) Geologic cross-sections through the site, both perpendicular and parallel to the groundwater flow direction.
iii) Table of monitor wells in the vicinity including as-built information.

F Groundwater Information:

i) Narrative description of the occurrence and quality of groundwater at the site, including upgradient and downgradient conditions
ii) A figure depicting groundwater monitor wells/piezometers and water supply wells
iii) Figures showing groundwater potentiometric surface maps for each layer of interest.
iv) Figure showing water supply wells within 1-mile of the project location, along with any available information regarding construction, use and pumping rates.

G Water Quality Information:

i) Tables of water quality data for each monitor well within the area of the testing. Wells segregated into monitor zones, and upgradient, downgradient and within the plume wells. The data should include detection and reporting levels for the analyses listed.
ii) Water quality data should include VOCs, general minerals, metals (need to include iron, manganese, total chromium, hexavalent chromium, . . .), sulfate, nitrate, ammonia, dissolved oxygen, oxidation/reduction potential, chemical oxygen demand, total dissolved solids, electrical conductivity, temperature
iii) Figures depicting the groundwater contaminant plume configurations for each of the monitor zones.
iv) Tables presenting background concentrations of COCs, injectant components and potential breakdown products.

H Project Proposal:

i) Proposed injection points
ii) Injectant(s) to be used for remediation and for biofouling control
iii) Analysis of the injectants – VOCs, semi-VOCs, metals, general minerals, pH, TDS. . .
iv) Potential breakdown products of COCs and injectants. Estimated concentrations of the injectants and breakdown products remaining at the conclusion of the project. The estimated concentrations need to be compared to background concentrations of the pollutants.
v) Proposed injectant rates and concentrations.
vi) Proposed tracer compounds, application concentration rates, and concentrations of tracer within treatment zone for conducting tracer tests
vii) Delineation of treatment zone – including figure
viii) Delineation of transition zone – including figure
ix) Proposed monitoring program – frequency, methods, quantitation and detection limits – use Attachment C as template.
x) Treatment system, if any, description and proposed operation
xi) List of proposed wells, and figure delineating the locations of the wells, for monitoring upgradient and downgradient groundwater quality and groundwater elevations. Wells should be designated for the treatment zone, transition area within treatment zone and compliance wells at the treatment zone downgradient boundary.
xii) Contingency Plan – Plan for corrective actions if violations are found at the points of compliance.

I List of Interested Parties
J Draft Fact Sheet

ATTACHMENT C

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2015-0012

FOR
IN-SITU GROUNDWATER REMEDIATION
AND DISCHARGE OF TREATED GROUNDWATER TO LAND

NOTE: THIS MONITORING AND REPORTING PROGRAM SHALL BE CUSTOMIZED TO FIT THE SITE-SPECIFIC NEEDS OF THE PROJECT. CONSTITUENTS TO BE SAMPLED, SAMPLING FREQUENCY AND REPORTING FREQUENCY NEED TO BE SPECIFIED FOR THE PROJECT. THE TABLES PROVIDE TEMPLATES AND LIKELY CONSTITUENT LISTS THAT NEED TO BE MODIFIED TO MEET THE SITE-SPECIFIC NEEDS.

This Monitoring and Reporting Program (MRP) describes requirements for monitoring a groundwater remediation system for NAME OF SITE AND LOCATION. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. As appropriate, California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) staff shall approve specific sample station locations prior to implementation of sampling activities.

All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

GROUNDWATER MONITORING

As shown on Figure x, there are xx monitor wells, xx extraction wells, and xx injection wells/trenches associated with this site. The groundwater monitoring program for these wells and any treatment system wells installed subsequent to the issuance of this MRP shall follow the schedule below. Monitor wells with free phase petroleum product or visible sheen shall be monitored, at a minimum, for product thickness and depth to water. The volume of extracted groundwater, if applicable, shall also be provided in quarterly monitoring reports. Sample collection and analysis shall follow standard EPA protocol.

The monitor wells, extraction wells and/or injection wells shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 2, as follows:

Table 1: Sampling Frequency and Constituent Suite

Well Number[1]	Constituent[2]	Frequency[3]	Monitoring Objective
			Compliance[4]
			Treatment Zone[5]
			Transition Zone[6]
			Background[7]

[1] Well numbers and locations as shown on Figure X.

[2] Constituent analytical methods are listed in Table 2.
[3] i.e., weekly, monthly, quarterly, semi-annually, annually, other. Semi-annual sampling occurs 1st and 3rd quarters, annual sampling occurs in the 1st quarter, biennial sampling occurs every two years in the 1st quarter, with the first sample during year two.
[4] Wells used to determine compliance with water groundwater limitations.
[5] Wells sampled to evaluate in-situ bioremediation progress inside the treatment zone.
[6] Wells sampled to evaluate migration of pollutants within the treatment zone.
[7] Wells used to develop background concentrations.

NOTE: ADD OR DELETE CONSTITUENTS AND METHODS AS NEEDED IN TABLES 2 THROUGH 6. TABLE 2 PROVIDES THE GENERAL LIST OF CONSTITUENTS THAT ARE MOST LIKELY TO BE SAMPLED FOR AT AN INSITU REMEDIATION SITE

Table 2: Analytical Methods

Constituent	Method[1]	Maximum Practical Quantitation Limit (µg/L)[2]
Volatile Organic Compounds	EPA 8020 or 8260B	0.5
Sodium	EPA 200.7	100
Potassium	EPA Method 300	20
Volatile Organic Acids	EPA 6500	1,000
Orthophosphate	Hach Method 8131	30
Ethane	Modified EPA 602	0.1
Ethene	Modified EPA 602	0.1
Methane	Modified EPA 602	0.1
Total Dissolved Solids	EPA 160.1	10,000
Total Organic Carbon	EPA 415	300
Chloride	EPA 6500	300
Nitrate	EPA 6500	300
Sulfate	EPA 6500	200
Sulfide	Hach Method 8131	30
Iron, Total and Dissolved	EPA 200.7	100
Ferrous and Ferric Iron	EPA 200, 6020 or SM3000	100
Hexavalent Chromium	EPA 7199	1
Phosphorous	EPA 200.7, 365	1,000
Metals, Total and Dissolved[3]	EPA 200.7, 200.8	Various
1,2,3-Trichloropropane[4]	EPA 8260B[4]	0.5 µg/L[4]

[1] Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit.
[2] All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as an estimated value.
[3] Metals include barium cadmium, calcium, total chromium, copper, lead, magnesium, manganese, mercury, molybdenum, nickel and silica.
[4] If 1,2,3-TCP in a monitor well is expected to exceed 0.5 µg/L, then Method 8260B may be used. If the concentration is expected to exceed 0.02 µg/L, then EPA Method 504.1 is to be used. If 1,2,3-TCP is not detected greater than 0.02 µg/L, then SRL 524M-TCP must be used in the next regularly scheduled sampling event.

FIELD SAMPLING

In addition to the above sampling and laboratory analyses, field sampling and analysis shall be conducted each time a monitor well or extraction well is sampled. The sampling and analysis of field parameters shall be as specified in Table 3.

Table 3: Field Sampling Requirements

Parameters	Units	Practical Quantitation Limit	Analytical Method
Groundwater Elevation	Feet, Mean Sea Level	0.01 feet	Measurement
Oxidation-Reduction Potential	Millivolts	10 millivolts	Field Meter
Electrical Conductivity	uhmos/cm	50 µS/cm^2	Field Meter
Dissolved Oxygen	mg/L	0.2 mg/L	Field Meter
pH	pH Units (to 0.1 units)	0.1 units	Field Meter
Temperature	$^oF/^oC$	0.1 $^oF/^oC$	Field Meter

All wells that are purged shall be purged until pH, temperature, conductivity and dissolved oxygen are within 10% of the previous value.

Field test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in item (b) of the “Reporting” section of this MRP.

TREATMENT PLANT EFFLUENT MONITORING

NOTE: ADD OR DELETE CONSTITUENTS AND METHODS AS NEEDED IN TABLE 4. TABLE 4 PROVIDES THE GENERAL LIST OF CONSTITUENTS THAT ARE MOST LIKELY TO BE SAMPLED FOR AT AN IN-SITU REMEDIATION SITE

The effluent from the groundwater treatment system shall be sampled on a monthly basis as follows in Table 4: **NOTE: FREQUENCY CAN BE ADJUSTED AS WARRANTED**

Table 4: Treatment Plant Effluent Sampling Requirements

Parameters	Units	Type of Sample
Volatile Organics	µg/L	Grab
Metals	µg/L	Grab
Pesticides	µg/L	Grab
Cyanide	µg/L	Grab
Petroleum Hydrocarbons	µg/L	Grab
Total Dissolved Solids	mg/L	Grab

Parameters	Units	Type of Sample
Electrical Conductivity	µhmos/cm	Grab
Dissolved Oxygen	mg/L	Grab
pH	pH Units (to 0.1 units)	Grab

IN-SITU DISCHARGE MONITORING

The Discharger shall monitor daily the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 5. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the aquifer.

Table 5: Discharge Monitoring Requirements

Parameters	Units	Type of Sample
Injected Volume	gallons per day	Meter
Amendment(s) Added	pounds per day	Measured
Biocide Added	pounds per day	Measured

AMENDMENT ANALYSIS

Prior to use, amendments shall be analyzed for the constituents listed in Table 6. The analysis should be done on a mixture of the amendment and deionized water at the estimated concentration that would be injected during the pilot project.
SOME CONSTITUENTS CAN BE ELIMINATED DEPENDING ON THE AMENDMENT

Table 6: Amendment Analytical Requirements

Constituent	Method[1]	Maximum Practical Quantitation Limit (µg/L)[2]
Volatile Organic Compounds	EPA 8020 or 8260B	0.5
General Minerals[3]		
Metals, Total and Dissolved[4]	EPA 200.7, 200.8	Various
Semi-Volatile Organic Compounds	EPA Method 8270	5.0
Total Dissolved Solids	EPA 160.1	10,000
pH	meter	NA
Electrical Conductivity	meter	NA

[1] Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit.
[2] All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as an estimated value.
[3] General Minerals include: alkalinity, bicarbonate, potassium, chloride, sulfate, total hardness, nitrate, nitrite, ammonia.

[4] Metals include arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium and silica.

ESTABLISHMENT OF BACKGROUND CONCENTRATION VALUES

NOTE: SPECIFIC BACKGROUND CONSTITUENTS DEPEND UPON THE NATURE OF THE AMENDMENTS, TREATMENT PROCESSES, AND ANTICIPATED INSITU REACTIONS.

The Discharger shall develop background values for concentrations of constituents such as dissolved iron, dissolved manganese, metal xxx, total dissolved solids and electrical conductivity in groundwater following the procedures found in CCR Section 20415(e)(10). The Discharger shall submit a proposal to develop the background concentrations by **XX XXXXX XXXX**.

REPORTING

NOTE: CUSTOMIZE THE REPORTING FREQUENCY. QUARTERLY REPORTS ARE RECOMMENDED AND THIS SECTION IS DEVELOPED AROUND THAT CONCEPT

When reporting the data, the Discharger shall arrange the information in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner as to illustrate clearly the compliance with this Order. In addition, the Discharger shall notify the Central Valley Water Board within 48 hours of any unscheduled shutdown of any soil vapor and/or groundwater extraction system. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Central Valley Water Board.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional Civil Engineer or Geologist or their subordinate and signed by the registered professional.

The Discharger shall submit quarterly electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The quarterly reports shall be submitted electronically over the internet to the Geotracker database system by the 1st day of the second month following the end of each calendar quarter by **1 February, 1 May, 1 August, and 1 November** until such time as the Executive Officer determines that the reports are no longer necessary.

Each quarterly report shall include the following minimum information:

(a) a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;

(b) field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc.;

(c) groundwater contour maps for all groundwater zones, if applicable;

(d) pollutant concentration maps for all groundwater zones, if applicable;

(e) a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;

(f) a table showing historical lateral and vertical (if applicable) flow directions and gradients;

(g) cumulative data tables containing the water quality analytical results and depth to groundwater;

(h) a copy of the laboratory analytical data report;

(i) the status of any ongoing remediation, including an estimate of the cumulative mass of pollutant removed from the subsurface, system operating time, the effectiveness of the remediation system, and any field notes pertaining to the operation and maintenance of the system; and

(j) if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

An Annual Report shall be submitted to the Central Valley Water Board by **1 February (1 November for semi-annual monitoring)** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation. The Annual Report may be substituted for the fourth quarter **(or second semi-annual)** monitoring report as long as it contains all of the information required for that report plus that required for the Annual Report. The Annual Report shall contain the following minimum information:

(a) both tabular and graphical summaries of all data obtained during the year;

(b) groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;

(c) a discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;

(d) an analysis of whether the pollutant plume is being effectively treated;

(e) a description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;

(f) an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and

(g) if desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

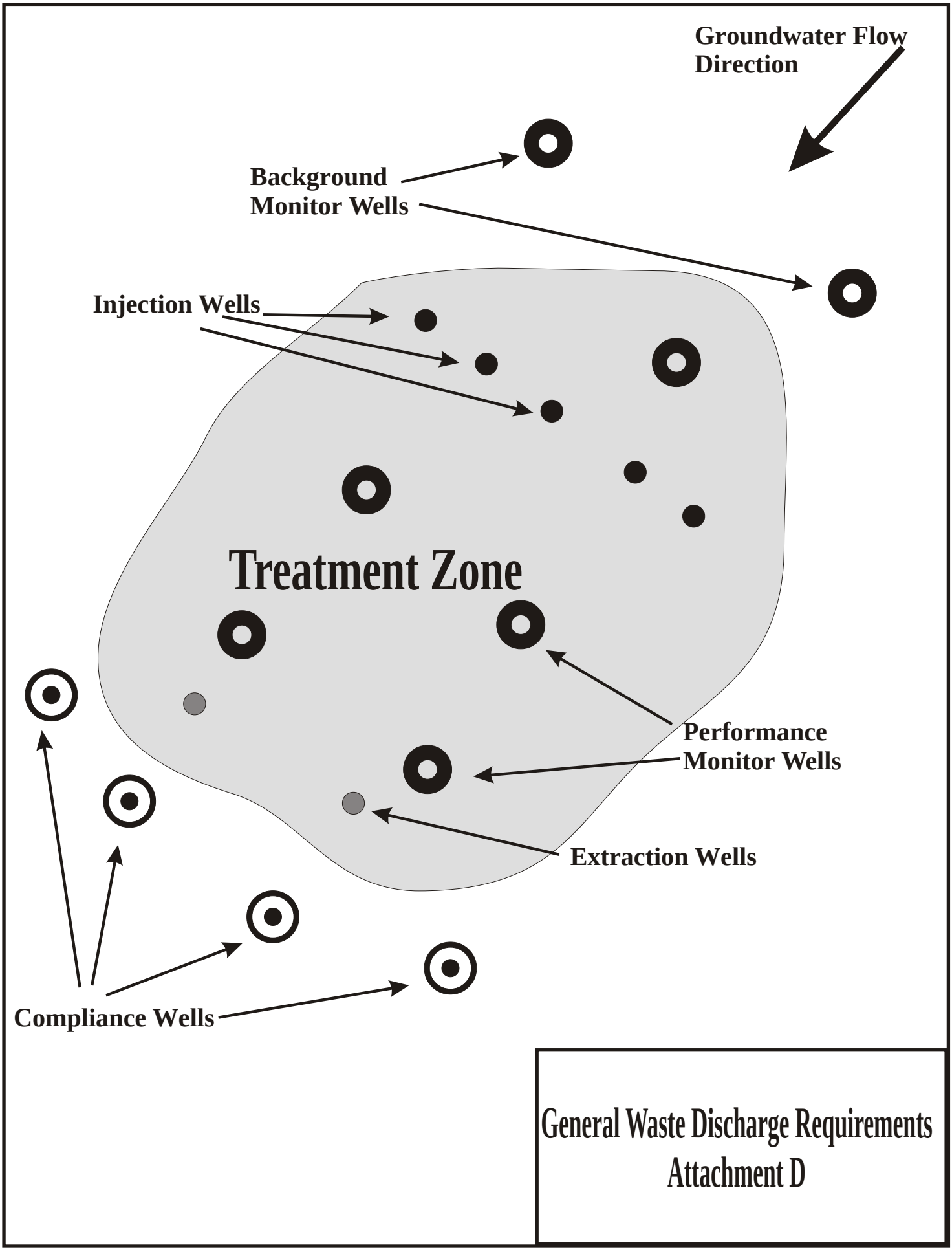
A letter transmitting the monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by: _____
PAMELA C. CREEDON Executive Officer

6 February 2015
(Date)

09/22/14:AMM,AST,MLP



General Waste Discharge Requirements
Attachment D

General Waste Discharge Requirements
Attachment E
Treated Water Discharge Locations