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DLA DISTRIBUTION SAN JOAQUIN, CALIFORNIA

DEFENSE DISTRIBUTION DEPOT SAN JOAQUIN–SHARPE SITE
THIRD FIVE-YEAR REVIEW REPORT

FINAL

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September 2014

Third Five-Year Review Report, Sharpe Site
Regulatory Concurrence

This report has been prepared in accordance with U.S. EPA OSWER Directive 9355.7-03B-P. The undersigned concur with the findings and protectiveness determination presented in this Third Five-Year Review Report.

15 SEP 14

JONATHAN E. MATHEWS — Date
Site Director
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Phillip R. Dawson — Sept 26, 2014

PHILLIP R. DAWSON — Date
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Refer to U.S. EPA Concurrence Letter: 30 September 2014

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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SEP 30 2014

Mr. Maurice Benson
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DLA Installation Support at San Joaquin
P.O. Box 960001
Stockton, CA 95296-0001

SUBJECT: THIRD FIVE-YEAR REVIEW REPORT FOR THE DEFENSE LOGISTICS AGENCY, DISTRIBUTION SAN JAUQUIN, CALIFORNIA - SHARPE SITE

Dear Mr. Benson,

The U.S. Environmental Protection Agency (EPA) Region IX received the Final Third Five-Year Review Report for the Defense Logistics Agency, Distribution San Joaquin, California-Sharpe Site (5YR Report), dated September 2014. EPA reviewed the 5YR Report along with other supporting documents and, except for the issues identified below, EPA concurs with the findings, recommendations, and conclusions of the 5YR Report. EPA's protectiveness determinations for each Operable Unit (OU) in the 5YR Report are set forth below.

OU1 - OU1 is protective of human health and the environment in the short term, but is not protective in the long term. In order for the remedy to be protective in the long term, the Army must implement the Land Use Controls (LUCs) in the Explanation of Significant Difference (ESD) for the OU1 ROD. These LUCs are necessary for protection against the potential exposure to volatile organic compounds in the groundwater and from vapors which could volatilize from the contaminated groundwater. These contaminated vapors can migrate through the soil and accumulate inside buildings that overlie groundwater contamination. The LUCs will ensure that buildings will not be occupied or constructed over contaminated groundwater, and will eliminate direct contact with contaminated groundwater by restricting use of contaminated groundwater on the Base. In addition, the ESD includes in situ remediation of hot spots of contamination in the soil, although this remedial action is being added to enhance the groundwater remedy, rather than to enhance the protectiveness of the remedy selected in the ROD.

OU2 - OU2 is protective of human health and the environment in the short term, but is not protective in the long term. In order for the remedy to be protective in the long term, the Army must evaluate certain site conditions and take any actions determined necessary to protect human health and the environment. In particular, the Army must delineate the extent of contamination and determine if a remedial action is required at Sites P-1A, P-1B, P-1C, the MQ326 Cluster Area, and the area of

potential radiological concern at Site S-33/29.

The five year review process is mandated by CERCLA section 121 and designed to ensure that remedies remain protective over the long term where hazardous substances are left on-site. EPA's policy for conducting Five Year Reviews at Federal Facilities is explained in the August 1, 2011 Memorandum entitled "Program Priorities for Federal Facility Five-Year Review," and Correction to the Memorandum "Program Priorities for Federal Facility Five-Year Reviews."

The 5YR Report states that the next Five Year review "will evaluate the remedies at TCE Sites P-1A, P-1B, P-1C, P-1G, and P-5A, and metals Sites S-3, S-26, S-30, S-33/29, and S-36 for the time period between 2013 and 2017 and is required to be completed no later than five years from the date of this final third five-year review." However, according to EPA guidance, the next Five Year Review should evaluate the protectiveness of any remedial actions at the Site, not only those in progress at the time of this Five Year Review, and is due no later than September 24, 2019. In addition, to the maximum extent possible, the Five Year Review Report should include a full five years of data, and include the most up-to-date data possible.

Pursuant to Section 21.0 of the Federal Facilities Agreement (FFA), the Army and the regulators need to develop a mutually acceptable timeline for completion of the actions described above. The LUCs in the ESD for the OU1 ROD should be implemented within 6 months of the signing of this 5YR Report, and the site investigations in OU2 should be completed within 1 year.

If you have questions regarding this letter, please contact John Lucey at (415) 972-3145 or you can reach me at (415) 972-3144.

Ms. Angeles Herrera
Assistant Director of Federal Facilities and
Site Cleanup Branch, Region 9

Cc: Mr. Chris Sherman, California DTSC
Mr. Marcus Pierce, California RWQCB

DEFENSE LOGISTICS AGENCY
DEFENSE DISTRIBUTION DEPOT SAN JOAQUIN–SHARPE SITE
THIRD FIVE-YEAR REVIEW REPORT

September 2014

This report was prepared by the staff of URS Group, Inc. (URS) under the supervision of registered professionals. The data interpretation, conclusions, and recommendations presented in the report were governed by URS' experience and professional judgment. This report has been prepared based on data current at the time of preparation. Assumptions based on this data, although believed reasonable and appropriate based on the data provided herein, may not prove to be true in the future as new data are collected. The conclusions and recommendations of URS are conditioned upon these assumptions.

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Professional Geologist 7980

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TABLE OF CONTENTS

Page

ES.0 EXECUTIVE SUMMARY ES-1
ES.1 Progress Since Second Five-Year Review ES-2
ES.1.1 Operable Unit 1 ..... ES-2
ES.1.2 Operable Unit 2 ..... ES-2
ES.2 Issues ES-3
ES.2.1 Operable Unit 1 ..... ES-3
ES.2.2 Operable Unit 2 ..... ES-4
ES.3 Recommendations and Follow-Up Actions ES-5
ES.3.1 Operable Unit 1 ..... ES-5
ES.3.2 Operable Unit 2 ..... ES-6
ES.4 Protectiveness Statements ES-7
ES.4.1 Operable Unit 1 ..... ES-7
ES.4.2 Operable Unit 2 ..... ES-7

SF.0 FIVE-YEAR REVIEW SUMMARY FORM SF-1

1.0 INTRODUCTION 1-1
1.1 Previous Five-Year Review Reports 1-3
1.2 Third Five-Year Review Report 1-3

2.0 CHRONOLOGY 2-1

3.0 BACKGROUND 3-1
3.1 Physical Characteristics 3-1
3.1.1 Surface Water Hydrology 3-1
3.1.2 Regional Geology 3-2
3.1.3 Site Geology and Groundwater Hydrogeology 3-3
3.2 Land and Resource Use 3-3
3.3 History of Contamination 3-4
3.4 Initial Responses 3-5
3.4.1 Initial Groundwater Response Actions 3-5
3.4.2 Initial Soil Response Actions 3-5
3.5 Basis for Taking Action 3-6
3.5.1 Basis for Groundwater Action 3-6
3.5.2 Basis for Soil Action 3-6

4.0 SUMMARY OF FIVE-YEAR REVIEW PROCESS 4-1
4.1 Administrative Components 4-1
4.2 Community Involvement and Notification 4-1
4.3 Document Review 4-2
4.4 Data Review 4-5
4.4.1 Hydraulic Data Summary 4-5
4.4.2 Analytical Data Summary 4-5
4.5 Site Inspection and LUC Management 4-11
4.6 Interviews 4-12

TABLE OF CONTENTS (Continued)

Page

5.0 GROUNDWATER: OPERABLE UNIT 1 5-1
5.1 Remedial Action 5-1
5.1.1 Remedy Selection 5-1
5.1.2 Remedy Implementation 5-4
5.1.3 Groundwater Treatment System O&M 5-4
5.2 Progress Since Last Review 5-6
5.2.1 Protectiveness Statement from Second Five-Year Review 5-6
5.2.2 Status of Recommendations from Second Five-Year Review 5-7
5.3 Five-Year Review Process 5-12
5.4 Technical Assessment 5-12
5.4.1 Question A: Is the remedy functioning as intended by the OU 1 ROD? 5-12
5.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the OU 1 groundwater remedy selection still valid? 5-20
5.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the OU 1 groundwater remedy? 5-30
5.5 Issues Identified During This Five-Year Review, Recommendations, and Follow-Up Activities 5-322
5.5.1 Issues That May Affect OU 1 Remedy Protectiveness and Recommendations to Address Those Issues 5-32
5.5.2 Issue Identified and Recommendations Completed Prior to Finalization of Third Five-Year Review 5-34
5.5.3 Issue That Does Not Affect OU 1 Remedy Protectiveness and Recommendations to Address This Issue 5-36
5.6 Protectiveness Statement 5-36
5.7 Next Five-Year Review 5-36

6.0 SOIL: OPERABLE UNIT 2 6-1
6.1 TCE Remedial Action 6-1
6.1.1 Remedy Selection 6-1
6.1.2 Remedy Implementation 6-2
6.1.3 System O&M 6-12
6.2 Progress Since Last Review 6-13
6.2.1 Protectiveness Statement from the Second Five-Year Review 6-13
6.2.2 Status of Recommendations from the Second Five-Year Review 6-13
6.3 Five-Year Review Process 6-14
6.4 Technical Assessment 6-14
6.4.1 Question A: Are the soil remedies for the OU 2 TCE sites functioning as intended by the OU 2 ROD? 6-14
6.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the selection of the remedies for the OU 2 TCE sites still valid? 6-15
6.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the soil remedies for the OU 2 TCE sites? 6-20

TABLE OF CONTENTS (Continued)

Page

6.5 Metals Remedial Action 6-21
6.5.1 Remedy Selection 6-21
6.5.2 Remedy Implementation 6-22
6.5.3 System O&M 6-28
6.6 Progress Since Last Review 6-28
6.6.1 Protectiveness Statement from the Second Five-Year Review 6-28
6.6.2 Status of Recommendations from the Second Five-Year Review 6-29
6.7 Five-Year Review Process 6-29
6.8 Technical Assessment 6-29
6.8.1 Question A: Are the soil remedies for the OU 2 metals sites functioning as intended by the OU 2 ROD? 6-29
6.8.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the selection of the remedies for the OU 2 metals sites still valid? 6-30
6.8.3 Question C: Has any other information come to light that could call into question the protectiveness of the soil remedies for the OU 2 metals sites? 6-36
6.9 Issues Identified During This Five-Year Review, Recommendations, and Follow-Up Actions 6-36
6.9.1 Issues That May Affect OU 2 Remedy Protectiveness and Recommendations to Address Those Issues 6-36
6.9.2 Issue Identified and Recommendation Completed Prior to Finalization of Third Five-Year Review 6-38
6.10 Protectiveness Statement 6-39
6.11 Next Five-Year Review 6-39

7.0 REFERENCES 7-1

LIST OF APPENDICES

A Interview Records
B Site Inspection Forms
C Regulatory Agency Comments and Responses to Comments

LIST OF TABLES

Page

1-1 Installation Restoration Program Sites Requiring a Five-Year Review, Sharpe Site 1-4

2-1 Chronology of Site Events, Sharpe Site 2-1

4-1a Documents Reviewed – Basis for the Response Action, Sharpe Site 4-2
4-1b Documents Reviewed – Implementation of the Response, Sharpe Site 4-3
4-1c Documents Reviewed – Remedy Performance, Sharpe Site 4-3
4-1d Documents Reviewed – Operation and Maintenance, Sharpe Site 4-4
4-1e Documents Reviewed – Legal Documentation, Sharpe Site 4-5
4-1f Documents Reviewed – Community Involvement, Sharpe Site 4-5
4-2 Minimum and Maximum Detections of Trichloroethene, Tetrachloroethene, and Carbon Tetrachloride in Groundwater, 2008 through 2012 4-6

5-1 Remedial Performance Standards – Aquifer Cleanup Levels, Sharpe Site 5-1
5-2 Elements of the Groundwater Remedy, OU 1 ROD 5-2
5-3 Substantive Waste Discharge Requirements for Land Disposal and Sampling Frequency Sample Locations: Influent and Effluent at GWTPs, Sharpe Site 5-3
5-4 North Balloon, South Balloon, and Central Area Extraction Wells, Sharpe Site (December 2012) 5-5
5-5 Annual Cost-Per-Pound of Mass Removed from 2008-2012, Sharpe Site 5-6
5-6 Percentage Changes in Total TCE Plume Area, 2008 to 2012, Sharpe Site 5-13
5-7 2012 Capture Zone and Containment Summary, Sharpe Site 5-17
5-8 Evaluation of Cleanup Standards Presented in the OU 1 ROD 5-22
5-9 Evaluation of Action-Specific ARARs, OU 1, Sharpe Site 5-25
5-10 Issues Identified for OU 1 Groundwater During This Five-Year Review, Recommendations, and Follow-Up Actions, Sharpe Site 5-34

6-1 Remedial Actions at TCE Sites, Sharpe Site 6-2
6-2 Status of TCE Sites, Sharpe Site 6-3
6-3 Evaluation of Action-Specific ARARs, OU 2 TCE Sites, Sharpe Site 6-17
6-4 Remedial Actions at Metals Sites, Sharpe Site 6-22
6-5 Status of Metals Sites, Sharpe Site 6-23
6-6 Evaluation of Action-Specific and Location-Specific ARARs, OU 2 Metals Sites, Sharpe Site 6-32
6-7 Issues Identified for OU 2 Soil Sites During This Five-Year Review, Recommendations, and Follow-Up Actions, Sharpe Site 6-37

LIST OF FIGURES

1-1 Soil Sites and Groundwater Plumes, Sharpe Site

3-1 Location Map, Sharpe Site
3-2 Local Area, Sharpe Site
3-3 Site Map, Sharpe Site
3-4 Stratigraphic and Hydrostratigraphic Nomenclature, Sharpe Site

4-1 Well Locations, Sharpe Site
4-2 Municipal Wells and Off-Depot Piezometer Locations, Sharpe Site
4-3 Potentiometric Surface Contours and Estimated Capture Zones in the A Zone, Third Quarter 2012, Sharpe Site
4-4 Potentiometric Surface Contours and Estimated Capture Zones in the B Zone, Third Quarter 2012, Sharpe Site
4-5 Potentiometric Surface Contours and Estimated Capture Zones in the C Zone, Third Quarter 2012, Sharpe Site
4-6 Potentiometric Surface Contours in the D Zone (North Balloon), Third Quarter 2012, Sharpe Site
4-7 TCE Concentrations in Groundwater, South Balloon and Central Area, A, B, C, and D Zones, Third Quarter 2012, Sharpe Site
4-8 TCE Concentrations in Groundwater, North Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site
4-9 Hydrogeologic Cross-Section Locations, Sharpe Site
4-10 TCE Vertical Isoconcentration Profile, Hydrogeologic Cross-Section A-A′, South Balloon, Third Quarter 2012, Sharpe Site
4-11 TCE Vertical Isoconcentration Profile, Hydrogeologic Cross-Section B-B′, Central Area, Third Quarter 2012, Sharpe Site
4-12 TCE Vertical Isoconcentration Profile, Hydrogeologic Cross-Section C-C′, North Balloon, Third Quarter 2012, Sharpe Site
4-13 PCE Concentrations in Groundwater, South Balloon and Central Area, A, B, C, and D Zones, Third Quarter 2012, Sharpe Site
4-14 PCE Concentrations in Groundwater, North Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site
4-15 PCE Vertical Isoconcentration Profile, Hydrogeologic Cross-Section A-A′, South Balloon, Third Quarter 2012, Sharpe Site
4-16 PCE Vertical Isoconcentration Profile, Hydrogeologic Cross-Section C-C′, North Balloon, Third Quarter 2012, Sharpe Site
4-17 Carbon Tetrachloride Concentrations in Groundwater, South Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site
4-18 Carbon Tetrachloride Vertical Isoconcentration Profile, Hydrogeologic Cross-Section A-A´, South Balloon, Third Quarter 2012, Sharpe Site
4-19 Other Contaminants of Concern with Detections Greater than Aquifer Cleanup Levels, A, B, and C Zones, Third Quarter 2012, Sharpe Site
4-20 TCE Concentrations in Groundwater at Potable Wells, Third Quarter 2012, Sharpe Site
4-21 PCE Concentrations in Groundwater at Potable Wells, Third Quarter 2012, Sharpe Site

LIST OF FIGURES (Continued)

5-1 Locations of Groundwater Treatment Plants, Extraction Wells, and Percolation Ponds, Sharpe Site
5-2 Flow Schematic for Sharpe Site Groundwater Treatment Systems, 2008–2012
5-3 Yearly VOC Mass Removed, 1996 - 2012, Sharpe Site
5-4 Average Annual Cost-per-Pound of Mass Removed, 1996 through September 2012, Sharpe Site
5-5 Composite TCE Plume Comparison, A, B, and C Zones, 2008–2012, Sharpe Site
5-6 Composite PCE Plume Comparison, A, B, and C Zones, 2008–2012, Sharpe Site
5-7 Interpreted Extraction Well Capture in the A Zone, Third Quarter 2012, Sharpe Site
5-8 Interpreted Extraction Well Capture in the B Zone, Third Quarter 2012, Sharpe Site
5-9 Interpreted Extraction Well Capture in the C Zone, Third Quarter 2012, Sharpe Site
5-10 Significant Decreasing Concentration Trends in VOCs in Groundwater, Third Quarter 2012, Sharpe Site
5-11 A Zone: Sharpe Site Transport Model Results for TCE
5-12 B Zone: Sharpe Site Transport Model Results for TCE
5-13 C Zone: Sharpe Site Transport Model Results for TCE
5-14 CD Transition: Sharpe Site Transport Model Results for TCE

6-1 Status of TCE Soil Sites, Sharpe Site
6-2 Metals Soil Sites with Land Use Controls, Sharpe Site

ACRONYMS AND ABBREVIATIONS

ACL	aquifer cleanup level
ADAF	age-dependent adjustment factors
AHA	Administration and Housing Area
ALM	Adult Lead Methodology
ARAR	applicable or relevant and appropriate requirements
Army	United States Department of the Army
bgs	below ground surface
B240	Building 240
B404	Building 404
CCl_4	carbon tetrachloride
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
CPT	cone penetrometer test
CrIII	trivalent chromium
CrVI	hexavalent chromium
CVWB	Central Valley Regional Water Quality Control Board
DCA	dichloroethane
DCE	dichloroethene
DDJC	Defense Distribution Depot San Joaquin
DHS	California Department of Health Services
DI-WET	deionized water waste extraction test
DLA	Defense Logistics Agency
DLR	detection limit for purposes of reporting
DPH	California Department of Public Health
DTSC	California Department of Toxic Substances Control
DWR	Department of Water Resources
EHC	redox compound
EOS	emulsified oil substrate
EPA	United States Environmental Protection Agency
ESD	explanation of significant differences
ESE	Environmental Science and Engineering, Inc.
FFA	Federal Facility Agreement
FS	feasibility study
GAC	granular activated-carbon
gpm	gallons per minute
GWTP	groundwater treatment plant
HHRA	human

ACRONYMS AND ABBREVIATIONS (Continued)

IC	institutional control
IRP	Installation Restoration Program
kg	kilogram
$KMn0_4$	potassium permanganate
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
OEHHA	California Office of Environmental Health Hazard Assessment
OU	operable unit
O&M	operations and maintenance
PCE	tetrachloroethene
PHG	public health goal
ppbv	parts per billion by volume
Radian	Radian International
RAO	remedial action objective
RAR	remedial action report
RI	remedial investigation
ROD	record of decision
RPM	remedial project manager
RPMPD	Real Property Master Plan Digest
RSL	regional screening level
SCADA	supervisory control and data acquisition
SJCEHD	San Joaquin County Environmental Health Department
SSJIDC	South San Joaquin Irrigation District Canal
SVE	soil vapor extraction
SWMU	solid waste management unit
TBC	to be considered
TCE	trichloroethene
TPH	total petroleum hydrocarbons
URS	URS Group, Inc.
UST	underground storage tank
VEW	vapor extraction well
VMW	vapor monitoring well
VOC	volatile organic compound
WDR	waste discharge requirements
WWTP	wastewater treatment plant

ACRONYMS AND ABBREVIATIONS (Continued)

µg/dL	micrograms of lead per deciliter
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
§	Section
3Q12	third quarter 2012

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ES.0 EXECUTIVE SUMMARY

This is the third five-year review report for remedial actions performed at the Defense Distribution Depot San Joaquin–Sharpe Site (Sharpe Site) pursuant to the Operable Unit (OU) 1 record of decision (ROD) and OU 2 ROD, as modified by an amendment and a memorandum to the site file. The RODs and ROD modifications are as follows:

Operable Unit 1

- *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site Record of Decision, Operable Unit 1* (Environmental Science and Engineering, Inc. [ESE], 1993), herein referred to as the OU 1 ROD. This ROD establishes groundwater extraction, air stripping, disposition of treated groundwater via surface water discharge, water reuse, or evaporation/infiltration ponds, and off-gas treatment as the remedy for contaminated groundwater beneath and emanating from the Sharpe Site. The OU 1 ROD identifies 22 volatile organic compounds (VOCs) in groundwater as contaminants of concern (COCs) to be targeted for cleanup at the Sharpe Site.

Operable Unit 2

- *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (ESE, 1996), herein referred to as the OU 2 ROD. This ROD documents excavation and off-site disposal of metals-contaminated soil and removal of trichloroethene (TCE) in the vadose zone via soil vapor extraction (SVE), treatment, and discharge to the atmosphere as the selected remedies for contaminated soil to protect the health of potential on-site workers and the beneficial use of groundwater, respectively. In addition, the OU 2 ROD documents No Further Action decisions for 111 solid waste management units (SWMUs) and the pesticide mix area in the North Balloon.

- *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS Group, Inc. [URS], 2011a), herein referred to as the OU 2 ROD Amendment. This amendment modifies the remedy for the TCE and metals soil sites by adding land use controls (LUCs) at eight TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A) to protect human health from the vapor intrusion pathway, LUCs at all five metals sites (S-3, S-26, S-30, S-33/29, and S-36) to protect human health from residual metals contamination in soil, and monitoring at two of the metals sites (S-3 and S-26) to protect burrowing owls from residual metals contamination in soils. No Further Action decisions at eight other TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A) are also documented in the OU 2 ROD Amendment.

- *Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (Defense Logistics Agency [DLA], 2012), herein referred to as the OU 2 Memorandum to the Site File. This memorandum terminates LUCs and documents no further action at three TCE sites (P-2A, P-2B, and P-4B).

Five-year reviews of remedial actions at the Sharpe Site are required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. This review evaluates the performance of remedial actions conducted during the third five-year review period, as well as actions taken in response to recommendations made in the second five-year review, to determine whether the remedial actions are protective of human health and the environment. This third five-year review for the Sharpe Site covers the period from 24 September 2009 through 24 September 2014 based on the United States Environmental Protection Agency's Region 9 (EPA)

concurrence of the second five-year review on 24 September 2009. As the lead agency, DLA has conducted its reviews no less often than every five years since initiation of the selected remedial action, as required by CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Therefore, data evaluated by DLA for this third five-year review cover the five-year period from 2008 through 2012. This five-year dataset follows the five-year dataset (2003 through 2007) covered by the second five-year review. Due to the time needed to prepare a five-year review in accordance with the *Comprehensive Five-Year Review Guidance* (EPA, 2001) and complete the review cycle process in accordance with the Federal Facility Agreement (FFA), including draft, draft final, and final versions of the report, evaluating data collected through 24 September 2014 for this third five-year review is not feasible. Data collected from 2013 through 24 September 2014 that were not evaluated for this third five-year review will be evaluated in the fourth five-year review.

ES.1 Progress Since Second Five-Year Review

ES.1.1 Operable Unit 1

Components of the OU 1 remedy (groundwater extraction and treatment) were fully implemented prior to the period of this third five-year review. Actions have been taken to improve the performance of the OU 1 remedy and to address recommendations in the second five-year review. Those actions include:

- Optimized groundwater extraction well array (i.e., shut down unnecessary wells/restarted other wells)
- Installed and began operating two extraction wells (EWB4 and EWCB6)
- Conducted three in situ amendment treatment technology pilot studies, including potassium permanganate ($KMnO_4$), redox compound (EHC), and emulsified oil substrate (EOS)
- Evaluated OU 1 remedy enhancement alternatives in a focused feasibility study
- Prepared an explanation of significant differences (ESD) (revised final pending as of September 2014) to add in situ treatment and LUCs to OU 1 remedy
- Developed and implemented off-depot potable water supply well contingency plan
- Installed discharge piping to connect the interplant pipeline to the wastewater treatment plant pond and Building 404 (B404) percolation pond
- Expanded B404 percolation pond
- Incorporated data from multiple cone penetrometer testing (CPT) investigations, monitoring and extraction well installations, and sample results to add a new aquitard layer containing substantial COC mass to the groundwater model
- Converted the flow component of the groundwater model from steady-state to transient flow

ES.1.2 Operable Unit 2

Since the second five-year review, SVE was implemented at Site P-5A in the Central Area, where TCE concentrations in soil vapor samples collected during investigations in 2006 and 2007 indicated the presence of a residual TCE source area. SVE operations began in April 2010 and continued through September 2012, when the system was shut down for a 6-month rebound evaluation. Also during the third

five-year review period, the OU 2 ROD Amendment was finalized, which documented No Further Action decisions at eight TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A) and added LUCs to the OU 2 remedy at eight other TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A). In 2012, LUCs were terminated at Sites P-2A, P-2B, and P-4B because current (2011) VOC concentrations in soil vapor allow for unlimited use and unrestricted exposure. LUCs continue to be implemented at the remaining five TCE sites (P-1A, P-1B, P-1C, P-1G, and P-5A) and warning signs were installed at each site in 2012. Annual inspections for LUC compliance were conducted in 2011 and 2012 and reported in the FFA Annual Progress Reports.

Remedial actions for metals soil sites, where required, were completed during the first and second five-year review period. During the third five-year review period, the OU 2 ROD Amendment was finalized, which added LUCs to the OU 2 remedy at the five metals sites (S-3, S-26, S-30, S-33/29, and S-36) and burrowing owl monitoring at Sites S-3 and S-26. Warning signs were installed at the five metals sites in 2012, and annual inspections were conducted in 2011 and 2012 and reported in the FFA Annual Progress Reports.

ES.2 Issues

ES.2.1 Operable Unit 1

The following issues that may affect the protectiveness of the OU 1 remedy will be tracked by EPA:

LUCs. VOCs can potentially migrate from contaminated groundwater up through the vadose zone and into buildings. On-depot LUCs to prevent human exposure to breathing indoor air with VOC concentrations that pose an unacceptable health risk have been proposed in an ESD (URS, 2012a, revised final pending as of September 2014). In addition, LUCs to restrict on-depot groundwater use and prevent human consumption of contaminated groundwater are also proposed in the ESD. The establishment of LUCs for OU 1 on government property will reduce the potential for exposure, thereby ensuring protection of human health from groundwater VOCs.

Potential Source Area Western South Balloon. During the 2007/2008 CPT/HydroPunch investigation, groundwater samples collected in the EWC4 area of the western South Balloon indicated the presence of a VOC plume. HydroPunch samples collected at one location had concentrations of tetrachloroethene (PCE), TCE, and carbon tetrachloride (CCl_4) exceeding their respective aquifer cleanup levels (ACLs). This new plume is unique at the Sharpe Site because both CCl_4 and PCE occur at concentrations greater than TCE concentrations. Subsequently, monitoring well cluster MW326 was installed in 2009 to provide plume core data for the PCE-TCE-CCl_4 plume. Concentrations of PCE, TCE, and CCl_4 have consistently exceeded their respective ACLs in samples collected from MW326B and MW326C since the first sampling event (first quarter 2010 [1Q10]) at the cluster; all COC concentrations have been less than their ACLs at MW326CD and MW326D. At MW326A, fluctuating VOC concentrations (primarily CCl_4) may be caused by seasonal groundwater fluctuations; for example, when water levels rise, concentrations increase, and when water levels decline, concentrations decrease. A correlation between increasing concentrations and rising water levels suggests the possible presence of residual VOC mass in the vadose zone at or near that well location.

Issues identified in the draft and draft final version of this third five-year review that do not require tracking by EPA because they were addressed prior to the final submittal of this document include:

Plume Migration to Off-Depot Industrial Supply Well PW020. Increased TCE concentrations at off-depot industrial supply well PW020 during the third five-year review period suggest that a portion of the TCE plume has migrated as a result of hydraulic influences from the pumping of this well. To prevent the

migration from resulting in a reduction in long-term protectiveness, mitigation is necessary. DLA has implemented response actions established in the *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* (URS, 2010e) and installed a guard well cluster (MW539) upgradient of PW020, which is used to supply industrial process water to a nearby industrial facility. The well owner supplies bottled water for human consumption and no employee is consuming water from PW020. Additional action may be necessary to maintain long-term protectiveness if higher concentration portions of the TCE plume continue to be drawn toward PW020. Water from PW020 is being used for industrial processes.

Potential Conduit for Plume Migration. PW038 presents a potential conduit for migration of COC contamination to uncontaminated groundwater below the Corcoran Clay equivalent because PW038 has screen intervals above and below the clay layer. Even when not in operation, the casing and screens are a conduit through the clay. PW038 remains in standby mode in the event its capacity is needed for an emergency. However, it should not be used for routine operation.

Discharge Capacity. Treated groundwater discharge capacity is limited on the Sharpe Site and does not allow flexibility to optimize groundwater extraction. If restart of existing or installation of additional extraction wells is necessary to protect groundwater users in the long term, there is insufficient capacity on the Sharpe Site to discharge the extracted groundwater after treatment.

The following issue does not affect protectiveness of the OU 1 remedy:

Time to Achieve Cleanup. The predicted time required to achieve groundwater ACLs is greater than 30 years because of the mass of VOCs that remains in low permeability (A/B aquitard) areas within the saturated zone. Without additional remedial action to remove some of the VOC mass, the mass will be released very slowly to groundwater over a period of many years. DLA is planning to add an in situ treatment component to the groundwater remedy to remove mass from the low permeability areas through an ESD (URS, 2012a, revised final pending as of September 2014). The long-term cost of cleanup to ACLs is a concern.

ES.2.2 Operable Unit 2

The following issues that may affect the protectiveness of the OU 2 remedy at TCE Sites P-1A, P-1B, and P-1C and metals Site S-33/29 will be tracked by EPA:

Sites P-1A, P-1B, and P-1C. TCE concentrations in soil vapor samples collected in 2011 indicate that residual TCE mass present in the vadose zone at Sites P-1A, P-1B, and P-1C may pose a threat to groundwater quality. Human health is protected because LUCs are in place and effective. TCE concentrations in 14 of 27 soil vapor samples were greater than the OU 2 ROD cleanup standard, and TCE concentrations in 6 of 14 HydroPunch samples collected from the shallowest groundwater were greater than the TCE ACL. Although SVE was conducted at Sites P-1A, P-1B, and P-1C between 1998 and 2002, TCE concentrations in soil vapor have rebounded. The rebound likely is due to diffusion and advection of TCE desorbed from silt and clay deposits to more permeable sandy deposits and/or volatilization from the groundwater.

Site S-33/29. Radiological detections at Site S-33/29 have not been fully characterized. What, if any, effect the radiological detections may have on the OU 2 remedy has not been determined.

The following issue identified in the draft and draft final versions of this third five-year review does not affect protectiveness of the OU 2 remedy at TCE Site P-1G and was addressed prior to the final submittal of this document:

Site P-1G. In analysis of 2011 soil vapor data, 1,3-butadiene emerged as the dominant contributor to the cumulative risk estimates for 11 of the 12 samples collected from Site P-1G and is solely responsible for risk estimates greater than the de minimis (inconsequential) threshold of 1×10^{-6} cancer risk. However, historically, this VOC has not been associated with the Sharpe Site, nor are there any known or suspected sources of this compound associated with Sharpe Site operations. Monitoring to confirm the presence or absence of 1,3-butadiene in soil vapor at Site P-1G is needed. However, human health and the environment are protected because LUCs are in place and effective, and 1,3-butadiene has never been detected in groundwater at the Sharpe Site.

ES.3 Recommendations and Follow-Up Actions

ES.3.1 Operable Unit 1

The following recommendations intended to address issues that may affect the protectiveness of the OU 1 remedy will be tracked by EPA:

LUCs. Finalize the OU 1 ESD (URS, 2012a, revised final pending as of September 2014) that adds LUCs to the OU 1 remedy to protect human health from vapor intrusion by preventing exposure to indoor air with VOC concentrations that pose an unacceptable health risk and prevent access to or use of on-depot groundwater with COC concentrations exceeding ACLs.

Potential Source Area Western South Balloon. To evaluate the potential for the presence of a secondary source of VOCs in the western portion of the South Balloon, a field sampling effort to collect and analyze soil vapor and shallow groundwater samples in the MW326 area has been proposed. If a residual source is present, identify appropriate and feasible actions to ensure long-term protectiveness.

Status: In 2013, a field sampling effort was conducted in the MW326 area. The soil vapor sample results suggest that a limited residual CCl_4 source that poses a threat to groundwater quality and to human health (via the vapor intrusion pathway) may exist in the vadose zone southeast of the MW326 well cluster (URS, 2014a). For groundwater, 10 of 17 HydroPunch samples had concentrations of CCl_4 greater than the ACL. Additional soil vapor sampling to collect sufficient data to determine whether remedial action is warranted and establishment of a new OU 2 site with LUCs to prohibit residential-type uses have been recommended (URS, 2014a). For groundwater, two monitoring well clusters to monitor VOC contamination in groundwater have been recommended (URS, 2014a).

Other recommendations/follow-up actions intended to address issues for groundwater identified in the draft and draft final versions of this third five-year review that do not require tracking by EPA because they have already been completed include:

Plume Migration to Off-Depot Industrial Supply Well PW020. Identify and implement appropriate and feasible response actions to ensure protection of users of groundwater at off-depot industrial supply well PW020. Response actions may include shutting down PW020, replacement of water supply, wellhead treatment, and/or installation of additional extraction wells.

Status: PW020 was taken offline in 2Q13 and was not restarted. In 2014, Boral Roofing decommissioned PW020, and DLA replaced Boral Roofing's 2-inch potable water line with a 4-inch line that connects to the City of Lathrop's municipal water supply. Consequently, there is in no exposure pathway for TCE in groundwater beneath the Boral Roofing property, and DLA has completed the response action in accordance with the *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* (URS, 2010e). Furthermore, in June 2014, new extraction well EWNC6 was installed in the C Zone upgradient of PW020 to

prevent further downgradient migration of the North Balloon TCE plume. Startup of EWNC6 is expected in late summer 2014.

Potential Conduit for Plume Migration. Decommission (destroy) PW038 to eliminate it as a potential conduit for migration of the North Balloon TCE plume to below the Corcoran Clay equivalent.

Status: PW038 was decommissioned on 21 November 2013. The potential for vertical migration of the TCE plume below the Corcoran Clay equivalent at this well has been eliminated.

Discharge Capacity. Identify locations on the Sharpe Site where treated groundwater can be discharged to provide additional capacity for optimized groundwater extraction if wells are restarted or new wells are installed.

Status: The capacity of the treated groundwater discharge pond at B404 was increased in 2013 by expanding the area and depth of the pond.

The following recommendation is intended to address the issue that does not affect protectiveness of the OU 1 remedy:

Time to Achieve Cleanup. Shorten groundwater cleanup time by implementing in situ treatment component of the groundwater remedy that will remove VOC mass from the A/B aquitard.

ES.3.2 Operable Unit 2

The following recommendations intended to address issues that may affect the protectiveness of the OU 2 remedy at TCE Sites P-1A, P-1B, and P-1C and metals Site S-33/29 will be tracked by EPA:

Sites P-1A, P-1B, and P-1C. Conduct additional soil vapor sampling at Sites P-1A, P-1B and P-1C to delineate the extent of TCE concentrations in the vadose zone greater than the OU 2 ROD cleanup standard, and evaluate whether further remedial action is needed to prevent degradation of groundwater. Three groundwater monitoring wells (MW328A, MW329A, MW330A) installed in the shallow A Zone in September 2012 are being sampled quarterly through 3Q13. Initial sample results less than the TCE ACL at all three wells during the 4Q12 sampling event suggest that residual TCE mass is not migrating to groundwater at concentrations greater than the ACL.

Status. The additional soil vapor sampling at Sites P-1A, P-1B, and P-1C was conducted in July and August 2014 in accordance with the *Work Plan for Sampling at Operable Unit 2 TCE Sites P-1A, P-1B, and P-1C, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2014b). Results will be documented in a forthcoming report. In addition, TCE has not been detected at concentrations greater than the ACL at MW328A, MW329A, or MW330A in samples collected through 3Q13.

Site S-33/29. Complete investigation of the area of potential radiological concern at Site S-33/29. Document findings and selected remedial action, if any, in appropriate document(s) to the signatories of the FFA. Ensure that the remedial action is consistent with the OU 2 ROD remedy, as amended, for metals sites.

One other recommendation/follow-up action intended to address the issue identified in the draft and draft final versions of this third five-year review that does not affect protectiveness of the OU 2 remedy at TCE Site P-1G and has already been completed includes:

Site P-1G: Perform confirmation sampling at Site P-1G to determine if 1,3-butadiene detected in soil vapor samples collected in 2011 is actually present at the site. A work plan for the installation and sampling of two soil vapor monitoring wells has been prepared. Both wells will be sampled four times in the 6-month period following construction. Following completion of the sampling, the potential risk to human health from the vapor intrusion pathway will be recalculated to determine whether LUCs can be terminated.

Status: Soil vapor samples were collected from each of two VMWs installed at Site P-1G in two sampling events during 2013. 1,3-Butadiene was less than the method detection limit in all samples collected. DLA submitted a Memorandum to the Site File that included the VMW sample results and revised risk estimates and documented regulatory agency concurrence with termination of LUCs and no further action at Site P-1G (DLA, 2013).

ES.4 Protectiveness Statements

ES.4.1 Operable Unit 1

The remedy for OU 1 protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term, the following action needs to be taken: establish LUCs for groundwater use and potential vapor intrusion from groundwater in the OU 1 ESD.

ES.4.2 Operable Unit 2

The remedy for OU 2 protects human health and the environment in the short term. For the OU 2 remedies to be protective in the long term, the following actions need to be taken: delineate the extent of TCE concentrations in the vadose zone greater than the soil vapor cleanup standard and evaluate the need and feasibility for remedial action (SVE) at Sites P-1A, P-1B, and P-1C, and collect additional soil vapor samples in the MW326 cluster area to determine whether remedial action is warranted and establish this area as a new OU 2 site with LUCs. Furthermore, the area of potential radiological concern at Site S-33/29 needs to be investigated to determine whether a remedial action is necessary and feasible.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Sharpe Army Depot (US Army)		
EPA ID: CA8210020832		
Region: 9	**State:** CA	**City/County:** San Joaquin

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** Defense Logistics Agency
Author name (Federal or State Project Manager): Maurice Benson
Author affiliation: DLA Installation Support at San Joaquin
Review period: 24 January 2013 – 24 September 2014
Date of site inspection: 24 January 2013
Type of review: Statutory
Review number: 3
Triggering action date: 24 September 2009
Due date *(five years after triggering action date)*: 24 September 2014

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
NA

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Without LUCs in place on depot, there is potential for human exposure to VOCs in contaminated indoor air or groundwater.			
	Recommendation: Finalize the OU 1 ESD to establish LUCs to protect human health from potential exposure to contaminated indoor air caused by vapor intrusion and prevent access to or use of on-depot contaminated groundwater.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	30 September 2014

OU(s): 1	Issue Category: Changed Site Conditions			
	Issue: If there is a source of CCl4 in the western South Balloon (MW326 cluster area), there is potential for exposure to VOCs by future groundwater users or occupants of any buildings constructed in the area.			
	Recommendation: Collect soil vapor and shallow groundwater samples in the MW326 cluster area to determine whether there is a residual source of VOCs; if a residual source is present, identify appropriate and feasible actions to ensure long-term protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	30 September 2015

OU(s): 2	Issue Category: Changed Site Conditions			
	Issue: TCE concentrations in soil vapor samples collected in 2011 indicate that residual TCE mass present in the vadose zone at Sites P-1A, P-1B, and P-1C may pose a threat to groundwater quality and human health.			
	Recommendation: Conduct soil vapor sampling at Sites P-1A, P-1B, and P-1C to delineate the extent of TCE concentrations in the vadose zone greater than the cleanup standard and evaluate whether further remedial action is needed to prevent degradation of groundwater.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	31 December 2015

OU(s): 2	Issue Category: Changed Site Conditions			
	Issue: Radiological detections at Site S-33/29 have not been fully characterized.			
	Recommendation: Complete investigation of the area of potential radiological concern at Site S-33/29; select, document, and implement remedial action, if necessary; and ensure remedy is consistent with the OU 2 ROD remedy, as amended, for metals sites.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	31 December 2015

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
1	Short-term Protective	

Protectiveness Statement:
The remedy for OU 1 protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term, the following action needs to be taken: establish LUCs for groundwater use and potential vapor intrusion from groundwater in the OU 1 ESD.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
2	Short-term Protective	

Protectiveness Statement:
The remedy for OU 2 protects human health and the environment in the short term. For the OU 2 remedies to be protective in the long term, the following actions need to be taken: delineate the extent of TCE concentrations in the vadose zone greater than the soil vapor cleanup standard and evaluate the need and feasibility for remedial action (SVE) at Sites P-1A, P-1B, and P-1C, and collect additional soil vapor samples in the MW326 cluster area to determine whether remedial action is warranted and establish this area as a new OU 2 site with LUCs. Furthermore, the area of potential radiological concern at Site S-33/29 needs to be investigated to determine whether a remedial action is necessary and feasible.

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a site-wide protectiveness determination and statement.

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	

Protectiveness Statement:
The remedial actions at OU 2 TCE Sites P-1D, P-1E, P-1F, P-1G, P-2A, P-2B, P-3A, P-4A, P-4B, P-4C, P-5A, P-6A, and P-8A and OU 2 metals Sites S-3, S-26, S-30, and S-36 are protective of human health and the environment. Because the remedial actions at OU 1, OU 2 TCE Sites P-1A, P-1B, and P-1C, and OU 2 metals Site S-33/29 are protective in the short term, the Sharpe Site is protective of human health and the environment in the short term. Actions that need to be taken to ensure long-term protectiveness at those sites are described above in the OU 1 and OU 2 protectiveness statements.

1.0 INTRODUCTION

This is the third five-year review report for remedial actions taken at the Defense Distribution Depot San Joaquin–Sharpe Site (Sharpe Site) pursuant to the Operable Unit (OU) 1 record of decision (ROD) and OU 2[1] ROD, as modified by an amendment and a memorandum to the site file. The RODs and ROD modifications are as follows:

Operable Unit 1

- *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site Record of Decision, Operable Unit 1* (Environmental Science and Engineering, Inc. [ESE], 1993), herein referred to as the OU 1 ROD. This ROD establishes groundwater extraction, air stripping, disposition of treated groundwater via surface water discharge, water reuse, or evaporation/infiltration ponds, and off-gas treatment as the remedy for contaminated groundwater beneath and emanating from the Sharpe Site. The OU 1 ROD identifies 22 volatile organic compounds (VOCs) in groundwater as contaminants of concern (COCs) to be targeted for cleanup at the Sharpe Site.

Operable Unit 2

- *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (ESE, 1996), herein referred to as the OU 2 ROD. This ROD documents excavation and off-site disposal of metals-contaminated soil and removal of trichloroethene (TCE) in the vadose zone via soil vapor extraction (SVE), treatment, and discharge to the atmosphere as the selected remedies for contaminated soil to protect the health of potential on-site workers and the beneficial use of groundwater, respectively. In addition, the OU 2 ROD documents No Further Action decisions for 111 solid waste management units (SWMUs) and the pesticide mix area in the North Balloon.

- *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS Group, Inc. [URS], 2011a), herein referred to as the OU 2 ROD Amendment. This amendment modifies the remedy for the TCE and metals soil sites by adding land use controls (LUCs) at eight TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A) to protect human health from the vapor intrusion pathway, LUCs at all five metals sites (S-3, S-26, S-30, S-33/29, and S-36) to protect human health from residual metals contamination in soil, and monitoring at two of the metals sites (S-3 and S-26) to protect burrowing owls from residual metals contamination in soils. No Further Action decisions at eight other TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A) are also documented in the OU 2 ROD Amendment.

- *Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (Defense Logistics Agency [DLA], 2012), herein referred to as the OU 2 Memorandum to the Site File. This memorandum terminates LUCs and documents no further action at three TCE sites (P-2A, P-2B, and P-4B).

Five-year reviews of remedial actions at the Sharpe Site are required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted

[1] To facilitate environmental cleanup at the Sharpe Site, two OUs were established. OU 1 consists of contaminated groundwater and OU 2 consists of contaminated soil and soil vapor above the water table (the vadose zone).

exposure.[2] This third five-year review for the Sharpe Site covers the period from 24 September 2009 through 24 September 2014 based on the United States Environmental Protection Agency's Region 9 (EPA) concurrence of the second five-year review on 24 September 2009. As the lead agency, DLA has conducted its reviews no less often than every five years since initiation of the selected remedial action, as required by CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Therefore, data evaluated by DLA for this third five-year review cover the five-year period from 2008 through 2012. This five-year dataset follows the five-year dataset (2003 through 2007) covered by the second five-year review. Due to the time needed to prepare a five-year review in accordance with the *Comprehensive Five-Year Review Guidance* (EPA, 2001) and complete the review cycle process in accordance with the Federal Facility Agreement (FFA), including draft, draft final, and final versions of the report, evaluating data collected through 24 September 2014 for this third five-year review is not feasible. Data from 2013 through 24 September 2014 that were not evaluated for this third five-year review will be evaluated in the fourth five-year review.

A five-year review determines whether the remedial response actions are protective of human health and the environment and, as necessary, provides recommendations for attaining and/or maintaining sustainable protection. As this is the third five-year review of remedial actions at the Sharpe Site, this review evaluated changes in remedy implementation during this five-year period and actions taken in response to recommendations in the *DDJC-Sharpe Second Five-Year Review Report* (URS, 2009a), herein referred to as the Second Five-Year Review Report. The Second Five-Year Review Report for the Sharpe Site is available at http://cumulis.epa.gov/fiveyear/.

Executive Order 12580 delegates review responsibility to federal facilities that control the sole source of the release. This five-year review for the Sharpe Site was conducted by the DLA Installation Support at San Joaquin using URS under contract to the United States Army Corps of Engineers-Tulsa District. This report will become part of the Administrative Record for the Sharpe Site.

DLA is responsible for managing regional and local environmental programs at the Sharpe Site, including the Installation Restoration Program (IRP). The IRP at the Sharpe Site is managed in accordance with the FFA developed specifically for the Sharpe Site. In 1989, the United States Department of the Army (Army) (as the lead federal agency), EPA, and the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and Central Valley Regional Water Quality Control Board (CVWB) co-signed the FFA for the site. In 1990, DLA became the lead federal agency at the Sharpe Site when a memorandum of agreement between the Army and DLA was executed to transfer responsibilities of missions and functions of the Sharpe Site (then the Sharpe Army Depot) from the Army to DLA.

[2] Underground storage tanks (USTs) containing petroleum only are exempt from the CERCLA process (see CERCLA § 101[14]) and are not discussed in this five-year review other than the following summary. The Sharpe Site's UST Program was initiated in 1988, when the installation first began to remove or decommission (close in place) its existing USTs and sumps. Past investigations and remedial activities at UST sites at the Sharpe Site have been overseen by San Joaquin County Environmental Health Department (SJCEHD) or CVWB. Ninety-two UST sites have been identified at the Sharpe Site, including tanks, sumps, and vaults. All USTs have been removed, although there are a few remaining active and inactive sumps. Of the 92 sites, a total of 80 sites have been closed by either SJCEHD or CVWB. Four sites (12, 147, 148, and the former fueling station, which includes eight USTs and one sump) remain open because of residual contamination that could threaten beneficial uses of groundwater; monitored natural attenuation of total petroleum hydrocarbon (TPH) contamination in groundwater was recommended as the remedy for UST Site 12, Site 147, and the former fueling station (URS, 2003a). Annual groundwater sampling is currently limited to UST Site 12, a former 2,000-gallon steel tank, and Site 147, the location of four former ASTs. Annual sampling for petroleum hydrocarbons is continuing at these two sites until further recommendations from the UST Program and CVWB regarding UST site closure are provided (URS, 2013a).

The FFA has enforceable schedules; it ensures that environmental impacts are thoroughly investigated and that appropriate cleanup actions are taken to protect human health, welfare, and the environment. As described in the FFA, authority for IRP decision making rests with the team of remedial project managers (RPMs) from DLA Installation Support at San Joaquin, EPA, DTSC, and CVWB. DLA is the lead agency responsible for funding and implementing remedial actions. EPA provides final approval for decisions regarding remedial actions taken at the Sharpe Site. EPA, DTSC, and CVWB also provide regulatory oversight, including technical support, review, and comment on all investigative and remedial work at the Sharpe Site.

DLA is providing this Five-Year Review Report in accordance with CERCLA § 121 and the NCP. CERCLA § 121 states:

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

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

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

1.1 Previous Five-Year Review Reports

Five-year reviews were conducted in 2003 and 2008. The first review was documented in *DDJC-Sharpe Five-Year Review Report* (URS, 2004) and is referred to in this report as the First Five-Year Review Report. The second review was documented in *DDJC-Sharpe Second Five-Year Review Report* (URS, 2009a) and is referred to in this report as the Second Five-Year Review Report. The content of these reports can be accessed at http://cumulis.epa.gov/fiveyear/.

1.2 Third Five-Year Review Report

This third five-year review was prepared using the guidelines provided in the *Comprehensive Five-Year Review Guidance* (EPA, 2001) and supplements (EPA, 2011; 2012a; 2012b). The triggering action for this review is the date of EPA's concurrence on the second five-year review, which was 24 September 2009.

This five-year review addresses the IRP sites at the Sharpe Site that trigger a statutory review or a policy review. Five-year statutory reviews are required by statute for all sites for which a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Policy reviews are conducted for sites that, upon completion of remedial action, will allow unlimited use and unrestricted exposure, but that will require at least five years to attain the cleanup levels specified in the ROD. The five-year review is the same, however, regardless of whether it is required by statute or identified as a site to be reviewed as a

matter of policy. Table 1-1 lists the Sharpe Site IRP sites for which a five-year review is required. Figure 1-1 shows these sites and current (through the third quarter of 2012 [3Q12]) groundwater plumes.

Table 1-1. Installation Restoration Program Sites Requiring a Five-Year Review, Sharpe Site

OU 1 Groundwater Sites	Remedy Status
Plumes 1-8	Groundwater extraction, treatment, and discharge ongoing since 1987 (South Balloon), 1990 (North Balloon), and 1995 (Central Area).
OU 2 TCE Soil Sites	
P-1A, P-1B, P-1C	SVE operated between 1998 and 2001; LUCs implemented in 2011.
P-1E	SVE operated between 1998 and 1999; no further action documented in 2011.
P-5A	SVE operated between 2010 and 2012 (undergoing rebound study as of October 2012); LUCs implemented in 2011.
P-6A	SVE operated between 1998 and 2001; no further action documented in 2011.
P-8A	Pilot-scale SVE operated between 1993 and 1995; no further action documented in 2011.
P-1G	LUCs implemented in 2011.
P-2A, P-2B, P-4B	LUCs implemented in 2011; LUCs terminated and no further action documented in 2012.
P-1D, P-1F, P-3A, P-4A, and P-4C	No further action documented in 2011.
OU 2 Metals Soil Sites	
S-3	Soil excavation and off-site disposal in 1998; LUCs and burrowing owl monitoring implemented in 2011.
S-26	Soil excavation and off-site disposal in 1998 (Areas 1 through 5) and 2006 (Area 6); LUCs and burrowing owl monitoring implemented in 2011.
S-30, S-33/29, and S-36	LUCs implemented in 2011.

LUC = land use control
OU = operable unit
SVE = soil vapor extraction

Remainder of the Report. This report was developed using the *Comprehensive Five-Year Review Guidance* (EPA, 2001); however, the suggested content for Sections 4.0 through 11.0, as identified in the EPA guidance, is provided under separate tab (Sections 5.0 and 6.0) for each OU to consolidate the information related to an OU into one section. The remainder of this report is organized as follows:

Section 2.0 Chronology: Lists significant events related to the contamination and remediation history of the Sharpe Site.

Section 3.0 Background: Provides a succinct description of site characteristics. This section identifies the threat posed to the public and environment at the time of the ROD so that the performance of the remedy can be easily compared with the site conditions the remedy was intended to address.

Section 4.0 Five-Year Review Process: Provides an overview of activities performed during the five-year review (e.g., site inspections, interviews, and document reviews).

Sections 5.0 and 6.0: These sections cover the following topics for each OU reviewed:

Remedial Action − Provides a concise description of implementation history and the current status of the remedy.

Progress Since Last Review − Restates the recommendation(s) from the second five-year review and discusses actions taken or relevant events that have occurred since.

Five-Year Review Process − Provides site-specific results of site inspections, site interviews, and documents reviewed, as appropriate. Photographs taken during the site inspections are included at the end of each section.

Technical Assessment − Provides answers to the three questions required for the assessment (i.e., Question A: Is the remedy functioning as intended by the decision documents? Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives [RAOs] used at the time of remedy selection still valid? Question C: Has any other information come to light that could call into question the protectiveness of the remedy?)

Issues − Identifies issues related to current site operations, conditions, or activities, noting which issues, if any, prevent the remedy from being protective, currently or in the future.

Recommendations and Follow-Up Actions − Specifies required and suggested improvements to current site operations, activities, remedies, or conditions for those issues that affect current and/or future protectiveness.

Protectiveness Statement − Provides a protectiveness statement for each OU or site at which a remedial action has begun.

Next Five-Year Review – Identifies the need and time frame for the next five-year review.

Section 7.0 References: Provides reference information for sources cited in the report.

The report is supplemented with the following appendices:

- Appendix A: Interview Records
- Appendix B: Site Inspection Forms
- Appendix C: Regulatory Agency Comments and Responses to Comments

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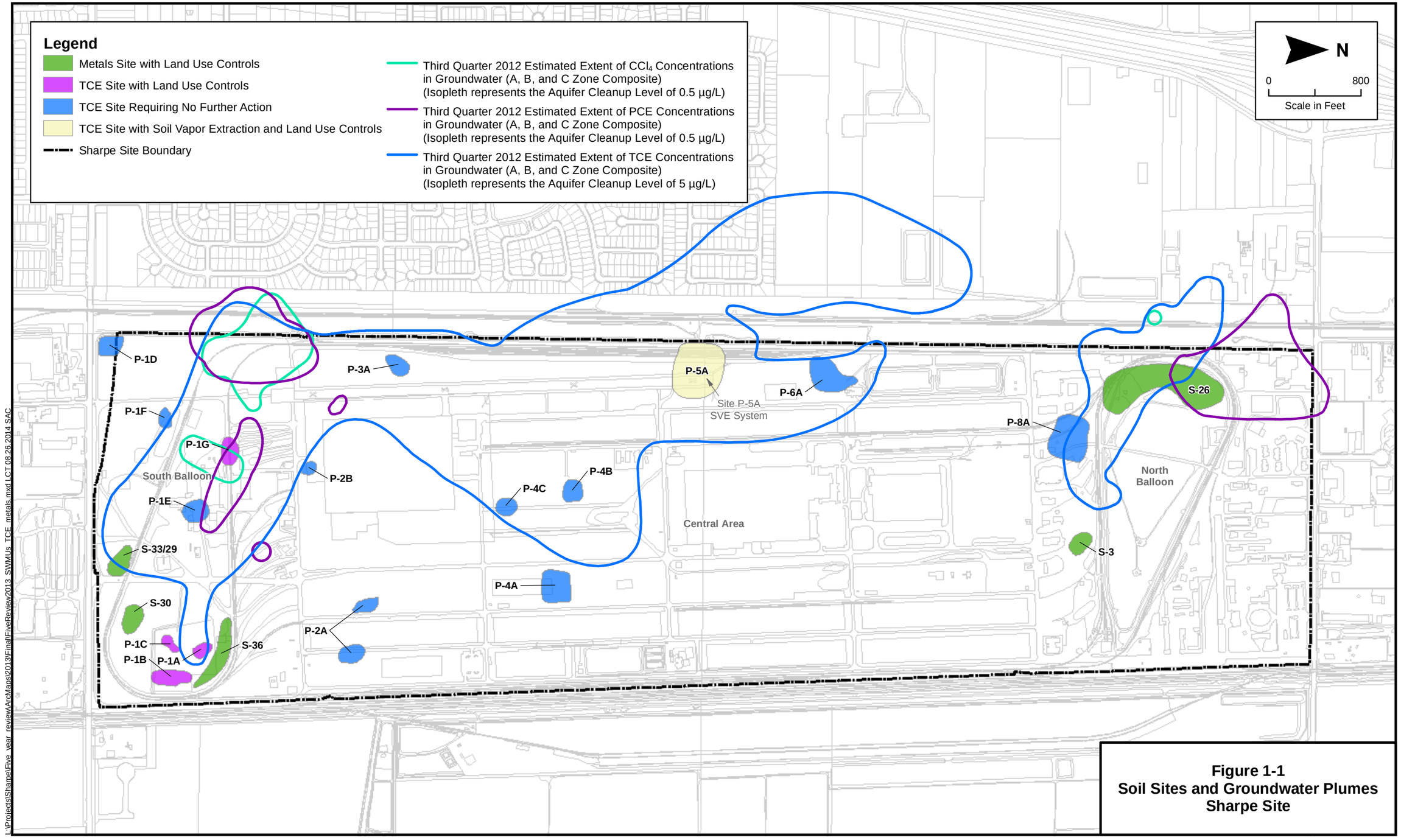

Figure 1-1
Soil Sites and Groundwater Plumes
Sharpe Site

2.0 CHRONOLOGY

Table 2-1 lists significant events and dates related to the initial discovery of contamination and implementation of site-wide remedies at the Sharpe Site.

Table 2-1. Chronology of Site Events, Sharpe Site

1980	Installation Restoration Program initiated
1982	Initial RI begun
1987	Installation added to National Priorities List by EPA
1987	Installation and operation of interim groundwater extraction and treatment system in the South Balloon
1989	FFA signed by the Army, EPA, CVWB, and DTSC
1989	Interim RI/FS for North Balloon completed
1990	Installation and operation of interim groundwater extraction and treatment system in the North Balloon
1991	RI completed
1991	FFA amended
1991	OU 1 FS completed
1992	OU 1 proposed plan published
1992	TPH-contaminated North Balloon soils removal action conducted
1993	OU 1 ROD signed by DLA, EPA, CVWB, and DTSC
1994	OU 2 FS completed
1994-1996	Pesticide-contaminated North Balloon soils removal action conducted and completed
1995	Startup and operation of groundwater extraction and treatment system in Central Area
1995	OU 2 proposed plan published
1996	OU 2 ROD signed by DLA, EPA, CVWB, and DTSC
1997	Full-scale operation of Central Area extraction and treatment system implemented
1998	Metals-contaminated soil removal actions conducted in North Balloon
1998-2000	Installation and operation of SVE systems in Central Area and South Balloon
2000	OU 2 metals RAR completed
2000	OU 2 NFA RAR completed
2001	OU 1 interim RAR completed
2002	SVE operations completed in Central Area and South Balloon
2002	OU 2 SVE RAR completed
2003	PCOR signed by EPA
2003	UST preferred alternatives report approved
2003	First five-year review signed by DLA, EPA, CVWB, and DTSC
2004	NFA approved for 10 UST sites
2005	RCP developed
2006	Additional metals-contaminated soil removed in North Balloon
2006	Monitored natural attenuation and alternative treatment technology investigations reports submitted
2006	Sharpe groundwater modeling report finalized
2006	Extraction well optimization plan implemented
2007	Compliance feasibility report for Time Schedule Order completed
2007	GWTP discharge to surface water and NPDES permit terminated
2008	OU 2 metals RAR for Site S-26, Area 6 completed
2009	OU 2 ROD amendment proposed plan published
2009	Second five-year review signed by DLA, EPA, CVWB, and DTSC
2010	Off-Depot Potable Well Contingency Plan finalized

Table 2-1. (Continued)

2010	Installation and operation of SVE system at Site P-5A
2011	OU 1 focused FS completed
2011	OU 1 ROD amendment proposed plan published
2011	OU 2 ROD Amendment signed by DLA, EPA, CVWB, and DTSC
2012	LUCs terminated and NFA documented at TCE Sites P-2A, P-2B, and P-4B
2014	OU 1 ESD prepared (revised final pending as of September 2014)

CVWB = Central Valley Regional Water Quality Control Board
DLA = Defense Logistics Agency
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
ESD = explanation of significant differences
FFA = Federal Facility Agreement
FS = feasibility study
GWTP = groundwater treatment plant
LUC = land use control
NFA = no further action
NPDES = National Pollutant Discharge Elimination System
OU = operable unit
PCOR = preliminary closeout report
RAR = remedial action report
RCP = response completion plan
RI = remedial investigation
ROD = record of decision
SVE = soil vapor extraction
TCE = trichloroethene
TPH = total petroleum hydrocarbons
UST = underground storage tank

3.0 BACKGROUND

The Sharpe Site is a distribution depot operated by DLA to supply all military services with equipment needed to fulfill its missions. This section describes activities resulting in contamination at the facility and the physical characteristics influencing contaminant behavior and remediation. This section also describes the initial response actions taken prior to the signing of the RODs and risk evaluation results.

3.1 Physical Characteristics

The Sharpe Site is in California's primarily agricultural San Joaquin Valley (Figure 3-1). The installation lies in San Joaquin County, within the limits of the City of Lathrop, a community incorporated in 1989 (Figure 3-2). The unincorporated community of French Camp borders Lathrop to the northwest, and the City of Manteca borders Lathrop to the east. Nearby large urban communities include the City of Stockton, approximately 9 miles to the north, and the City of Modesto, approximately 20 miles south of the depot.

The installation forms an approximate rectangle 0.5 mile wide (east-west) and 2 miles long (north-south) (Figure 3-2). It encompasses approximately 720 acres and ranges in elevation from 15 to 23 feet above mean sea level. Roth Road borders the northern boundary of the depot, Lathrop Road borders the southern boundary, and the Union Pacific Railroad runs parallel and adjacent to the installation's west and east boundaries. The South San Joaquin Irrigation District Canal (SSJIDC) also parallels the eastern boundary, and the Union Pacific Inter-Modal Facility borders the installation to the northeast.

The installation is divided into four major areas: the Administration and Housing Area (AHA), located at the northern end of the installation; the North Balloon, located just south of the AHA; the South Balloon, located at the southern end of the installation; and the Central Area, located between the North and South Balloon areas (Figure 3-3). The North and South Balloons are named after the shapes of areas enclosed by railroad tracks, which in map view look like hot-air balloons.

3.1.1 Surface Water Hydrology

Most surface water runoff is collected by the stormwater drainage system (i.e., catch basins and stormwater drains throughout the installation) that discharges to the SSJIDC, which parallels the eastern boundary of the installation (Figure 3-2). The SSJIDC drains north into French Camp Slough, a tributary of the San Joaquin River. The river discharges into the Sacramento-San Joaquin Delta Estuary just west of Stockton, California.

Stormwater detention ponds are also used to collect stormwater. Stormwater runoff from unpaved areas collects in trenches that discharge to the stormwater ponds. Runoff from paved areas also can enter the ponds through concrete-lined swales along the edges of the ponds and drop inlets. Water that infiltrates the ground surface and that percolates from the unlined stormwater, wastewater treatment, and remedial system percolation ponds migrates toward the water table.

Sanitary wastewater from the Sharpe Site is treated at the depot's on-site wastewater treatment plant (WWTP) and discharged to the unlined WWTP percolation pond located south of the WWTP (Figure 5-1).

Most of the extracted groundwater treated at the Sharpe Site is discharged to the Central Area percolation ponds (located north of the Central Area Groundwater Treatment Plant [GWTP]), with the remainder discharged to the Building 404 (B404), Building 240 (B240), and WWTP percolation ponds (Figure 5-1). The Central Area percolation ponds are able to accept all of the Central Area GWTP effluent (i.e., up to

500 gallons per minute [gpm], the design flow rate of the Central Area GWTP). The B240 stormwater detention ponds are used for backup discharge capacity on an as-needed basis during the dry season. The B240 ponds were designed to discharge stormwater to the storm drain. Therefore, the discharge lines from the B240 ponds are plugged when the ponds are used for disposal of treated groundwater, thus preventing discharge of non-stormwater to the storm drainage system and ultimately the SSJIDC. Plumbing from the South Balloon GWTP to the WWTP and B404 ponds was completed in January 2010 to provide an alternate land discharge location. The B404 pond was expanded in 3Q11 and is now the primary pond receiving discharge from the South Balloon GWTP.

3.1.2 Regional Geology

The Sharpe Site is located in the Central Valley of the Great Valley Geomorphic Province. The Central Valley is a broad, low-lying valley. The uppermost portion of the valley is backfilled with lacustrine, alluvial, and fluvial deposits of Pliocene through Holocene age (Figure 3-4). Surficial fan, interfan, and flood basin deposits overlie discontinuous layers and lenses of alluvial fan and stream deposits of the Victor Formation (also known as the Modesto/Riverbank Formation) and the underlying Laguna Formation. The fan and interfan deposits consist of unconsolidated sands, silts, and clays, with the fan deposits also containing gravels. The flood basin deposits (fine sand and clay) occur near a paleochannel of the San Joaquin River. Both the Victor and Laguna Formations are heterogeneous, containing interbedded gravels, sands, silts, and clays. The contact between the Victor and Laguna Formations is not readily apparent. The lithologic units (i.e., sand or gravel lenses, silt or clay layers) within these formations are discontinuous and generally do not correlate over areas greater than approximately 0.2 square mile (130 acres). Some continuous clay layers within the Laguna Formation have been noted as discussed below.

Figure 3-4 provides the stratigraphic and hydrostratigraphic nomenclature used for the uppermost portion of the Eastern San Joaquin Subbasin of the San Joaquin Valley Groundwater Basin in which the Sharpe Site is located. In Stockton and Lathrop, groundwater is first encountered in the Victor Formation deposits at approximately 15 to 20 feet below ground surface (bgs). The saturated Victor deposits are approximately 55 feet thick and typically are coarser-grained and more permeable than the underlying Laguna deposits. The Laguna deposits are reported to average 1,400 feet thick near Stockton (California Department of Water Resources [DWR], 2006).

The Laguna Formation is the time-stratigraphic equivalent of the Tulare Formation, which occurs in other portions of the San Joaquin Valley Groundwater Basin. Clay layers 20 to 40 feet thick occur within the depth interval of 180 to 250 feet bgs at the depot. These clay layers have sufficient continuity to serve as confining layers. A discontinuous “blue clay” has been reported at depths ranging from 230 to 280 feet bgs within the Laguna deposits in logs for certain wells at and near the Sharpe Site. These blue clays may represent the lacustrine deposits identified elsewhere in the San Joaquin Valley Groundwater Basin. However, the regionally extensive Corcoran Clay member of the Tulare Formation, which separates that formation into an upper and lower aquifer, is not observed in the Eastern San Joaquin Subbasin, on which the depot is situated (Hotchkiss, 1972; DWR, 2006). Beneath the clay deposits, the Laguna Formation contains interbedded gravel, sand, silt, and clays above its boundary with the Mehrten Formation. Both the deep Laguna and the Mehrten Formations produce groundwater for agricultural, private, and municipal water wells. The deepest freshwater aquifer in the Eastern San Joaquin Subbasin is in the Mehrten Formation, which consists of stream-deposited, semi-consolidated to consolidated clays, silts, sands, and gravels, which coarsen downward. Because of extensive water supply pumping, the Mehrten Formation and Laguna deposits have been affected by encroachment of saline water from west of the Sharpe Site (Brown and Caldwell Consulting Engineers, 1985).

3.1.3 Site Geology and Groundwater Hydrogeology

Subsurface deposits at the installation to a depth of 300 feet bgs have been described based on monitoring well logs, borehole geophysical logs, and seismic reflection survey data (ESE, 1994a). Surface soils are loam to sandy loam that have been disturbed by agricultural and industrial development. The predominant lithologies at the installation are clay, silty sand, and silt. Sand layers tend to be laterally discontinuous in the A and B Zones. Some clays beneath the site are interpreted to extend laterally for several thousand feet; however, most clay layers are less continuous and pinch out between wells.

There is one complex, heterogeneous aquifer in which four hydrostratigraphic zones have been identified in the hydrogeologic system between 14 and 270 feet bgs (ESE, 1990). These hydrostratigraphic zones are termed monitoring zones for the purposes of monitoring hydraulic gradients and contaminant migration. The zones include saturated transmissive layers (sands) 5 to 12 feet thick in the following depth intervals:

- A Zone – water table (approximately 14 feet bgs) to 40 feet bgs
- B Zone – 40 to 90 feet bgs
- C Zone – 90 to 170 feet bgs
- D Zone – 170 to 270 feet bgs

In the A Zone, groundwater is generally unconfined; however, a silt and clay layer in the lower A Zone and upper B Zone (A/B aquitard at an approximate depth of 45 to 75 feet bgs) locally creates confining conditions. Even though there is continuity of the confining layer across the Sharpe Site, groundwater can move from one zone to another. Furthermore, pumping of on-depot and off-depot water supply wells may cause downward vertical gradients across multiple monitoring zones in the areas near the supply wells. Collectively, the B through D Zones behave as a leaky confined aquifer.

Annual peak groundwater elevations occur approximately in the first or second quarter of each year. Recharge typically has a greater effect on water levels in wells screened in the A Zone and a lesser effect on wells screened in the B, C, and D Zones. Recharge resulting from percolating surface water generally affects groundwater levels 12 to 14 months after rainfall occurs. Water levels reach their annual lows in the third or fourth quarters in response to decreased recharge and increased agricultural and domestic use. Seasonal fluctuations in water levels are greatest in off-depot wells. The difference in water levels from highs in the south to lows in the north across the Sharpe Site may be linked to a greater number of active water supply wells off the depot to the west and north of the North Balloon than in other areas around the depot.

3.2 Land and Resource Use

The distribution depot known as the Sharpe Site opened in 1941. The construction of major facilities at the Sharpe Site began during World War II and continued into the post-war period. Additional facilities were constructed during the Korean and Vietnam conflicts. Two large warehouse facilities and various improvements were constructed during the last two decades. Land use at the Sharpe Site is light industrial. For most of its existence, the installation carried both supply and maintenance missions. The supply mission remains active today; it includes storage, handling, preservation, packaging, and shipment of general supplies and equipment. The maintenance mission included the repair and reconditioning of heavy equipment and aircraft; major waste-generating activities included paint stripping, metal finishing,

and painting. After 1976, the maintenance mission was reduced to the maintenance of installation facilities and vehicles used in performing the supply mission.

Land surrounding the depot is used for a variety of purposes, including agricultural, residential, and light industrial uses. Agricultural lands lie to the east of the Union Pacific Inter-Modal Facility. Mixed light industrial areas lie to the north, northwest, and south of the depot; and residential developments lie to the west. A large residential development borders the depot's immediate southwestern boundary.

The baseline risk assessment assumed continued industrial use at the depot and did not account for changes in land use (ESE, 1994b). In general, a change in land use would require an evaluation to determine whether contamination left in place would pose an unacceptable risk to human health or the environment under any new exposure scenario. At the time of preparation of this five-year review, no known plans are in place to change land use at the Sharpe Site or the surrounding areas.

There are four water supply wells at the Sharpe Site: PW038 (Sharpe No. 1), PW039 (Sharpe No. 3), PW040 (Sharpe No. 5), and PW041 (Sharpe No. 6) (see Figure 4-1). These wells are screened at intervals ranging from 138 to 435 feet bgs. PW039 and PW040 supply potable water for all Sharpe Site needs. Because of increasing TCE concentrations at the well, PW038 was placed in standby mode in 2009 and will be operated only in the event of an emergency, such as a fire on the depot. Due to poor drinking water quality (arsenic and manganese concentrations greater than California primary or secondary drinking water standards), PW041 is not used to supply potable water to depot users. DLA is considering installing a new water supply well and decommissioning PW038. Installation of a new well would allow DLA to reduce pumping at PW039 and PW040 (i.e., the latter will be placed into standby mode). Sharpe Site facilities managers are planning to use PW041 to supply irrigation water for the landscaped areas of the installation. Use of PW041 for this purpose will reduce the need to pump PW039 and PW040 during the warm months.

3.3 History of Contamination

Wastes generated at the Sharpe Site were primarily a result of former maintenance operations such as paint stripping, metal finishing, and painting. Other waste-generating activities included engine overhauls; hydraulic and electrical repairs; airframe and bodywork; and component repair and reconditioning. These tasks required the use of petroleum hydrocarbon fuels and a variety of other industrial chemicals (e.g., chlorinated solvents). Releases of these chemicals contaminated installation soil and groundwater through multiple mechanisms.

VOC contamination in groundwater appears to have originated from chlorinated solvents used in industrial and vehicle maintenance activities being discharged or released into soil. VOCs may have migrated downward through the soil column via direct infiltration or through leaching (i.e., dissolving in percolating surface water). Contaminants dissolved in groundwater have migrated beyond the western and northern property boundaries of the Sharpe Site.

Non-VOC contaminants detected in soil at the Sharpe Site include metals, TPH, and pesticides. Metals (lead and total chromium) contamination of soils occurred as a result of various activities, including the disposal of paints, paint solvents, and sandblasting wastes. TPH contamination of soils occurred as a result of leaking USTs. In addition, pesticides present in surface soil were the result of pesticide mixing and container rinsing operations (ESE, 1996). Metals (arsenic, selenium, chromium, and lead), the herbicide bromacil (used by the Sharpe Site to control weed growth until 1996), nitrate, and TPH have also been detected in groundwater samples. Among the non-VOCs detected in groundwater, only bromacil, TPH, lead, and chromium may have originated at source areas on the Sharpe Site.

3.4 Initial Responses

Environmental studies have been underway at the Sharpe Site since 1980 when groundwater contamination was first detected at the Sharpe Site. VOCs, metals, and pesticides were identified as groundwater contaminants. In 1982, the United States Army Environmental Center, formerly the United States Army Toxic and Hazardous Materials Agency, initiated a remedial investigation (RI) at the Sharpe Site.

Results of the RI led to the Sharpe Site being added to CERCLA's National Priorities List as a Superfund site in 1987. In 1989, the Army, EPA, CVWB, and DTSC co-signed the FFA for the Sharpe Site (United States Department of the Army, 1989). The FFA established two OUs to facilitate environmental cleanup at the Sharpe Site. OU 1 encompasses groundwater in four (A, B, C, and D) monitoring zones contaminated primarily with VOCs released from activities on the installation. OU 2 consists of contaminated soil and soil vapor above the water table.

3.4.1 Initial Groundwater Response Actions

An interim groundwater extraction and treatment system was put into operation in March 1987 to control migration of VOC-contaminated groundwater from the South Balloon. Separate investigations were conducted to identify and evaluate interim remedial action alternatives in the North Balloon. These investigations led to the design and placement of a second interim groundwater extraction and treatment system, which began operation in October 1990.

The groundwater remedy selected in the OU 1 ROD was extraction and treatment of VOC-contaminated groundwater by air stripping, with treated groundwater being used for industrial purposes or being discharged to surface water, percolation ponds, or injection wells (ESE, 1993). The two interim groundwater extraction and treatment systems constructed in the North and South Balloons were incorporated into the OU 1 remedy. Construction of a third groundwater treatment plant, located in the Central Area, was completed and operation began in May 1995. Construction completion of the OU 1 remedy was signified by the start of groundwater extraction from extraction well EWCC3 in March 1998.

3.4.2 Initial Soil Response Actions

Soil in several areas of the Sharpe Site was found to be contaminated with TCE, lead, total chromium, and pesticides. As part of the feasibility study (FS) for soil, pilot-scale SVE studies were conducted in 1991, 1992, and 1995 to determine whether SVE was a feasible remedial technology for the treatment of TCE-contaminated soils at the Sharpe Site (ESE, 1992; 1994a; Radian Corporation, 1996a). In November 1994 and April 1995, excavation and off-site disposal of pesticide-contaminated soils from the former Pesticide Mix Area in the North Balloon was performed (ESE, 1994c; CKY Inc., 1995).

In February 1996, the OU 2 ROD was signed (ESE, 1996). The OU 2 ROD designated 111 SWMUs for no further action (including UST sites that are not remediated under CERCLA). In addition, because pesticide-contaminated soil at the former Pesticide Mix Area had been removed prior to the signing of the OU 2 ROD, the ROD stated that no further action would be required for the Pesticide Mix Area. The OU 2 ROD identified 14 TCE sites requiring further investigation and/or remediation using in situ volatilization (now more commonly referred to as SVE), and 14 areas with lead and/or chromium concentrations that required further investigation and/or remediation by excavation and off-site disposal. These 14 metals areas were consolidated into five metals sites.

3.5 Basis for Taking Action

The basis for the OU 1 groundwater remedial action was the potential for unacceptable risk to human health. Remedial response actions for contaminated soil in OU 2 are based on the potential for unacceptable risk to human health and the environment.

3.5.1 Basis for Groundwater Action

Contaminant concentrations in groundwater beneath the Sharpe Site exceed risk-based cleanup levels (ESE, 1993). The baseline risk assessment results indicated that health risks could result if on-installation concentrations of TCE and other VOCs were to migrate to areas of the groundwater system used for domestic water supply and were subsequently ingested. This potential threat prompted the remedial actions identified in the OU 1 ROD (ESE, 1993). The carcinogenic risk to human health calculated during the risk assessment resulted in the selection of aquifer cleanup levels (ACLs) for 21 VOC COCs. Section 5.0 provides ACLs for each COC.

3.5.2 Basis for Soil Action

The OU 2 ROD requires remediation of lead- and chromium-contaminated soil at the Sharpe Site to reduce the potential threat to human health and the environment. Cleanup levels for lead and chromium established in the OU 2 ROD are protective of human health if sites are used for industrial purposes. The lead cleanup level (1,000 milligrams per kilogram [mg/kg]) is considered protective of an industrial adult worker, based on results from DTSC's Lead Spreadsheet Model default exposure scenarios. CVWB requested the chromium cleanup level (300 mg/kg) because it considered 300 mg/kg more conservative and protective of groundwater than the dermatitis toxicity value of 500 mg/kg for trivalent chromium (CrIII) that was being considered. Although the 500 mg/kg level accounts for both sensitization and elicitation for the dermatitis reaction, it is not protective of 10 percent of the population considered hypersensitive (ESE, 1996).

TCE in soil was determined not to represent a potential threat to human health or the environment based on the relevant exposure scenarios evaluated in the risk assessment; however, TCE-contaminated soils represented a continuing threat to groundwater quality through leaching pathways. The TCE soil vapor cleanup standard of 350 parts per billion by volume (ppbv) established in the OU 2 ROD is protective of the beneficial use of groundwater as a potential drinking water supply, assuming a maximum contaminant level (MCL) of 5 micrograms per liter (µg/L) of TCE in groundwater (ESE, 1996).

The ecological risk assessment indicated that the principal risk to identified species was concentrations of lead and chromium in soils in the North and South Balloons (ESE, 1994b). Because of the high degree of land development and management within and adjacent to the Sharpe Site, natural resources are limited. Therefore, the area does not support a great diversity of wildlife species. Species that occur are those that can survive on the extremely limited resources within depot boundaries or in adjacent agricultural resources and marginal natural areas. The ecological risk assessment focused on a limited number of species that may come into contact with contaminated soil while in transit to viable habitats. No endangered plants or animals are currently found at the Sharpe Site, although a comprehensive inventory of wildlife composition has not been conducted at the depot. Even though most of the on-site areas appear uninhabitable, the black-tailed jackrabbit (*Lepus californicus*) and burrowing owl (*Athene cunicularia*) are observed commonly, especially along the border fence. Burrowing owls are considered a "Species of Special Concern" in California. The coyote (*Canis latrans*) is also rarely observed on the Sharpe Site property. In addition, several species of field mouse (*Perognathus sp.*, *Onychomys sp*., and *Peromyscus sp*.) exist in the area.

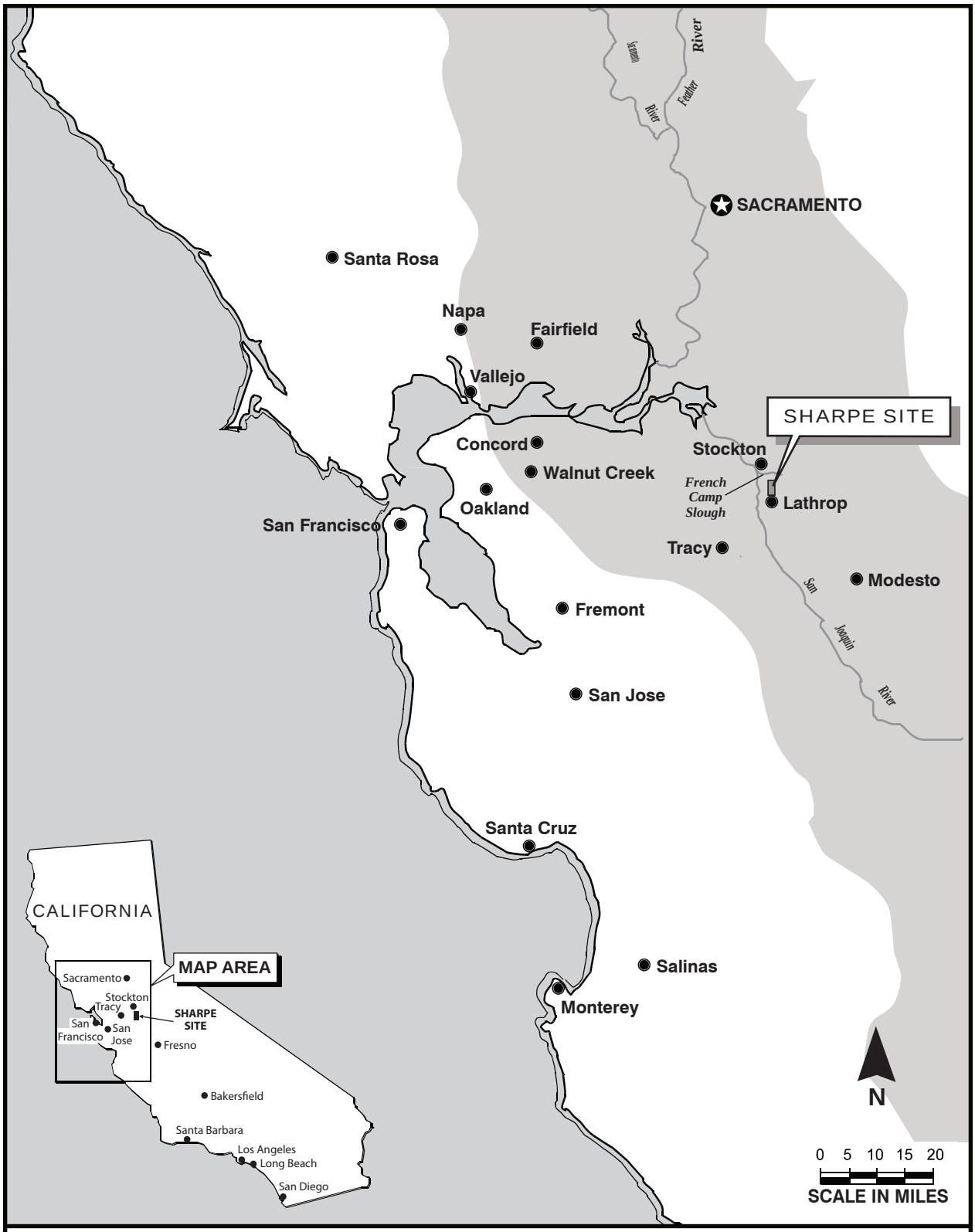

Figure 3-1. Location Map, Sharpe Site

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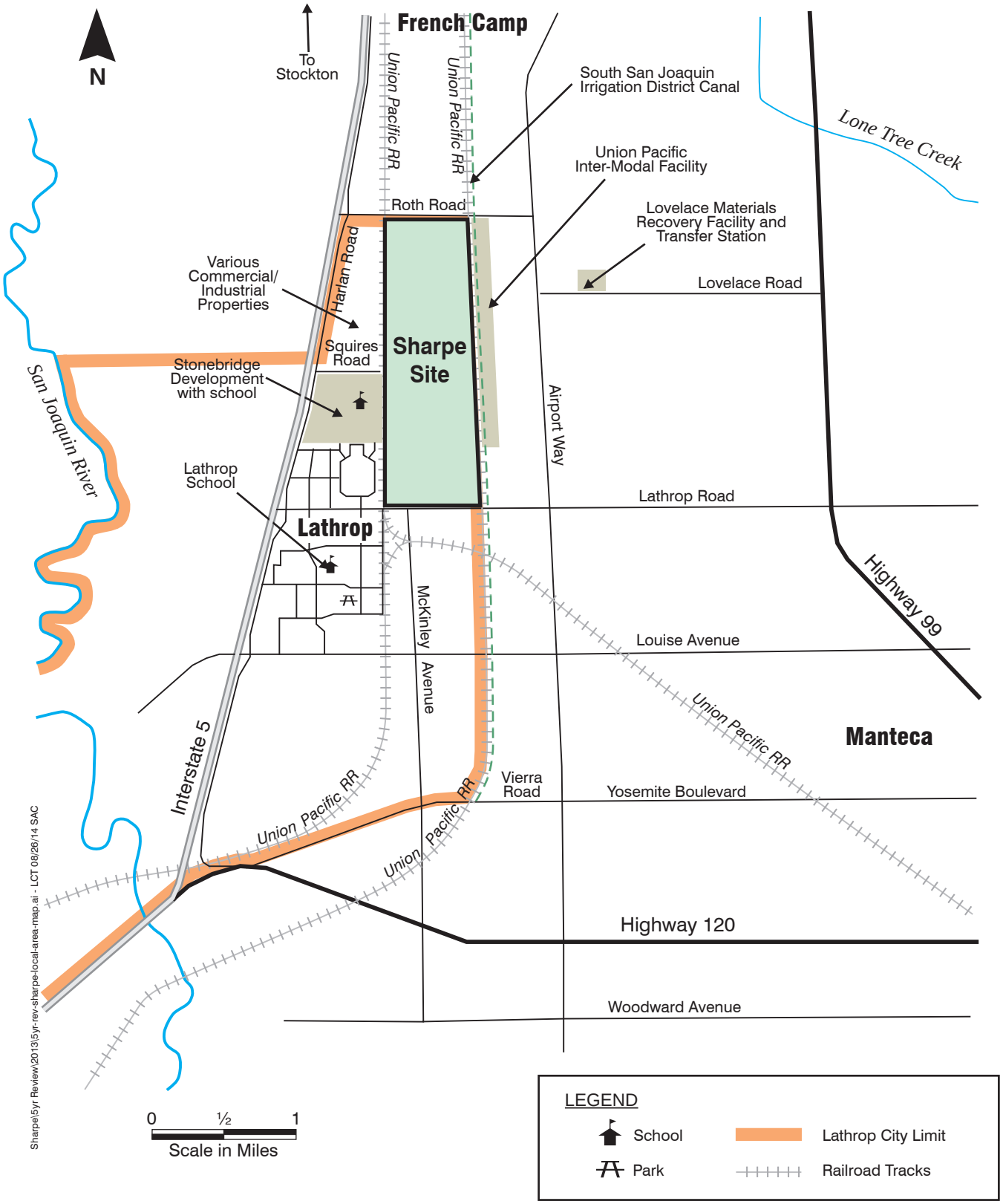

Figure 3-2. Local Area, Sharpe Site

Figure 3-3. Site Map, Sharpe Site

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Age	Stratigraphic Units		Description	Regional Hydrostratigraphic Zones	Geologic Horizon Description	Av. Depth Below Surface (ft) (Top of Zone)	Geologic Zone and Well Designations	Groundwater Model Layer
Quaternary (Pleistocene and Holocene)	Alluvium	Holocene fan and terrace deposits	Unconsolidated clay, sand, and gravel.	Vadose Zone	Alluvial deposits in discontinuous layers and lenses; 5 to 12 feet thick sand layers; local stream deposits.	0		
		Interfan	Unconsolidated sand, silt, and clay.					
		Flood basin	Fine sand and clays.		Fluvial/overbank deposits, 5 to 10 feet thick, thickening to west.			
Tertiary & Quaternary (Pliocene and Pleistocene)	Laguna Aquifer	Victor Formation (Modesto/ Riverbank)	Interbedded gravel, sand, silt, and clay. Deposited in alluvial and fluvial environments.	Upper Aquifer— Upper waterbearing zone; contains water under semi-confined and unconfined conditions.		15	A	1
					Alluvial deposits in discontinuous layers and lenses; 5 to 12 feet thick sand layers.	40	B	2
		Laguna Formation						3
					Semi-consolidated sand, silt, and clay layers in discontinuous layers and lenses; 5 to 12 feet thick sand layers.	90	C	4
					Semi-consolidated sand, silt, and clay layers in discontinuous layers and lenses; 5 to 12 feet thick sand layers.	120	C and CD Transition	5
						170	D	6-8
			Sandy clay, silty clay, silt, and clay interbedded with fine-grained sand.	Locally confining layers between the upper and lower water-bearing zones.	Clays 20 to 40 feet thick in this interval.	230	None	Bottom Boundary
			Interbedded gravel, sand, silt, and clay.			250	None	Not in Model

Modified From: Engineering Technologies Associates, Inc., 1993.

Figure 3-4. Stratigraphic and Hydrostratigraphic Nomenclature, Sharpe Site

4.0 SUMMARY OF FIVE-YEAR REVIEW PROCESS

This section describes activities performed during the Sharpe Site five-year review, including identifying the five-year review team, notifying the local community, reviewing relevant documents and data, inspecting current site conditions, and conducting interviews to assist in determining site status. While this section presents information about the five-year review process that applies to the Sharpe Site in general, Sections 5.0 and 6.0 provide summaries about site-specific information drawn from data collected during individual site inspections.

4.1 Administrative Components

The Sharpe Site five-year review team is composed of the following RPMs:

- Maurice Benson, DLA Installation Support at San Joaquin, Environmental Services Branch
- John Lucey, EPA (Region 9)
- Marcus Pierce, CVWB
- Christopher Sherman, DTSC

Members of the review team were notified of the initiation of the third five-year review for the Sharpe Site at the January 2013 RPM meeting.

4.2 Community Involvement and Notification

The DLA Installation Support at San Joaquin, Environmental Services Branch, has maintained an active community involvement program since the early 1990s. Key components of this program include:

- Providing general information updates to the community through the distribution of the depot's Environmental Update fact sheets to interested community members and mailings to nearby residents.
- Notifying the community of program milestones and providing opportunities for public review and comment through public notices placed in local newspapers, as required by EPA guidance.
- Holding public meetings to present milestone documents and solicit public review and comment, as required.
- Providing access to program information through the Information Repository located at the Defense Distribution Depot San Joaquin, Tracy Site. The Information Repository is made available for public review of program documents.

In accordance with EPA guidance (2001), DLA will notify the community of the Sharpe Site's third five-year review at both the beginning and the conclusion of the process.

A public notice was published on 29 January 2013 in the *Stockton Record* and *Manteca Bulletin*, on 1 February 2013 in the *Tracy Press*, and on 6 February 2013 in *Vida en el Valle* (a regional Spanish language newspaper that serves the City of Lathrop). The notice provides an overview of the third five-year review process, outlines the five-year review schedule, and provides a list of contacts for community members who have questions or would like to provide input on the development of the five-year review.

As part of the third five-year review process, DLA solicited regional stakeholders for feedback regarding ongoing environmental restoration activities at the Sharpe Site. Stakeholders asked to participate in interviews include a cross-section of community leaders, including representatives from local

government, civic leaders, community members, and members of the business community. Section 4.6 provides a summary of the interviews. Appendix A provides interview records.

A public notice will be published in the *Stockton Record*, *Tracy Press*, *Manteca Bulletin*, and *Vida en el Valle* to notify the community of the completion of the review process and finalization of the third five-year review. This notice will briefly summarize the review, note how and where the public can view the report, and list points of contact for community members who would like to obtain more information or ask questions about the results of the third five-year review.

The final third five-year review report for the Sharpe Site will be available for viewing by the public in the Administrative Record at the Information Repository located at the Tracy Site.

4.3 Document Review

The five-year review process included a review of documents relevant to the Sharpe Site IRP, including the OU 1 and OU 2 RODs, the OU 2 ROD Amendment, and the Second Five-Year Review Report, to identify a comprehensive set of current RAOs, cleanup levels, applicable or relevant and appropriate requirements (ARARs), and the recommendations from the Second Five-Year Review Report. Documents relevant to the implementation and performance of the groundwater, soil vapor, and soil remedies were also reviewed, including monthly performance monitoring reports and quarterly and annual Well Monitoring Program reports. Documents relevant to the performance of the various treatment systems were reviewed to evaluate whether the systems are operating in accordance with their operation and maintenance (O&M) manuals. Finally, investigation and risk assessment documents were reviewed as needed. Documents consulted during the preparation of this third five-year review report are listed in Tables 4-1a through 4-1f and included in the reference list in Section 8.0.

Table 4-1a. Documents Reviewed − Basis for the Response Action, Sharpe Site

Installation-Wide
DDJC-Sharpe Second Five-Year Review Report (URS, 2009a)
DDJC-Sharpe Response Completion Plan (URS, 2005a)
OU 1 (Groundwater)
Remedial Investigation/Feasibility Study at DDRW-Sharpe Site Record of Decision, Operable Unit 1 (ESE, 1993)
Operable Unit 1 Remedy Enhancement Focused Feasibility Study, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2011b)
Explanation of Significant Differences to the Record of Decision Operable Unit 1, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2012a, revised final pending as of September 2014)
OU 2 (Soil)
Record of Decision, Basewide Remedy for DDRW-Sharpe Site (ESE, 1996)
Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils) (URS, 2011a)
Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B (DLA, 2012)

DDJC = Defense Distribution Depot San Joaquin, California
DDRW = Defense Distribution Region West
DLA = Defense Logistics Agency
ESE = Environmental Science and Engineering
OU = operable unit
URS = URS Group, Inc.

Table 4-1b. Documents Reviewed − Implementation of the Response, Sharpe Site
Installation-Wide
Defense Distribution Depot San Joaquin Real Property Master Plan Digest (R&K Engineering, 2009)
OU 1 (Groundwater)
Groundwater Well Installation Report for MW327, MW328, MW329, MW330, MW447, MW539, EWB4, and EWCB6, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2013b)
Technical Memorandum: DDJC-Sharpe Alternate Discharge Location for Treated Groundwater (URS, 2009b)
Technical Memorandum: Defense Distribution Depot San Joaquin–Sharpe Site, Percolation Test Results for Alternate Discharge Location for Treated Groundwater (URS, 2010a)
Building 404 Percolation Pond Expansion Pilot Test Report (URS, 2012b)
OU 2 (TCE)
DDJC-Sharpe Site P-5A Soil Vapor Extraction Remedial Design/Remedial Action Work Plan (URS, 2010b)
Addendum to the Real Property Master Plan Digest, included as Appendix C in the OU 2 ROD Amendment (URS, 2011a)
OU 2 (Metals)
Addendum to the Real Property Master Plan Digest, included as Appendix C in the OU 2 ROD Amendment (URS, 2011a)

DDJC = Defense Distribution Depot San Joaquin, California
OU = operable unit
ROD = record of decision
TCE = trichloroethene
URS = URS Group, Inc.

Table 4-1c. Documents Reviewed − Remedy Performance, Sharpe Site
OU 1 (Groundwater)
FFA Annual Progress Reports (URS, 2009c; 2010c; 2011c; 2012c; 2013a)
Groundwater Treatment Plant Monthly Performance Monitoring Reports (URS, 2008a; 2009d; 2010d; 2011d; 2012d)
Technical Memorandum: Defense Distribution Depot, San Joaquin California Sharpe Site, Three-Dimensional Groundwater Model Update to Third Quarter 2008 (URS, 2009e)
Update and Results of Simulation of Third Quarter Conditions with the Sharpe Site Groundwater Flow and Transport Model, included as an attachment or appendix to the *FFA Annual Progress Reports* (URS, 2010c; 2011c; 2012c; 2013a)
Technical Memorandum: Evaluation of the Optimized Extraction Well Test, DDJC-Sharpe (URS, 2009f)
DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report (URS, 2009g)
Memorandum: Results of Testing Extraction Wells (EW) NB1 and EWNB2 Operation to Reduce Supply Well Hydraulic Effects, North Balloon Area, DDJC-Sharpe (DLA, 2010)
DDJC-Sharpe Potable Well Evaluation (URS, 2009h)
DDJC-Sharpe Off-Depot Potable Well Contingency Plan (URS, 2010e)

Table 4-1c. (Continued)

OU 1 (Groundwater) (continued)
DDJC-Sharpe Hydraulic Fracturing and Injection of EHC Pilot Study Results Report (URS, 2010f)
DDJC-Sharpe Potassium Permanganate Pilot Study Results Report (URS, 2010g)
DDJC-Sharpe Enhanced Reductive Dechlorination Technology Emulsified Oil Pilot Study Results Report (URS, 2010h)
CPT Field Sampling Results Report for PW020, MW532A, and North Balloon Supply Well Areas, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2012e)
OU 2 (Soil)
FFA Annual Progress Reports (URS, 2011c; 2012c; 2013a)
Technical Memorandum: Site P-5A SVE Rebound Testing and Optimization Strategy, Sharpe Site (URS, 2012f)
Land Use Controls Sites Inspections and Burrowing Owl Monitoring, included as an appendix to the *FFA Annual Progress Reports* (URS, 2012c; 2013a)
Field Sampling Results and Risk Assessment Report Operable Unit 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2012g)

DDJC = Defense Distribution Depot San Joaquin, California
DLA = Defense Logistics Agency
EHC = redox compound
FFA = Federal Facility Agreement
OU = operable unit
SVE = soil vapor extraction
TCE = trichloroethene
URS = URS Group, Inc.

Table 4-1d. Documents Reviewed − Operation and Maintenance, Sharpe Site

DDJC-Sharpe Operation and Maintenance Manual for the Central Area Groundwater Treatment System (URS, 2001)
DDJC-Sharpe Operation and Maintenance Manual for the North Balloon Groundwater Treatment System (URS, 2003b)
DDJC-Sharpe Operation and Maintenance Manual for the South Balloon Groundwater Treatment System (URS, 2003c)
Substantive Waste Discharge Requirements for Land Disposal, DDRW-Sharpe (ROD Addendum, Attachment 2) (CVWB, 1992)
FFA Annual Progress Reports (URS, 2009c; 2010c; 2011c; 2012c; 2013a)
Groundwater Treatment Plant Monthly Performance Monitoring Reports (URS, 2008a; 2009d; 2010d; 2011d; 2012d)

CVWB = Central Valley Regional Water Quality Control Board
DDJC = Defense Distribution Depot San Joaquin, California
DDRW = Defense Distribution Region West
FFA = Federal Facility Agreement
ROD = record of decision
URS = URS Group, Inc.

Table 4-1e. Documents Reviewed − Legal Documentation, Sharpe Site
Federal Facility Agreement for Sharpe Army Depot, Docket No. 89-17. Effective Date: March 16 (United States Department of the Army, 1989)

Table 4-1f. Documents Reviewed − Community Involvement, Sharpe Site
Community Relations Plan, Defense Distribution Depot San Joaquin–Sharpe Site (URS, 2011e)
URS = URS Group, Inc.

4.4 Data Review

Groundwater level changes, gradients, flow directions, capture zones, and groundwater quality data are evaluated annually to update the Sharpe Site conceptual site model. This section provides a summary of the hydraulic and analytical data collected by the Well Monitoring Program during the 2012 monitoring period (4Q11 to 3Q12) and presented in the *FFA Annual Progress Report: October 2011 through September 2012, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2013a).

Figure 4-1 shows the Sharpe Site groundwater well locations; Figure 4-2 shows the groundwater model boundary piezometers and City of Lathrop municipal wells.

4.4.1 Hydraulic Data Summary

Because stable hydrogeologic conditions have been demonstrated at the Sharpe Site, the frequency of water level measurements was reduced in 2011 from once each quarter to twice per year (URS, 2012c). Depths to water are measured in the first and third quarters in monitoring wells and piezometers screened within the A, B, C, and D Zones. Groundwater elevations are calculated from water level measurements and used to develop potentiometric surface maps for use in determining groundwater flow directions, vertical and horizontal groundwater gradients, and estimating capture zones of extraction wells. Figures 4-3 through 4-6 present the groundwater potentiometric surface maps for the A, B, C, and D Zones, respectively, drawn with data from 3Q12. The maps were developed using contouring software and professional judgment. Potentiometric surface maps were first developed for the D Zone (North Balloon only) in 2009 when it was determined that there was an adequate number of wells screened within this zone to construct representative contours.

Water levels are evaluated to determine the following: seasonal fluctuations; percolation pond and extraction well influences; estimated capture zones; and any differences or similarities in hydraulic gradients between the A, B, C, and D Zones. Groundwater extraction from the North Balloon, South Balloon, and Central Area locally affect groundwater flow beneath the installation and adjacent off-installation areas to the west.

4.4.2 Analytical Data Summary

VOCs are the most widespread contaminants reported in groundwater beneath the Sharpe Site and off-depot areas. The most commonly detected VOCs are TCE, tetrachloroethene (PCE), and carbon tetrachloride (CCl_4). Table 4-2 summarizes the 2008 through 2012 minimum and maximum results for

Table 4-2. Minimum and Maximum Detections of Trichloroethene, Tetrachloroethene, and Carbon Tetrachloride in Groundwater, 2008 through 2012

	Maximum Result			Minimum Result		
Year/Monitoring Zone/Analyte	Location	Sample Date	Concentration (µg/L)	Location	Sample Date	Concentration (µg/L)
2008						
A						
Carbon tetrachloride	EWA5	02/08/2008	**1.69**	EWA5	07/31/2008	**1.38**
Tetrachloroethene	MW438A	08/05/2008	**2.01**	MW420A	08/13/2008	0.29 J
Trichloroethene	MW418AR	08/13/2008	**183.00**	MW407A	08/11/2008	0.28 J
B						
Carbon tetrachloride	MW445B	08/25/2008	**2.71**	EWNC3R	02/11/2008	0.41 J
Tetrachloroethene	MW445B	08/25/2008	**36.10**	MW527BR	12/02/2008	0.25 J
Trichloroethene	MW418B	08/26/2008	**169.00**	P5B	05/27/2008	0.32 J
C						
Carbon tetrachloride	MW450C	08/11/2008	**6.28**	MW498C	10/29/2008	0.31 J
Tetrachloroethene	MW445C	08/11/2008	**28.90**	MW527C	02/29/2008	0.30 J
Trichloroethene	MW437C	08/29/2008	**115.00**	MW510C	02/26/2008	0.29 J
D						
Trichloroethene	MW535D	12/18/2008	0.26 J	MW535D	12/18/2008	0.26 J
2009						
A						
Carbon tetrachloride	EWA5	02/20/2009	**0.71** J	EWA5	08/20/2009	**0.58** J
Tetrachloroethene	EWA1	10/26/2009	**2.44**	EWA5	08/20/2009	0.29 J
Trichloroethene	MW418AR	08/24/2009	**117.00**	MW531A	02/18/2009	0.26 J
B						
Carbon tetrachloride	MW445B	08/25/2009	**6.84**	MW497B	02/09/2009	**0.52** J
Tetrachloroethene	MW445B	08/25/2009	**33.50**	MW497B	08/24/2009	0.29 J
Trichloroethene	EWB1	09/22/2009	**194.00**	P5B	08/21/2009	0.29 J
C						
Carbon tetrachloride	MW450C	08/24/2009	**6.61**	MW498C	08/28/2009	0.34 J
Tetrachloroethene	MW445C	08/25/2009	**51.90**	EWC1	09/21/2009	0.26 J
Trichloroethene	MW537C	09/11/2009	**412.00**	MW510C	02/12/2009	0.34 J
D						
Trichloroethene	MW538D	09/15/2009	0.48 J	MW538D	11/12/2009	0.42 J

Table 4-2. (Continued)

Year/Monitoring Zone/Analyte	Maximum Result			Minimum Result		
	Location	Sample Date	Concentration (µg/L)	Location	Sample Date	Concentration (µg/L)
2010						
A						
Carbon tetrachloride	MW326A	02/24/2010	**55.90**	MW326A	07/26/2010	**1.50**
Tetrachloroethene	EWA1	08/20/2010	**2.20**	MW415A	07/26/2010	0.10 J
Trichloroethene	EWA5	02/19/2010	**117.00**	MW407A	07/27/2010	0.10 J
B						
Carbon tetrachloride	MW326B	05/11/2010	**66.70**	MW407B	07/27/2010	0.10 J
Tetrachloroethene	MW445B	07/27/2010	**29.00**	MW417B	07/27/2010	0.10 J
Trichloroethene	MW319B	02/18/2010	**1,020.00**	MW505B	08/04/2010	0.10 J
C						
Carbon tetrachloride	MW326C	02/25/2010	**10.20**	EWNB1	08/03/2010	0.20 J
Tetrachloroethene	MW445C	07/27/2010	**35.00**	MW435C	07/27/2010	0.10 J
Trichloroethene	MW537C	02/10/2010	**452.00**	MW442C	07/28/2010	0.10 J
D						
Tetrachloroethene	MW538D	08/04/2010	0.10 J	MW538D	08/04/2010	0.10 J
Trichloroethene	MW538D	08/04/2010	0.40 J	MW538D	02/10/2010	0.32 J
2011						
A						
Carbon tetrachloride	MW326A	03/09/2011	**73.00**	EWA5	08/15/2011	**1.56**
Tetrachloroethene	MW326A	03/09/2011	**2.20**	EWA5	03/07/2011	0.30 J
Trichloroethene	MW325A	08/16/2011	**82.30**	MW407A	03/07/2011	0.10 J
B						
Carbon tetrachloride	MW326B	08/10/2011	**83.40**	MW407B	03/07/2011	0.10 J
Tetrachloroethene	MW445B	08/15/2011	**40.60**	MW505B	03/03/2011	0.10 J
Trichloroethene	MW319B	08/26/2011	**1,020.00**	MW531B	03/10/2011	0.10 J
C						
Carbon tetrachloride	MW445C	08/15/2011	**8.06**	EWNB3	03/11/2011	0.10 J
Tetrachloroethene	MW445C	08/15/2011	**34.30**	MW505C	03/03/2011	0.20 J
Trichloroethene	MW537C	03/09/2011	**390.00**	MW510C	03/03/2011	0.30 J
D						
Tetrachloroethene	MW538D	03/04/2011	0.20 J	MW538D	03/04/2011	0.20 J
Trichloroethene	MW538D	03/04/2011	0.50 J	MW526D	03/08/2011	0.10 J

Table 4-2. (Continued)

Year/Monitoring Zone/Analyte	Maximum Result			Minimum Result		
	Location	Sample Date	Concentration (µg/L)	Location	Sample Date	Concentration (µg/L)
2012						
A						
Carbon tetrachloride	MW326A	02/23/2012	**5.21**	MW326A	11/26/2012	0.45 J
Tetrachloroethene	EWA1	09/11/2012	**2.10**	MW413A	08/23/2012	0.23 J
Trichloroethene	EWA5	08/24/2012	**61.00**	MW330A	11/29/2012	0.28 J
B						
Carbon tetrachloride	EWB4	09/07/2012	**10.00**	MW448B	08/23/2012	**0.72**
Tetrachloroethene	MW326B	08/30/2012	**19.00**	MW540B	12/06/2012	0.20 J
Trichloroethene	MW319B	09/12/2012	**940.00**	MW505B	08/30/2012	0.21 J
C						
Carbon tetrachloride	MW497CD	03/05/2012	**1.03**	EWNC5	08/28/2012	0.20 J
Tetrachloroethene	MW326C	08/30/2012	**4.70**	MW450C	08/23/2012	0.21 J
Trichloroethene	MW537C	09/06/2012	**410.00**	MW511C	08/28/2012	0.24 J
D						
Tetrachloroethene	MW538D	09/05/2012	0.23 J	MW538D	09/05/2012	0.23 J
Trichloroethene	MW327D	08/29/2012	1.70	MW538D	09/05/2012	0.43 J

Notes:

Bold indicates the trichloroethene, tetrachloroethene, or carbon tetrachloride concentration is greater than the ACL for that analyte.

If trichloroethene, tetrachloroethene, or carbon tetrachloride concentrations are not listed for a particular year and monitoring zone, then the analyte was not detected.

ACL = aquifer cleanup level
J = estimated concentration
µg/L = micrograms per liter

TCE, PCE, and CCl_4 by zone. Analysis for other contaminants in groundwater samples has included bromacil, total chromium, hexavalent chromium (CrVI), arsenic, selenium, and TPH. Sampling for all but VOCs and TPH was discontinued prior to the period covered in this third five-year review.

The nature and extent of contamination in groundwater beneath the Sharpe Site is assessed using analytical results from the quarterly groundwater sampling events and to a lesser extent, in areas where groundwater monitoring wells are not present, groundwater analytical results from HydroPunch samples collected during the 2007/2008 and 2011/2012 cone penetrometer test (CPT)/HydroPunch investigations. Sample results from the 2007/2008 and 2011/2012 CPT/HydroPunch investigations are provided in the *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report* (URS, 2009g) and the *CPT Field Sampling Results Report for PW020, MW532A, and the North Balloon Supply Areas, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012e), respectively; they are not reproduced in this third five-year review.

Depictions of the TCE, PCE, and CCl_4 plumes were generated using results from the 2012 monitoring period and the 2007/2008 and 2011/2012 CPT/HydroPunch investigations, as needed. Composite plume figures presented in this section are based on the highest TCE, PCE, or CCl_4 concentration at each well or well cluster reported during the 3Q12 sampling event to show the estimated horizontal extent. Because of this approach to presenting the composite plumes, a monitoring or extraction well may be shown within a higher concentration area than the concentration reported for that well (i.e., a nearby well screened in a different zone has a higher concentration affects the composite plume shape).

The 2007/2008 HydroPunch samples were collected in coarse- and fine-grained deposits. For the purpose of the Sharpe Site groundwater monitoring program, the concentrations from samples collected in the coarse-grained deposits were used in refining the shapes of the plumes in areas where there are no monitoring wells. However, it is important to note that the HydroPunch samples collected from discrete sampling intervals (typically 2 feet) are not directly comparable to the well samples (from screen intervals of 10 feet or longer). The HydroPunch samples collected from fine-grained deposits were not used in the development of the plume shapes. In addition, the results from groundwater samples collected in 2012 from wells screened in the saturated silt/clay sediments of the lower A Zone and upper B Zone (A/B aquitard) also were not used in the development of the plume shapes because the wells (with screens less than 5 feet long) are not screened in the transmissive portions of the A or B Zones that typically are monitored for contaminant concentrations and migration at the Sharpe Site.

4.4.2.1 TCE

Figures 4-7 (South Balloon and Central Area) and 4-8 (North Balloon) illustrate the 2012 horizontal extent of TCE concentrations greater than the ACL (5 µg/L) in groundwater beneath the Sharpe Site.

Figure 4-9 shows locations of selected monitoring wells, extraction wells, and the lines of three hydrogeologic cross-sections. Figures 4-10 through 4-12 are vertical profiles of TCE concentrations in groundwater reported in 3Q12 along the hydrogeological cross-sections A-A´, B-B´, and C-C´, which pass through the South Balloon, Central Area, and North Balloon, respectively. For comparison, the vertical extent of TCE contamination in 3Q11 is also shown. There were no detections of TCE greater than the ACL in the D Zone between 2008 and 2012.

4.4.2.2 PCE

Figures 4-13 (South Balloon and Central Area) and 4-14 (North Balloon) illustrate the 2012 horizontal extent of PCE concentrations greater than the ACL (0.5 µg/L) in groundwater beneath the Sharpe Site;

PCE was not detected at a concentration greater than its ACL at any Central Area well during the 2012 monitoring period.

Figures 4-15 and 4-16 are vertical profiles of PCE concentrations in groundwater reported in 3Q12 along the hydrogeological cross-sections A-A´ and C-C´, which pass through the South Balloon and North Balloon, respectively. For comparison, the vertical extent of PCE contamination in 3Q11 is also shown. There were no detections of PCE greater than the ACL in the D Zone between 2008 and 2012.

4.4.2.3 CCl_4

Figures 4-17 and 4-18 were developed for the first time during the 2012 monitoring period to depict the 2012 horizontal and vertical extents, respectively, of CCl_4 concentrations greater than the ACL (0.5 µg/L) in groundwater beneath the Sharpe Site. In the South Balloon, CCl_4 concentrations decreased at several wells between 2011 and 2012 affecting the plume shapes on cross-section A-A´ (Figure 4-18). CCl_4 was not detected at a concentration greater than the ACL at any Central Area well during the 2012 monitoring period; in the North Balloon, CCl_4 was detected at a concentration greater than the ACL at only one C Zone well (MW517C). There were no detections of CCl_4 greater than the ACL in the D Zone between 2008 and 2012.

4.4.2.4 Other VOC COCs

In addition to TCE, PCE, and CCl_4, 19 other VOC COCs are specified in the OU 1 ROD for the Sharpe Site (Table 5-1). Eight of those COCs have not been detected above their respective ACLs for at least a year. Of those eight COCs, three have not been detected since at least 1996 (cis-1,3-dichloropropene, trans-1,3-dichloropropene, and 1,1,2,2-tetrachloroethane), and four have not been detected at concentrations greater than their respective ACLs since at least 1996 (1,1-dichloroethane [DCA]), 1,1,1-trichloroethane, 1,4-dichlorobenzene, and 1,1,2-trichloroethane). In addition, 1,2-dichlorobenzene was detected at a concentration greater than its ACL only once (1997). During 2012, seven COCs other than TCE, PCE, and CCl_4 were detected in monitoring and extraction well samples at concentrations that exceeded their respective ACLs (Figure 4-19).

4.4.2.5 Potable Water Supply Wells

Figures 4-20 and 4-21 present the 3Q12 TCE and PCE, respectively, results for on- and off-depot potable water supply wells. Since 2005, at on-depot supply well PW038 (Sharpe No. 1) in the North Balloon, TCE has been consistently detected at concentrations less than the MCL, which is equivalent to the Sharpe Site ACL of 5 µg/L. During the period of this five-year review, TCE was detected one time each at PW039 (2012) and at PW040 (2008) at a concentration less than the MCL. Section 5.0 further discusses the effect of depot water supply well pumping on TCE plume migration in the North Balloon.

In 2010, DLA adopted the *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* (Contingency Plan) (URS, 2010e), the goal of which is to reduce the potential for human exposure to VOCs in groundwater originating from the Sharpe Site. The Contingency Plan establishes notification (residential use wells only), trigger, and action levels for 10 COCs and establishes a response plan to be taken if any of these levels are exceeded. The Contingency Plan addresses only those off-depot potable wells that have been, or have the potential to be, affected by contaminants from the Sharpe Site because the wells are directly downgradient of a Sharpe Site plume. Between 2010 and 2012, TCE concentrations exceeded levels specified in the Contingency Plan in samples collected from potable well PW006 and industrial supply well PW020 located west of the North Balloon. Section 5.0 provides additional details about the Contingency Plan and actions taken at PW006 and PW020.

4.4.2.6 In Situ Remediation Technology Testing

In support of the *DDJC-Sharpe Response Completion Plan* (URS, 2005a), three in situ amendment technologies were selected for injection testing in areas with the greatest TCE concentrations in groundwater: emulsified oil substrate (EOS) in the North Balloon near the western depot boundary, potassium permanganate ($KMnO_4$) in the South Balloon approximately 60 feet north of Building 649, and redox compound (EHC) at Site P-5A in the Central Area. The objective of implementing in situ treatment technologies would be to expedite COC mass destruction at high concentration areas, thereby reducing the cleanup times estimated for groundwater extraction and treatment alone. Pilot studies for the three technologies were initiated in 2008, and the 12-month test period for each of the pilot studies concluded during the 2009 monitoring period. The amendments were effective in destroying COCs where they were introduced. Additional groundwater samples were collected during the 2010, 2011, and 2012 monitoring periods to continue monitoring the effectiveness of the $KMnO_4$ and EHC pilot tests. No additional sampling was recommended in the EOS pilot study area after the 2010 monitoring period. Section 5.0 provides additional information about the results of the three pilot studies and the proposed addition of in situ treatment to the OU 1 ROD remedy.

4.5 Site Inspection and LUC Management

DLA Installation Support at San Joaquin and URS inspected OU 1 and OU 2 remedial action sites on 24 January 2013. Representatives from EPA, DTSC, and CVWB also participated in the inspections.

Site inspections are conducted to provide information about a site's status and to visually confirm and document the conditions of the remedy, the site, and the surrounding area. At the Sharpe Site, this inspection included the OU 1 groundwater extraction and treatment systems, the percolation ponds, the OU 2 soil sites with LUCs, and the OU 2 Site P-5A SVE system. For all sites, site inspection forms were completed and photographs taken to show the current site conditions.

LUCs are managed by DLA Installation Support at San Joaquin, including the Environmental Services Branch and the Master Planner. LUC procedures for the Sharpe Site were developed to be consistent with the 2003 Department of Defense – EPA guidance *Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions* (United States Department of Defense and EPA, 2003). The Federal Facilities Land Use Control ROD Checklist (EPA, 2006) was used during this five-year review to confirm the LUC procedures are consistent with the referenced 2003 guidance. Appendix C of the 2011 OU 2 ROD Amendment is the Addendum to the Real Property Master Plan Digest (RPMPD) (formerly the Installation Master Plan), which documents LUC requirements and procedures for OU 2 sites at the Sharpe Site (URS, 2011a). The appendix provides a description of each site with LUCs and a figure showing the extent of the LUCs. In addition, the appendix describes agency notification requirements, maintenance and reporting requirements, and land use change requirements for the Sharpe Site. This appendix has been incorporated into the RPMPD for the Sharpe Site. Formal LUCs have not yet been implemented for groundwater (OU 1) but are being added to the OU 1 remedy in the *Explanation of Significant Differences to the Record of Decision Operable Unit 1, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012a, revised final pending as of September 2014).

No significant issues were identified during the site inspections. The groundwater extraction and treatment system was operational and in good condition at the time of the inspection; however, the northern Central Area percolation pond had been recently temporarily repaired due to a minor leak. Permanent repair of the pond is planned for summer 2013.

Site-specific summaries in Sections 5.0 and 6.0 describe findings, if any, from the site inspections. Appendix B provides site inspection forms. Photographs taken during the site inspections are included at the end of each site-specific section.

4.6 Interviews

As part of the Sharpe Site five-year review process, a series of interviews were conducted to evaluate opinions and concerns regarding the environmental restoration activities at the Sharpe Site. The interview process included two components – interviews with community members, and interviews with O&M representatives, including the RPMs and O&M contractor for the Sharpe Site. The DLA Public Affairs Office gave potential interviewees the option of completing a survey in person, or by phone, mail, or email. Of the 22 individuals asked to participate in the interview process, 8 responded either by mail or email.

Three of the 15 community representatives contacted responded to DLA's request for input: the Vice-Mayor of the City of Lathrop, a Civil Engineer from the City of Lathrop Public Works Department, and the Superintendent of the Manteca Unified School District. The city's Public Works engineer expressed knowledge of the site, including some coordination with the Sharpe Site in regards to water studies and a well replacement project. The City's engineer also expressed his opinion that the Sharpe Site is doing a good job of cleaning up contamination at the site. The other two community respondents expressed limited or no knowledge of the environmental restoration activities at the site. The city's Vice-Mayor suggested getting more information out to the community.

Five of the seven O&M representatives who were contacted for an interview participated: the RPMs for DLA Installation Support at San Joaquin, DTSC, and CVWB, the O&M project manager, and the O&M site manager. In general, the overall impression of the remedies selected for the Sharpe Site's IRP was favorable. At the time of the survey, the majority of respondents felt the groundwater and soil remedies were generally functioning as expected. Concerns expressed regarding the performance of the IRP remedies included the off-site migration of contaminated groundwater, the potential threat to human health from exposure to VOCs in drinking water, the lack of additional discharge capacity for the groundwater treatment system, and the availability of funding to maintain aging infrastructure. Some concern was also expressed regarding the recent detection of 1,3-butadiene in soil vapor. Additional sampling for this particular VOC is planned in 2013.

The responses to the five-year review interviews will be taken into account as DLA moves forward with the public outreach program and continues its environmental restoration activities at the Sharpe Site. Appendix A includes these interview records.

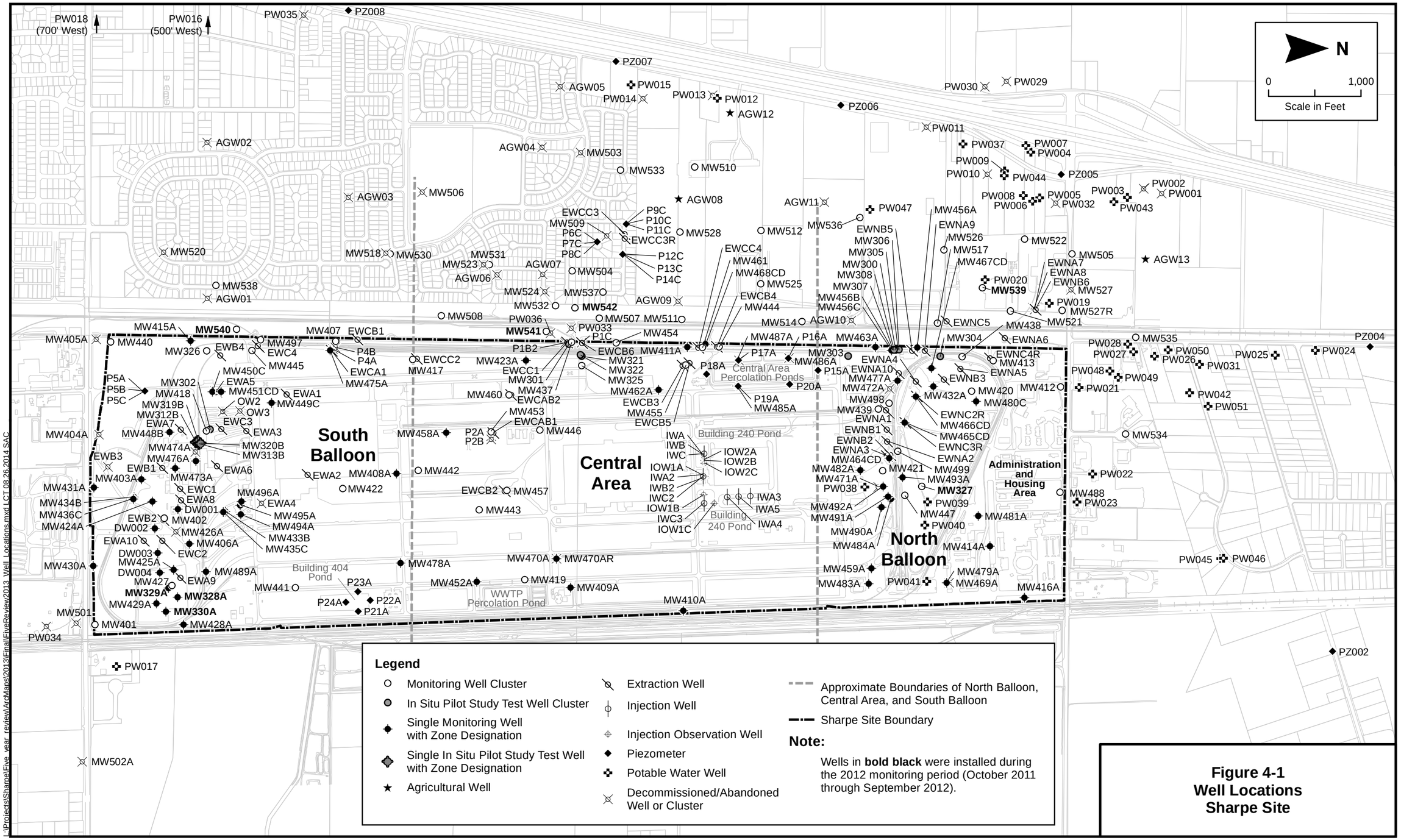


Figure 4-1
Well Locations
Sharpe Site

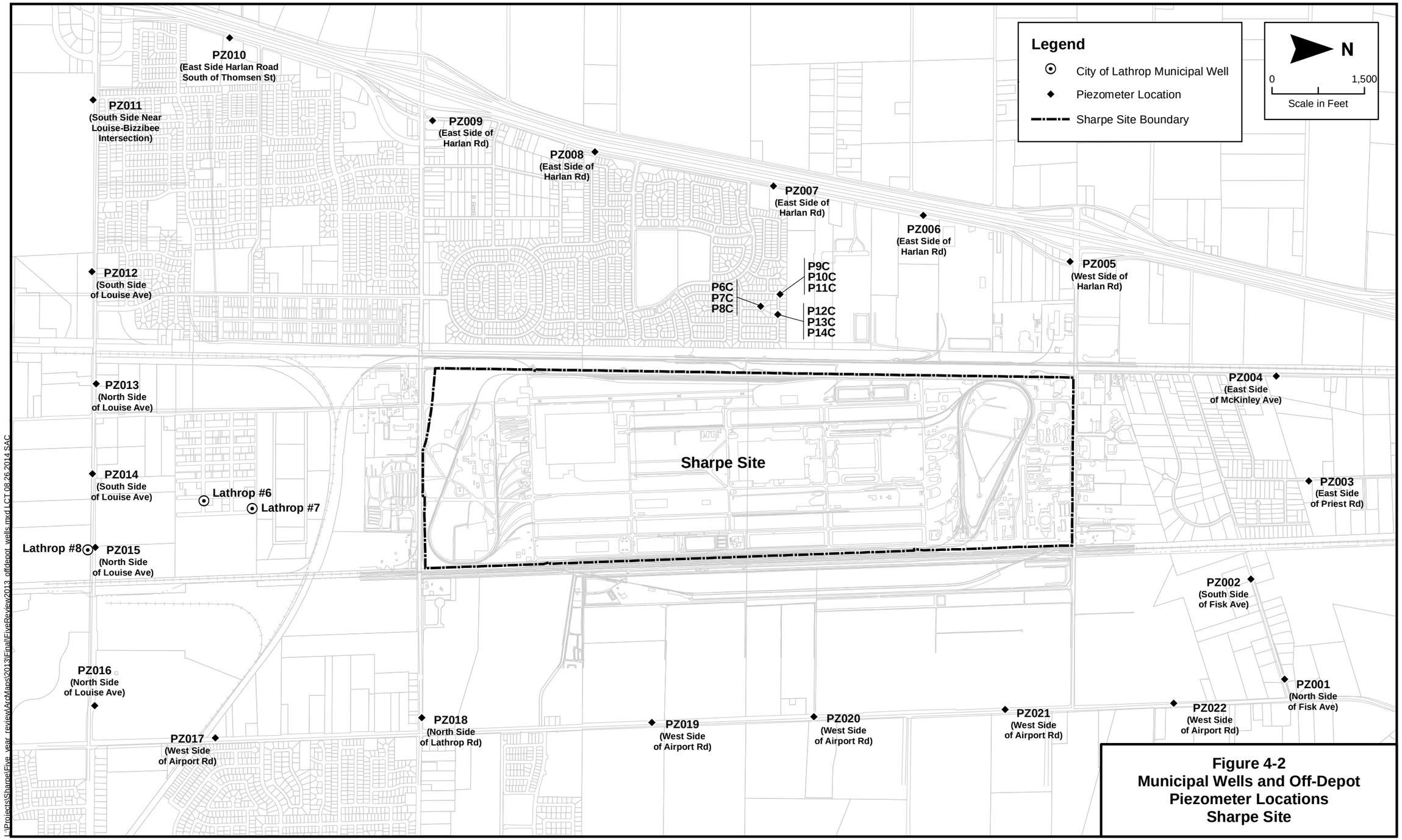
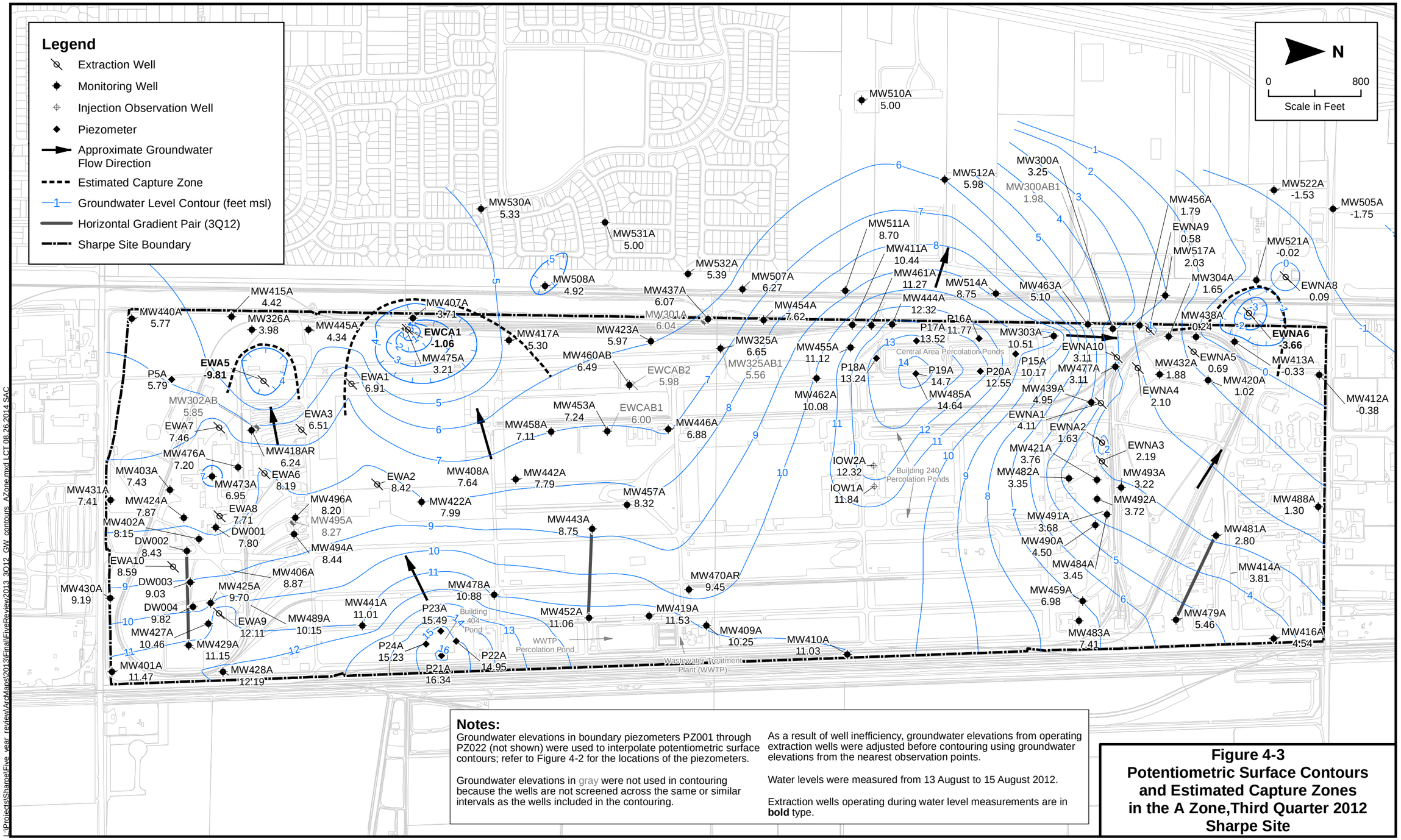


Figure 4-2
Municipal Wells and Off-Depot Piezometer Locations
Sharpe Site



Notes:

Groundwater elevations in boundary piezometers PZ001 through PZ022 (not shown) were used to interpolate potentiometric surface contours; refer to Figure 4-2 for the locations of the piezometers.

Groundwater elevations in gray were not used in contouring because the wells are not screened across the same or similar intervals as the wells included in the contouring.

As a result of well inefficiency, groundwater elevations from operating extraction wells were adjusted before contouring using groundwater elevations from the nearest observation points.

Water levels were measured from 13 August to 15 August 2012.

Extraction wells operating during water level measurements are in **bold** type.

Figure 4-3
Potentiometric Surface Contours and Estimated Capture Zones in the A Zone,Third Quarter 2012
Sharpe Site

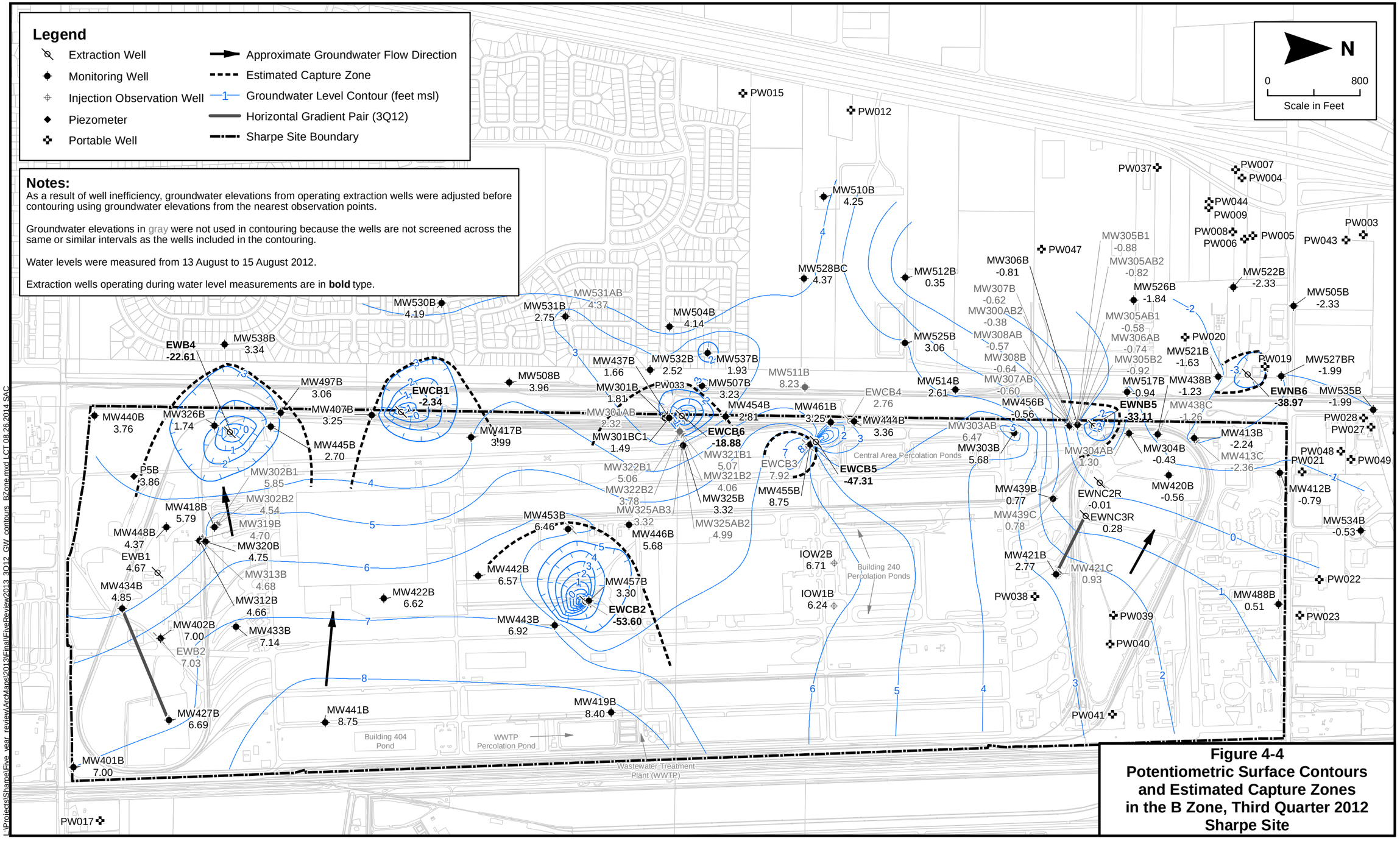
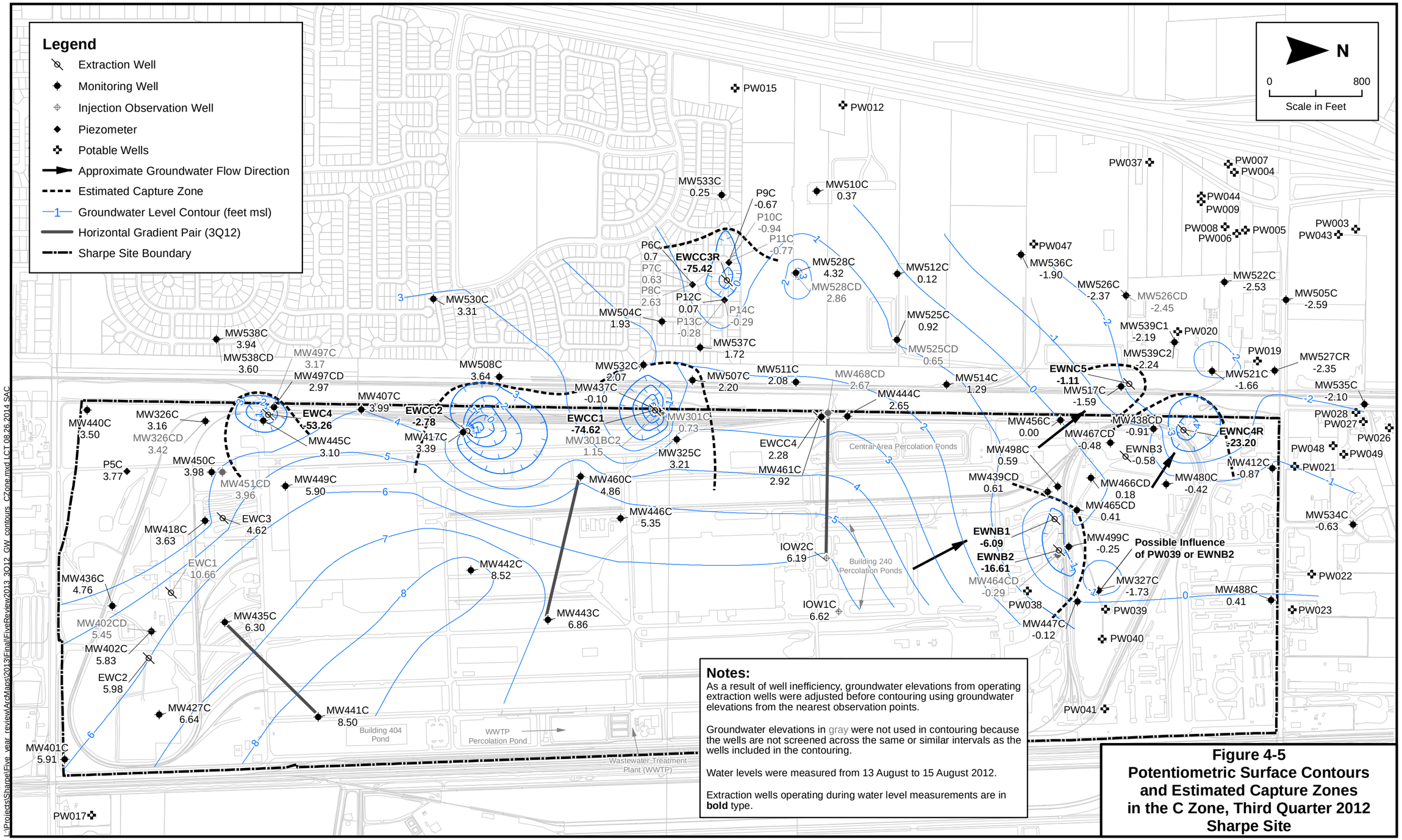


Figure 4-4
Potentiometric Surface Contours and Estimated Capture Zones in the B Zone, Third Quarter 2012 Sharpe Site



Notes:

As a result of well inefficiency, groundwater elevations from operating extraction wells were adjusted before contouring using groundwater elevations from the nearest observation points.

Groundwater elevations in gray were not used in contouring because the wells are not screened across the same or similar intervals as the wells included in the contouring.

Water levels were measured from 13 August to 15 August 2012.

Extraction wells operating during water level measurements are in **bold** type.

Figure 4-5
Potentiometric Surface Contours and Estimated Capture Zones in the C Zone, Third Quarter 2012
Sharpe Site

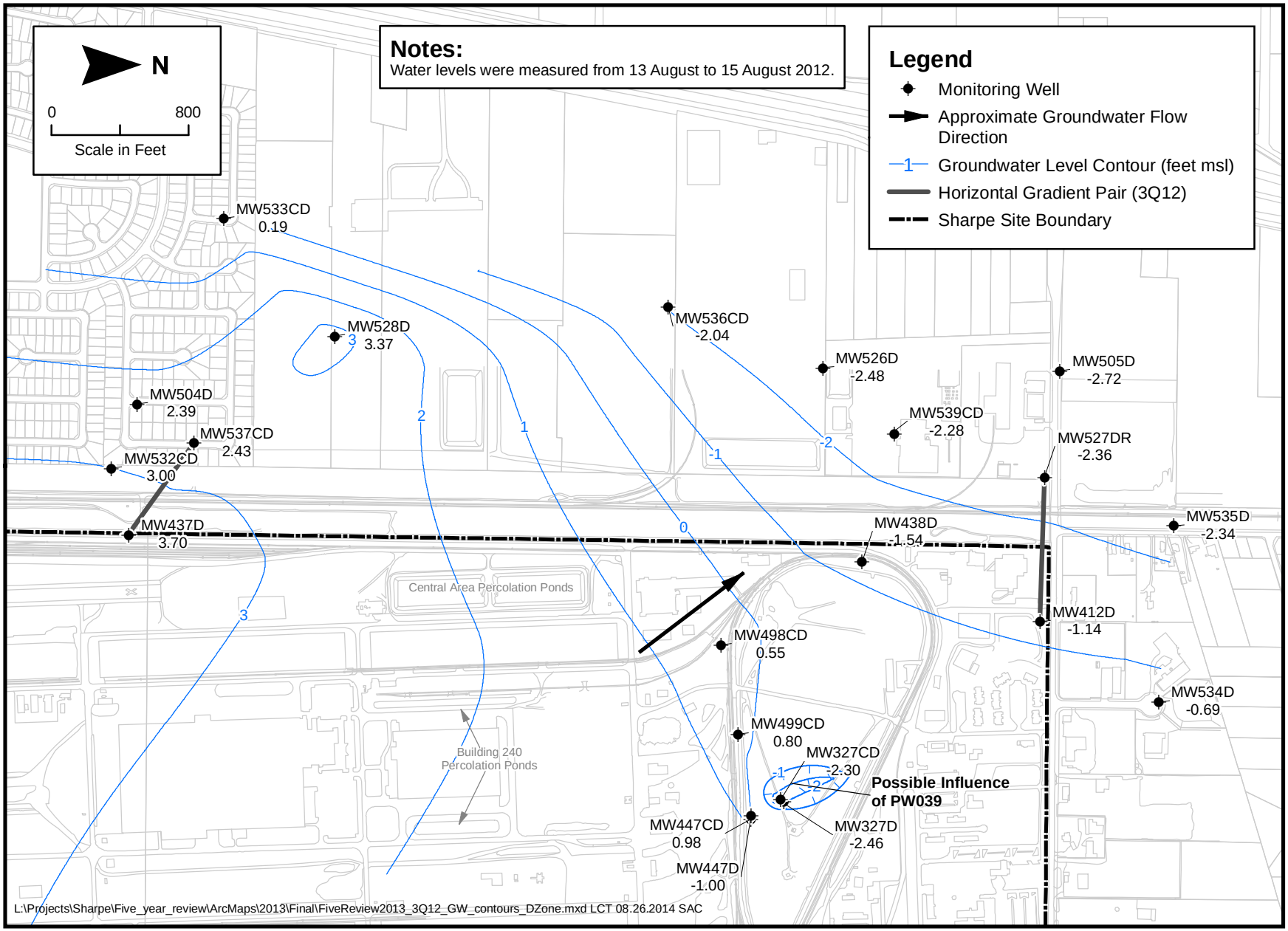


Figure 4-6. Potentiometric Surface Contours in the D Zone (North Balloon), Third Quarter 2012, Sharpe Site

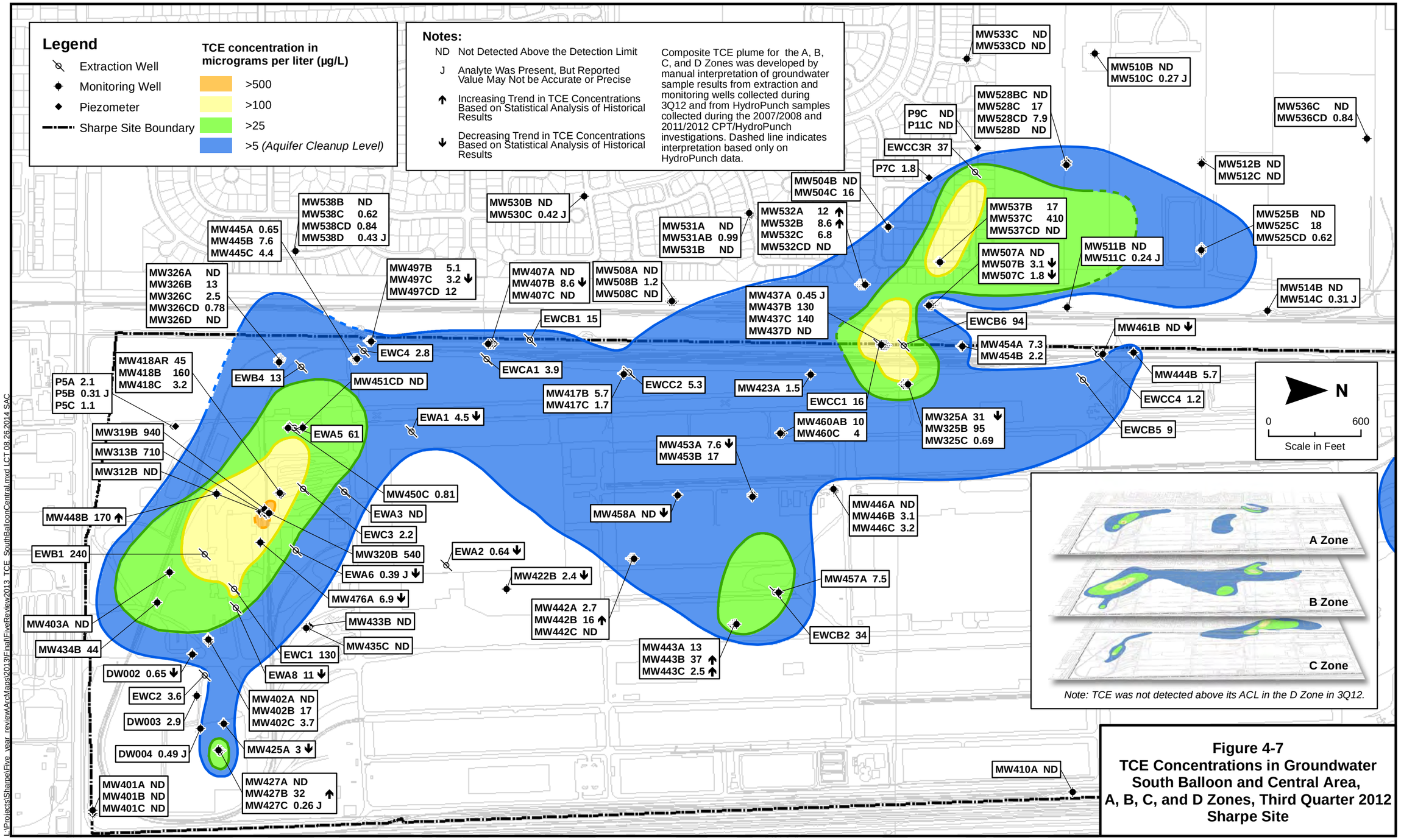


Figure 4-7
TCE Concentrations in Groundwater South Balloon and Central Area, A, B, C, and D Zones, Third Quarter 2012 Sharpe Site

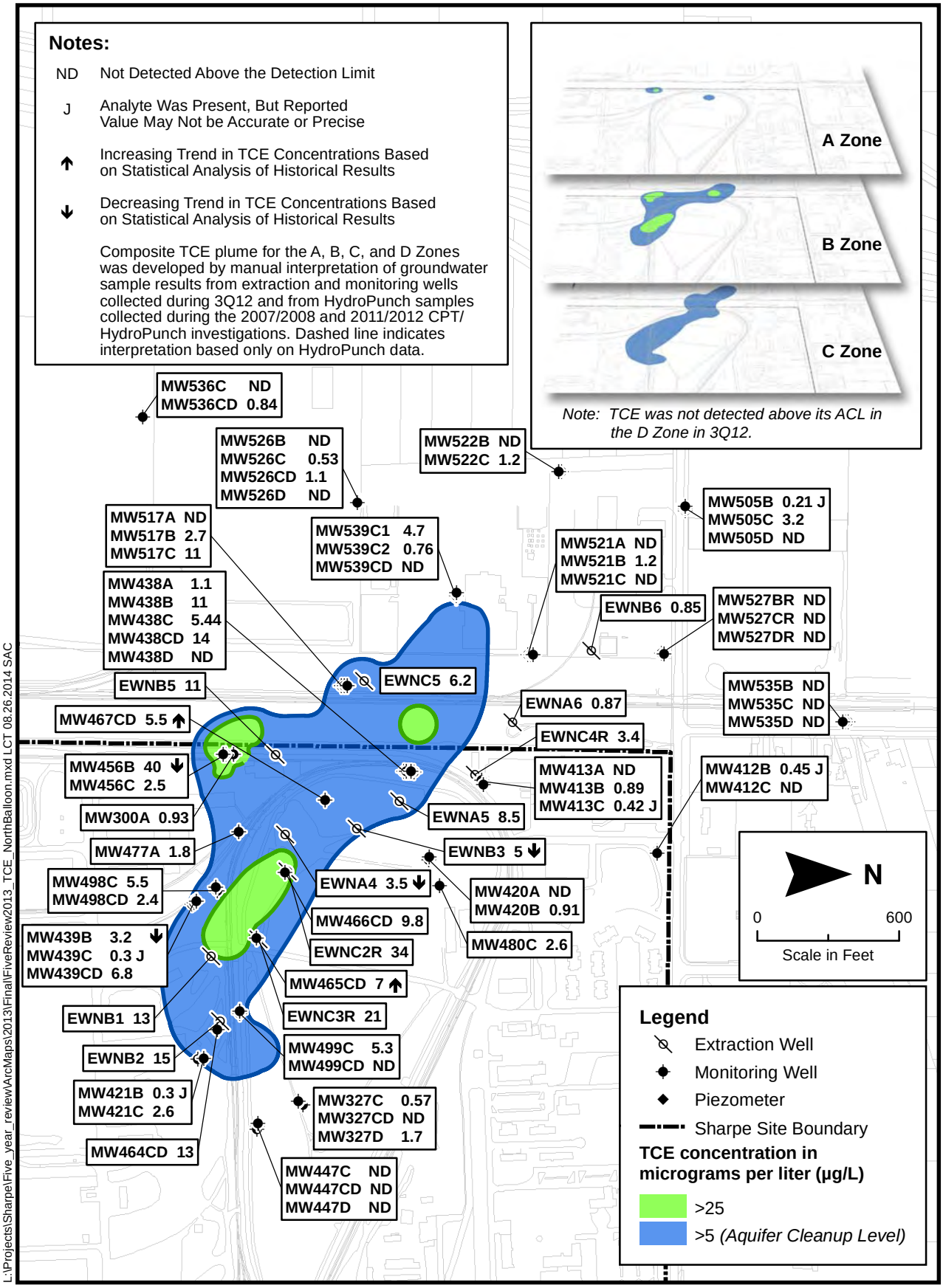


Figure 4-8. TCE Concentrations in Groundwater, North Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site

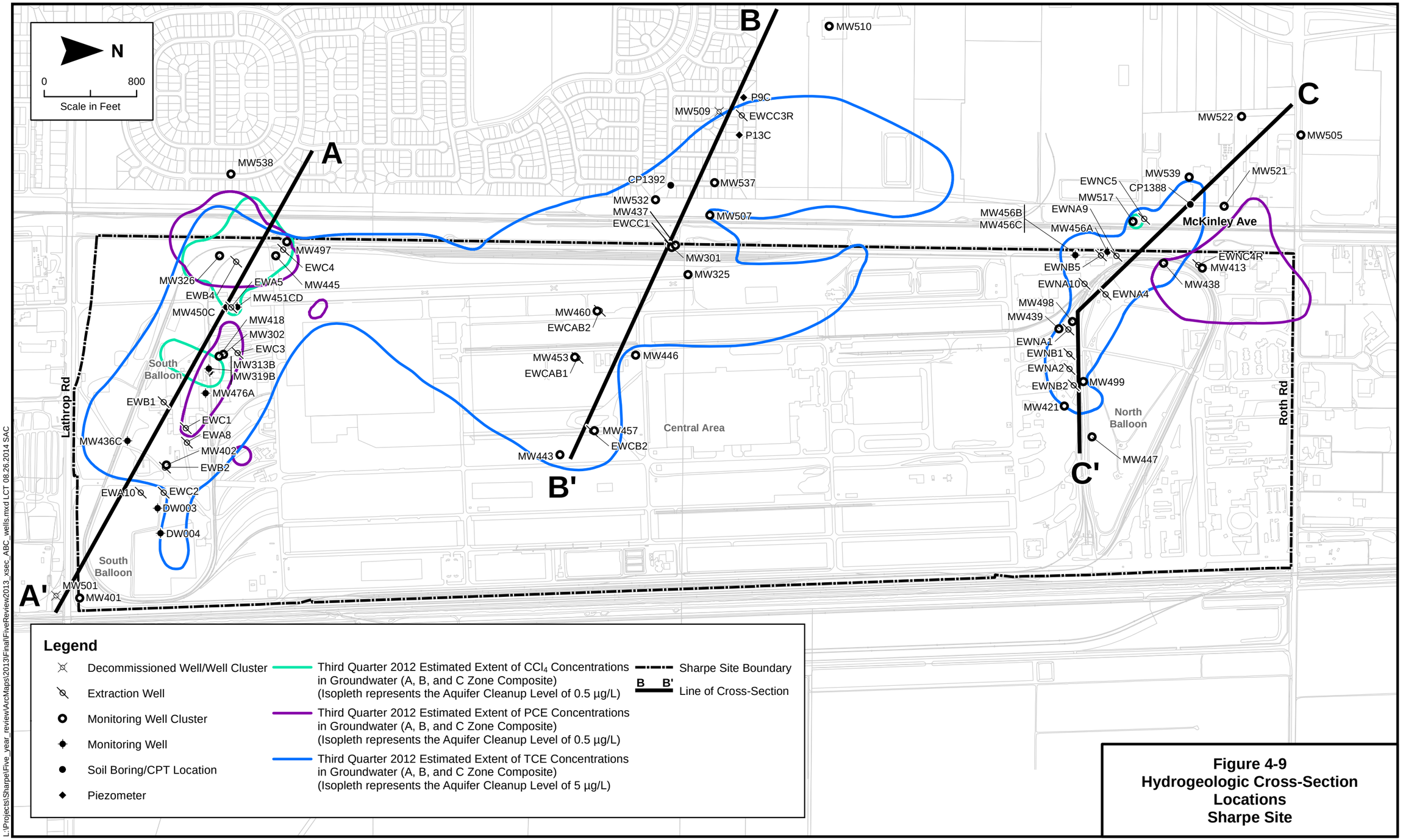


Figure 4-9
Hydrogeologic Cross-Section Locations
Sharpe Site

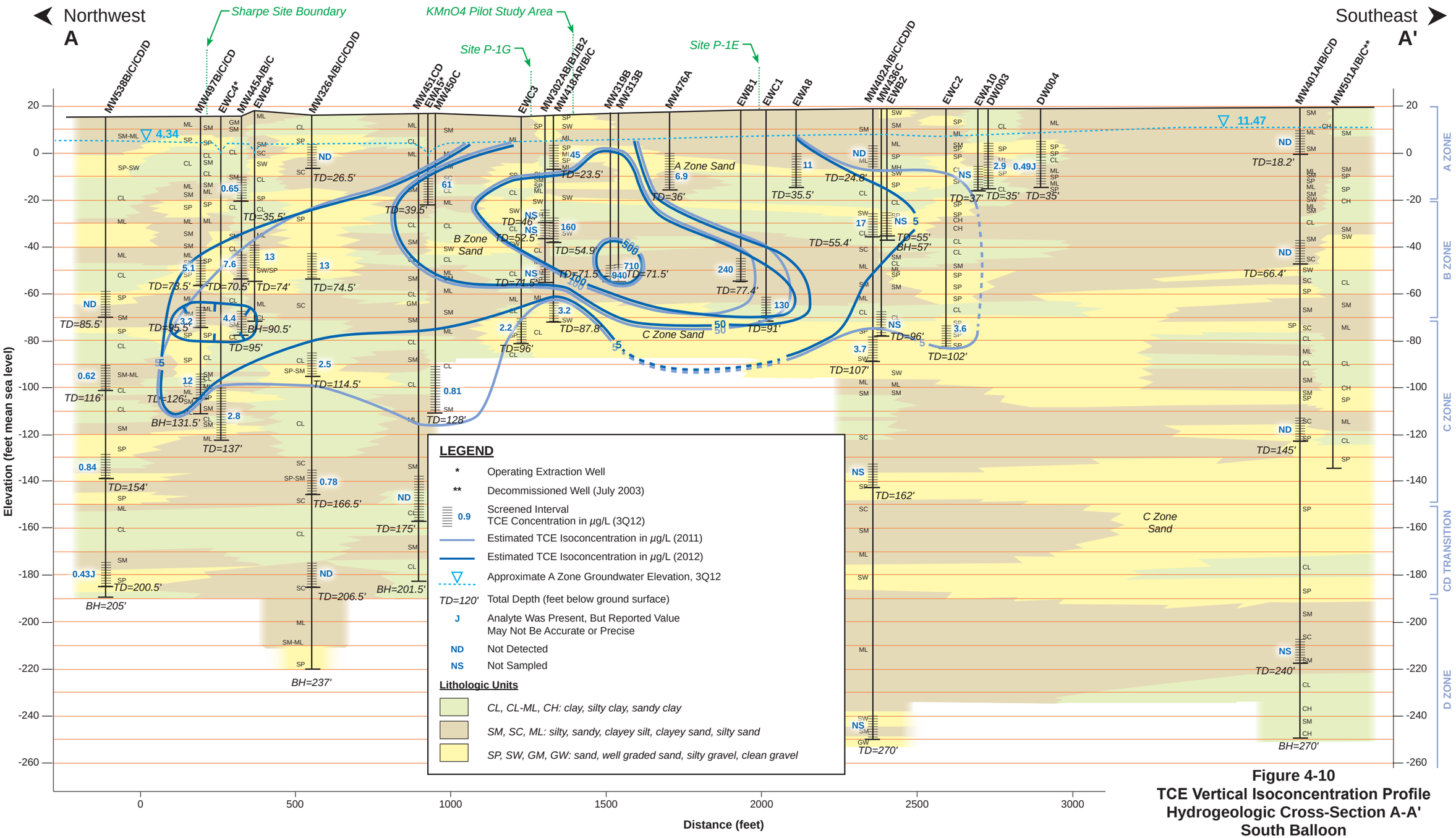


Figure 4-10
TCE Vertical Isoconcentration Profile
Hydrogeologic Cross-Section A-A'
South Balloon
Third Quarter 2012
Sharpe Site

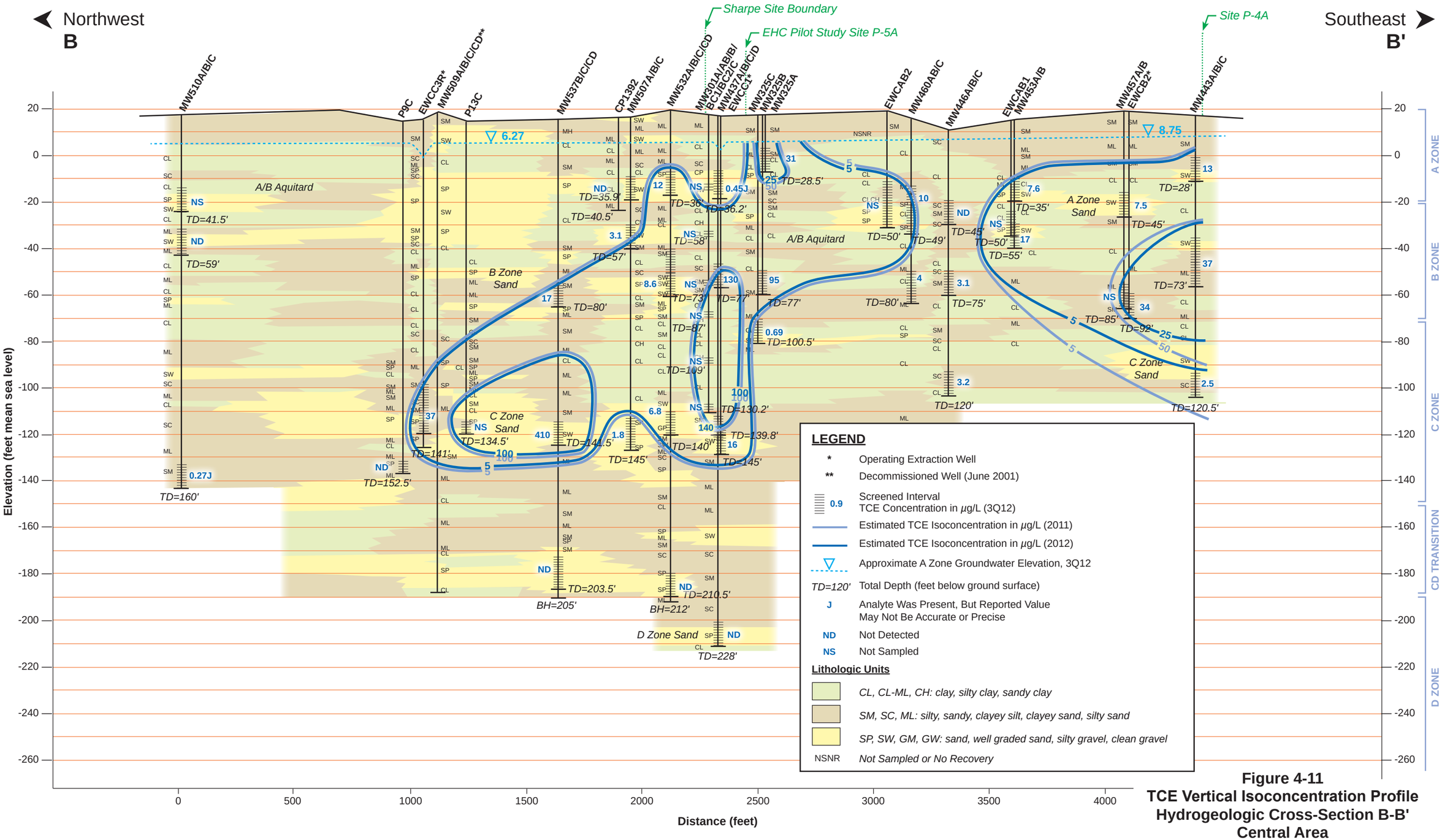


Figure 4-11
TCE Vertical Isoconcentration Profile
Hydrogeologic Cross-Section B-B'
Central Area
Third Quarter 2012
Sharpe Site

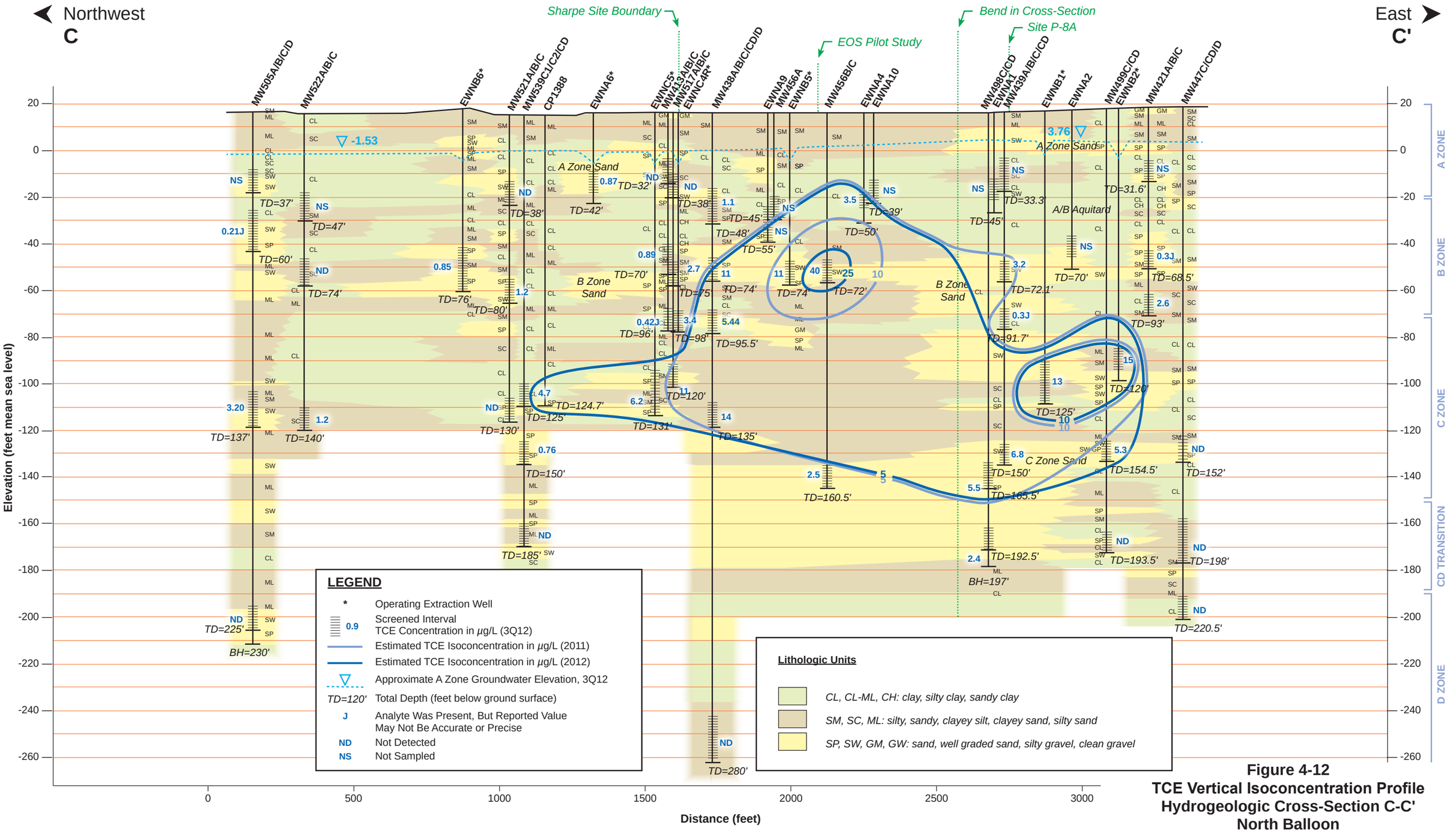


Figure 4-12
TCE Vertical Isoconcentration Profile
Hydrogeologic Cross-Section C-C'
North Balloon
Third Quarter 2012
Sharpe Site

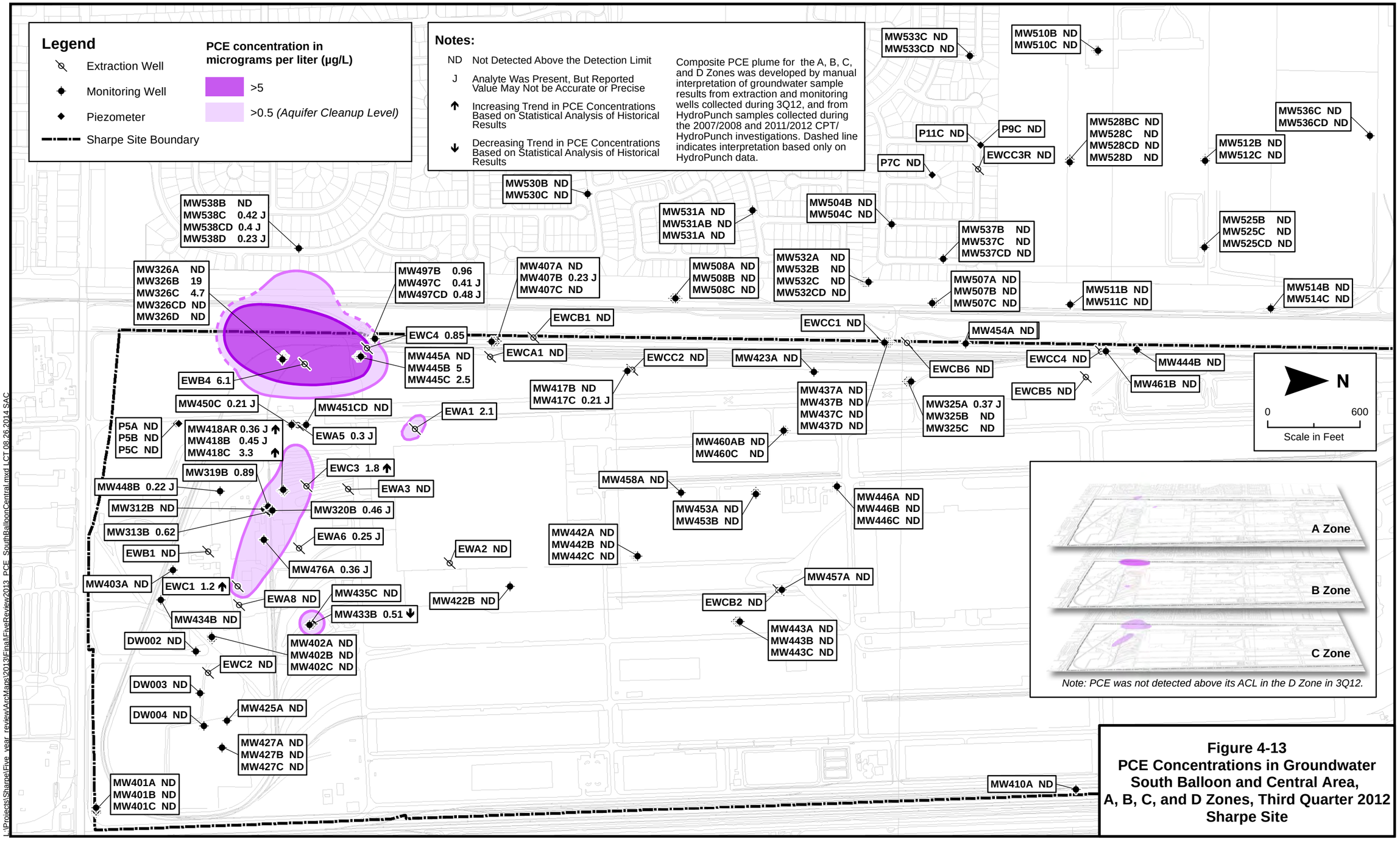


Figure 4-13
PCE Concentrations in Groundwater South Balloon and Central Area, A, B, C, and D Zones, Third Quarter 2012 Sharpe Site

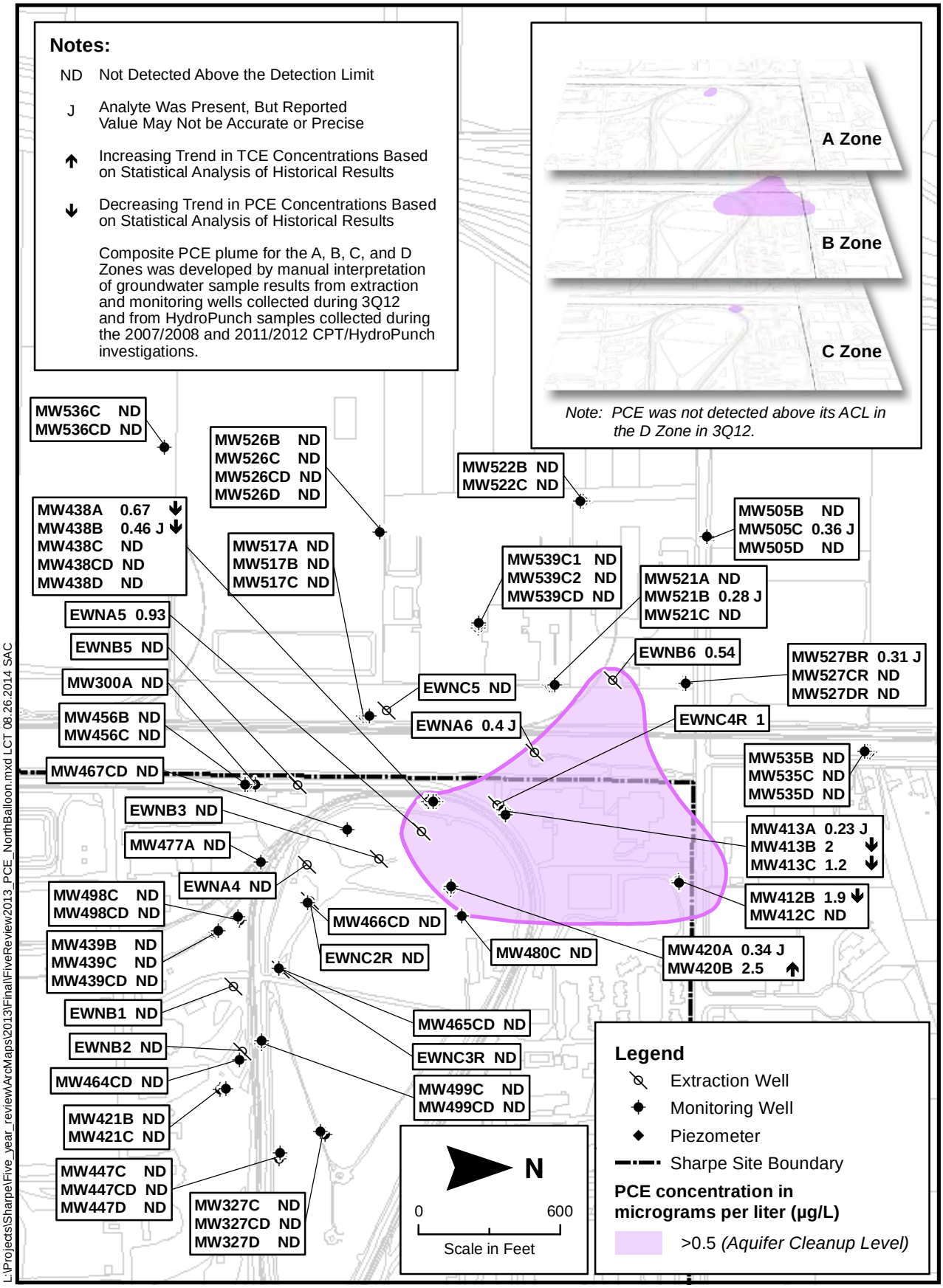


Figure 4-14. PCE Concentrations in Groundwater, North Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site

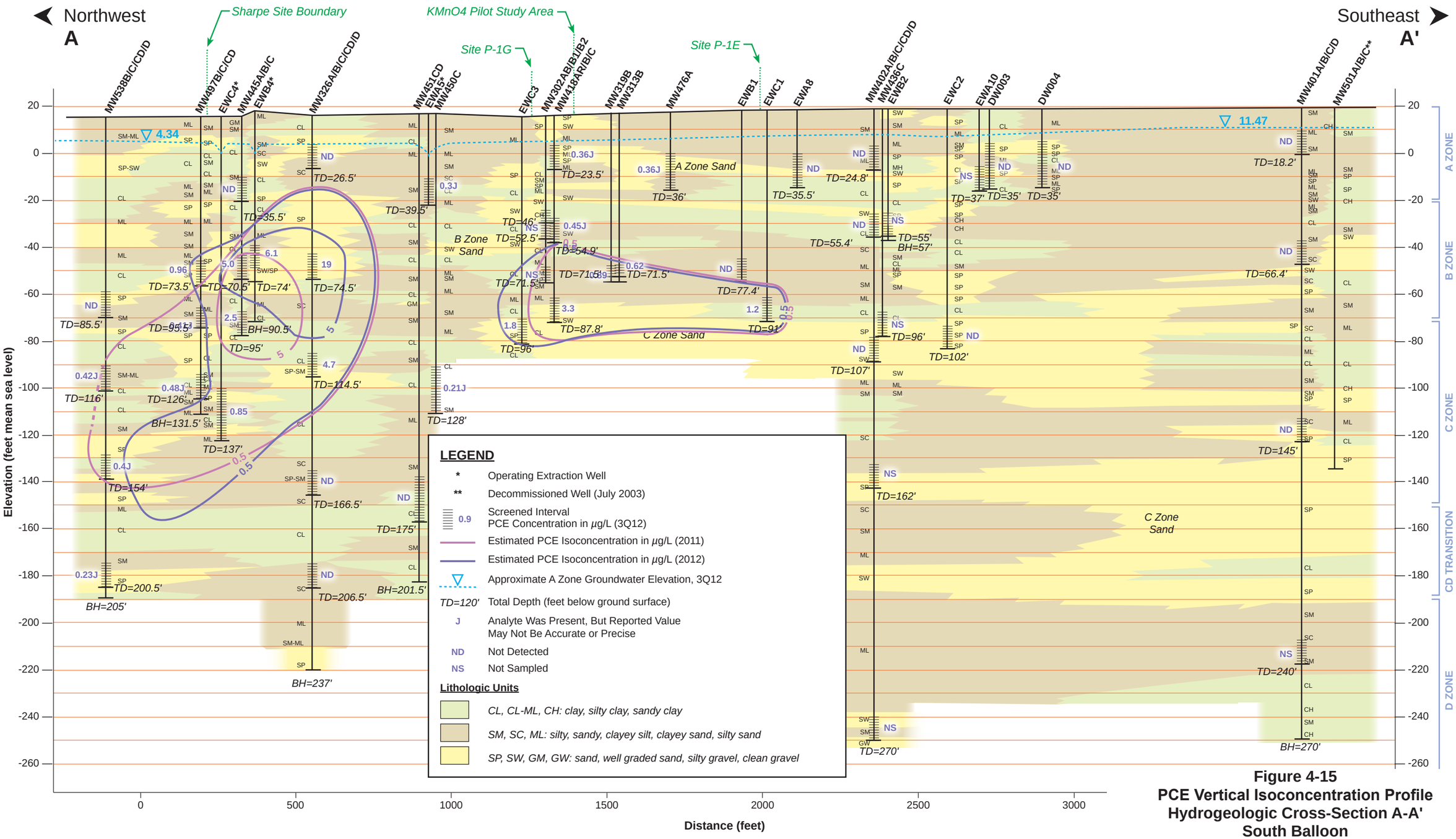


Figure 4-15
PCE Vertical Isoconcentration Profile
Hydrogeologic Cross-Section A-A'
South Balloon
Third Quarter 2012
Sharpe Site

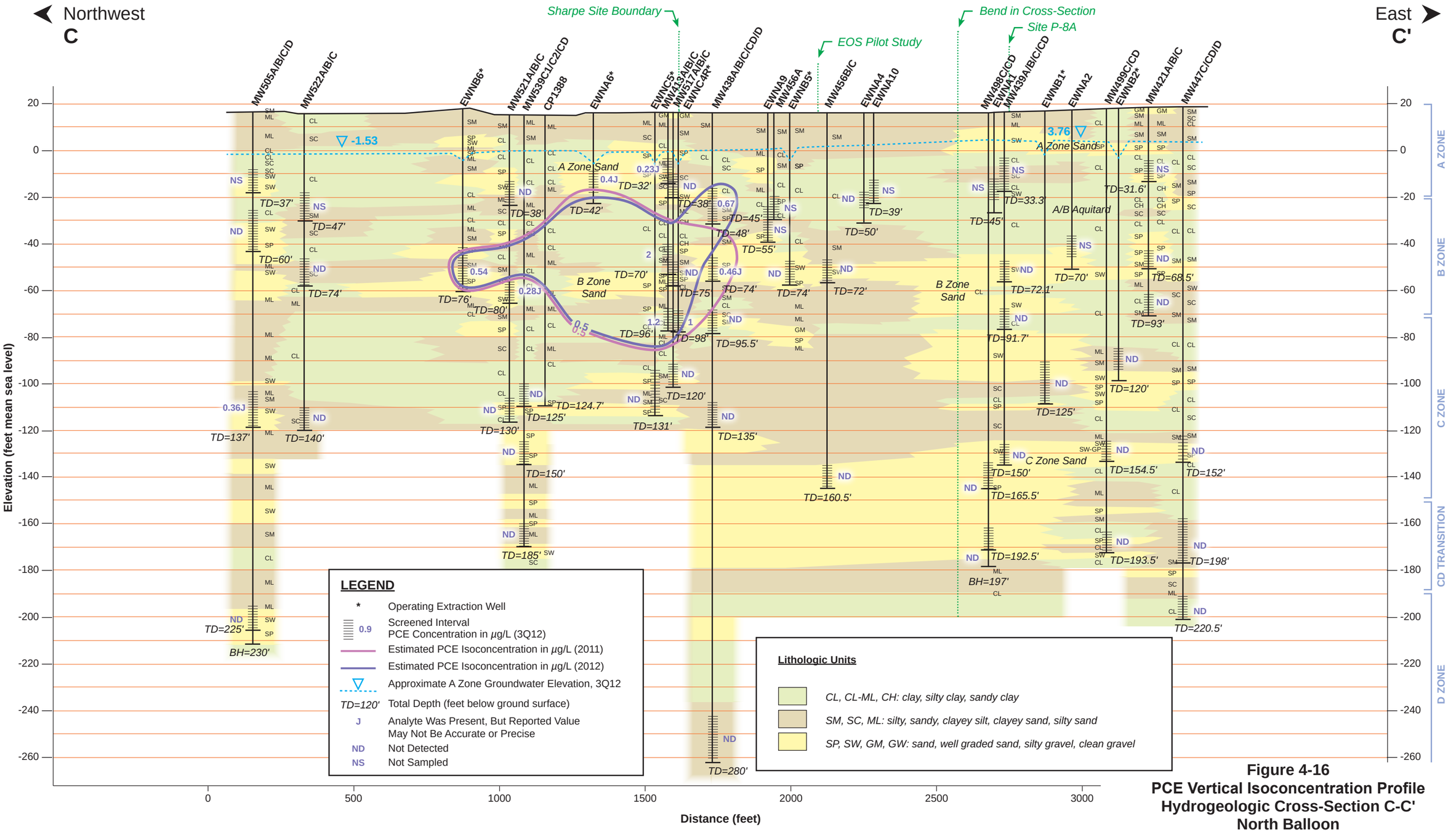


Figure 4-16
PCE Vertical Isoconcentration Profile
Hydrogeologic Cross-Section C-C'
North Balloon
Third Quarter 2012
Sharpe Site

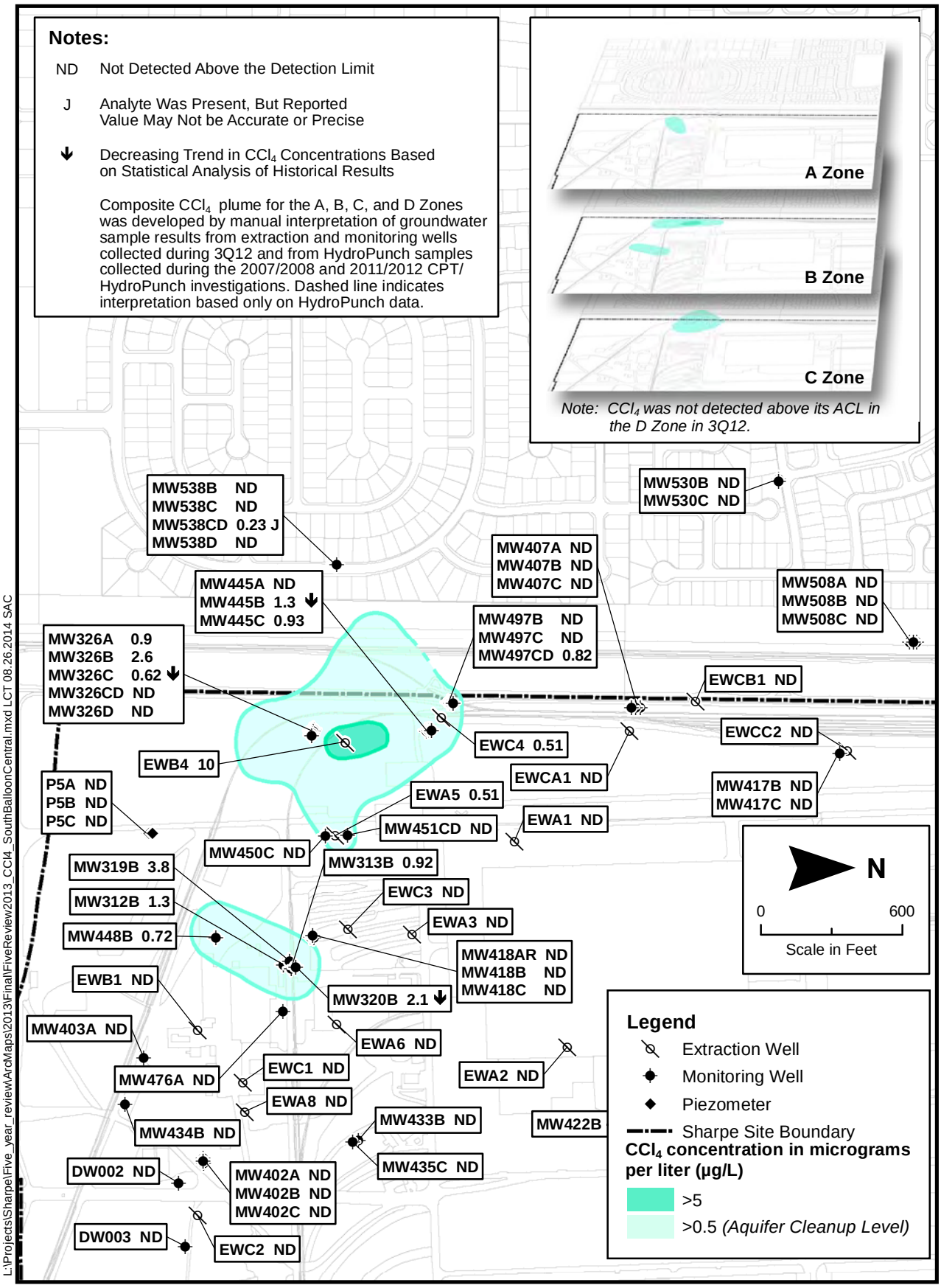


Figure 4-17. Carbon Tetrachloride Concentrations in Groundwater, South Balloon A, B, C, and D Zones, Third Quarter 2012, Sharpe Site

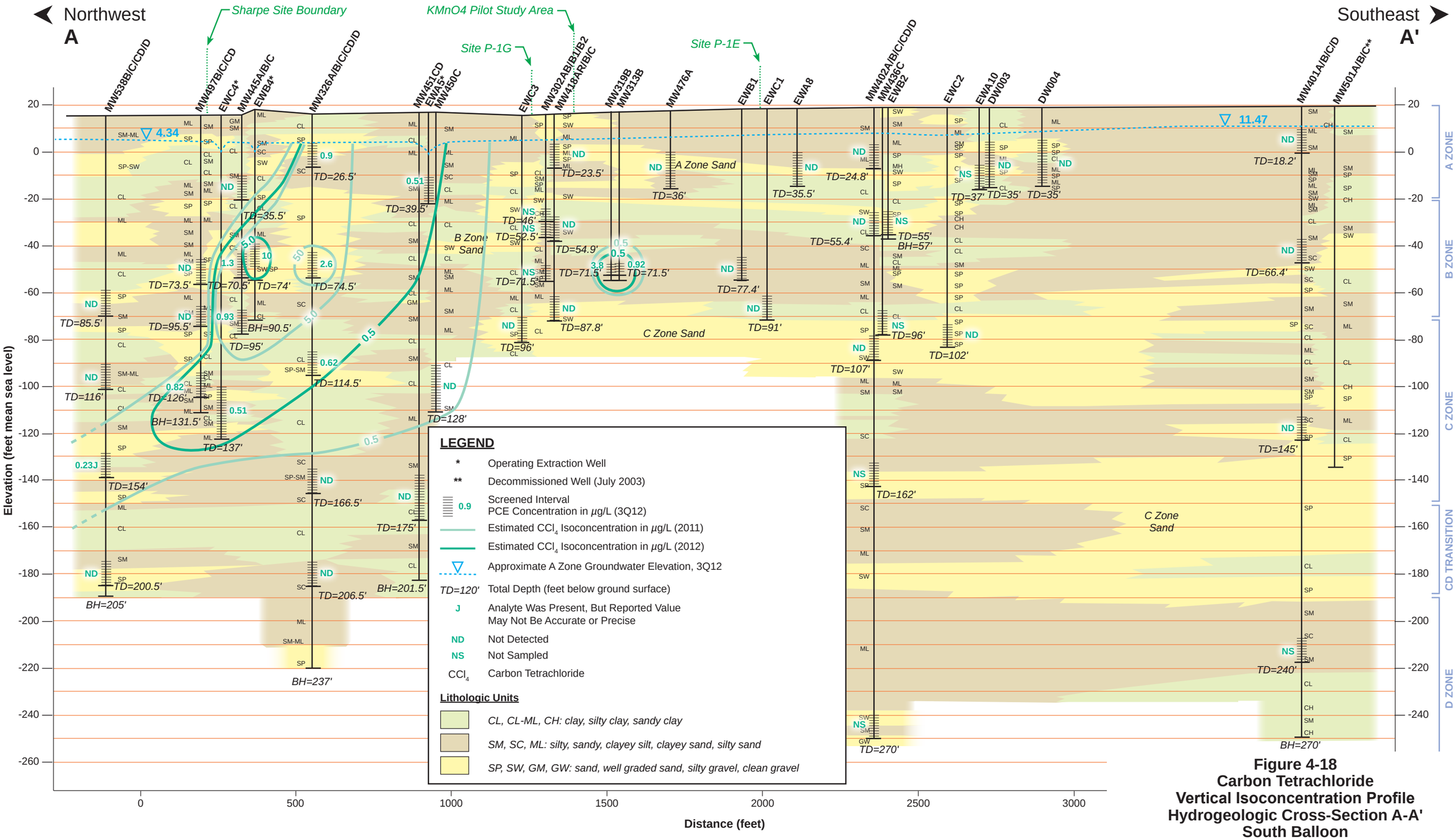


Figure 4-18
Carbon Tetrachloride
Vertical Isoconcentration Profile
Hydrogeologic Cross-Section A-A'
South Balloon
Third Quarter 2012
Sharpe Site

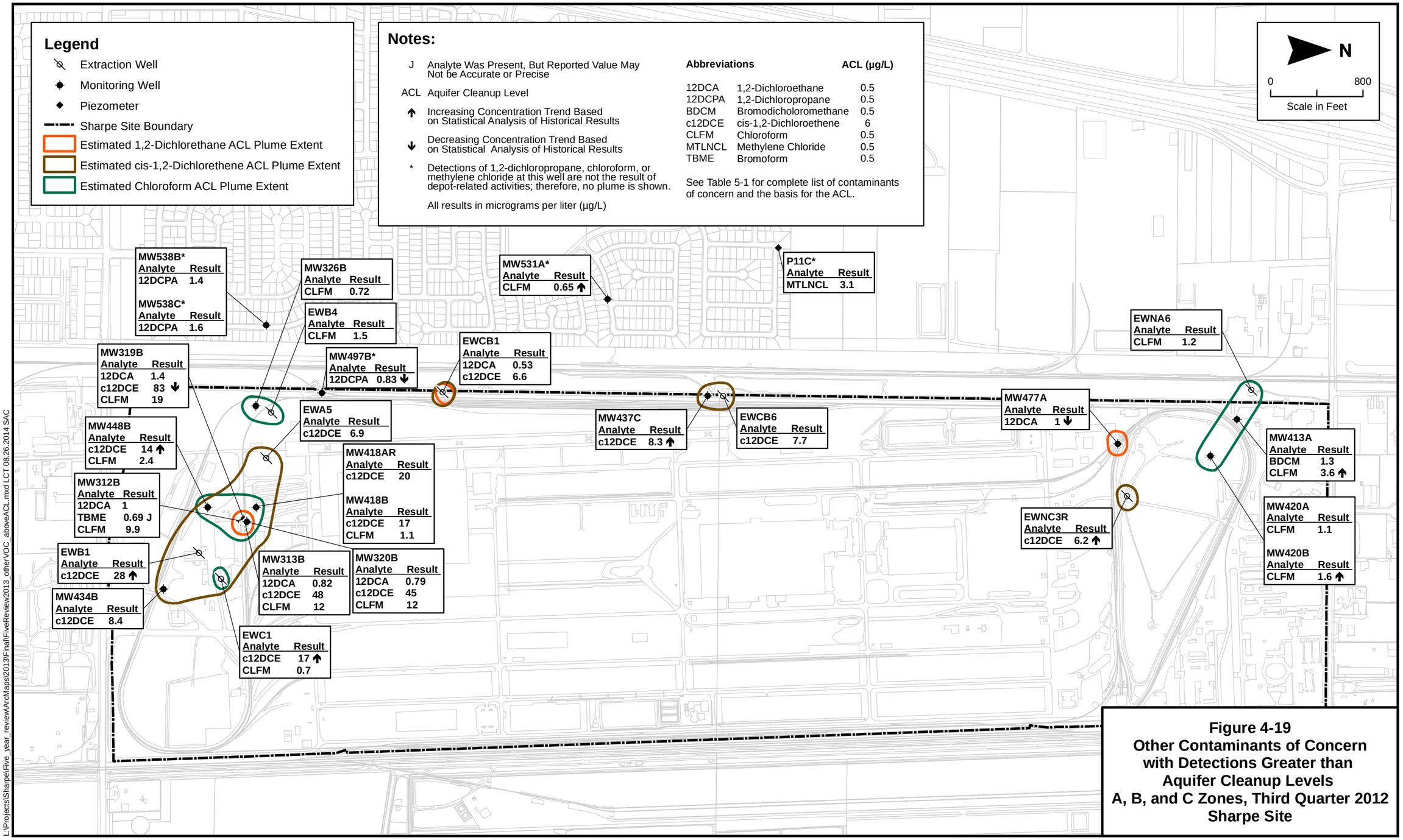


Figure 4-19
Other Contaminants of Concern with Detections Greater than Aquifer Cleanup Levels
A, B, and C Zones, Third Quarter 2012
Sharpe Site

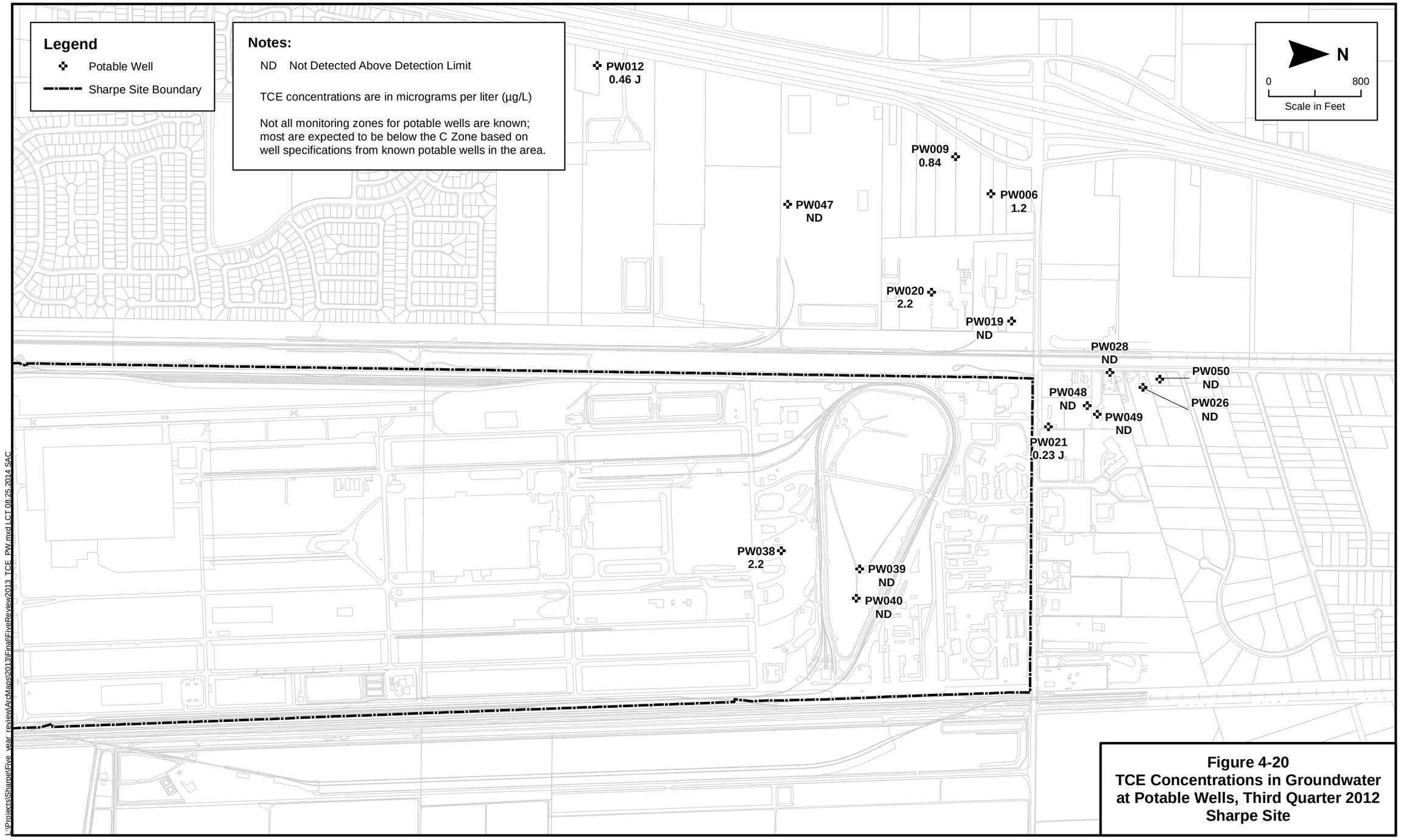


Figure 4-20
TCE Concentrations in Groundwater at Potable Wells, Third Quarter 2012
Sharpe Site

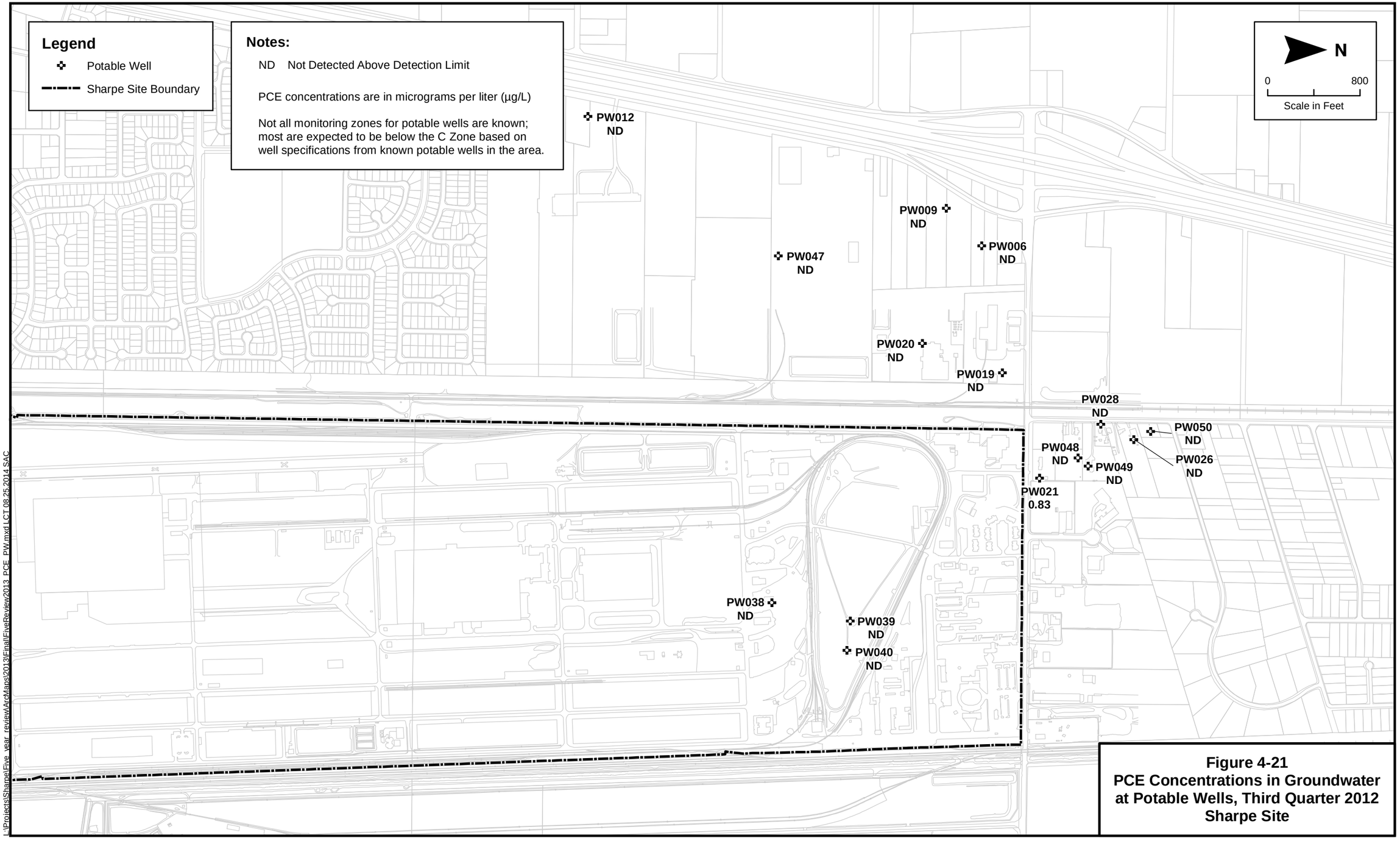


Figure 4-21
PCE Concentrations in Groundwater at Potable Wells, Third Quarter 2012
Sharpe Site

5.0 GROUNDWATER: OPERABLE UNIT 1

5.1 Remedial Action

This section briefly describes the remedy selected for OU 1 and implementation of that remedy, with emphasis on events that occurred during the third five-year review period.

5.1.1 Remedy Selection

The OU 1 ROD was signed in January 1993 by DLA, EPA, DTSC, and CVWB to address contaminated groundwater at the Sharpe Site. The RAOs identified in the ROD are to "mitigate potential long-term contaminant migration and protect human health and the environment" (ESE, 1993). The goal of the remedial action is to "restore groundwater to its beneficial reuse" (ESE, 1993).

The COCs identified in the OU 1 ROD include 21 VOCs, for which the ROD also specifies ACLs that must be met to the extent practicable (Table 5-1). The ROD also lists four other VOCs (benzene, toluene, ethylbenzene, and xylenes) and one herbicide (bromacil) as COCs, but ACLs were not established for these compounds. State and federal ARARs (i.e., MCLs) and the human health risk assessment (HHRA) were considered in the development of the ACLs.

Table 5-1. Remedial Performance Standards – Aquifer Cleanup Levels, Sharpe Site

Constituent	Aquifer Cleanup Level (µg/L)	Basis
Bromodichloromethane	0.5	HHRA
Bromoform	0.5	HHRA
Carbon tetrachloride	0.5	HHRA
Chloroform	0.5	HHRA
Dibromochloromethane	0.5	HHRA
ortho-Dichlorobenzene	10	California DHS Action Level
para-Dichlorobenzene	5	California Primary MCL
1,2-Dichloroethane	0.5	HHRA
1,1-Dichloroethene	0.5	HHRA
cis-1,2-Dichloroethene	6	California Primary MCL
trans-1,2-Dichloroethene	10	California Primary MCL
1,1-Dichloroethane	5	California Primary MCL
1,2-Dichloropropane	0.5	HHRA
1,3-Dichloropropene	0.5	HHRA
Methylene chloride	0.5	HHRA
1,1,1-Trichloroethane	200	California Primary MCL
1,1,2-Trichloroethane	0.5	HHRA
1,1,2,2-Tetrachloroethane	0.5	HHRA
Tetrachloroethene	0.5	HHRA
Trichloroethene	5	EPA and California Primary MCL
Vinyl chloride	0.5	HHRA

Table 5-1. (Continued)

DHS	=	Department of Health Services
EPA	=	United States Environmental Protection Agency
HHRA	=	human health risk assessment
MCL	=	maximum contaminant level
µg/L	=	micrograms per liter

Source: Environmental Science and Engineering, Inc., 1993.

In addition, if any increases of lead or chromium concentrations are identified in groundwater, Sharpe Site RPMs must evaluate the need for additional action (e.g., continued monitoring, additional trend analysis, soil sampling, or remedial action). This requirement was established in the OU 2 ROD, which addresses contaminants in soil and their potential impacts on groundwater (ESE, 1996). To date, Sharpe Site RPMs have not determined a need for a remedial action for chromium or lead in groundwater, and groundwater monitoring for these metals has been discontinued (Section 4.4).

The selected remedy for OU 1 is groundwater extraction and air stripping. Treated water (effluent) can be made available for industrial reuse or it can be discharged to surface water, percolation ponds, or injection wells for groundwater recharge. Table 5-2 outlines the treatment system components, performance monitoring and optimization requirements, and maintenance requirements specified in the OU 1 ROD. In addition to these requirements, the Substantive Waste Discharge Requirements (WDRs) for Land Disposal specifies twice monthly analysis of influent and effluent samples (CVWB, 1992). Table 5-3 shows the WDRs for full-scale operation, considered an addendum to the OU 1 ROD.

Table 5-2. Elements of the Groundwater Remedy, OU 1 ROD

Treatment System Components	Extraction well field and associated piping network to remove groundwater from the contaminated aquifer zones. Equalization tank designed to stabilize groundwater flow and influent VOC concentrations (Central Area only). Air stripping system consisting of countercurrent packed towers designed to remove VOC contamination from groundwater (including carbon adsorption of air stripper exhaust in the Central Area). Industrial reuse or discharge of treated effluent to surface water, percolation ponds, or injection wells.
Performance Monitoring and Optimization Components	Discontinue operation of extraction wells in areas where cleanup levels have been attained. Alternate pumping of extraction wells to eliminate stagnation points. Pulse-pump to allow aquifer equilibration and encourage adsorbed contaminants to partition into the groundwater. Conduct performance monitoring (requirements to be developed during the remedial design phase).
Maintenance Requirements	Maintenance requirements include replacement of pumps, periodic cleaning and acid washing of valves and pumps, well rehabilitation, replacement and adjustment of telemetry equipment, and other maintenance as needed.

OU = operable unit
ROD = record of decision
VOC = volatile organic compound

Source: Environmental Science and Engineering, Inc. 1993.

Table 5-3. Substantive Waste Discharge Requirements for Land Disposal and Sampling Frequency Sampling Locations: Influent and Effluent at GWTPs[a], Sharpe Site

Analytical Constituent/ Parameter	Method	Type	Frequency	Regulated Constituent/ Parameter	Effluent Limitation Monthly Median	Effluent Limitation Daily Maximum	Units
Volatile Organic Compounds	SW8260B	Grab	Twice Monthly	BTEX	0.5	5	µg/L
				Benzene	0.5	1	µg/L
				PCE	0.5	1	µg/L
				TCE	0.5	1	µg/L
				Total VOCs[b]	1	5	µg/L
Arsenic	SW6020	Grab	Quarterly[c]	Arsenic	NE	5 or 279[d]	µg/L
Selenium	SW6020	Grab	Quarterly[c]	Selenium	NE	5 or 24.4[d]	µg/L
Nitrate	E300	Grab	Quarterly[c]	Nitrate	NE	10 or 20.9[d]	mg/L
Bromacil	E507	Grab	Twice Yearly[c]	Bromacil	90	90	µg/L
pH	E150.1[e]	Grab	Twice Monthly	pH	NE	6.5 to 8.5	pH units
Temperature	E170.1[e]	Grab	Twice Monthly	—	—	—	°C
Specific Conductivity	E120.1[e]	Grab	Twice Monthly	—	—	—	µmhos/cm
Total Volume Treated	meter	—	Continuous	—	—	—	gallons
Flow Rate	meter	—	Continuous	—	—	—	gpm

[a] Sampling is only required when plant is operated in treatment mode.
[b] Summation of all halogenated VOCs.
[c] Effluent samples only are analyzed for arsenic, selenium, nitrate, or bromacil.
[d] Limitation is based on the background concentration for the A monitoring zone.
[e] Field parameter.

BTEX = benzene, toluene, ethylbenzene, xylenes
E = EPA 600 Water Series Method
EPA = United States Environmental Protection Agency
gpm = gallons per minute
GWTP = groundwater treatment plant
mg/L = milligrams per liter
NE = not established
PCE = tetrachloroethene
SW = SW846 Method
TCE = trichloroethene
VOC = volatile organic compounds
µg/L = micrograms per liter
µmhos/cm = micromhos per centimeter
°C = degrees Celsius
— = not applicable

5.1.2 Remedy Implementation

Three GWTPs were constructed at the Sharpe Site to treat contaminated groundwater extracted from associated wellfields: the North Balloon GWTP, the South Balloon GWTP, and the Central Area GWTP (Figure 5-1). The three systems operate independently of each other; however, discharge of treated water from the systems to four different percolation pond locations is interconnected (Figure 5-2). Construction of the treatment plants, with their associated extraction wells and discharge facilities, meets the requirements of the OU 1 ROD. The "construction complete" milestone was achieved when EPA signed the *Installation-Wide Preliminary Close Out Report, DDJC-Sharpe* in June 2003 (URS, 2002a).

The three GWTPs are operational and all are used as needed. The Central Area GWTP treats most of the extracted groundwater from the site, drawing flows from Central Area and North Balloon extraction wells and discharging to the Central Area percolation ponds. The North Balloon and South Balloon plants were converted to pump stations in April 2007. However, since December 2009, the South Balloon GWTP treats groundwater flowing only from South Balloon extraction wells and discharges the effluent to the WWTP and B404 ponds.

All treated groundwater has been discharged to on-site percolation ponds since 2006. Since the publication of the Second Five-Year Review Report, discharge of treated groundwater is distributed among four locations: the Central Area percolation ponds, the B240 stormwater detention ponds (during the dry season), the WWTP pond, and the B404 pond (Figure 5-1). Discharge to the WWTP and B404 ponds was implemented during the third five-year review period to allow for increased groundwater extraction.

Remedy effectiveness is monitored through the Sharpe Site Well Monitoring Program, which samples monitoring wells, extraction wells, piezometers, and select off-depot wells. Optimization is an integral part of the system operation and monitoring program.

5.1.3 Groundwater Treatment System O&M

The groundwater remedy is operated in accordance with the O&M manuals for the North Balloon, South Balloon, and Central Area GWTPs, which describe procedures to operate and maintain the three groundwater treatment systems at the Sharpe Site (URS, 2003b; 2003c; 2001, respectively). The manuals were written to comply with the requirements in the *Remedial Design/Remedial Action Handbook* (EPA, 1995). Modifications to the groundwater treatment systems, such as the installation of new extraction wells for refinement of plume control, are planned and implemented independently of the groundwater treatment system O&M program. Accordingly, the decision-making criteria and guidance for long-term management of the groundwater treatment systems are evaluated in the FFA Annual Progress Reports, not the O&M manuals.

Scheduled and unscheduled treatment system shutdowns are reported in GWTP monthly performance monitoring reports, which are provided to regulatory agencies. Numerous maintenance activities and system improvements have been implemented since the treatment plants were put into operation.

5.1.3.1 O&M Activities

O&M activities include weekly and monthly O&M inspections; monthly and annual O&M service and calibration; and system shutdowns for scheduled and unscheduled maintenance or repair. Emergency maintenance includes correction of deficiencies that have rendered a treatment system, or part of a system, inoperable.

Other specialized maintenance activities may be required by other environmental program activities, such as groundwater monitoring or treatment plant optimization tasks. Specialized O&M activities during this five-year review period were associated with installation of piping and startup of discharge to the WWTP percolation pond and the percolation pond south of B404 (referred to as the B404 pond) and expansion of the B404 pond. Table 5-4 summarizes the operational status of extraction wells (as of December 2012).

Table 5-4. North Balloon, South Balloon, and Central Area Extraction Wells, Sharpe Site (December 2012)

Operating Wells		
North Balloon	**South Balloon**	**Central Area**
EWNA6	EWA5	EWCB2
EWNB1	EWB4	EWCB5
EWNB2	EWC4	EWCB6
EWNB5	EWCA1	EWCC1
EWNB6	EWCB1	EWCC2
EWNC4R		EWCC3R
EWNC5		EWCAB1
		EWCAB2
Wells Shut Down (Date)		
North Balloon	**South Balloon**	**Central Area**
EWNA1 (9 July 2002)	EWA1 (28 September 2005)	EWCB3 (4 December 2006)
EWNA2 (4 December 2006)	EWA2 (4 December 2006)	EWCB4 (11 March 2008)
EWNA3 (9 July 2002)	EWA3 (13 May 2004)	EWCC3 (5 October 2008)
EWNA4 (4 December 2006)	EWA6 (4 December 2006)	EWCC4 (7 March 2011)
EWNA5 (9 July 2002)	EWA7 (4 December 2006)	
EWNA8 (11 March 2008)	EWA8 (4 December 2006)	
EWNA9 (4 December 2006)	EWA9 (9 July 2002)	
EWNA10 (4 December 2006)	EWA10 (4 December 2006)	
EWNB3 (9 July 2002)	EWB1 (4 December 2006)	
EWNC2R (4 December 2006)	EWB2 (4 December 2006)	
EWNC3R (25 February 2010)	EWC1 (9 July 2002)	
	EWC2 (4 December 2006)	
	EWC3 (1 February 2006)	

5.1.3.2 O&M Costs

From 1996 through September 2012, approximately 1,576 pounds of COCs were removed from groundwater beneath the Sharpe Site and treated by the groundwater treatment systems (Figure 5-3). Since 1996, approximately $20.8 million have been spent on groundwater remediation costs. Before 1996, approximately $13.0 million was spent on capital costs for installation of the three treatment systems and associated O&M and groundwater monitoring costs from 1984 through 1995. (Note: These capital costs were not used in the cost-per-pound calculations.) Therefore, the cost of the OU 1 remedial action (approximately $34 million) has far exceeded the estimated 1993 net present worth of $4.1 million (ESE, 1993). The estimated operating period of 16 years will be exceeded in 2014.

During this five-year review period, the average cost-per-pound of COCs removed was approximately $23,000/pound (Table 5-5). The costs used to calculate cost-per-pound for the Sharpe Site groundwater remediation includes costs for the O&M of the extraction and treatment plant systems, plus improvement-related costs; performance monitoring costs (sampling, laboratory analysis, data validation, and reporting); and costs associated with the Well Monitoring Program, which is used to evaluate groundwater remedy effectiveness. The annual average cost-per-pound of COC mass removed had

previously decreased after a peak in 2001 of approximately $19,000/pound, to a relatively stable $14,000/pound from 2003 through 2006 due largely to optimization efforts that focused on removing more pounds of contaminants for lower costs (Figure 5-4). During the 2007 to 2012 monitoring periods, the focus of the optimization efforts shifted to maintaining plume capture using the fewest number of wells, with the expectation that O&M and compliance sampling costs would continue to decrease because only the Central Area GWTP would be needed for groundwater treatment. In 2007, the cost-per-pound of COCs removed and treated increased significantly due to decreased mass removal associated with the shutdown of 20 extraction wells for the extraction well optimization test and continued use of three GWTPs for much of the monitoring period. In 2008, the cost-per-pound decreased by approximately 30 percent compared to 2007 because of increased mass removal and the use of just one GWTP for the majority of the monitoring period. In 2009, the cost-per-pound increased due to an 18 percent decrease in mass removal likely caused by decreasing influent concentrations and the non-operation (due to failure) of EWCC3, as well as capital costs to install piping to allow discharge to the WWTP and B404 ponds. In 2010, the cost-per-pound again decreased by 23 percent from costs generated in 2009 due to increased mass removal from operation of EWCC3R, EWNB1, and EWNB2. In 2011, costs increased by 37 percent (from 2010) due in part to the cost for the installation and connection of EWB4 and EWCB6 to the GWTPs and enlargement of the B404 pond. In 2012, the cost-per-pound decreased by 34 percent (from 2011) to $19,053 because there were no significant capital expenditures for system modifications or extraction well installation and because of increased removal of mass at newly operating extraction wells EWB4 and EWCB6.

Table 5-5. Annual Cost-Per-Pound of Mass Removed from 2008–2012, Sharpe Site

Year	Annual Cost[a] ($)	Mass Removed[b] (lbs)	Average Cost Per Pound[c] ($/lb)
2008	991,275	49.5	20,046
2009	1,107,899	40.5	27,356
2010	1,188,675	56.6	21,009
2011	1,610,166	55.8	28,877
2012	1,237,889	65.0	19,053
Total	**$6,135,904**	**267.4**	**$22,947[d]**

[a] Cost includes GWTP O&M costs, supporting performance monitoring costs, and Well Monitoring Program costs for the calendar year.
[b] Total pounds removed during the monitoring period October through September.
[c] Average cost per pound = cost/mass removed for that year.
[d] This value is the cumulative cost divided by the cumulative pounds of COC mass extracted.

COC = contaminant of concern
GWTP = groundwater treatment plant
lbs = pounds
O&M = operation and maintenance
$/lb = cost per pound

5.2 Progress Since Last Review

5.2.1 Protectiveness Statement from Second Five-Year Review

The protectiveness statement for OU 1 in the Second Five-Year Review Report (URS, 2009a) states:

> *The OU 1 remedy remains protective of human health and the environment in the short-term. Results from the 2007/2008 CPT/HydroPunch investigation suggest that the plumes are not migrating to privately owned, potable supply wells even though contaminant plume capture is incomplete west of the depot boundary. However, additional data collection is necessary to confirm that the plumes will be sufficiently contained to provide long-term protectiveness.*

As described in Subsection 5.2.2, the OU 1 recommendations and follow-up actions presented in the Second Five-Year Review Report were implemented. The technical assessment of the OU 1 remedy in Section 5.3 of this report describes the groundwater investigations and evaluations conducted and the groundwater extraction and treatment system modifications made over the past five years to address the protectiveness concerns described in the First Five-Year Review Report. Results of this assessment were used to develop the revised protectiveness statement presented in Section 5.7.

5.2.2 Status of Recommendations from Second Five-Year Review

Recommendation: Continue containment and mass removal with the 15 extraction well array until the additional activities described in this section are completed.

Status: The extraction well array continues to be operated with a focus on plume containment, rather than mass removal. Twenty extraction wells are operating. New extraction wells were added in two locations and several wells that had been shut down in 2006 were restarted. The following changes to operating extraction wells have been made since December 2007:

- EWNA8 and EWCB4 were shut down in March 2008 for long-term optimization as the wells were no longer needed for plume containment because groundwater COC concentration levels had decreased to below the ACL.

- EWCB5 restarted in March 2008 to improve plume capture within the Central Area B Zone TCE plume.

- EWNC3R was restarted in March 2008 to counteract migration of the North Balloon TCE plume toward the on-depot potable water supply wells. However, the well was ineffective at reversing the downward gradient caused by the supply wells and was shut down in February 2010.

- EWNB1 and EWNB2 were restarted in March 2010 to counteract migration of the North Balloon plume TCE plume towards the on-depot potable water supply wells. These wells were restarted with the purpose of creating an upward gradient to counter the downward gradient of the water supply wells.

- EWB4 and EWCB6 are new wells that started operation in June 2011. EWB4 was installed to improve capture of the TCE/PCE/CCl_4 plume in the B Zone near the western depot boundary in the South Balloon. EWCB6 was installed to improve capture of the Central Area TCE plume migrating off depot from Site P-5A.

- EWCC3 shut down in October 2008 due to damage to the well screen. EWCC3R was installed east of EWCC3 and started operation in July 2009 to contain the TCE plume in the C Zone west of the depot boundary.

- EWCC4 was shut down in March 2011 because it has been outside of the Central Area C Zone TCE plume since 1Q09 and TCE concentrations are continuing to decrease. In addition, EWCC4 had little, if any, influence on the B Zone plume.

- EWCB2 was restarted in October 2011 to improve plume capture in the Central Area TCE plume.

- EWCAB1 and EWCAB2 were restarted in December 2012 to increase capture in the Central Area A Zone TCE plume.

- EWB1 is planned for restart when additional discharge capacity is available. The well is being restarted to improve capture of the eastern B Zone plume and reduce vertical migration into the C Zone.

Recommendation: To address potential off-depot migration of COC plumes:

Monitoring well clusters will be constructed in off-depot areas for long-term monitoring to assist in determining the extent and stability of plumes that are not within capture zones.

Status: Monitoring well clusters were constructed in eight off-depot areas for long-term monitoring to assist in determining the extent and stability of plumes that are not within capture zones.

Soil and groundwater samples collected from new off-depot monitoring well borings will be analyzed for natural attenuation constituents and parameters.

Status: Soil and groundwater samples were collected from new off-depot monitoring well borings during 2008, 2009, and 2010 and analyzed for natural attenuation constituents and parameters. A work plan was prepared for additional sampling for natural attenuation evaluation that will occur during the next five-year review period (URS, 2012h).

Incorporate data from the 2007/2008 CPT/HydroPunch investigation and any future monitoring wells into the groundwater model to reduce uncertainty in its predictions.

Status: Data from the 2007/2008 CPT/HydroPunch investigation (URS, 2009g) and 2008 through 2012 monitoring and extraction well installations and sampling were added to the groundwater model resulting in a new aquitard layer and changes in plume shapes. Hydraulic conductivities were modified in some areas/layers where new aquifer test results warranted the changes. Transient conditions were introduced to the model to allow flexibility to adjust pumping rates of extraction, potable, or agricultural wells within the model domain to account for potential changes in land use (URS, 2011c).

Recommendation: Develop and implement a water contingency plan to help ensure the protection of downgradient potable well users.

Status: The *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* was prepared to help ensure the protection of off-depot potable well users (URS, 2010e). The goal of the Contingency Plan adopted is to reduce the potential for human exposure to VOCs in groundwater that originated from the Sharpe Site. The Contingency Plan identifies 10 COCs for potable wells; establishes notification (residential wells only), trigger, and action levels for those COCs; selects the group of potable wells that will be monitored; and puts in place the contingency response action that will be taken if one of those levels is exceeded. In general, action levels are equivalent to California or federal MCLs, whichever is more stringent; trigger levels are equal to one-half of the action levels; and notification levels are equal to one-quarter of the action levels.

The Contingency Plan addresses only those off-depot potable wells that have been or have the potential to be affected by contaminants from the Sharpe Site because the wells are directly downgradient of a Sharpe Site plume. Therefore, potable wells were selected for monitoring on the basis of where plumes are known to be and flowpaths that plumes could follow if the plumes were not being captured or naturally attenuated and current groundwater gradients do not change. The potable wells that supply all water used on the Sharpe Site (PW038 through PW041) are excluded from the off-depot Contingency Plan.

Under the Contingency Plan, a response action will be taken to assure protection from exposure to COCs in groundwater that may migrate into the well screen of a potable well at concentrations that reach notification, trigger, or action levels for a residential well or that reach trigger or action levels for a commercial or industrial well. Specific plans to be implemented when notification or trigger levels are exceeded are presented in the Contingency Plan. Response actions for potable wells to be taken when concentrations exceed action levels are also explained in the plan. To maintain protection of the public, response actions (e.g., providing bottled water or wellhead treatment) may be warranted depending on the use of the well's water (e.g., process water versus drinking water).

The sampling frequency for off-depot potable wells is determined differently than for monitoring wells. The potable well sampling frequencies are determined using a well-by-well analysis of each potable well, its use (residential, commercial, or industrial), its history of COC detections, and the history of detections at the nearest guard well and other information about the wells.

Recommendation: Monitor vertical gradients, potential causes of gradients (on-depot potable well operation), and contaminant concentration changes in the North Balloon C Zone and C/D transition zone to determine whether the TCE plume continues to migrate vertically.

Status: Vertical gradient monitoring in the North Balloon led to the conclusion that the daily operation of Sharpe water supply wells (PW038, PW039, and PW040) was drawing the TCE plume from the C Zone to greater depths (DLA, 2010). PW038, the closest well to the TCE plume, was placed on standby status (emergency operation only) and is being considered for decommissioning; PW039 and PW040 will continue to provide water for Sharpe Site needs. A new monitoring well cluster (MW327) was installed to monitor plume migration toward PW039 and a D Zone well (MW447D) was added to the MW447 cluster to monitor plume migration toward PW040 (URS, 2013b).

Recommendation: To address capture or containment:

Continue to optimize the extraction well array to maximize COC plume containment using available lines of evidence, including the updated groundwater model.

Status: See above, for changes made to the extraction well array.

Evaluate CPT and groundwater sample results, monitoring well data, and groundwater model predictions to assess whether an alternative response action is warranted to enhance containment of COC plumes. If an alternative response action is warranted, an amendment to the OU 1 ROD will be prepared.

Status: Based on new information (i.e., the presence of VOC mass in the A/B aquitard) obtained from CPT/HydroPunch samples and results from new monitoring wells, modifications to the original OU 1 remedy are being made to enhance its effectiveness and to ensure long-term protection of human health. Three alternatives were evaluated in the final OU 1 focused feasibility study (URS, 2011b). The preferred alternative consists of a comprehensive approach in which groundwater extraction would continue, VOC mass would be destroyed in situ, and LUCs would be added to increase long-term protectiveness. Reductions in VOC mass and the addition of two extraction wells are expected to help shorten cleanup

time. DLA has prepared an explanation of significant differences (ESD) to modify the current OU 1 remedy (URS, 2012a, revised final pending as of September 2014). The OU 1 ESD is scheduled to be completed in 2014.

Recommendation: Identify locations on the Sharpe Site where treatment plant effluent can be discharged, should capacity be needed as a result of optimized groundwater extraction and to avoid high water levels during the wet season at the Central Area percolation ponds.

Status: The following changes have been made for treated groundwater discharge:

- Discharge piping was installed in February 2009 to connect the interplant pipeline to the WWTP percolation pond. The pond's infiltration capacity to accept treated groundwater along with treated waste water was tested. Subsequently, the pond has been used routinely for discharge from the South Balloon GWTP, except when flow to the pond needs to be discontinued for maintenance by the WWTP operator (URS, 2009b).

- Discharge piping was installed in February 2009 to connect the interplant pipeline to the B404 pond, and the pond was tested to determine its infiltration capacity. Following testing, the B404 pond was enlarged in September 2011 to serve as the primary discharge location for the South Balloon GWTP. Additional expansion of the B404 pond has been recommended to increase its discharge capacity and reduce flows to the Central Area percolation ponds (URS, 2009b; 2012b).

- During the dry season, the B240 ponds are routinely used for discharge of treated groundwater from the North Balloon GWTP.

Recommendation: Prepare technical memoranda that report the analytical results of any new off-depot groundwater and soil sampling activities; the results from the recalibrated groundwater model; results from groundwater treatment system optimization; and results of treatment plant effluent discharge testing at the alternative discharge location.

Status: The following technical memoranda were prepared:

- Aquifer testing results were included *in DDJC-Sharpe Aquifer Testing and Analysis Report to Support Ongoing Remediation* (URS, 2008b).

- Modifications to the groundwater model were reported in the *Technical Memorandum: DDJC-Sharpe Three-Dimensional Groundwater Model Update* (URS, 2009e).

- Results for construction of the interplant pipeline to the WWTP and B404 ponds are included in the *Technical Memorandum: DDJC-Sharpe Alternate Discharge Location for Treated Groundwater* (URS, 2009b).

- Recommended extraction well flow rates are presented in the *Technical Memorandum: Evaluation of the Optimized Extraction Well Test, DDJC-Sharpe* (URS, 2009f).

- Rehabilitation of extraction wells was documented in the *Technical Memorandum: DDJC-Sharpe and DDJC-Tracy Extraction Well Rehabilitation Effort, 2007 and 2008, Methods and Results* (URS, 2009i).

- The WWTP and B404 pond infiltration rate testing results are reported in the *Technical Memorandum: Defense Distribution Depot San Joaquin–Sharpe Site, Percolation Test Results for Alternate Discharge Location for Treated Groundwater* (URS, 2010a).

- The results for expansion and testing of the B404 pond are reported in *Building 404 Percolation Pond Expansion Pilot Test Report, Defense Distribution Depot, San Joaquin–Sharpe Site* (URS, 2012b).

Recommendation: Complete the treatment technology pilot studies and evaluate whether full-scale implementation of one or more treatment technologies can cost-effectively reduce the cleanup time of residual COC source mass in groundwater. If an alternative response action is warranted, an amendment to the OU 1 ROD will be prepared.

Status: Three in situ amendment technologies selected for injection testing in areas with the greatest TCE groundwater concentrations included: emplacement of $KMnO_4$ using hydraulic fracturing in the South Balloon historical source area/Site P-1G Area (URS, 2010g); emplacement of EHC amendment using hydraulic fracturing at Site P-5A in the Central Area (URS, 2010f); and injection of EOS via injection wells under low pressure in the western North Balloon historical source area (URS, 2010h). The amendments were effective in destroying COCs where they were introduced. TCE concentrations were reduced to less than the ACL in the EOS and $KMnO_4$ pilot studies. In the EHC pilot study, TCE concentrations were reduced to less than the ACL 18 to 24 months after injection, and the percent reduction in TCE concentrations was 99 to 100 percent where EHC was distributed (URS, 2011c). Only $KMnO_4$ was effective in completely destroying COCs without formation of intermediates or daughter products. In addition, $KMnO_4$ was the only amendment shown to effectively diffuse both vertically and laterally, following introduction into the subsurface.

Aquifer cleanup times can be shortened if COC mass in the A/B aquitard can be reduced in situ without extraction. Results of the in situ treatability study indicated that COC mass in the A/B aquitard can be destroyed or concentrations can be reduced to less than ACLs when amendments make contact with COCs (URS, 2010f; 2010g; 2010h). To improve the potential for any amendment to make contact with COC mass, the aquitard must be artificially fractured before the amendment is injected or the amendment must be injected through multiple boreholes or wells in the aquitard. Any one or all of the amendments tested may be used to enhance the OU 1 remedy because each was effective in reducing TCE concentrations. The objective of implementing in situ treatment technologies would be to expedite COC mass destruction at the high concentration areas, thereby reducing the cleanup times estimated for groundwater extraction and treatment alone. Because of the reduction in groundwater cleanup times, modification of the OU 1 remedy was warranted, and an ESD was prepared and submitted to regulatory agencies for review (URS, 2012a, revised final pending as of September 2014).

Recommendation: To address the groundwater treatment system O&M issues:

Replace outdated equipment, as needed.

Status: Outdated equipment is replaced, as needed, when equipment fails. During 2011, the packing material in the South Balloon GWTP Tower A was replaced due to scale accumulation that could not be removed by acid washing.

Replace or update electronic groundwater extraction well measuring instrumentation, as needed.

Status: Groundwater extraction well instrumentation is replaced, as needed, when the instrumentation fails or changes to well operations require equipment upgrade, such as when pump size is replaced to adjust target flow rate.

Replace extraction well flow meters for currently operating extraction wells. Replace flow meters in extraction wells brought back into service, as needed.

Status: Flow meters for the operating extraction wells and GWTPs have been replaced with Sparling Tigermag flow meters, as needed.

5.3 Five-Year Review Process

The OU 1 remediation systems were visited on 24 January 2013 by the RPMs from DLA Installation Support at San Joaquin, EPA, DTSC, and CVWB. Mr. Andrew Archuleta with URS, the Site Operations Manager for GWTPs, was interviewed, and he provided a tour of the facilities. Extraction wells and percolation ponds were also visited. At the time of the inspection, the northern Central Area percolation pond was not being used due to a minor leak discovered on 16 January 2013. The leak was temporarily repaired and a permanent repair is planned for summer 2013. No other issues with the OU 1 remediation systems were observed.

On-site documents and records were reviewed. The O&M manual for the GWTPs were readily available. Mr. Archuleta noted that an update to the O&M manuals for the GWTPs was being prepared and that replacement of the supervisory control and data acquisition (SCADA) system for the GWTPs was underway with an expected completion date of March 2013. The site-specific health and safety plan and Occupational Safety and Health Administration training records were available and in order. Appendix B provides site inspection forms for the OU 1 remediation systems. Photographs taken during the site inspection are included at the end of this section.

5.4 Technical Assessment

5.4.1 Question A: Is the remedy functioning as intended by the OU 1 ROD?

5.4.1.1 Remedial Action Performance

The RAOs identified in the ROD are to “mitigate potential long-term contaminant migration and protect human health and the environment” (ESE, 1993). The goal of the remedial action is to “restore groundwater to its beneficial reuse” (ESE, 1993). Criteria used to evaluate performance of the remedial action included: plume and concentration changes with time; plume capture by the extraction well array; and model predictions indicating that cleanup would be achieved in a reasonable time.

Plume Changes with Time

To demonstrate progress toward ACLs for the Sharpe Site, it is important to have evidence that plumes are stable and that concentrations within the plumes are generally decreasing. The VOC plumes emanating from the Sharpe Site have been stabilized by the hydraulic influences of extraction wells and by natural attenuation mechanisms. Since the last five-year review, attainment of plume stability at the Sharpe Site has been evaluated with graphical and statistical methods. The following sections provide evidence of plume stability at the Sharpe Site.

The total areas of TCE plumes that exceed 5 μg/L (i.e., the ACL) have either decreased or remained stable in the period from 2008 to 2012. Interpretations of groundwater data from the Sharpe Site indicate how TCE has migrated to create the current plume shapes, often under artificial hydraulic gradients induced by pumping of previously active agricultural wells, currently used potable or industrial supply wells, and Sharpe Site water production wells. PCE plumes are less extensive, and their areal changes are

smaller than those of TCE, possibly due to smaller volume releases, cumulative reductions in mass via degradation to less chlorinated daughter products, and/or slightly lower aqueous solubility than TCE.

TCE is the most extensive plume emanating from the Sharpe Site source areas, and TCE has physicochemical properties generally similar to the other VOCs in groundwater; therefore, TCE can be used as an indicator of VOC plume migration downgradient from source areas. The shape and areal extent of most of the TCE plumes from 2008 to 2012 are indicative of the stability or contraction of TCE plume areas and generally decreasing concentrations over that time period. Figures 5-5 and 5-6 illustrate changes in the interpreted composite TCE and PCE plumes with time, respectively. Since 2009, the most consistent changes have been reductions in the total lateral extent of the composite South Balloon-Central Area TCE plume footprint. Since 2009, the North Balloon plume has shown some expansion to the west and east increasing the total composite plume area.

The changes in composite TCE plume areas between 2008 and 2012 are quantified in Table 5-6. Percentage changes in plume sizes in the table indicate plumes may fluctuate (positive or negative changes) year to year. However, the total changes in plume area in the last five years indicate overall increase by 7.6 percent in the North Balloon, although there has been a 37 percent decrease in the size of the North Balloon composite plume since 2000. The increase in the last five years results from some apparent plume expansion in the C Zone of the western North Balloon plume resulting from detections at the new MW539 cluster. It is uncertain whether the western area of the C Zone plume that expanded is fully contained because it has been hydraulically influenced by the operation of PW020; TCE results from the MW539 cluster over a period of time will indicate whether the C Zone plume continues to migrate west.

Table 5-6. Percentage Changes in Total TCE Plume Area, 2008 to 2012, Sharpe Site

Years[a]	South Balloon/ Central Area Plume Area Change Year to Year (%)	South Balloon/ Central Area Plume Area Change Since 2008 (%)	North Balloon Plume Area Change Year to Year (%)	North Balloon Plume Area Change Since 2008 (%)
2008–2009	-2.41	-2.4	-1.7	-1.7
2009–2010	-10.7	-12.9	-1.3	-3.0
2010-2011	-0.5	-13.3	-2.7	-5.6
2011-2012	-0.8	-14.0	14	7.6

[a] Areas of the composite TCE plume exceeding 5 µg/L were determined with data from monitoring well samples collected in the third quarter of each year.

TCE = trichloroethene
µg/L = micrograms per liter
% = percent

The South Balloon-Central Area TCE and PCE composite plume shapes have contracted since 2008 (Figures 5-5 and 5-6). However, there has been recent localized expansion on the west central portion of the plume because of a TCE concentration increase, to 16 µg/L at MW504C, which had not been sampled since 2007 when the concentration was 1.26 µg/L (URS, 2013a). The plume expansion at this well and at well cluster MW532 is probably the result of hydraulic mounding caused by the discharge of approximately 500 gpm of treated groundwater to the Central Area percolation ponds since 2005. The TCE plume is moving southwesterly, not in the direction of on-depot or off-depot potable supply wells. However, the migration could move the plume beneath residences located to the southwest. TCE or its

degradation products in A Zone groundwater could present a vapor intrusion risk if they were to volatilize from the groundwater surface and rise beneath a residence. TCE concentrations reported in soil vapor and shallow A Zone groundwater samples collected in 2011 and 2012 did not pose an unacceptable risk to human health via the vapor intrusion pathway (URS, 2012e). New monitoring well clusters (MW541A and B and MW542A and B) were installed in the MW532 area to monitor the migration of the plume in the A and B zones (Figures 5-7 and 5-8, respectively). The northwestern portion of the South Balloon-Central Area TCE plume has been generally stable in extent since 2009. However, a new maximum TCE concentration (18 µg/L) in the 3Q12 sample from MW525C suggests there is potential for plume expansion to the north in the C Zone of the Central Area (Figure 5-9). TCE concentration increases at MW525C between 3Q10 (first sample event at the well) to 3Q12 may reflect short-term increases resulting from downgradient plume migration when EWCC3 was not operating in 2008 and 2009. Since it was started in 3Q09, EWCC3R has been operating at approximately 80 gpm, and an increase in the pumping rate to increase the capture zone is not a viable alternative, even though the well was recently rehabilitated. Even with the recent changes at the edges of the South Balloon-Central Area plume, the total composite plume area is 14 percent less than the total area of the composite plume in 2008.

The South Balloon PCE plume was interpreted to have a smaller area in 2012 than in 2008 on the basis of analytical results from monitoring well clusters MW326 and MW538 installed since 2008 (Figure 5-6). The area of the South Balloon PCE plume that exceeded 25 µg/L was deleted from the 2012 plume shown on Figure 5-6 because concentrations at all monitoring wells in the plume were less than 25 µg/L. The MW540 well cluster was installed in 2012 on Union Pacific Railroad property west of EWC4 to provide new data for PCE-TCE-CCl_4 plume definition in the South Balloon. The 4Q12 results from this cluster indicate that CCl_4 is present at a concentration greater than the ACL in the B Zone, and TCE and PCE are present at concentrations greater than their respective ACLs in the C Zone at the MW540 cluster (URS, 2013c). Since 2008, the composite PCE plume in the North Balloon has contracted and does not extend as far to the northwest as it did historically (Figure 5-6). Therefore, it is considered stable.

Plume stability analysis must consider vertical changes in plume geometry in addition to the lateral changes discussed in the preceding paragraphs. Consideration of vertical changes is particularly important for the Sharpe Site plumes, where vertical transport of contaminants from the A Zone, where contaminants originally entered the aquifer from the vadose zone, through the B, C, and D Zones has been widespread. Based on hydraulic data, vertical plume migration appears to have been caused predominantly by artificially induced gradients caused by water supply well pumping in the C and D Zones. Evidence of vertical plume expansion has been observed in the central North Balloon, where the TCE plume at MW439CD, MW498C, and MW499C has deepened over the last few years. This vertical expansion of the plume was caused by the hydraulic influence of the Sharpe Site water supply wells, which was greater than the influence of North Balloon extraction wells in the B and C Zones. Evaluation of hydrographs for monitoring wells near the water supply wells determined that Sharpe supply well No. 1 (PW038) had the strongest hydraulic influence on the TCE plume, and that well has been taken out of regular pumping service. PW038 will be operated only in the event of an emergency, such as a fire on the depot. PW039 and PW040, which are farther from the plume and have less hydraulic influence, are being used to supply water for all uses on the Sharpe Site. Since 2010, EWNB1 and EWNB2 have been creating an upward gradient to counter the downward gradient caused by pumping of the water supply wells, and in 3Q12, the TCE concentration at MW499C (5.3 µg/L) was slightly greater than the ACL but less than its maximum of 51.1 µg/L detected in 3Q09. In the western portion of the North Balloon, the 3Q12 TCE concentration at MW438C (5.44 µg/L) was greater than the 3Q11 result (1.82 µg/L) but less than its maximum concentration of 15 µg/L detected in 2001. However, the TCE concentration at MW438CD reached a new maximum of 14 µg/L in 3Q12. These increases at MW438C and MW438CD indicate a possible downward gradient caused by hydraulic influences other than PW039 and PW040, and future stability is uncertain. However, these wells are upgradient from extraction well EWNC4R.

Concentration Changes with Time

Another measure of remedial action performance is reduction of concentrations in plumes.

Concentrations in most areas of the TCE plumes have decreased in the period from 2008 to 2012. Figure 5-5 shows concentration changes in areas of green, yellow, and orange within the dark blue plume representing concentrations greater than 5 µg/L. In the period 2008 to 2012, there was contraction in several of the plume areas where TCE or PCE concentrations exceed 25 µg/L. Areas of plumes with concentrations exceeding 100 µg/L were gone from the North Balloon in 2010. Exceptions to the generally decreasing trends are: a recent detection of a concentration greater than 25 µg/L in a HydroPunch sample from the B Zone of the western North Balloon; increasing concentrations at MW504C and the MW532 cluster in the western Central Area; and in the central portion of the South Balloon, expansion of the TCE plume area with concentrations greater than 100 µg/L to the south and east based on concentration increases at EWB1, MW448B, and EWC1. Where there has been contraction of the portions of the plumes with concentrations greater than 25 µg/L or greater than 100 µg/L, there is evidence that the extraction and treatment remedy is effective. The increasing concentrations at EWB1 and EWC1 since their shutdown in 2006 and 2002, respectively, indicate that the remedy had been effective until the wells were shut down. DLA has decided to restart extraction at EWB1 as soon as there is capacity for discharge of the additional treated groundwater.

Additional evidence of widespread remedy effectiveness is the number of statistically significant decreasing trends in VOC concentrations relative to increasing trends. The Mann-Kendall statistical trend analysis test is used to evaluate COC concentration trends in monitoring wells at the Sharpe Site. In conjunction with the Mann-Kendall statistical analysis, time series plots are created to assist in the evaluation of the statistical trends. The results of the statistical trend analysis and the time series plots are presented annually in the FFA Annual Progress Reports. In 3Q12, 35 wells (excluding operating extraction wells) have statistically significant decreasing trends for VOCs (URS, 2013a). The decreasing trends cannot be attributed to groundwater extraction alone because a number of the wells with decreasing trends are not within 400 feet of, or within the capture zone of, an operating extraction well (URS, 2013a). Figure 5-10 shows the distribution of 27 monitoring wells across the Sharpe Site with significant decreasing VOC concentration trends that are not directly attributable to extraction. Most wells with significant decreasing trends have a decreasing TCE trend (14 wells); however, there are also significant decreasing trends in PCE (six wells), 1,2-DCA (two wells), CCl_4 (three wells), chloroform (two wells), and cis-1,2-dichloroethene (DCE) (one well). Wells with these trends occur in source areas (MW319B, MW320B, MW325A, MW425A, MW476A, and MW455B), cross-gradient or upgradient from higher concentration areas (DW001, DW002, MW433B, MW458A, and MW470AR), and downgradient from sources and higher concentration areas (MW412B, MW460AB, MW461B, and MW508B) (Figure 5-10).

Results from the 2007/2008 CPT/HydroPunch investigation in the saturated zone near source areas indicate that hundreds of pounds of TCE remain within 300 feet of central South Balloon and western Central Area historical source areas (URS, 2009g). Even though the contaminant releases to the saturated zone occurred more than 20 years ago and plumes were beyond the Sharpe Site boundary 20 years ago, the distal portions of the plumes have not migrated farther away from the Sharpe Site within the last 10 years. The operation of Sharpe Site extraction wells over the past 25 years, in combination with the low natural horizontal hydraulic gradients and natural attenuation, have limited the horizontal migration of the leading edges of most of the plumes.

Contaminant Plume Capture Analysis

The evaluation of plume capture with data from 2012 indicates that, at several locations west of the depot boundary, there has been less than complete capture of plumes (URS, 2013a). Guard well clusters downgradient from plumes suggest that plumes in most areas are not migrating toward potable wells; the

North Balloon plumes both on and off-depot are apparent exceptions (URS, 2013a). One hypothesis to explain general stability of plume extent without full capture is that natural attenuation (through non-destructive and potentially destructive mechanisms) is occurring at the leading edges of the stable plumes. Evidence obtained between 2008 and 2011 suggested that portions of plumes west and north of the depot boundary were being contained as a result of physical extraction and natural attenuation mechanisms. The evidence of the role of natural attenuation has not been confirmed. However, DLA is planning a thorough evaluation of its role in plume containment (URS, 2012h).

Capture Analysis Methodology. Groundwater level data were used to estimate the areas of hydraulic influence of extraction wells as the initial step for analysis of contaminant plume capture by constructing potentiometric surfaces maps for the A, B, and C zones with 3Q12 data (Figures 5-7 through 5-9). The potentiometric surface contour maps were developed using contouring software and adjusted using empirical data using professional judgment.

An upgradient curvature in several contour lines is considered an indication that one well or a group of closely spaced wells is creating a depression on the groundwater surface. The surface depression causes the flow lines to point toward a well location. A series of points exist in the downgradient direction from every extraction well (or group of wells) where a groundwater molecule could travel to the extraction wells or could be carried downgradient and away from the extraction wells. At those points which reflect the downgradient extent of capture for the given extraction wells, flow lines could point back toward the wells or away from the wells (stagnation points).

Capture zones for extraction wells were interpreted from the hydraulic gradients indicated by ground-water potentiometric contours. The downgradient extent to which a single well or group of wells had hydraulic influence was estimated from flow lines on a contour map for each zone and with particle tracks simulated by the Sharpe Site groundwater flow model.

The simulated particle tracks were created by selecting imaginary water particles around each operating extraction well in its respective modeled layer (analogous to the monitoring zones) and simulating their movement over 30 years. In the third quarter of each year, both particle-tracking results and potentiometric surface contours are used to interpret and draw capture zones.

Capture zone curves drawn on Figures 5-7 through 5-9 represent the series of points situated cross-gradient and downgradient of an extraction well where groundwater would be drawn into the well when it is operating. All capture zone curves are dashed because they are interpreted. The extents of the contaminant plumes are shown as solid-line isopleths with 3Q12 VOC concentrations greater than their respective ACLs on each capture zone map.

COC Plume Capture/Containment Evaluation. Table 5-7 provides a summary of the interpreted capture and containment of plumes. Full plume containment through extraction well capture and natural attenuation processes is suggested by the stability in concentrations at the downgradient edge of most plumes and the very few detected concentrations at potable or guard wells downgradient from plumes. There is plume expansion in a few locations.

Model Predictions

A groundwater model was developed for the Sharpe Site during the time between the first and second five-year review periods (URS, 2006). The model was developed using the Department of Defense's Groundwater Modeling System Version 5.1, by Environmental Modeling Research Laboratory. The model computer code selected was MODFLOW, a three-dimensional, cell-centered, finite difference, saturated flow model developed by the United States Geological Survey (McDonald and Harbaugh, 1988). The 2012 Sharpe Site groundwater model now uses GMS Version 8.3, by Aquaveo, LLC. GMS

Table 5-7. 2012 Capture Zone and Containment Summary, Sharpe Site

Geographic Area	Monitoring Zone	Capture/Containment Status	Lines of Evidence
South Balloon	A	**TCE and CCl_4 plume:** Partial capture by EWCA1 and EWA5. West/northwest and downward migration expected with probable capture of TCE plume at EWB4 or EWC4. Containment by natural attenuation processes possible but not confirmed. **Chloroform plumes:** Chloroform was less than ACLs in the A Zone in 3Q12; therefore, capture was not necessary. Natural attenuation mechanisms probably responsible. **cis-1,2-DCE plumes:** Within capture zone of EWA5 or EWB4. **PCE plumes:** Southwestern-most plume, inferred from CPT data, may not be present; the plume identified at only EWA1 is captured by EWCA1.	Potentiometric contours and particle tracks suggest partial capture in the A Zone and migration to the west and downward. Natural attenuation suggested by stable or decreasing concentrations at downgradient monitoring wells over time, but not confirmed.
Central Area	A	**TCE plumes:** No capture in A Zone. Migrating to the west/southwest into very low gradient area because of hydraulic mound at the Central Area percolation ponds. Vertical migration to B and C Zones and possible partial capture by B and C Zone extraction wells. Containment by natural attenuation possible but not confirmed.	Potentiometric contours and particle tracks indicate migration to the west/southwest and downward. Natural attenuation indicated by stable or decreasing concentrations at most downgradient monitoring wells over time, but not confirmed.
North Balloon	A	**TCE, PCE, chloroform, and 1,2-DCA plumes:** Apparently full capture by EWNA6. .	Potentiometric contours and most particle tracks suggest capture in the A Zone.
South Balloon	B	**TCE plume:** Partial capture by EWB4 and EWCB1; vertical migration to C Zone and possible partial capture by EWC4 and EWCC2. Containment by natural attenuation possible but not confirmed. **PCE, CCl_4, chloroform, cis-1,2-DCE, and 1,2-DCA plumes:** Almost complete capture by EWB4.	Potentiometric contours and particle tracks suggest partial capture in B Zone and vertical migration and possible capture of TCE, PCE, and CCl_4 in C Zone. Natural attenuation indicated by not detected or less than ACL concentrations at downgradient monitoring wells over time, but this has not been confirmed.

Table 5-7. (Continued)

Geographic Area	Monitoring Zone	Capture/Containment Status	Lines of Evidence
Central Area	B	**TCE plume:** Partial capture by EWCB1, EWCB2, EWCB5, and EWCB6; vertical migration to C Zone and probable partial capture by EWCC1, EWCC2, and EWCC3R. Containment by natural attenuation possible but not confirmed. **cis-1,2-DCE and 1.2-DCA plumes:** Within capture zones at EWCB6 and EWCB1, respectively.	Potentiometric contours and particle tracks suggest partial capture in the B Zone and vertical migration and potential capture in the C Zone. Natural attenuation indicated by stable concentrations at downgradient monitoring wells over time, but this has not been confirmed.
North Balloon	B	**TCE plume:** Partially captured by EWNB5. EWNB6 capture zone also downgradient; vertical migration to C Zone and probable partial capture by EWNB1, EWNB2, EWNC5, and EWNC4R. **Chloroform plume:** Potentially in capture zone of EWNB6 or downward migration and capture at EWNC4R. **cis-1,2-DCE plume**. Potentially in capture zone of EWNB5. **PCE plume:** Partial capture by EWNB6; vertical migration and probable partial capture at EWNC4R. Containment by natural attenuation possible but not confirmed.	Potentiometric contours and particle tracks suggest plumes are partially captured in B and C Zones. Natural attenuation indicated by stable or decreasing concentrations at downgradient monitoring wells or PW021 over time, but this has not been confirmed.
South Balloon	C	**TCE plume:** Capture at EWC4. **Western PCE, and CCl_4 plumes:** Partial capture by EWC4. Containment by natural attenuation possible but not confirmed. **cis-1,2-DCE, chloroform, and eastern PCE plumes:** Possible capture downgradient at EWC4.	Potentiometric contours and particle tracks suggest partial to full capture in C Zone. Natural attenuation indicated by geochemical parameters and almost no COC detections at MW530C; natural attenuation not confirmed.
Central Area	C	**TCE plume:** Partial capture by EWCC1, EWCC2, and EWCC3R. Containment by natural attenuation possible but not confirmed. **cis-1,2-DCE plume:** Within capture zone of EWCC1.	Potentiometric contours and particle tracks suggest plumes are partially to fully captured in the C Zone.

Table 5-7. (Continued)

Geographic Area	Monitoring Zone	Capture/Containment Status	Lines of Evidence
North Balloon	C	**TCE plume:** Partially captured at EWNB1, EWNB2, EWNC4R, and EWNC5; potential for vertical migration is being limited. Horizontal containment of uncaptured plume by natural attenuation possible but not confirmed. **CCl_4 plume:** Captured at EWNC5. **PCE plume:** Within capture zone of EWNC4R.	Potentiometric contours and particle tracks suggest that TCE plume is partially captured in the C Zone. Smaller CCl_4 and PCE plumes in capture zones. Downward vertical gradient limited by operation of EWNB1 and EWNB2.

ACL = aquifer cleanup level
CCl_4 = carbon tetrachloride
COC = contaminant of concern
CPT = cone penetrometer testing
DCA = dichloroethane
DCE = dichloroethene
PCE = tetrachloroethene
TCE = trichloroethene
3Q12 = third quarter 2012

Version 8.3 is being used to provide an interface to the updated version of MODFLOW-2005 (Harbaugh, 2005). Contaminant transport simulations were conducted using the SURFACT groundwater contaminant transport model code. In 2010, the model was converted from a steady-state to a transient groundwater flow and fate and transport model. This transient model allows for greater flexibility to simulate real-world conditions and increases the accuracy of flow and fate-and-transport simulation predictions. Other details of model development, testing, and updates are presented in the *DDJC-Sharpe Three-Dimensional Groundwater Model Report* (URS, 2006), *Three-Dimensional Groundwater Model Update to Third Quarter 2008* (URS, 2009e), and annual updates presented in FFA Annual Progress Reports (URS, 2010c; 2011c; 2012c; 2013a, respectively).

Transport Simulation Results. The groundwater model was used to simulate the migration of contaminant plumes within each groundwater monitoring zone. Simulation values for TCE transport, longitudinal, transverse, and vertical dispersion and TCE retardation (which varied with lithology types throughout the model), and a TCE decay/degradation of 0.00012 per year (15.5-year half-life) was used. Migration of TCE plumes was simulated for a period of 30 years with the assumption that the currently operating extraction well array (18 wells) continues to operate for the entire period at the current average discharge rates. Figures 5-11 through 5-14 show the predicted extent of the plumes in the A Zone through the CD transition, respectively.

A Zone. The prediction for Layer 1 indicates that a portion of the A Zone TCE plume exceeding 5 µg/L will extend beyond the west Sharpe Site boundary in the Central Area between 10 and 30 years (Figures 5-11a through 5-11c). Within 30 years, the North Balloon A Zone plume dissipates and disappears, the Central Area plumes shrink, and South Balloon TCE concentrations decrease under the current pumping regime (Figures 5-11a through 5-11c).

B Zone. The plumes in the North and South Balloons and Central Area are predicted to be reduced in size such that very small portions of plumes are beyond depot boundaries in 30 years. Concentrations in the South Balloon are predicted to be greater than 100 µg/L for the next 30 years. With the exception of the South Balloon and a small Central Area plume, concentrations in all plumes on and off depot are reduced to less than 25 µg/L within 30 years (Figure 5-12a through 5-12c).

C Zone. The plumes in North and South Balloons and Central Area are not predicted to migrate downgradient and are reduced in size and concentration over 30 years (Figure 5-13a through 5-13c).

CD Transition. Only the North Balloon and Central Area have plumes in this depth interval. The North Balloon plume is predicted to be removed in less than 20 years, whereas the Central Area plume persists, but becomes smaller and has decreased concentrations within 30 years (Figures 5-14a through 5-14c).

5.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the OU 1 groundwater remedy selection still valid?

Exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid and do not affect the protectiveness of the remedy.

Since approval of the second five-year review in 2009, there have been changes in promulgated regulatory standards or “to be considereds” (TBCs), and in exposure assumptions, toxicity data, and methods of standardized risk assessment procedures. Therefore, the RAOs were re-evaluated to assess whether changes affect the protectiveness of the groundwater remedy. The original assumptions regarding current and future land and groundwater uses and COCs were re-evaluated to determine whether they are still valid, and whether any physical features (or understanding of physical site conditions) have changed (e.g., changes in anticipated direction or rate of contaminant migration).

5.4.2.1 Changes in Standards and TBCs

Under CERCLA, a remedy is required to protect human health and the environment. To achieve this requirement, remedial actions must meet ARARs. The ARARs can be defined as requirements in promulgated state and federal environmental laws as they relate to on-site remedial actions. Where ARARs are insufficient or not available, TBCs (e.g., non-promulgated advisories, criteria, guidance, or proposed standards) issued by federal and state agencies are identified (40 CFR § 300.400(g)(3)). These TBC documents are not enforceable nor are they legally binding and do not have the same status as ARARs. However, guidance documents are considered when developing cleanup levels and evaluating risks to human health or the environment.

In the five-year review process, requirements promulgated or modified after the ROD is signed must be addressed if they are necessary to ensure that the remedy is protective of human health and the environment (40 CFR § 300.430(f)(ii)(B)(1)).

Chemical-Specific ARARs. The OU 1 remedial goals (ACLs) were initially established through available environmental or health-based standards. These standards were presented as ARARs in the ROD. Where ARARs were not sufficiently protective, the HHRA, regulatory agencies' recommendations, and TBCs were used to establish cleanup levels. For example, the California Department of Health Services (DHS) action level is a TBC chosen in the 1993 ROD as the ACL for 1,2-dichlorobenzene; action levels are now referred to as public health goals (PHGs) and are administered by the California Department of Public Health (DPH).

The OU 1 ROD established ACLs as cleanup standards for 21 VOCs. ACLs for six of these COCs (1,4-dichlorobenzene, 1,1-DCA, cis- and trans-1,2-DCE, 1,1,1-trichloroethane, and TCE) are chemical-specific ARARs based on California or federal MCLs. TCE was the primary COC because it was the most frequently detected and at the highest concentrations; its chemical-specific ARAR is the California and federal MCL of 5 µg/L. Fifteen COCs did not have California or federal MCLs; ACLs for 14 of these COCs were established at values equivalent to the then-current lower limits of analytical detection and the fifteenth was the DHS action level for 1,2-dichlorobenzene (a value equivalent to the current DPH PHG). The HHRA component of the 1991 RI/FS risk assessment determined that analytical detection limit-based ACLs for these 14 constituents are necessary to ensure that the cumulative drinking-water exposure to all the VOCs in groundwater is within the acceptable risk management range of 1E-04 to 1E-06 incremental cancer risk (ESE, 1991).

Since approval of the ROD, California has promulgated MCLs for additional VOCs that are identified in the ROD as warranting cleanup. Table 5-8 compares the OU 1 ROD ACLs and current MCLs and other guideline values. The guideline values include concentrations in drinking water that correspond to a de minimis (inconsequential) cancer risk of 1E-06 or concentrations that are not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure (EPA, 2013a; 2013b). EPA has not established risk-based guideline values for the herbicide bromacil because of insufficient toxicity data, but a lifetime health advisory value has been developed within the drinking water program (EPA, 2012c); health advisory numbers are guidance values based on non-cancer health effects for different durations of exposure. Table 5-8 also provides, *for comparative purposes only*, the California PHGs and detection limits for purposes of reporting (DLRs). MCLs are legally enforceable standards that are agency derived after formal review of health risk and technological and economic considerations; PHGs are based solely on health risk assessment, while DLRs are indicators of the analytical sensitivity that must be achieved by a chemical laboratory. As indicated previously, many of the OU 1 ACLs were established at values equivalent to the DLR to ensure that cumulative risks are within acceptable bounds when the concurrent exposure to TCE was included.

Table 5-8. Evaluation of Cleanup Standards Presented in the OU 1 ROD

	1993 OU 1 ROD		Current (2013) Standards	
Constituent	**Aquifer Cleanup Level[a] (µg/L)**	**Basis[a]**	**Current MCLs and Other Guidelines (µg/L)**	**Basis**
Benzene	—	—	1	California MCL (DLR=0.5; PHG=0.15)
Bromacil	—	—	70	EPA Lifetime Health Advisory
Bromodichloromethane	0.5	HHRA	0.6	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
Bromoform	0.5	HHRA	4	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
Carbon Tetrachloride	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.1)
Chloroform	0.5	HHRA	0.19	EPA Regional Screening Level; (CA DLR=1[b])
Chlorodibromomethane	0.5	HHRA	0.4	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
1,2-Dichlorobenzene	10	California DHS Action Level	600	California MCL (DLR=0.5; PHG=600)
1,4-Dichlorobenzene	5	California MCL	5	California MCL (DLR=0.5; PHG=6)
1,2-Dichloroethane	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.4)
1,1-Dichloroethene	0.5	HHRA	6	California MCL (DLR=0.5; PHG=10)
cis-1,2-Dichloroethene	6	California MCL	6	California MCL (DLR=0.5; PHG=100)
trans-1,2-Dichloroethene	10	California MCL	10	California MCL (DLR=0.5; PHG=60)
1,1-Dichloroethane	5	California MCL	5	California MCL (DLR=0.5; PHG=3)
1,2-Dichloropropane	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.5)
1,3-Dichloropropene	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.2)
Ethylbenzene	—	—	300	California MCL (DLR=0.5; PHG=300)
Methylene Chloride	0.5	HHRA	5	California MCL (DLR=0.5; PHG=4)
1,1,1-Trichloroethane	200	California MCL	200	California MCL (DLR=0.5; PHG=1,000)
1,1,2-Trichloroethane	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.3)
1,1,2,2-Tetrachloroethane	0.5	HHRA	1	California MCL (DLR=0.5; PHG=0.1)
Tetrachloroethene	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.06)
Trichloroethene	5	EPA and California MCL	5	California MCL (DLR=0.5; PHG=1.7)
Toluene	—	—	150	California MCL (DLR=0.5; PHG=150)
Vinyl Chloride	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.05)
Xylenes	—	—	1,750	California MCL (DLR=0.5; PHG=1,800)

Table 5-8. (Continued)

[a] From Table 8 in the OU 1 ROD (ESE, 1993)
[b] California has established an MCL for total trihalomethanes (the sum of concentrations of these four compounds) at 80 µg/L.

CA	=	California
CVWB	=	Central Valley Regional Water Quality Control Board
DHS	=	Department of Health Services (now the Department of Public Health)
DLR	=	(Lower) detection limit for purposes of reporting (the DLR, or lower, must be achieved by the analytical laboratory); the DLR is a parameter that is set by regulation for each reportable analyte, is not laboratory specific, and is independent of the analytical method used.
EPA	=	United States Environmental Protection Agency
ESE	=	Environmental Science and Engineering, Inc.
HHRA	=	human health risk assessment
IRIS	=	Integrated Risk Information System (EPA, 2013a)
MCL	=	maximum contaminant level (considers health risk, technical, and economic factors).
OU	=	operable unit
PHG	=	public health goal (considers health risk only)
ROD	=	record of decision
µg/L	=	micrograms per liter
"—"	=	An aquifer cleanup level for this analyte was deferred to CVWB.

EPA's Integrated Risk Information System program (EPA, 2013a) is a primary determinant of, and repository for, toxicity values used to generate risk-based guidelines. During the period covered by this third five-year review, there were eight COCs that received agency-approved toxicological reviews and revisions to toxicity values: CCl_4, cis- and trans-1,2-DCE, ethylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, PCE, and TCE. Toxicity value revisions have gone in both directions; for example, TCE is now considered to have increased toxicity relative to the previous assessment, while PCE is considered to have reduced toxicity relative to the previous assessment. The revision to the TCE toxicity values occurred in September 2011; soon after, EPA issued revised regional screening levels (RSLs)[3] for tap water, resulting in changes in screening values from 2.0 to 0.44 µg/L (based on carcinogenic effects), and from 21 to 2.6 µg/L (based on noncancer effects). RSLs are strictly "risk-based" values, in contrast to MCL values, which are established to be health-protective for short-term and long-term exposures, and in consideration of economic impacts and the technological feasibility of achieving treatment goals. For purposes of chemical-specific ARARs for this third five-year review, all the toxicity value changes remain as TBCs, as none of the changes have yet been incorporated into enforceable standards.

The protectiveness of the OU 1 ROD ACLs can be evaluated through a comparison of the OU 1 ROD ACLs with current MCLs and other guidelines (Table 5-8). Groundwater ACLs remain protective of human health because the values of the ACLs are generally equal to, or less than, a corresponding MCL.

Action- and Location-Specific ARARs. Action-specific ARARs are usually technology- or activity-based requirements, while location-specific ARARs are restrictions placed on the chemical contaminant or the remedial activities based on the site's geographic or ecological features. The action-specific ARARs presented in the OU 1 ROD were re-evaluated for protectiveness (Table 5-9). No changes to the action-specific ARARs were identified that affect the protectiveness of the remedy, and no location-specific ARARs are documented in the OU 1 ROD.

There are no new action- or location-specific requirements that have a bearing on the protectiveness of the selected remedy. The action-specific ARARs continue to support the protectiveness of the remedy for OU 1.

5.4.2.2 Changes in Exposure Pathways

Inhalation exposure to volatile compounds that have migrated from the subsurface into the indoor air of overlying structures (the "vapor intrusion pathway") is a now well-recognized exposure pathway that was not well understood, nor evaluated, during development of the original risk assessment for the OU 1 ROD (ESE, 1993). Both the first five-year review and the second five-year review provided quantitative analyses of the vapor intrusion pathway within the framework of evaluating remedy protectiveness. In the second five-year review, the conclusion was that the OU 1 remedy was protective of human health and the environment in the short-term, pending future analysis of potential plume migration. In the interim and as detailed in Subsection 5.4.3, there are some indications of deeper-zone plume migration, but A Zone groundwater has been relatively stable.

As land uses overlying OU 1 at the Sharpe Site have not changed since the second five-year review, there are not new, previously unconsidered, exposure pathways relevant to OU 1. Groundwater monitoring and

[3] RSLs are used for site "screening" and are developed using risk assessment guidance from the EPA Superfund program. They are generic, long-term health-protective concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data and are calculated without site-specific information.

Table 5-9. Evaluation of Action-Specific ARARs, OU 1, Sharpe Site

Regulation	Citation	Description	Requirement	Comment
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR § 264.190 - 264.192	Treatment and storage of hazardous waste in tank systems.	Design and installation of new tank systems and components.	Relevant and appropriate. Tanks used to contain hazardous waste (equalizer tank) for the air stripping system were designed and installed within the performance specifications in these regulations.
Guidelines Establishing Test Procedures for the Analysis of Pollutants	40 CFR § 136.1 et seq.	Approved test methods for waste constituents discharge to Waters of the U.S.	Detailed requirements for analytical procedures and quality controls are provided.	Requirements will be followed for discharge to Waters of the U.S. Surface water discharge of treated groundwater has been discontinued indefinitely. This requirement is no longer relevant and could be removed as an ARAR in future post-ROD changes.
Prohibition of Movement of Fluid into Underground Sources of Drinking Water	40 CFR § 144.12	Class V underground injection wells include waste that does not include hazardous, radioactive, natural gas, or mining waste.	Ensure that reinjection of treated groundwater will not cause the aquifer underlying the site to violate primary drinking water regulations.	The requirements for Class V injection wells (40 CFR § 144.12) are the most appropriate for discharge of treated groundwater.
Inventory Requirements	40 CFR § 144.26	Inventory information reporting for injection of groundwater.	The owner or operator of an injection well which is authorized under this requirement shall submit inventory information to the EPA.	Inventory information reporting for injection of groundwater is in compliance with 40 CFR § 144.26. This is an administrative requirement and could be removed as an ARAR in future post-ROD changes.
Guidelines for the Implementation of CEQA	14 CCR § 15000 et seq.	California agencies providing discretionary approval are responsible for complying with CEQA Guidelines.	The DTSC has approved a negative declaration and CEQA. CEQA requirements have been satisfied.	This is an administrative requirement and could be removed as an ARAR in future post-ROD modifications.

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Benzene	—	—	1	California MCL (DLR=0.5; PHG=0.15)
Bromacil	—	—	70	EPA Lifetime Health Advisory
Bromodichloromethane	0.5	HHRA	0.6	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
Bromoform	0.5	HHRA	4	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
Carbon Tetrachloride	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.1)
Chloroform	0.5	HHRA	0.19	EPA Regional Screening Level; (CA DLR=1[b])
Chlorodibromomethane	0.5	HHRA	0.4	1E-06 Risk Level in Drinking Water; EPA IRIS; (CA DLR=1[b])
1,2-Dichlorobenzene	10	California DHS Action Level	600	California MCL (DLR=0.5; PHG=600)
1,4-Dichlorobenzene	5	California MCL	5	California MCL (DLR=0.5; PHG=6)
1,2-Dichloroethane	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.4)
1,1-Dichloroethene	0.5	HHRA	6	California MCL (DLR=0.5; PHG=10)
cis-1,2-Dichloroethene	6	California MCL	6	California MCL (DLR=0.5; PHG=100)
trans-1,2-Dichloroethene	10	California MCL	10	California MCL (DLR=0.5; PHG=60)
1,1-Dichloroethane	5	California MCL	5	California MCL (DLR=0.5; PHG=3)
1,2-Dichloropropane	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.5)
1,3-Dichloropropene	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.2)
Ethylbenzene	—	—	300	California MCL (DLR=0.5; PHG=300)
Methylene Chloride	0.5	HHRA	5	California MCL (DLR=0.5; PHG=4)
1,1,1-Trichloroethane	200	California MCL	200	California MCL (DLR=0.5; PHG=1,000)
1,1,2-Trichloroethane	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.3)
1,1,2,2-Tetrachloroethane	0.5	HHRA	1	California MCL (DLR=0.5; PHG=0.1)
Tetrachloroethene	0.5	HHRA	5	California MCL (DLR=0.5; PHG=0.06)
Trichloroethene	5	EPA and California MCL	5	California MCL (DLR=0.5; PHG=1.7)
Toluene	—	—	150	California MCL (DLR=0.5; PHG=150)
Vinyl Chloride	0.5	HHRA	0.5	California MCL (DLR=0.5; PHG=0.05)
Xylenes	—	—	1,750	California MCL (DLR=0.5; PHG=1,800)

Table 5-8. (Continued)

[a] From Table 8 in the OU 1 ROD (ESE, 1993)
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CA	=	California
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ESE	=	Environmental Science and Engineering, Inc.
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IRIS	=	Integrated Risk Information System (EPA, 2013a)
MCL	=	maximum contaminant level (considers health risk, technical, and economic factors).
OU	=	operable unit
PHG	=	public health goal (considers health risk only)
ROD	=	record of decision
µg/L	=	micrograms per liter
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Table 5-9. Evaluation of Action-Specific ARARs, OU 1, Sharpe Site

Regulation	Citation	Description	Requirement	Comment
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR § 264.190 - 264.192	Treatment and storage of hazardous waste in tank systems.	Design and installation of new tank systems and components.	Relevant and appropriate. Tanks used to contain hazardous waste (equalizer tank) for the air stripping system were designed and installed within the performance specifications in these regulations.
Guidelines Establishing Test Procedures for the Analysis of Pollutants	40 CFR § 136.1 et seq.	Approved test methods for waste constituents discharge to Waters of the U.S.	Detailed requirements for analytical procedures and quality controls are provided.	Requirements will be followed for discharge to Waters of the U.S. Surface water discharge of treated groundwater has been discontinued indefinitely. This requirement is no longer relevant and could be removed as an ARAR in future post-ROD changes.
Prohibition of Movement of Fluid into Underground Sources of Drinking Water	40 CFR § 144.12	Class V underground injection wells include waste that does not include hazardous, radioactive, natural gas, or mining waste.	Ensure that reinjection of treated groundwater will not cause the aquifer underlying the site to violate primary drinking water regulations.	The requirements for Class V injection wells (40 CFR § 144.12) are the most appropriate for discharge of treated groundwater.
Inventory Requirements	40 CFR § 144.26	Inventory information reporting for injection of groundwater.	The owner or operator of an injection well which is authorized under this requirement shall submit inventory information to the EPA.	Inventory information reporting for injection of groundwater is in compliance with 40 CFR § 144.26. This is an administrative requirement and could be removed as an ARAR in future post-ROD changes.
Guidelines for the Implementation of CEQA	14 CCR § 15000 et seq.	California agencies providing discretionary approval are responsible for complying with CEQA Guidelines.	The DTSC has approved a negative declaration and CEQA. CEQA requirements have been satisfied.	This is an administrative requirement and could be removed as an ARAR in future post-ROD modifications.

Table 5-9. (Continued)

Regulation	Citation	Description	Requirement	Comment
Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins	Porter-Cologne Water Quality Act § 13240	Requires development of a basin plan. The act and the basin plan protect the beneficial uses of groundwater. Defines beneficial use levels for constituents in groundwater.	Surface water and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	Injection of treated groundwater in the contaminated aquifer will not affect the beneficial uses or degrade the water quality of the receiving body. The existing groundwater treatment systems are capturing and treating VOC plumes.
SWRCB Anti-Degradation Policy	SWRCB Resolution No. 68-16	Protects the beneficial uses of groundwater.	Surface waters and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water.	Injection of treated groundwater in the contaminated aquifer will not affect the beneficial uses or degrade the water quality of the receiving body.
Water Wells	Lathrop Municipal Code Title 8 - Health & Safety, Chapter 8.36	Injection of groundwater within the City of Lathrop.	Groundwater extracted shall be injected into the area of the groundwater table the water was extracted.	This requirement should be deleted. Only state and federal requirements are ARARs. This requirement could be removed as an ARAR in future post-ROD modifications.
SJVAPCD Rules and Regulations	Rule 2201 - New and Modified Stationary Source Review Rule	Applies to new emissions from stationary sources.	Comply by implementing BACT.	The treatment systems will employ a BACT (i.e., carbon adsorption) for emission treatment, if necessary. Currently, emissions from the air strippers are below the de minimis threshold for BACT.

Table 5-9. (Continued)

Regulation	Citation	Description	Requirement	Comment
Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins	Porter-Cologne Water Quality Act § 13240	Requires development of a basin plan. The act and the basin plan protect the beneficial uses of groundwater. Defines beneficial use levels for constituents in groundwater.	Surface water and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	Injection of treated groundwater in the contaminated aquifer will not affect the beneficial uses or degrade the water quality of the receiving body. The existing groundwater treatment systems are capturing and treating VOC plumes.
SWRCB Anti-Degradation Policy	SWRCB Resolution No. 68-16	Protects the beneficial uses of groundwater.	Surface waters and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water.	Injection of treated groundwater in the contaminated aquifer will not affect the beneficial uses or degrade the water quality of the receiving body.
Water Wells	Lathrop Municipal Code Title 8 - Health & Safety, Chapter 8.36	Injection of groundwater within the City of Lathrop.	Groundwater extracted shall be injected into the area of the groundwater table the water was extracted.	This requirement should be deleted. Only state and federal requirements are ARARs. This requirement could be removed as an ARAR in future post-ROD modifications.
SJVAPCD Rules and Regulations	Rule 2201 - New and Modified Stationary Source Review Rule	Applies to new emissions from stationary sources.	Comply by implementing BACT.	The treatment systems will employ a BACT (i.e., carbon adsorption) for emission treatment, if necessary. Currently, emissions from the air strippers are below the de minimis threshold for BACT.

Table 5-9. (Continued)

ARAR	=	Applicable or Relevant and Appropriate Requirement
BACT	=	best available control technology
CCR	=	California Code of Regulations
CEQA	=	California Environmental Quality Act
CFR	=	Code of Federal Regulations
DTSC	=	Department of Toxic Substances Control
EPA	=	United States Environmental Protection Agency
OU	=	operable unit
ROD	=	record of decision
SJVAPCD	=	San Joaquin Valley Air Pollution Control District
SWRCB	=	State Water Resources Control Board
U.S.	=	United States
VOC	=	volatile organic compound

the potable well Contingency Plan continue to track information for evaluating, if necessary, pathways associated with ingestion or domestic use of water. However, as VOCs are present in shallow groundwater, the vapor intrusion pathway remains potentially complete in the presence of overlying structures, which is not true for most of the area overlying contaminated A Zone groundwater. An A Zone groundwater plume with TCE concentrations ranging from approximately 5 to less than 100 µg/L underlies OU 2 Site P-1E and Building 649, but analyses presented in the OU 2 ROD Amendment (URS, 2011a) demonstrated that the vapor intrusion pathway was insignificant for the expected use conditions at Building 649 (i.e., occupied approximately 1 hour per day).

5.4.2.3 Changes in Toxicity and Other Contaminant Characteristics

EPA's Integrated Risk Information System program (EPA, 2013a) is a primary determinant of, and repository for, toxicity values used to generate risk-based guidelines. As discussed previously, during the period covered by this third five-year review, there were eight COCs that received agency-approved toxicological reviews and revisions to toxicity values: CCl_4, cis- and trans-1,2-DCE, ethylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, PCE, and TCE. Toxicity value revisions have gone in both directions; for example, TCE is now considered to have increased toxicity relative to the previous assessment, while PCE is considered to have reduced toxicity relative to the previous assessment. As mathematical components of equations used to derive risk estimates or cleanup goals, any change in a value affects any derived values. As noted previously (Subsection 5.4.2.1), a revision to TCE toxicity values has resulted in a revision to EPA's carcinogen-based and noncancer-based site screening values (RSLs) to concentrations less than the MCL. At present, however, while these toxicity value changes are becoming integrated within the current discipline of risk assessment, they have not yet resulted in changes to enforceable standards (i.e., MCLs); therefore, the TCE ACL for the Sharpe Site will not be revised.

5.4.2.4 Changes in Risk Assessment Methods

During the period of this third five-year review, there have been two substantial changes in risk assessment methodology affecting (1) inhalation exposure methodology and (2) toxicity mechanisms of action for mutagenic carcinogens.

Inhalation Exposure — The EPA updated its methods for the evaluation of inhaled chemicals in 2009 (EPA, 2009a). Previous methods utilized predictive equations that used inhalation rates and body weights of typical receptors to derive an inhaled mass-based dose of chemical (that is, mass of inhaled chemical per kilogram [kg] of body weight per day). Current methods recognize that the exposure concentration, the pattern of exposure (e.g., intermittent versus continuous), and the ultimate organ or organ system that is affected by an inhaled chemical, all interact to affect the response in an exposed receptor. Consequently, the new methods derive concentration-based exposures for inhaled compounds averaged over a given exposure period, (e.g., 8-hour average concentration, 30-year average concentration, or lifetime average concentration). Although this new approach is markedly different from prior methods, the mathematical outcome (i.e., estimating risk or deriving cleanup goals) does not produce significant quantitative differences in outcomes.

Mutagenic Mode Of Action — The *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens* published by EPA (2005) evaluated cancer risks from early-life exposure and compared them to cancer risks associated with exposures occurring later in life. The agency concluded that additional safety factors should be used when quantitatively evaluating childhood exposure contributions to lifetime cancer risk for those chemicals that induce cancer through a mutagenic mode of

action.[4] This is accomplished through the additional multiplication of age-dependent adjustment factors (ADAFs) for particular intervals of childhood exposure (e.g., a factor of 10 is included in exposure estimates if exposure occurs during the first 2 years of life).

Currently, EPA recognizes 29 compounds as possessing a mutagenic mode of action (e.g., see EPA, 2013b). Four OU 1 COCs are considered to have a mutagenic mode of action: methylene chloride, TCE, 1,2,3-trichloropropane, and vinyl chloride. In general, the inclusion of ADAFs results in approximately 3- to 5-fold increases in estimated cancer risks, although there are some specific technical differences in the treatment of vinyl chloride as a mutagen (e.g., see EPA, 2013b). The mutagenic mode of action is an emerging substantive difference in how some carcinogens are treated within the risk assessment process but has not yet been incorporated into enforceable regulatory criteria.

5.4.2.5 Expected Progress Toward Meeting RAOs

The RAOs for groundwater in the OU 1 ROD are to "mitigate potential long-term contaminant migration and to protect human health and the environment" (ESE, 1993). The groundwater extraction and treatment system has made progress toward meeting groundwater RAOs. This conclusion is based on information presented in Subsection 5.1.3, and the plume capture and containment evaluations presented in the FFA Annual Progress Reports for 2008 through 2012 (URS, 2009c; 2010c; 2011c; 2012c; 2013a, respectively).

Modifications were made to the operation of the groundwater extraction and treatment system between 2008 and 2012 to increase plume capture (Subsection 5.2.2). At this time, the system continues to make progress toward meeting the RAO, by partially capturing the contaminant plumes. Uncertainties associated with plume capture are a result of the currently operating extraction well array because the areas where capture is incomplete (e.g., B and C Zones in the North Balloon or the A Zone in the western Central Area) were also not complete using a larger well array. Other plumes at the Sharpe Site that may not be captured also show evidence of containment through natural attenuation (URS, 2013a). Portions of plumes where concentrations increased from 2008 to 2012 were generally in plume cores near sources.

The off-depot potable well Contingency Plan (URS, 2010e) was prepared by DLA to increase the protection of human health. The plan includes monitoring of off-depot potable wells for COCs as well as actions to be taken in the event that a COC is detected at a concentration exceeding a notification (residential wells only), trigger, or action level, as defined in the plan. The Sharpe Site has a *Potable Well Contingency Plan* (DLA, 2009) that addresses the same issues for on-depot supply well groundwater. This plan provides human health protectiveness for Sharpe Site water users. These contingency plans use the federal or California MCLs as their action levels. In September 2011, the EPA revised its TCE non-cancer toxicity values. In November 2011, the non-cancer reassessment resulted in a new RSL value of 2.6 µg/L for domestic use of tap water (i.e., drinking, washing), which is less than the 1993 OU 1 ROD-specified ACL of 5 µg/L. The California CVWB has concerns that the TCE MCL may not be protective; however, to the best of DLA's knowledge there has been no effort by California or EPA to promulgate a new MCL.

[4] A mutagenic carcinogen is a chemical or its metabolite which reacts with or binds to DNA in a manner that causes mutations leading to formation of tumors; nonmutagenic carcinogens act via other mechanisms, for example, by stimulation of processes that result in uncontrolled cell division and cell proliferation.

5.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the OU 1 groundwater remedy?

There have been no impacts to the groundwater remedial action due to natural disasters during this time period that could jeopardize the protectiveness of the OU 1 remedy. However, other concerns have emerged during this third five-year review period, as discussed below.

5.4.3.1 Additional VOC Mass in Groundwater

The CPT/HydroPunch investigation (URS, 2009g) undertaken in 2007 and 2008 near source areas indicated accumulations of COC mass in the A/B aquitard that had not previously been identified. Groundwater modeling was performed to simulate the effects that these masses may have on the time necessary to cleanup groundwater with an extraction well field and air stripping treatment alone. The model results indicated that the masses would extend the cleanup time estimated in the OU 1 ROD because the mass is in the A/B aquitard and is released very slowly to migrate to extraction wells.

Aquifer cleanup times can be shortened if COC mass in the aquitard can be reduced in situ without extraction. Results of the in situ treatability study indicated that COC mass in the A/B aquitard can be destroyed or concentrations can be reduced to less than ACLs when amendments make contact with COCs (URS, 2010f; 2010g; 2010h). Modifications to the original OU 1 remedy are being made to enhance its effectiveness and to ensure long-term protection of human health. Three remedial alternatives were evaluated in the final OU 1 focused feasibility study (URS, 2011b). On the basis of that study, a preferred alternative was identified. The preferred alternative consists of a comprehensive approach in which groundwater extraction would continue, VOC mass would be destroyed in situ, and LUCs will be added for OU 1. To destroy VOC mass, chemical amendments will be emplaced into fine-grained, saturated areas of the A/B aquitard where VOC concentrations are greater than 1,000 µg/L. Two additional extraction wells (EWB4 and EWCB6) were included in the preferred alternative to increase plume capture downgradient from source areas. Reductions in VOC mass and the addition of two extraction wells are expected to help shorten cleanup time. The LUCs are physical, legal, and administrative mechanisms to restrict the use of, and limit access to, contaminated groundwater. When established, the LUCs will address the long-term protectiveness of the remedy by preventing unacceptable health risks to potential users of contaminated groundwater or potential receptors of COC vapors in indoor air. Therefore, even though there is additional VOC mass in OU 1, DLA is modifying the remedy to shorten cleanup times and increase long-term protectiveness at the site (URS, 2012a, revised final pending as of September 2014).

5.4.3.2 Potable/Industrial Well Detections

PW020. In 2Q10, the commercial/industrial trigger level for TCE (2.5 µg/L) established in the Contingency Plan (URS, 2010e) was exceeded in a sample from PW020, a water supply well for a concrete roofing tile manufacturing facility (Boral Roofing) located west of the Sharpe Site (Figure 4-20). PW020 has screen intervals in both the C Zone (141 to 171 feet bgs) and the D Zone (253 to 279 feet bgs), DLA followed the Contingency Plan steps for a trigger level exceedance at a commercial/industrial well. The following response actions were implemented during the 2010 monitoring period: DLA notified the well owner and regulatory agencies of the trigger level exceedance, met with the well owner to determine how the water supplied by the well is used, continued quarterly sampling at PW020, and conducted a video survey to determine the well construction (URS, 2011c). In 2010, Boral Roofing confirmed that the company provides bottled water for human consumption, and no employee drinks water from PW020. In 2012, Boral Roofing management confirmed that groundwater from PW020 is used only in industrial processes and is no longer connected to office trailers. Restroom and lunchroom water is supplied by the City of Lathrop. PW020 was sampled quarterly from 2Q10 through 4Q12;

analytical results from those samples show that the trigger level for TCE was exceeded 10 times, but the MCL (action level) for TCE was exceeded only once in 3Q11 (URS, 2013a).

To monitor potential horizontal and vertical migration of the C Zone TCE plume relative to PW020, monitoring well cluster MW539 was constructed with two screen intervals (MW539C1 and MW539C2) in the C Zone and one screen (MW539CD) in the CD transition. In the 4Q12 samples collected from the cluster, TCE concentrations ranged from not detected at MW539CD to 5.3 µg/L at MW539C1 (URS, 2013c).

Although the potential risk to human health from industrial use of TCE-contaminated groundwater is less than from residential uses, DLA will continue monitoring the migration of TCE toward PW020, which will assist DLA and the well owner in determining the appropriate protectiveness response for potential users of water from PW020. The sampling frequency for PW020 will remain quarterly through 2013, and the MW539 cluster wells will be sampled quarterly from 4Q12 through 3Q13.

PW006. In 3Q11, the residential notification level for TCE (1.25 µg/L) was exceeded in a sample collected from PW006 (2.1 µg/L), a water supply well for a residence and commercial trucking business located west of the Sharpe Site (Figure 4-20). The screen interval of PW006 is not known; however, it must be less than 163 feet bgs (C Zone) because that is the reported total depth of the well. DLA followed the Contingency Plan for a notification level exceedance at a residential well and collected a confirmation sample. TCE was detected at 1.6 µg/L, which, although a lower concentration, confirmed exceedance of the notification level. TCE has been detected at PW006 since 2002 at concentrations that have fluctuated between 0.4 and 2.1 µg/L. DLA informed the regulatory agencies of the notification level exceedance in 4Q11; written notification of the results was sent to the well owner; and the sampling frequency for the well was increased from yearly to quarterly for 1 year (4Q11 through 3Q12). During the 2012 monitoring period, the concentration of TCE at PW006 decreased in 2Q12 (1.1 µg/L) and 3Q12 (1.2 µg/L) and was less than the notification level, until 4Q12 when the TCE concentration exceeded the notification level (URS, 2013c). Based on the 2012 quarterly sample results, DLA will continue to sample PW006 quarterly through 2013.

PW021. PCE concentrations have been detected consistently at PW021 since 1996. The well provides the water supply for a residence north of the Sharpe Site (Figure 4-21). The screen interval of PW021 is not known. PCE concentrations in samples collected from PW021 have never exceeded the state or federal MCL of 5 µg/L for a drinking water supply. A granular activated-carbon (GAC) filter is installed at PW021 to treat the water from this well and, therefore, the residents are protected. The carbon treatment system consists of two canisters of GAC; groundwater samples are collected each quarter for VOC analysis from the pipeline connecting the first and second canisters (between carbon vessels) and the pipeline connecting the second canister and the residence (post-treatment). If a VOC is detected at a concentration exceeding its ACL in the sample collected between the first and second canisters, the GAC in both canisters is replaced with fresh GAC.

DLA has implemented the Contingency Plan for off-depot potable well PW006 and industrial supply well PW020. For potable well PW021, a granular activated-carbon unit filters groundwater to remove VOCs before use. Therefore, users of water from those wells continue to be protected.

Sharpe Site Supply Wells. Since the second five-year review, PW038 was taken out of regular use and placed on standby (for emergency use only) because the well was drawing the C Zone TCE plume toward its screen intervals and concentrations of TCE in the well's samples were approaching the MCL. The two active on-depot supply wells, PW039 and PW040, continue to provide water for Sharpe Site needs. However, these wells create a hydraulic gradient sufficient to draw the TCE plume toward their screen intervals. DLA has taken two steps to maintain protection of the Sharpe Site water users. The first step

was the establishment of a contingency plan for on-depot water users, which prescribes specific actions to be taken if the MCL of any VOC is exceeded in samples collected from either of the operating wells (DLA, 2009). The second step added guard monitoring wells between the current location of the TCE plume and the locations of PW039 and PW040. Monitoring well cluster MW327 was installed to monitor plume migration toward PW039 and MW447D was added to the MW447 cluster to monitor plume migration toward PW040 (URS, 2013b).

With the monitoring of COC concentrations in quarterly samples, the on-depot contingency plan, and new guard wells in place, the health of users of water from on-depot water supply wells will continue to be protected.

5.4.3.3 New Ecological Concerns

During the development of the OU 2 ROD Amendment (URS, 2011a), EPA raised concerns about the potential for subsurface VOC vapors (originating within the vadose zone or from shallow A Zone groundwater) to affect resident burrowing owls (*Athene cunicularia*), a California Species of Special Concern. Ensuring protection of ecological resources at OU 2 soil sites affected by residual VOCs was addressed in a memorandum prepared by DTSC and the California Department of Fish and Game (CDFG) (DTSC and CDFG, 2010). These agencies concluded that burrowing owls are present at the Sharpe Site, that burrowing owls are successfully reproducing at OU 2 Site P-3A, and there is de minimis inhalation risk to a surrogate burrow-occupying receptor—the California ground squirrel (*Spermophilus beecheyi*)—using the standardized quotient method of indicating ecological hazard. While this was a new concern within the period of this third five-year review, the evaluation of the DTSC in conjunction with the resource agency CDFG (known as the California Department of Fish and Wildlife, effective 1 January 2013), the concern was addressed and retired.

5.4.3.4 Dynamics of Toxicity Values and Risk Assessment Methods

A variety of changes have occurred within the risk assessment process during the period of this third five-year review, including toxicity value changes (increases and decreases) and methodological changes. Each of these changes has an influence on derived mathematical results for risk estimates or derivation of cleanup goals. However, ACLs remain compliant with current enforceable standards.

5.5 Issues Identified During This Five-Year Review, Recommendations, and Follow-Up Actions

Subsections 5.5.1 through 5.5.3 discuss the issues identified during this five-year review period for OU 1 and provide recommendations and follow-up actions to address those issues. Table 5-10 summarizes the issues, recommendations, and follow-up actions.

5.5.1 Issues That May Affect OU 1 Remedy Protectiveness and Recommendations to Address Those Issues

5.5.1.1 LUCs

Issue. VOCs can potentially migrate from contaminated groundwater up through the vadose zone and into buildings. On-depot LUCs to prevent human exposure to breathing indoor air with VOC concentrations that pose an unacceptable health risk have been proposed in an ESD (URS, 2012a, revised final pending as of September 2014). In addition, LUCs to restrict on-depot groundwater use and prevent human consumption of contaminated groundwater are also proposed in the ESD. The establishment of LUCs for OU 1 on government property will reduce the potential for exposure, thereby ensuring protection of human health from groundwater VOCs.

Table 5-10. Issues Identified for OU 1 Groundwater During This Five-Year Review, Recommendations, and Follow-Up Actions, Sharpe Site

Issues	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Current Protective-ness (Yes/No)	Affects Future Protective-ness (Yes/No)
LUCs. Without LUCs in place on depot, there is potential for human exposure to VOCs in contaminated indoor air or groundwater.	Finalize the OU 1 ESD to establish LUCs to protect human health from potential exposure to contaminated indoor air caused by vapor intrusion and prevent access to or use of on-depot contaminated groundwater.	DLA	EPA, DTSC, CVWB	30 September 2014	No	Yes
Potential Source Area. If there is a source of CCl_4 in the western South Balloon (MW326 cluster area), there is potential for exposure to VOCs by future groundwater users or occupants of any buildings constructed in the area.	Collect soil vapor and shallow groundwater samples in the MW326 cluster area to determine whether there is a residual source of VOCs; if a residual source is present, identify appropriate and feasible actions to ensure long-term protectiveness.	DLA	EPA, DTSC, CVWB	30 September 2015	No	Yes
PW020. The TCE plume has migrated off depot to potable supply well PW020.	Identify and implement appropriate and feasible response actions to ensure protection of users of groundwater at PW020.	DLA	EPA, DTSC, CVWB	30 June 2014	No	Yes
PW038. On-depot supply well (PW038), currently in stand-by mode, may be a conduit for VOC plumes to migrate into a deeper aquifer zone, below extraction well influences.	Decommision PW038 to eliminate it as a potential conduit for migration of VOC plumes into a deeper aquifer zone.	DLA	EPA, DTSC, CVWB	31 December 2013	No	Yes
Discharge Capacity. Discharge capacity for treated groundwater is limited. If additional extraction wells are necessary to ensure protectiveness, there is insufficient capacity on the Sharpe Site to discharge treated groundwater.	Increase treated groundwater discharge capacity by identifying potential discharge locations on the Sharpe Site.	DLA	EPA, DTSC, CVWB	31 December 2013	No	Yes
Other Issue						
Cleanup Time. The time necessary for the remedy to achieve ACLs is predicted to be greater than 30 years.	Finalize the OU 1 ESD, which will add in situ treatment to the groundwater remedy to shorten groundwater cleanup times.	DLA	EPA, DTSC, CVWB	30 September 2014	No	No

ACL = aquifer cleanup level
CCl_4 = carbon tetrachloride
CVWB = Central Valley Regional Water Quality Control Board
DLA = Defense Logistics Agency
DTSC = Department ofToxic Substances Control
EPA = United States Environmental Protection Agency
ESD = explanation of significant differences
LUC = land use control
OU = operable unit
TCE = trichloroethene
VOC = volatile organic compound

Recommendation. Finalize the OU 1 ESD (URS, 2012a, revised final pending as of September 2014) that adds LUCs to the OU 1 remedy to protect human health from vapor intrusion by preventing exposure to indoor air with VOC concentrations that pose an unacceptable health risk and prevent access to or use of on-depot groundwater with COC concentrations exceeding ACLs.

5.5.1.2 Potential Source Area Western South Balloon

Issue. During the 2007/2008 comprehensive CPT/ HydroPunch investigation (URS, 2009g), groundwater samples collected in the EWC4 area of the western South Balloon indicated the presence of a VOC plume. HydroPunch samples collected at one location had concentrations of PCE, TCE, and CCl_4 exceeding their respective ACLs. This new plume is unique at the Sharpe Site because both CCl_4 and PCE occur at concentrations greater than TCE concentrations. Soil vapor sampling during the RI did not indicate a potential source in the area south of EWC4 and east of the depot boundary (ESE, 1991). The 2007/2008 CPT/HydroPunch investigation delineated the lateral extent of the PCE, TCE, and CCl_4 plume, but a specific source area was not identified. Subsequently, monitoring well cluster MW326 was installed in 2009 to provide plume core data for the PCE-TCE-CCl_4 plume. Concentrations of PCE, TCE, and CCl_4 have consistently exceeded their respective ACLs in samples collected from MW326B and MW326C since the first sampling event (first quarter 2010 [1Q10]) at the cluster; all COC concentrations have been less than their ACLs at MW326CD and MW326D. At MW326A, fluctuating VOC concentrations (primarily CCl_4) may be caused by seasonal groundwater fluctuations; for example, when water levels rise, concentrations increase, and when water levels decline, concentrations decrease. A correlation between increasing concentrations and rising water levels suggests the possible presence of residual VOC mass in the vadose zone at or near that well location. EWB4 is capturing the B Zone portion of the PCE/CCl_4/TCE plume from this area, and EWC4 is capturing most of the C Zone portion. The plume has migrated downgradient to well cluster MW540. However, because of the capture zones of EWB4 and EWC4, there is no current threat to human health from this plume. In addition, there is no current threat to human health via the vapor intrusion pathway because no buildings are constructed in this area.

Recommendation. To evaluate the potential for the presence of a secondary source of VOCs in the western portion of the South Balloon, a field sampling effort to collect and analyze soil vapor and shallow groundwater samples in the MW326 area has been proposed in the *Field Sampling Work Plan, MW326 Cluster Area, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2013d). If a residual source is present, identify appropriate and feasible actions to ensure long-term protectiveness.

Status. In 2013, a field sampling effort was conducted in the MW326 area. The soil vapor sample results suggest that a limited residual CCl_4 source that poses a threat to groundwater quality and to human health (via the vapor intrusion pathway) may exist in the vadose zone southeast of the MW326 well cluster (URS, 2014a). For groundwater, 10 of 17 HydroPunch samples had concentrations of CCl_4 greater than the ACL. Additional soil vapor sampling to collect sufficient data to determine whether remedial action is warranted and establishment of a new OU 2 site with LUCs to prohibit residential-type uses have been recommended (URS, 2014a). For groundwater, two monitoring well clusters to monitor VOC contamination in groundwater have been recommended (URS, 2014a).

5.5.2 Issues Identified and Recommendations Completed Prior to Finalization of Third Five-Year Review

5.5.2.1 Plume Migration to Off-Depot Industrial Supply Well PW020

Issue. Increased TCE concentrations at off-depot industrial supply well PW020 during the third five-year review period suggest that a portion of the TCE plume has migrated as a result of hydraulic influences from the pumping of this well. To prevent the migration from resulting in a reduction in long-term

protectiveness, mitigation is necessary. DLA has implemented response actions established in the Contingency Plan and installed a guard well cluster (MW539) upgradient of PW020, which is used to supply industrial process water to a nearby industrial facility. The well owner supplies bottled water for human consumption and no employee is consuming water from PW020. Additional action may be necessary to maintain long-term protectiveness if higher concentration portions of the TCE plume continue to be drawn toward PW020. Water from PW020 is being used for industrial processes.

Recommendation. Identify and implement appropriate and feasible response actions to ensure protection of users of groundwater at off-depot industrial supply well PW020. Response actions may include shutting down PW020, replacement of water supply, wellhead treatment, and/or installation of additional extraction wells.

Status. PW020 was taken offline in 2Q13 and was not restarted. In 2014, Boral Roofing decommissioned PW020, and DLA replaced Boral Roofing's 2-inch potable water line with a 4-inch line that connects to the City of Lathrop's municipal water supply. Consequently, there is in no exposure pathway for TCE in groundwater beneath the Boral Roofing property, and DLA has completed the response action in accordance with the *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* (URS, 2010e). Furthermore, in June 2014, new extraction well EWNC6 was installed in the C Zone upgradient of PW020 to prevent further downgradient migration of the North Balloon TCE plume. Startup of EWNC6 is expected in late summer 2014.

5.5.2.2 Potential Conduit for Plume Migration

Issue. PW038 presents a potential conduit for migration of COC contamination to uncontaminated groundwater below the Corcoran Clay equivalent because PW038 has screen intervals above and below the clay layer. Even when not in operation, the casing and screens are a conduit through the clay. PW038 remains in standby mode in the event its capacity is needed for an emergency. However, it should not be used for routine operation.

Recommendation. Decommission (destroy) PW038 to eliminate it as a potential conduit for migration of the North Balloon TCE plume to below the Corcoran Clay equivalent.

Status. PW038 was decommissioned on 21 November 2013. The potential for vertical migration of the TCE plume below the Corcoran Clay equivalent at this well has been eliminated.

5.5.2.3 Discharge Capacity

Issue. Treated groundwater discharge capacity is limited on the Sharpe Site and does not allow flexibility to optimize groundwater extraction. If restart of existing or installation of additional extraction wells is necessary to protect groundwater users in the long term, there is insufficient capacity on the Sharpe Site to discharge the extracted groundwater after treatment.

Recommendation. Identify locations on the Sharpe Site where treated groundwater can be discharged to provide additional capacity for optimized groundwater extraction if wells are restarted or new wells are installed.

Status. The capacity of the treated groundwater discharge pond at B404 was increased in 2013 by expanding the area and depth of the pond.

5.5.3 Issue That Does Not Affect OU 1 Remedy Protectiveness and Recommendation to Address This Issue

5.5.3.1 Time to Achieve Cleanup

Issue. The predicted time required to achieve groundwater ACLs is greater than 30 years because of the mass of VOCs that remains in low permeability (A/B aquitard) areas within the saturated zone. Without additional remedial action to remove some of the VOC mass, the mass will be released very slowly to groundwater over a period of many years. DLA is planning to add an in situ treatment component to the groundwater remedy to remove mass from the low permeability areas through an ESD (URS, 2012a, revised final pending as of September 2014). The long-term cost of cleanup to ACLs is a concern.

Recommendation. Shorten groundwater cleanup time by implementing in situ treatment component of the groundwater remedy that will remove VOC mass from the A/B aquitard.

5.6 Protectiveness Statement

The remedy for OU 1 protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term, the following action needs to be taken: establish LUCs for groundwater use and potential vapor intrusion from groundwater in the OU 1 ESD.

5.7 Next Five-Year Review

The fourth five-year review for the Sharpe Site will evaluate the OU 1 remedy for the time period 2013 through 2017 and is required to be completed no later than five years from the date of this final third five-year review.

Photo 1. North Balloon Groundwater Treatment Plant

Photo 2. East Building 240 Pond

Photo 3. West Building 240 Pond

Photo 4. Central Area, Groundwater Treatment Plant

Photo 5. Central Area, Percolation Ponds

Photo 6. South Balloon Groundwater Treatment Plant

Photo 7. Building 404 Percolation Pond

Photo 8. Wastewater Treatment Plant Pond

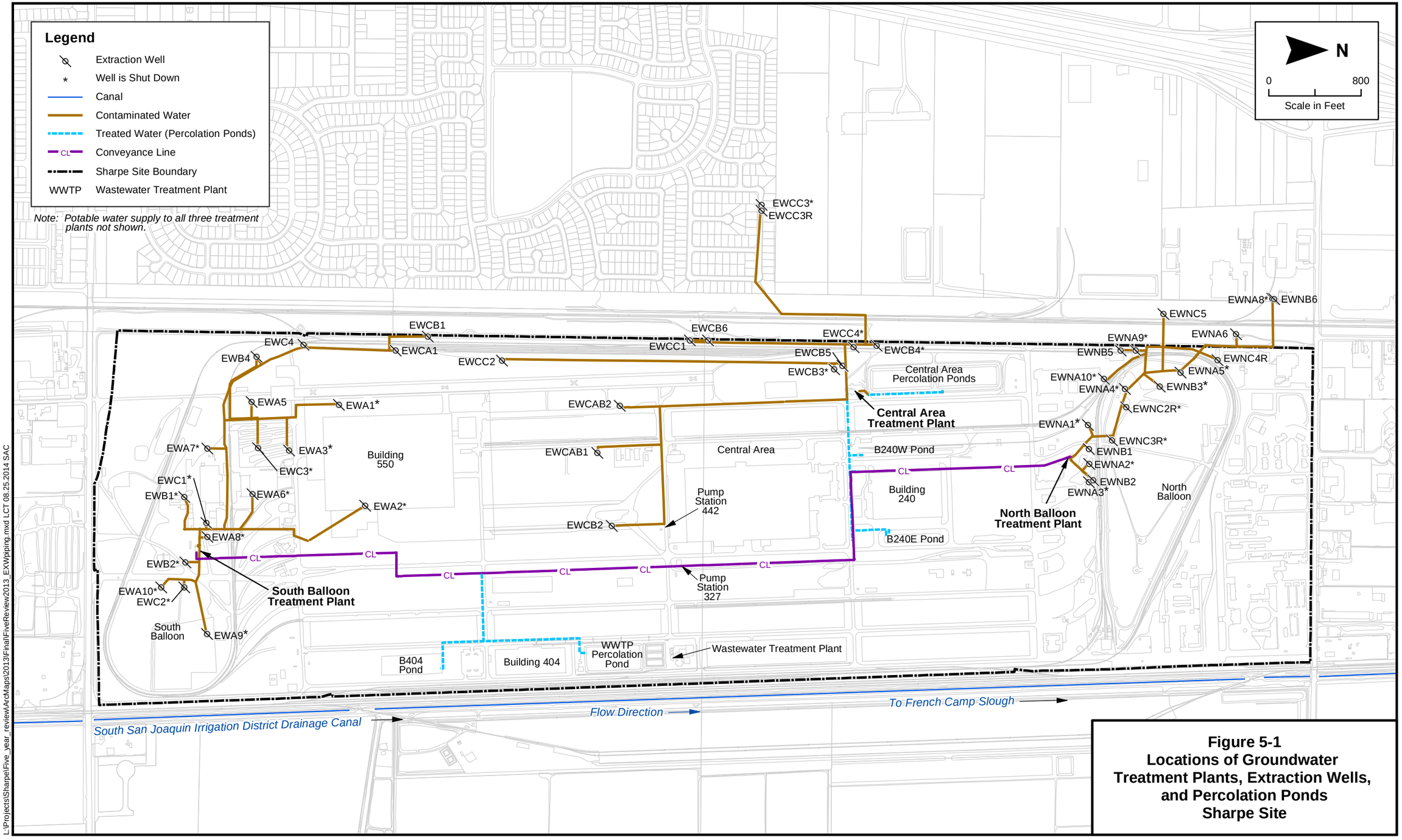

Figure 5-1
Locations of Groundwater Treatment Plants, Extraction Wells, and Percolation Ponds
Sharpe Site

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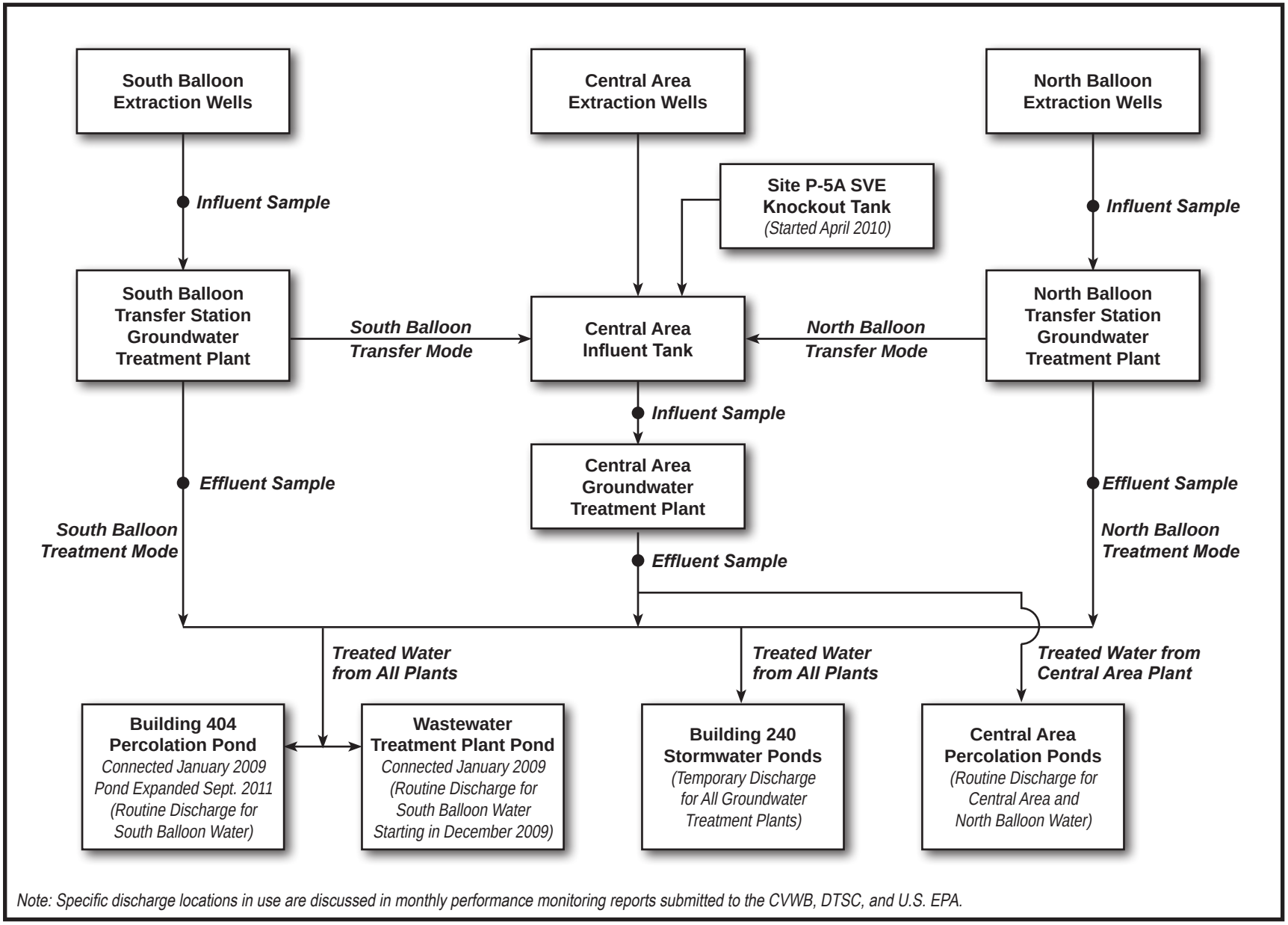

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Figure 5-2. Flow Schematic for Sharpe Site Groundwater Treatment Systems, 2008-2012

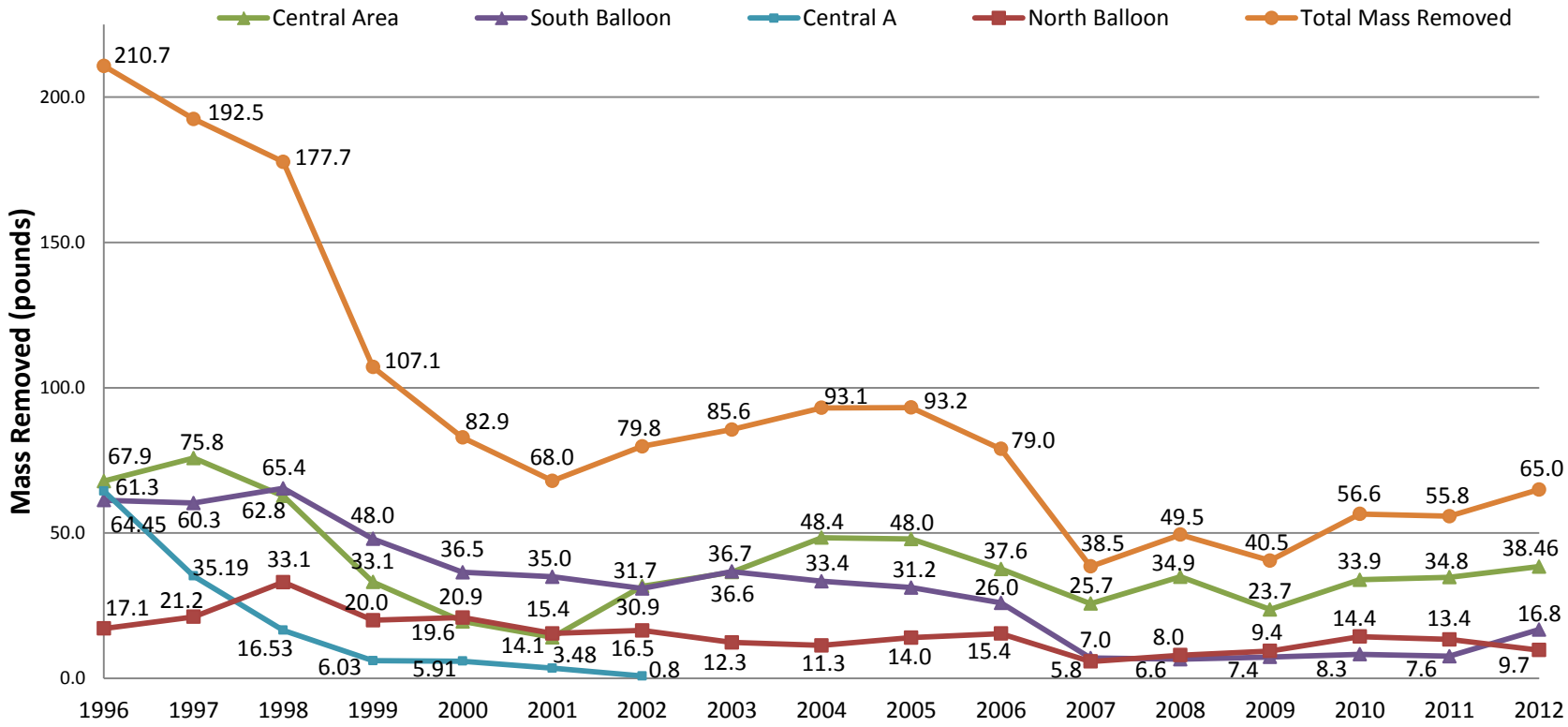


Figure 5-3. Yearly VOC Mass Removed, 1996 - 2012, Sharpe Site

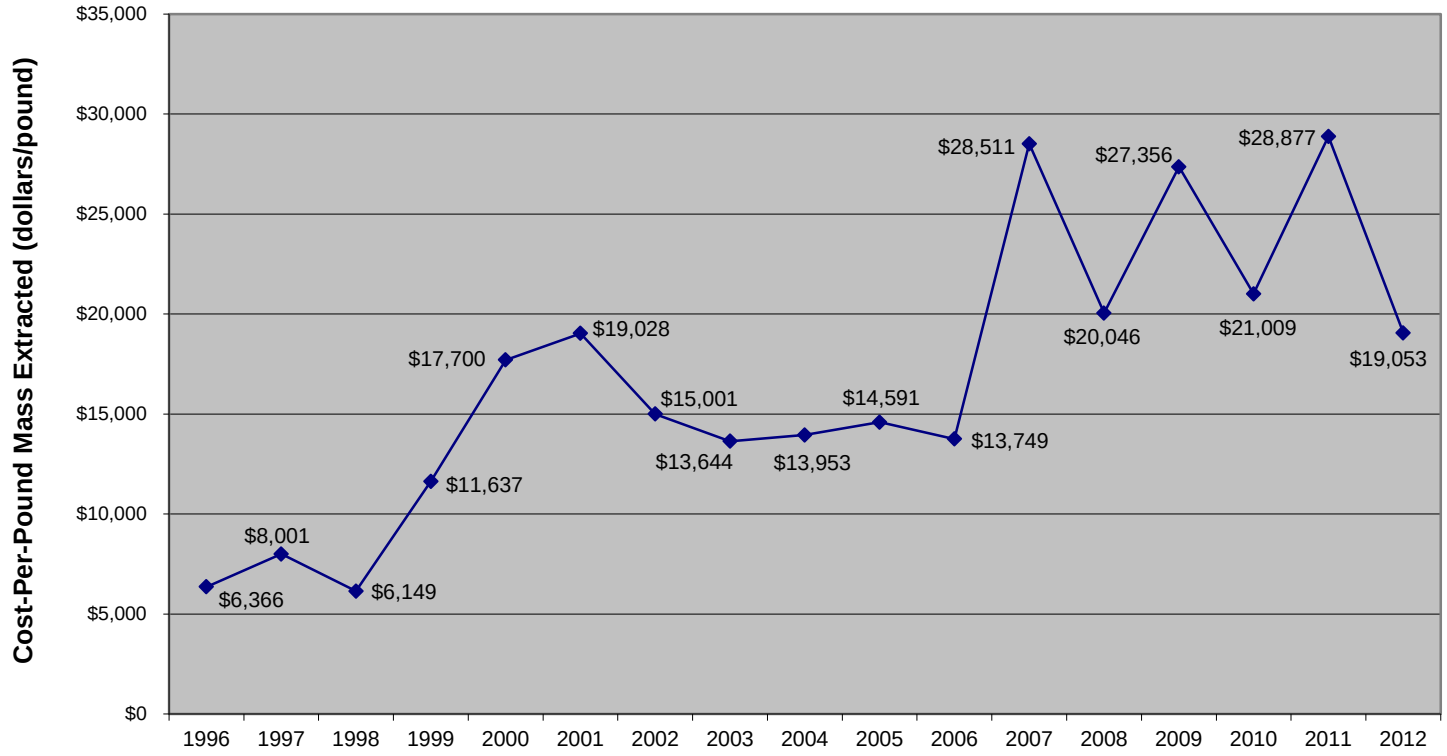
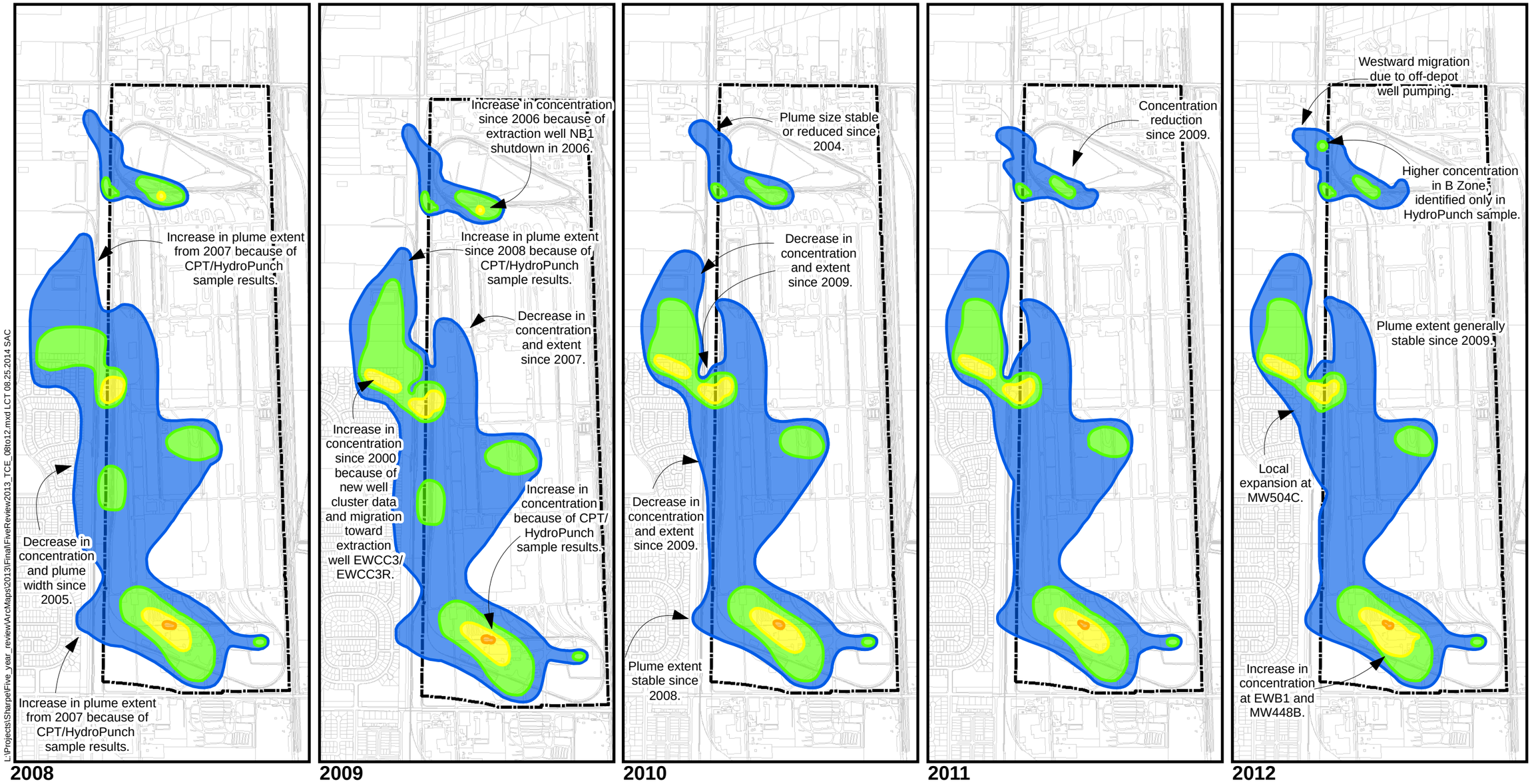


Figure 5-4. Average Annual Cost-per-Pound of Mass Removed, 1996 through September 2012, Sharpe Site



N

0 1,750

Scale in Feet

Sharpe Site Boundary

TCE concentration in micrograms per liter (µg/L)

- >500
- >100
- >25
- >5 *(Aquifer Cleanup Level)*

Note:
TCE concentrations represent data from groundwater samples collected at extraction and monitoring wells in the third quarter of each year or most recent sampling event within the previous four quarters and collected from borings during the 2007/2008 and 2011/2012 CPT/HydroPunch investigations.

Figure 5-5
Composite TCE Plume Comparison
A, B, and C Zones, 2008-2012
Sharpe Site

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N

0 1,750

Scale in Feet

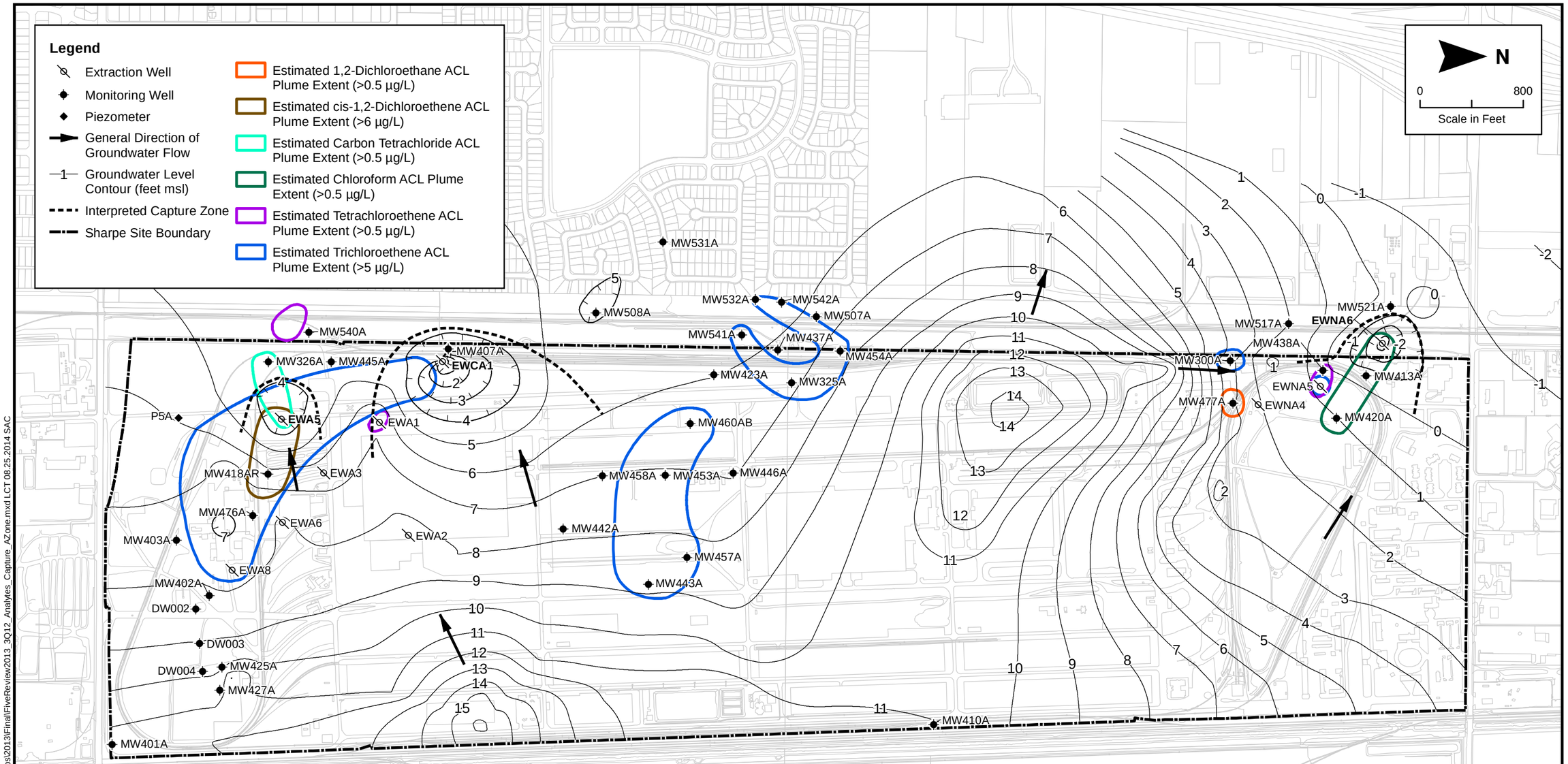
Sharpe Site Boundary

PCE concentration in micrograms per liter (µg/L)

- >25
- >5
- >0.5 *(Aquifer Cleanup Level)*

Note:
PCE concentrations represent data from groundwater samples collected at extraction and monitoring wells in the third quarter of each year or most recent sampling event within the previous four quarters and collected from borings during the 2007/2008 and 2011/2012 CPT/HydroPunch investigations.

Figure 5-6
Composite PCE Plume Comparison
A, B, and C Zones, 2008-2012
Sharpe Site



Notes:
Extraction wells operating during 3Q12 water level measurements are indicated in **bold** type.

A Zone wells shown here represent wells sampled for chemical analysis in 3Q12 and are a subset of the total number of A Zone wells measured for water levels. Refer to Figure 4-3 for the wells and water level values used to develop the groundwater level contours shown here.

The TCE/PCE plumes were developed by manual interpretation of 3Q12 groundwater sample results from extraction and monitoring wells and from HydroPunch sample results from the 2007/2008 and 2011/2012 CPT/HydroPunch investigations.

Figure 5-7
Interpreted Extraction Well Capture in the A Zone, Third Quarter 2012
Sharpe Site

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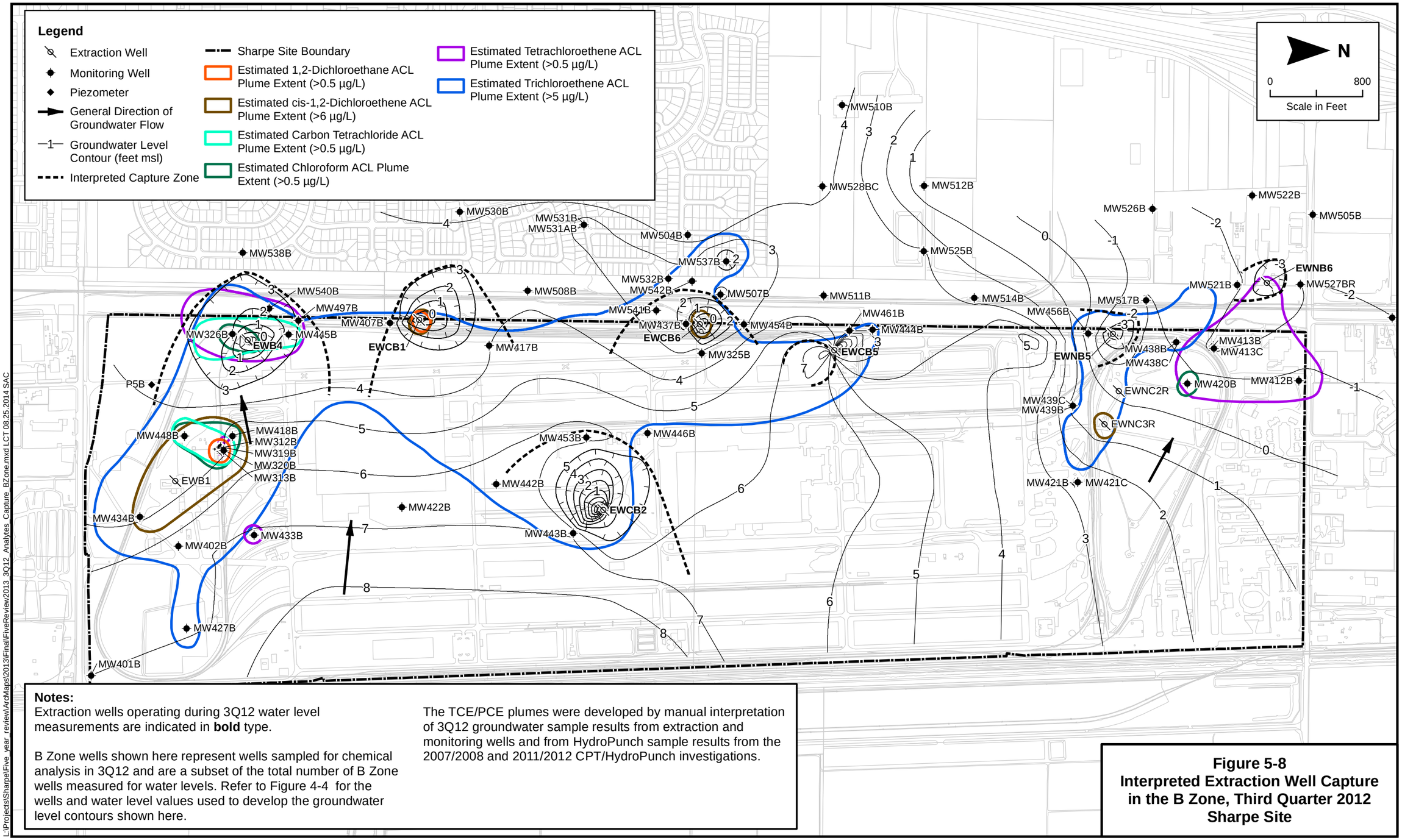

Notes:
Extraction wells operating during 3Q12 water level measurements are indicated in **bold** type.

B Zone wells shown here represent wells sampled for chemical analysis in 3Q12 and are a subset of the total number of B Zone wells measured for water levels. Refer to Figure 4-4 for the wells and water level values used to develop the groundwater level contours shown here.

The TCE/PCE plumes were developed by manual interpretation of 3Q12 groundwater sample results from extraction and monitoring wells and from HydroPunch sample results from the 2007/2008 and 2011/2012 CPT/HydroPunch investigations.

Figure 5-8
Interpreted Extraction Well Capture in the B Zone, Third Quarter 2012
Sharpe Site

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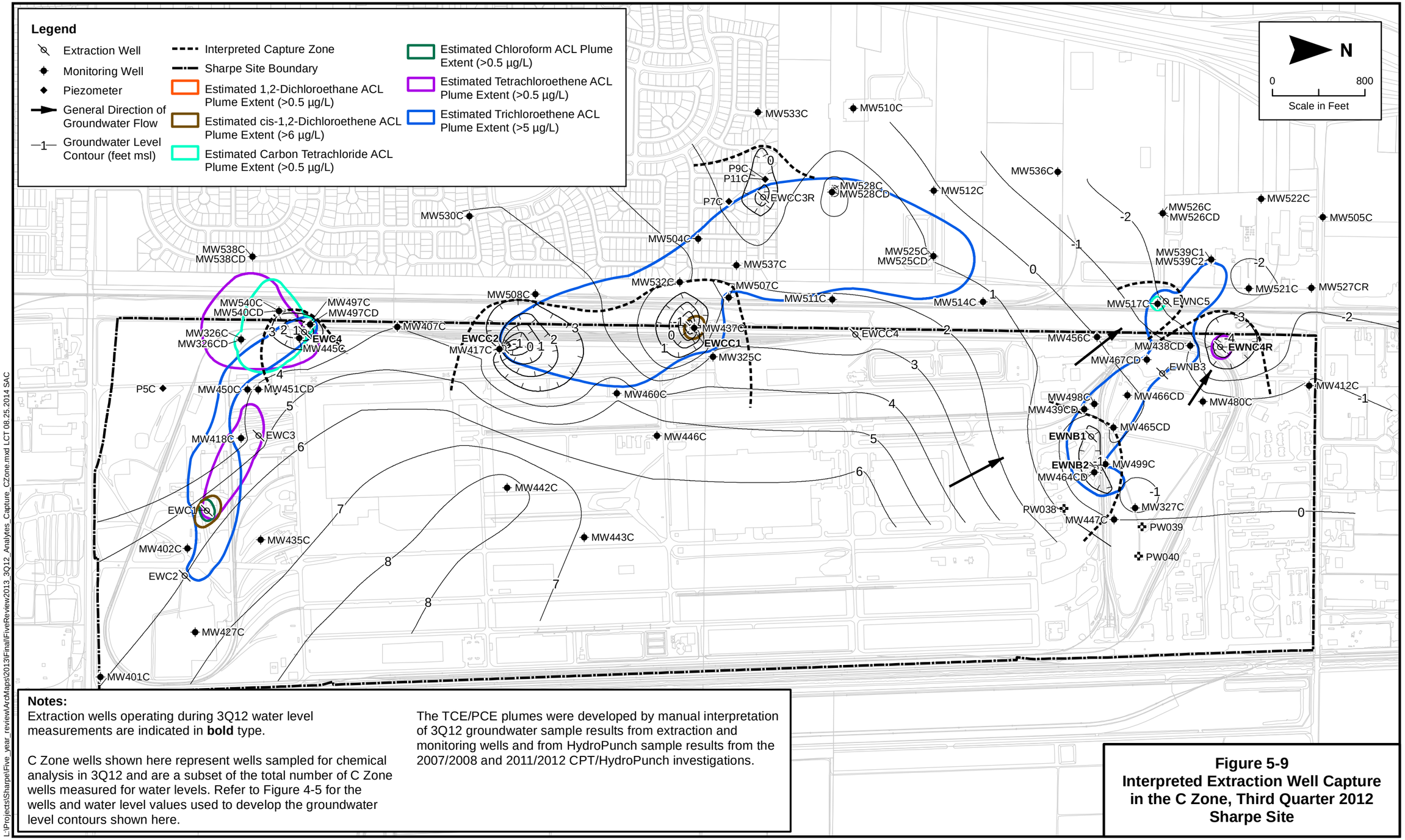

Notes:
Extraction wells operating during 3Q12 water level measurements are indicated in **bold** type.

C Zone wells shown here represent wells sampled for chemical analysis in 3Q12 and are a subset of the total number of C Zone wells measured for water levels. Refer to Figure 4-5 for the wells and water level values used to develop the groundwater level contours shown here.

The TCE/PCE plumes were developed by manual interpretation of 3Q12 groundwater sample results from extraction and monitoring wells and from HydroPunch sample results from the 2007/2008 and 2011/2012 CPT/HydroPunch investigations.

Figure 5-9
Interpreted Extraction Well Capture in the C Zone, Third Quarter 2012
Sharpe Site

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Figure 5-10
Significant Decreasing Concentration Trends in VOCs in Groundwater
Third Quarter 2012
Sharpe Site

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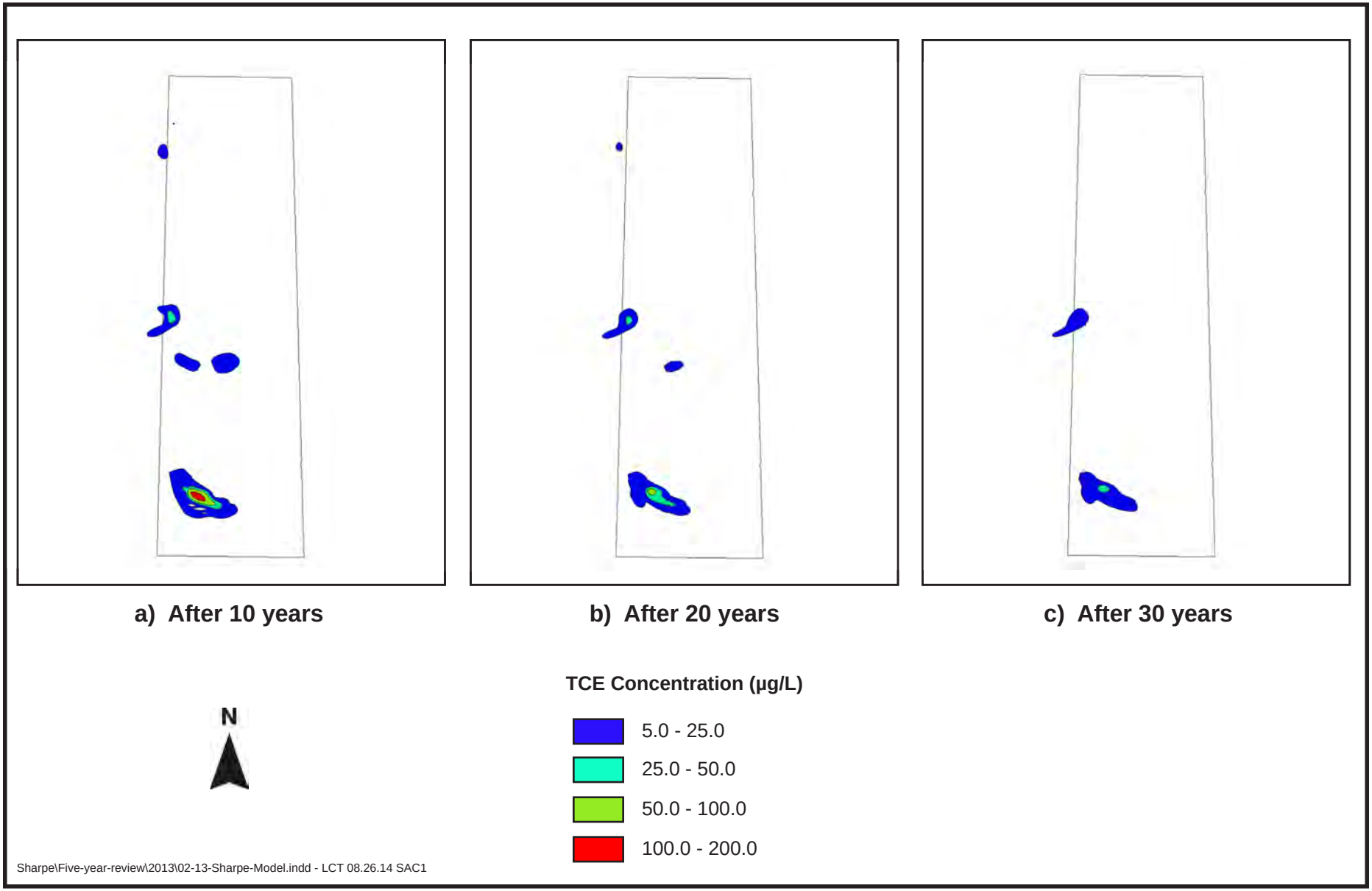

Figure 5-11. A Zone: Sharpe Site Transport Model Results for TCE

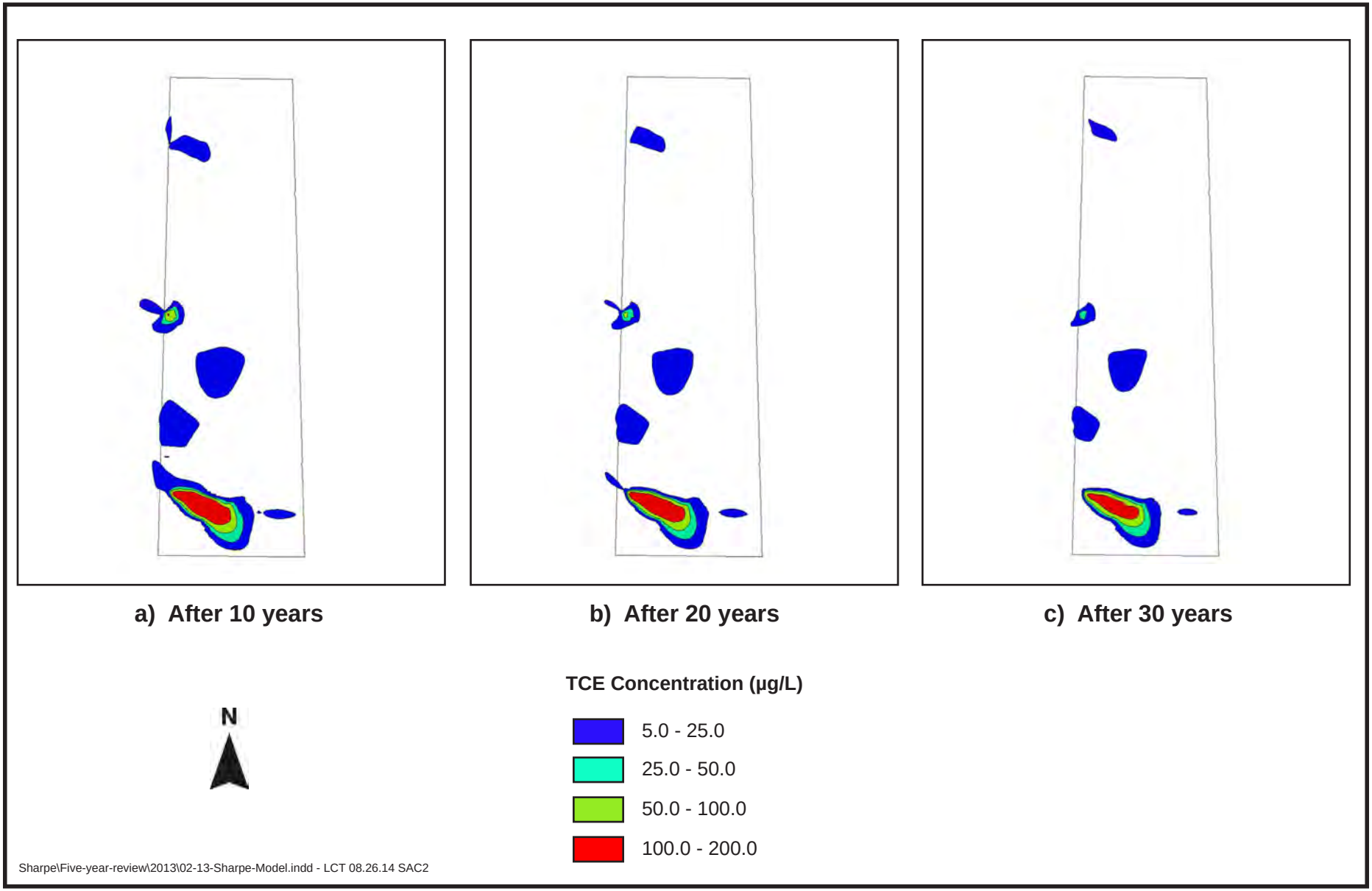

Figure 5-12. B Zone: Sharpe Site Transport Model Results for TCE

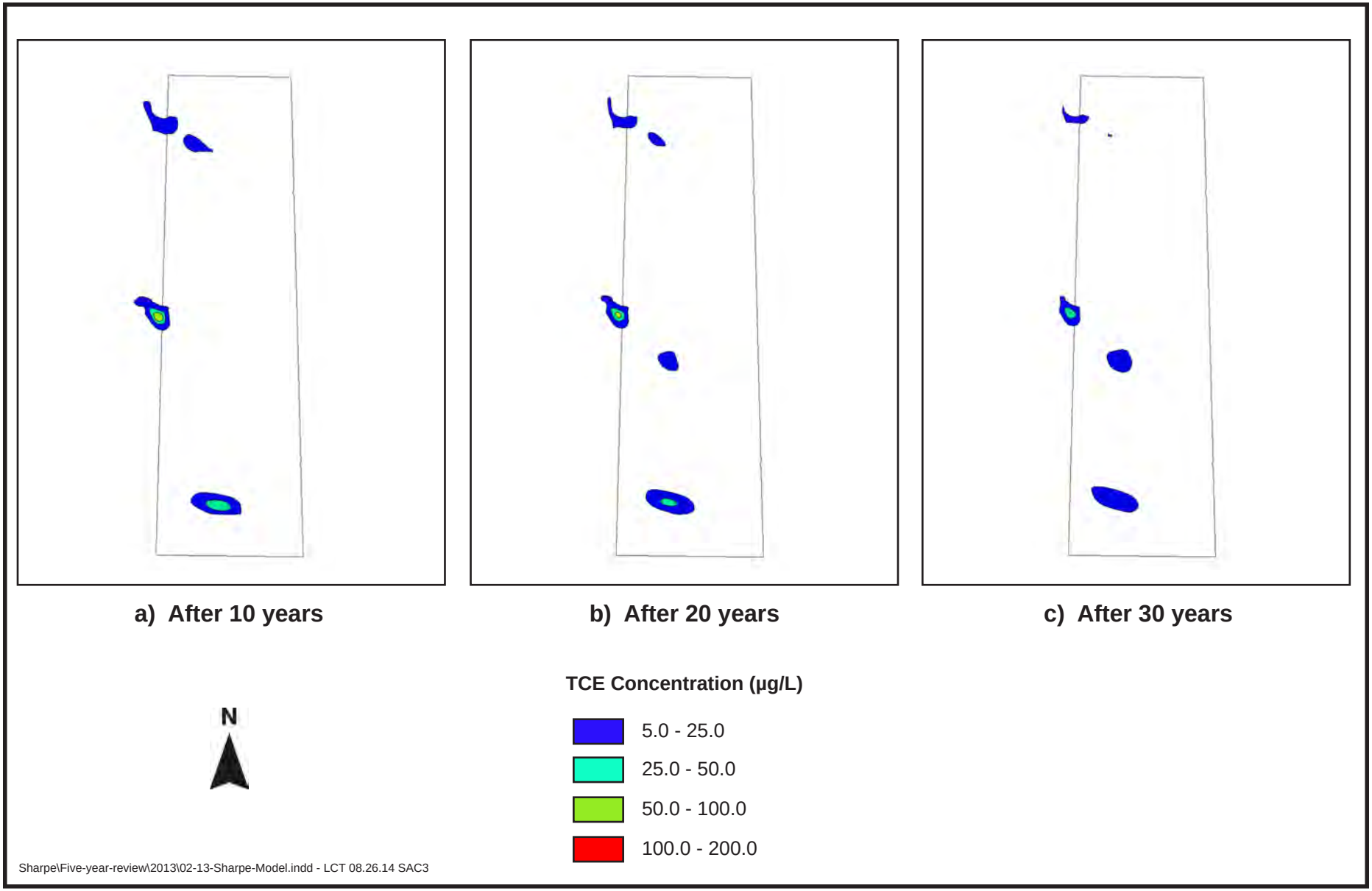

Figure 5-13. C Zone: Sharpe Site Transport Model Results for TCE

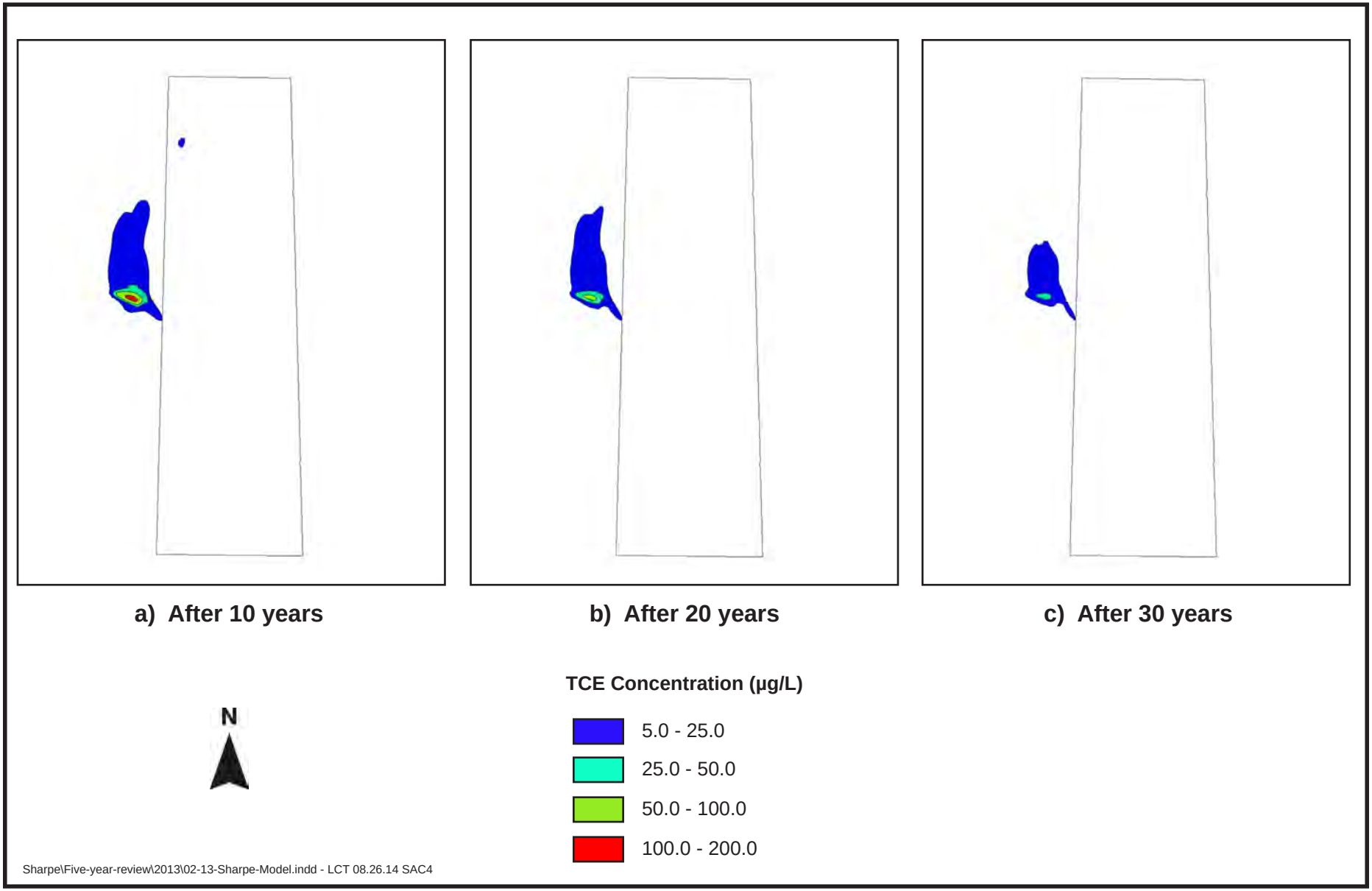

Figure 5-14. CD Transition: Sharpe Site Transport Model Results for TCE

6.0 SOIL: OPERABLE UNIT 2

6.1 TCE Remedial Action

This section briefly describes remedies selected for the OU 2 TCE sites and implementation of those remedies, with emphasis on events that occurred during the third five-year review period.

6.1.1 Remedy Selection

The OU 2 ROD was signed in February 1996 by DLA, EPA, DTSC, and CVWB (ESE, 1996). For VOC contamination in soil vapor, primarily TCE, the OU 2 ROD identified 14 sites that required remedial action and/or further characterization to determine whether remedial action was necessary. VOC contamination was caused by previous use and disposal of VOCs at the Sharpe Site. VOC disposal occurred in designated disposal areas within the South Balloon and the North Balloon. Disposal also occurred at undesignated, isolated locations in other parts of the installation, such as the Central Area. TCE-contaminated sites are designated with a "P" (e.g., Site P-1A). This designation was introduced for these sites in the *Operable Unit 2 Remedial Design Work Plan, DDRW-Sharpe* (Radian Corporation, 1996b). The P-designated names were necessary in the work plan to isolate smaller areas for remediation and characterization, from the larger areas identified in the OU 2 ROD on the basis of groundwater plumes (e.g., Plume 1, Plume 2, etc.).

The selected remedy for soil vapor with TCE concentrations that pose a threat to groundwater quality was SVE. The OU 2 ROD states that the TCE-contaminated soil sites do not pose a risk to human health (ESE, 1996). The RAOs are to prevent further degradation of groundwater and minimize aquifer cleanup time by reducing the mass of TCE that reaches groundwater (ESE, 1996). The cleanup standard for TCE in soil vapor identified in the OU 2 ROD is 350 ppbv in soil vapor.

The TCE sites identified in the OU 2 ROD were grouped according to those requiring SVE and those requiring further characterization to evaluate whether SVE was required to meet the RAOs. Based on the 1994 RI/FS results, the OU 2 ROD identified seven sites that had been sufficiently characterized and found to be degrading groundwater. These seven sites were: P-1A, P-1B, P-1C, P-1D, P-5A, P-6A, and P-8A.

Seven other sites were identified in the OU 2 ROD as requiring further characterization to determine whether they were causing groundwater degradation. These sites would be subject to remediation based on the post-ROD characterization results. These seven other sites were P-1E, P-1F, P-1G, P-2A, P-3A, P-4A, and P-4B.

During preparation of the *Operable Unit 2 Remedial Design Work Plan*, Sites P-2B and P-4C were added to the characterization effort because a review of RI data indicated that these two sites may also be degrading groundwater (Radian Corporation, 1996b). With these two additional sites, the total number of TCE-contaminated sites increased to 16. Figure 6-1 shows the 16 TCE sites.

Post-ROD (pre-design) investigations at the 16 TCE sites were completed in 1996, 1997, and 1999 to further define the extent of TCE contamination in the vadose zone and determine whether each site was causing groundwater degradation, hence requiring remediation. The *Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe* (Radian International [Radian], 1997a) and *Addendum to the Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe* (Radian, 1997b) present the 1996 and 1997 investigation results. The *Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a) presents the 1999 investigation results. Following completion of the post-ROD investigations, five TCE sites (P-1A, P-1B, P-1C, P-1E, and P-6A) were determined to require remedial

action to protect groundwater quality (Radian, 1997a), and 11 TCE sites (P-1D, P-1F, P-1G, P-2A, P-2B, P-3A, P-4A, P-4B, P-4C, P-5A, and P-8A) were determined to require no further remedial action (Radian, 2000a). However, the results of later investigations indicated that a residual TCE source area exists at Site P-5A (URS, 2007a; 2007b; 2009g); therefore, as of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements.

The OU 2 ROD Amendment (URS, 2011a), signed in 2011, documented No Further Action decisions for soil at Sites P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A because there is no current or potential threat to human health, the environment, or groundwater quality (i.e., "site closure" as suitable for unrestricted use). At the eight remaining TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A), the OU 2 ROD Amendment required adoption of LUCs to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. The LUCs prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing. Subsequent to the OU 2 ROD Amendment, further sampling was conducted, and three of the LUC sites (P-2A, P-2B, and P-4B) were determined to require no further action (URS, 2012g). LUCs were terminated at those sites in 2012 (DLA, 2012).

6.1.2 Remedy Implementation

The selected remedial actions for the TCE sites have been fully implemented where required. The only site still undergoing active remediation using SVE is Site P-5A. Figure 6-1 shows the 16 TCE sites and illustrates their current status. Table 6-1 summarizes the remedial action history for the TCE sites, and Table 6-2 summarizes the status of each TCE site.

Table 6-1. Remedial Actions at TCE Sites, Sharpe Site

Type of Action	Year Started	Nature of Action	Status
SVE	1992	Pilot-scale SVE study at Site P-8A.	Completed in 1995; system decommissioned in 2002.
SVE	1998	SVE at Sites P-1A, P-1B, P-1C, P-1E, and P-6A.	Completed in 2001; systems decommissioned in 2002.
SVE	2010	SVE at Site P-5A.	SVE implemented in 2010. SVE shut down in September 2012 for rebound evaluation.
LUCs	2011	LUCs to prohibit residential development and use of property at Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A.	Implemented in 2011 following signature of the OU 2 ROD Amendment. LUC signs installed in 2012. LUCs terminated at Sites P-2A, P-2B, and P-4B in 2012 and signs removed.

LUC = land use control
OU = operable unit
ROD = record of decision
SVE = soil vapor extraction
TCE = trichloroethene

The OU 2 ROD selected SVE for soil with TCE concentrations in soil vapor that pose a potential threat to groundwater quality (ESE, 1996). The TCE sites identified in the ROD were grouped according to those requiring SVE and those requiring further characterization to evaluate whether SVE was required to meet the RAOs. For most sites requiring further characterization, the characterization was performed prior to or during the first five-year review period and led to the conclusion that no remedial action was necessary to accomplish the RAOs. For sites identified in the OU 2 ROD as requiring remediation (P-1A, P-1B, P-1C, P-1E, and P-6A), SVE operations were completed by 2001 and the systems were decommissioned in 2002. The first five-year review confirmed the SVE systems were designed, constructed, and operated in compliance with the OU 2 ROD (URS, 2004).

Table 6-2. Status of TCE Sites, Sharpe Site

Site	Status	References
P-1A, P-1B, P-1C	SVE system operated in phases between September 1998 and December 2001 at Sites P-1A, P-1B, and P-1C. The total TCE mass removed by the SVE system was approximately 23 pounds from Site P-1A, 2.2 pounds from Site P-1B, and 16 pounds from Site P-1C. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause ACL exceedance), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, Sites P-1A, P-1B, and P-1C required no further remedial action.	*Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe* (URS, 2002b)
	TCE concentrations in soil vapor samples collected during the 2011 sampling effort indicate residual TCE mass is present in the vadose zone at Sites P-1A, P-1B, and P-1C that may pose a threat to groundwater quality and human health. TCE concentrations in 14 of 27 soil vapor samples were greater than 350 ppbv, and TCE concentrations in 6 of 14 HydroPunch samples collected in shallow A Zone groundwater were greater than the ACL of 5 µg/L. Although SVE was conducted at these sites between 1998 and 2002, TCE concentrations in soil vapor have rebounded. The rebound most likely is due to diffusion and advection of TCE that had been sorbed to silt and clay deposits to more permeable sandy deposits and/or volatilization from the groundwater surface since the system was shut down.	*Field Sampling Results and Risk Assessment Report OU 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012g)
	The area of the three sites is open space. Hence, no unacceptable risk to current industrial receptors exists. However, the sites are not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway. Estimated cumulative cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors exceed or are at the upper end of the risk management range of 1×10^{-4} to 1×10^{-6}. Hazard indices for noncancer risk are greater than 1 for all three sites.	
	Residual VOC soil vapor concentrations at Sites P-1A, P-1B, and P-1C do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health from the potential unacceptable risk associated with inhalation of VOCs via the vapor intrusion pathway.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)

Table 6-2. (Continued)

Site	Status	References
P-1D, P-1F, P-4A, P-4C	TCE concentrations in post-ROD soil vapor samples were less than 350 ppbv. Therefore, there was no threat to groundwater quality, and Sites P-1D, P-1F, P-4A, and P-4C required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	The area of the sites is open space. Hence, no unacceptable risk to current industrial receptors exists. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1×10^{-4} to 1×10^{-6}. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors. Therefore, Sites P-1D, P-1F, P-4A, or P-4C require no further action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
P-1E	SVE system operated in phases between August 1998 and June 1999. The total TCE mass removed by the SVE system was 0.2 pound. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, Site P-1E required no further remedial action.	*Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe* (URS, 2002b)
	Most of the area of the site is open space; Building 649, a portion of which is within the site, is occupied less than 1 hour per day, and concentrations in soil vapor beneath the building are less than the generic industrial screening level. Hence, no unacceptable risk to current industrial receptors exists. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1×10^{-4} to 1×10^{-6}. Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, Site P-1E requires no further action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)

Table 6-2. (Continued)

Site	Status	References
P-1G	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (less than 0.5 pound) was estimated. Vadose zone modeling predicted this sites will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, Site P-1G required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	VOC concentrations in soil vapor samples collected during the 2011 sampling effort confirm a residual VOC source area is not present in the vadose zone at Site P-1G that would warrant further action for soil to protect groundwater. TCE was not detected in soil vapor at a concentration greater than 350 ppbv, and TCE concentrations in A Zone groundwater at the site are already greater than the 5 µg/L ACL. At all of the 2011 sampling locations at Site P-1G, the higher TCE concentration in soil vapor was in the sample collected at the second depth near the groundwater surface, suggesting volatilization from the TCE plume in groundwater instead of soil. In addition to the current groundwater extraction and treatment remedy for OU 1 at the Sharpe Site, additional remedial actions for TCE in the saturated zone are recommended in the OU 1 ESD, including in situ remediation and LUCs to prohibit installation of water supply wells with screen intervals in COC plumes and to protect workers and potential future residents from potential exposure to contaminated indoor air due to volatilization from the groundwater surface (URS, 2012a, revised final pending as of September 2014).	*Field Sampling Results and Risk Assessment Report OU 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012g)
	The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. However, the site is not ready for unlimited use and unrestricted exposure because of the potential risk via the vapor intrusion pathway. Estimated cumulative cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1×10^{-4} to 1×10^{-6}, although the risk levels calculated using the EPA screening method are near the upper end of the risk management range. Estimated noncancer hazard indices are less than 1, with the exception of the estimated cumulative hazard index calculated using the EPA screening method for the samples collected at the second depth (deep stratum).	
	Residual VOC soil vapor concentrations at Site P-1G do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential unacceptable risk associated with inhalation of VOCs via the vapor intrusion pathway.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)

Table 6-2. (Continued)

Site	Status	References
P-2A	TCE concentrations in post-ROD soil vapor samples collected in the eastern portion of Site P-2A were greater than 350 ppbv, but minimal TCE mass (0.18 pound) was estimated. Vadose zone modeling predicted the site will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. TCE concentrations in post-ROD soil vapor samples collected in the western portion of Site P-2A were less than 350 ppbv. Therefore, Site P-2A required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a); *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results* (URS, 2007b); *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report* (URS, 2009g)
	The OU 2 ROD Amendment concluded that residual VOC soil vapor concentrations at Site P-2A do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	VOC concentrations in soil vapor samples collected during the 2011 sampling effort confirm a residual VOC source area is not present in the vadose zone at Site P-2A and that no further action is necessary for soil to protect groundwater or human health. TCE was not detected in soil vapor at a concentration greater than 350 ppbv, and TCE was not detected in groundwater. The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. Any remaining VOC mass in soil vapor at Site P-2A is not expected to pose an unacceptable risk to any future residential receptors. Estimated cumulative cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are near the lower end of or below the risk management range of 1×10^{-4} to 1×10^{-6}, and the estimated noncancer hazard indices are less than 1.	*Field Sampling Results and Risk Assessment Report OU 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012g)
	Evaluation of the 2011 soil vapor and groundwater data, land use, operational history, mass estimates, vadose zone and groundwater modeling, and risk and hazard estimates from the vapor intrusion pathway (assuming potential future unrestricted land use) support no further action for soil at Sites P-2A. All parties to the FFA for the Sharpe Site, including DLA, EPA, DTSC, and CVWB, concurred with this conclusion, and the LUCs were terminated.	*Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (DLA, 2012)

Table 6-2. (Continued)

Site	Status	References
P-2B	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (less than 0.5 pound) was estimated. Vadose zone modeling predicted this sites will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, Site P-2B required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	The OU 2 ROD Amendment concluded that residual VOC soil vapor concentrations at Site P-2B do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	VOC concentrations in soil vapor samples collected during the 2011 sampling effort confirm a residual VOC source area is not present in the vadose zone at Site P-2B and that no further action is necessary for soil to protect groundwater or human health. TCE was not detected in soil vapor at a concentration greater than 350 ppbv, and TCE was not detected in groundwater in the HydroPunch samples collected at the site. Most of the area of the site is open space; however, the northern quarter of the site is covered by Building 550. In 2010, DLA Installation Support at San Joaquin collected an indoor air sample in the building to ensure that employees are not being exposed to VOCs from soil vapor beneath the building; VOCs were not detected. Hence, no unacceptable risk to current industrial receptors exists. In addition, any remaining VOC mass in soil vapor at Site P-2B is not expected to pose an unacceptable risk to any future residential receptors. Estimated cumulative cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1×10^{-4} to 1×10^{-6}, and the estimated non cancer hazard indices are less than 1.	*Field Sampling Results and Risk Assessment Report OU 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012g)
	Evaluation of the 2011 soil vapor and groundwater data, land use, operational history, mass estimates, vadose zone and groundwater modeling, and risk and hazard estimates from the vapor intrusion pathway (assuming potential future unrestricted land use) support no further action for soil at Sites P-2B. All parties to the FFA for the Sharpe Site, including DLA, EPA, DTSC, and CVWB, concurred with this conclusion, and the LUCs were terminated.	*Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (DLA, 2012)

Table 6-2. (Continued)

Site	Status	References
P-3A	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (0.15 pound) was estimated. Vadose zone modeling predicted this site will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, Site P-3A required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	In addition, available data do not indicate an ecological hazard to burrowing owls at Site P-3A from residual TCE concentrations in soil.	*Ecological Risk Evaluation for Burrowing Owls at Site P-3A* (DTSC and CDFG, 2010)
	The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1×10-4 to 1×10-6. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, Site P-3A requires no further action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
P-4B	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (less than 0.5 pound) was estimated. Vadose zone modeling predicted this sites will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, Site P-4B required no remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	The OU 2 ROD Amendment concluded that residual VOC soil vapor concentrations at Site P-4B do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)

(continued) (continued)

Table 6-2. (Continued)

Site	Status	References
P-4B (cont'd)	(continued)	(continued)
	VOC concentrations in soil vapor samples collected during the 2011 sampling effort confirm a residual VOC source area is not present in the vadose zone at Site P-4B and that no further action is necessary for soil to protect groundwater or human health. TCE was not detected in soil vapor at a concentration greater than 350 ppbv, and TCE concentrations in A Zone groundwater at the site are already greater than the 5 µg/L ACL. The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. Any remaining VOC mass in soil vapor at Site P-4B is not expected to pose an unacceptable risk to any future residential receptors. Estimated cumulative cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1×10^{-4} to 1×10^{-6}, and the estimated noncancer hazard indices are less than 1.	*Field Sampling Results and Risk Assessment Report OU 2 TCE Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012g)
	Evaluation of the 2011 soil vapor and groundwater data, land use, operational history, mass estimates, vadose zone and groundwater modeling, and risk and hazard estimates from the vapor intrusion pathway (assuming potential future unrestricted land use) support no further action for soil at Site P-4B. All parties to the FFA for the Sharpe Site, including DLA, EPA, DTSC, and CVWB, concurred with this conclusion, and the LUCs were terminated. LUCs added to the remedy for this site in the OU 2 ROD Amendment that prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing were terminated in accordance with the procedures outlined in the OU 2 ROD Amendment.	*Memorandum to the Site File: Termination of Land Use Controls and Documentation of No Further Action at Operable Unit 2 Trichloroethene Sites P-2A, P-2B, and P-4B, Defense Distribution Depot San Joaquin–Sharpe Site* (DLA, 2012)
P-5A	TCE concentrations in soil vapor samples collected during investigations in 2006 and 2007 indicated the presence of a residual TCE source area. As of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements. The SVE system was shut down in September 2012 for a 6-month rebound evaluation.	*Site P-5A Groundwater and Soil Vapor Investigation Results, Technical Memorandum, DDJC-Sharpe* (URS, 2007a); *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results* (URS, 2007b); *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report* (URS, 2009g) *DDJC-Sharpe Site P-5A Soil Vapor Extraction Remedial Design/Remedial Action Work Plan* (URS, 2010b)
	(continued)	(continued)

Table 6-2. (Continued)

Site	Status	References
P-5A (cont'd)	(continued)	(continued)
	The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. Estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within to greater than the risk management range of 1×10^{-4} to 1×10^{-6}. Therefore, TCE soil vapor concentrations at Site P-5A do not allow for unlimited use and unrestricted exposure. LUCs are necessary at this site to protect human health from the potential unacceptable risk associated with inhalation of VOCs via the vapor intrusion pathway. The need for LUCs will be re-evaluated following completion of the SVE remedial action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
P-6A	SVE system operated in phases between July 1998 and December 2001. The total TCE mass removed by the SVE system was less than 2 pounds. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, Site P-6A required no further remedial action.	*Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe* (URS, 2002b)
	The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1×10^{-4} to 1×10^{-6}. Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors. Therefore, Site P-6A requires no further action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
P-8A	A pilot-scale SVE system operated in 1993 and 1995. TCE concentrations in post-SVE soil vapor samples were greater than 350 ppbv, but minimal TCE mass (0.003 pound) was estimated. Vadose zone modeling predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., soil vapor concentrations will not cause ACL exceedance), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, Site P-8A required no further remedial action.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	The area of the site is open space. Hence, no unacceptable risk to current industrial receptors exists. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1×10^{-4} to 1×10^{-6}. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors. Therefore, Site P-8A requires no further action.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)

Table 6-2. (Continued)

Note: The cleanup standard for TCE in soil vapor is 350 ppbv.

ACL	=	aquifer cleanup level	OU	=	operable unit
CDFG	=	California Department of Fish and Game	ppbv	=	parts per billion by volume
COC	=	contaminant of concern	ROD	=	record of decision
CVWB	=	Central Valley Regional Water Quality Control Board	SVE	=	soil vapor extraction
DLA	=	Defense Logistics Agency	TCE	=	trichloroethene
DTSC	=	Department of Toxic Substances Control	TEFA	=	technical and economic feasibility analysis
EPA	=	United States Environmental Protection Agency	URS	=	URS Group, Inc.
ESD	=	explanation of significant differences	VOC	=	volatile organic compound
FFA	=	Federal Facilities Agreement	µg/L	=	micrograms per liter
LUC	=	land use control			

No SVE systems operated during the period of the second five-year review. During the second five-year review period, characterization of Site P-2A was completed, and the investigation concluded that no remedial action was needed. For Site P-5A, groundwater data prompted further investigations, which were performed during the second five-year review period. These investigation results indicated that a remedial action was required at Site P-5A.

During the third five-year review period, SVE was implemented at Site P-5A. Pneumatic fracturing of the clay-rich soils beneath Site P-5A was performed in February 2010 to create a more permeable subsurface with the VOC contaminant plume to enhance SVE. Five vapor extraction wells (VEWs) and two vapor monitoring wells (VMWs) were connected to a trailer-mounted SVE system to provide extraction from the vadose zone (URS, 2011c). SVE operations began in April 2010 and continued through September 2012, when the system was shut down for a 6-month rebound evaluation.

In 2011, a soil vapor sampling effort was conducted at seven TCE sites with LUCs (excluding Site P-5A) to determine current VOC concentrations in soil vapor beneath the sites (URS, 2012g). The soil vapor data were used to estimate cancer risks and noncancer health hazards via the vapor intrusion pathway for each site. These estimates provided one line of evidence to determine whether continued implementation of LUCs at these sites is necessary to protect human health or whether LUCs can be terminated because current concentrations allow for unlimited use and unrestricted exposure. Evaluation of the data collected during the 2011 sampling effort and other lines of evidence supported no further action for three TCE sites, P-2A, P-2B, and P-4B, and LUCs were terminated at these sites with concurrence from the regulatory agencies in 2012 (DLA, 2012). LUCs continue to be implemented at the remaining five TCE sites (P-1A, P-1B, P-1C, P-1G, and P-5A).

During this third five-year review period, LUCs were implemented at eight TCE sites. LUC implementation included the installation of LUC signs and completion of annual inspections. LUC warning signs were installed in 2012 at each of the eight TCE sites and included a general “Area of Restricted Land Use” sign, notifying interested parties that all excavation and construction activities within the site must be approved by the Installation Master Planner and the Environmental Office, and a site-specific sign providing a site figure showing the limits of the site and surrounding roads and/or buildings for reference. Photographic documentation of the sign installation at each location was provided to DLA Installation Support San Joaquin California in the technical memorandum *Documentation of Operable Unit 2 Land Use Control Sign Installation at Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012i). Following termination of LUCs at Sites P-2A, P-2B, and P-4B in September 2012 (DLA, 2012), the LUC signs at those sites were removed.

Annual site inspections for LUC compliance were completed for the TCE sites in September 2011 and September 2012. Inspection results were reported in the 2011 and 2012 FFA Annual Progress Reports (URS, 2012c; 2013a, respectively). The annual inspections of the TCE sites with LUCs found no deficiencies or inconsistent land uses and no property transfers. LUC signs that had not been installed at the time of the 2011 inspections were in place during the 2012 inspection.

6.1.3 System O&M

Site P-5A is the only TCE site with an active remedial action in operation. SVE operations began in April 2010 following installation and connection of five VEWs and two single-completion VMWs (constructed similar to the VEWs) to a trailer-mounted SVE vacuum system to provide the motive force to extract soil vapor from the vadose zone at Site P-5A. Three dual-completion VMWs were also installed to evaluate SVE system performance.

The system was shut down frequently during initial startup in April 2010 because of high water level in the system knock-out pot, which resulted in the installation of the groundwater discharge line from the Site P-5A SVE system to the Central Area GWTP conveyance line to prevent further shutdowns. Once the system began routine operations in June 2010, the SVE system generally was shut down only for routine maintenance.

SVE operations continued until 28 September 2012 when the system was shut down to evaluate concentration rebound over a 6-month period.

Annual LUC inspections are being conducted by DLA at five TCE sites (P-1A, P-1B, P-1C, P-1G, and P-5A) to ensure that the required land use restrictions are being enforced and that the signs indicating areas of restricted land use are maintained. As needed, LUC signs will be replaced, added, moved, or removed to reflect site conditions and address deterioration due to weathering over the years. Activities associated with LUCs and annual inspections are reported in the FFA Annual Progress Reports.

6.2 Progress Since Last Review

6.2.1 Protectiveness Statement from the Second Five-Year Review

The protectiveness statement for OU 2 TCE soils sites in the Second Five-Year Review Report (URS, 2009a) states:

> *The OU 2 ROD remedy for TCE in soil currently protects human health and the environment in the short-term because remedial actions have been implemented and completed at TCE-contaminated sites identified in the OU 2 ROD. Long-term protectiveness depends on the performance of the OU 2 ROD remedy (SVE) at Site P-5A, which will be implemented during the period of the third five-year review.*

Since the second five-year review, SVE has been implemented at Site P-5A. The SVE system operated from April 2010 to September 2012, at which time it was shut down for a 6-month rebound evaluation.

Also, since the second five-year review, the OU 2 ROD Amendment was finalized and signed (URS, 2011a). LUCs were implemented because soil vapor at eight TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A) contains VOCs at concentrations that pose an unacceptable risk to human health if the sites were to be used for purposes such as schools, child care facilities, playgrounds, or residential housing. No threats to the environment were identified.

In 2011, a soil vapor sampling effort was conducted at seven of the TCE sites with LUCs (excluding Site P-5A) to determine then-current VOC concentrations in soil vapor beneath the sites. The soil vapor data were used to estimate cancer risk and noncancer health hazards via the vapor intrusion pathway for each site. Evaluation of the data collected and other lines of evidence supported no further action at Sites P-2A, P-2B, and P-4B, and LUCs were terminated for those sites (DLA, 2012). At the remaining five TCE sites, LUCs continue to be implemented.

6.2.2 Status of Recommendations from the Second Five-Year Review

Recommendation: Implement the OU 2 ROD remedy (SVE) at Site P-5A.

Status: SVE was implemented at Site P-5A in April 2010. The SVE system operated until September 2012, when it was shut down for a 6-month rebound evaluation. Rebound evaluation results will be

reported in 2013, along with recommendations for future operation and optimization of the SVE system or decommissioning of the SVE system if the RAOs have been met.

6.3 Five-Year Review Process

In a conversation on 12 February 2013, Mr. Brian Cole, the depot's Master Planner, confirmed that he understands the RPMPD addendum addressing LUCs for the five TCE sites and that the addendum is accessible.

The OU 2 TCE sites were visited on 24 January 2013 by the RPMs from DLA Installation Support at San Joaquin, EPA, DTSC, and the CVWB. Appendix B provides site inspection forms for Sites P-1A, P-1B, P-1C, P-1G, and P-5A. Photographs taken during the site inspection are included at the end of this section.

No significant issues were identified during the site inspection. LUC warning signs were in good condition, and land use has not changed. The Site P-5A SVE system was shut down for rebound during the time of the inspection.

6.4 Technical Assessment

6.4.1 Question A: Are the soil remedies for the OU 2 TCE sites functioning as intended by the OU 2 ROD?

Yes. The remedy for TCE sites is functioning as intended by the OU 2 ROD and OU 2 ROD Amendment.

Site P-5A was identified in the OU 2 ROD as a site requiring SVE. After additional post-ROD characterization (1996 to 1999), no further action was required at Site P-5A (Radian, 2000a). Groundwater concentrations that increased to greater than 600 µg/L in 2002 and 2003 in the area warranted further investigation of soil vapor in 2006 and 2007. Investigation results indicated that a residual TCE source area exists in Site P-5A soil and that a remedial action (i.e., SVE) would be necessary to remain protective of groundwater quality (URS, 2009g). The SVE system operated from April 2010 through September 2012 and removed approximately 4.2 pounds of TCE from the vadose zone.

Due to abnormally high groundwater conditions beneath the Site P-5A area, several feet of the VEW screens were periodically submerged during SVE operations between 2010 and 2012. The high groundwater condition may have been caused by greater-than-average precipitation in the area in the last few years. To operate the SVE system under these conditions, a groundwater discharge line was installed in April 2010 from the water collection knockout tank to the Central Area GWTP. The SVE vacuum system was operated using all five VEWs and the two single-completion VMWs to maximize air flow to remove mass and to remove as much moisture from the vadose zone as possible. During the warmer months of the year, the groundwater and subsurface moisture collected via the SVE system steadily declined such that mostly soil vapor moisture remained.

On 28 September 2012, the SVE system was shut down to evaluate concentration rebound. At the time the system was shut down, only one well had a TCE concentration greater than the OU 2 ROD cleanup standard of 350 ppbv TCE (VEW-5A005 at 730 ppbv TCE). The system will remain shut down for 6 months. The 6-month period should allow for the soil vapor and any remaining VOC mass in the subsurface to equilibrate and establish equilibrium concentrations. Data collected from the wells will be used to evaluate whether vadose zone cleanup has been achieved based on the ROD-specified criteria or whether additional optimization is necessary. The rebound evaluation will be conducted in 2013

following completion of the 6-month rebound period and will present a recommendation to either optimize and continue operations or decommission the Site P-5A SVE system.

LUCs required by the OU 2 ROD Amendment (URS, 2011a) are in place and effective. LUC signs are installed at five TCE sites. Procedures for implementation of the LUCs were established in the Addendum to the RPMPD (URS, 2011a). Two annual inspections have been conducted to ensure LUCs are maintained and enforced; inspection results and any follow-up actions are reported in the 2011 and 2012 FFA Annual Progress Reports (URS, 2012c; 2013a, respectively). There are no outstanding issues associated with the LUC requirements at the TCE sites.

6.4.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the selection of the remedies for the OU 2 TCE sites still valid?

Since the OU 2 ROD was signed (in 1996), there have been changes in exposure assumptions, toxicity data, and methods of standardized risk assessment processes, and additional data have been collected.

6.4.2.1 Changes in Standards and TBCs for TCE in Soil

Chemical-Specific ARARs. There are no chemical-specific ARARs pertaining to soil vapor, and the 1994 RI/FS risk assessment demonstrated that TCE in soil was not a potential threat to human health (ESE, 1994b). A cleanup standard for TCE in soil vapor was developed to be protective of groundwater quality. The cleanup standard for TCE in soil vapor established in the OU 2 ROD is 350 ppbv, which is based on maintaining TCE concentrations in groundwater less than the ACL if TCE in soil vapor were to migrate to groundwater and attain a state of equilibrium. Because there have been no changes to the ACL for TCE, the cleanup standard of 350 ppbv continues to be protective of groundwater.

In determining the TCE soil vapor cleanup standard, other potential routes of exposure to VOCs were not considered significant at the time of the 1994 RI/FS risk assessment because VOCs were below ground surface and no structures were built over soils contaminated with VOCs. However, awareness of the potential for health risks from inhalation of VOCs and changes in inhalation slope factors have heightened concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. The first five-year review, second five-year review, OU 2 ROD Amendment, and additional studies have variously addressed the potential human health threat from VOCs emanating from soil vapor and from groundwater by performing vapor intrusion analyses (URS, 2004; 2009a; 2011a; 2012g). As a result of these evaluations, 11 of the 16 original TCE sites have received No Further Action (closure) decisions, and the remaining 5 sites have LUCs to ensure protection of human health.

The EPA's Integrated Risk Information System program (EPA, 2013a) is a primary determinant of, and repository for, toxicity values used to generate risk-based guidelines. During the period covered by this third five-year review, there were eight chemicals identified as COCs in OU 1 groundwater that received agency-approved toxicological reviews and revisions to toxicity values: CCl_4, cis- and trans-1,2-DCE, ethylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, PCE, and TCE. Toxicity value revisions have gone in both directions; for example, TCE is now considered to have increased toxicity relative to the previous assessment, while PCE is considered to have reduced toxicity relative to the previous assessment. The revision to the TCE toxicity values occurred in September 2011; soon after, EPA issued

revised RSLs[5] for residential ambient air, resulting in changes in screening values from 1.2 micrograms per cubic meter (µg/m^3) to 0.43 µg/m^3 (based on carcinogenic effects), and from 10 µg/m^3 to 2.1 µg/m^3 (based on noncancer effects). RSLs are strictly "risk-based" values but are integral in characterizing acceptable indoor air concentrations which, in turn, are an integral endpoint in characterizing the vapor intrusion pathway. The revised TCE toxicity values were used in the most recent soil vapor evaluation and risk assessment (URS, 2012g). For purposes of chemical-specific ARARs for this third five-year review, these toxicity value changes remain as TBCs as there are no enforceable standards for soil vapor.

Action- and Location-Specific ARARs. Action-specific ARARs are usually technology- or activity-based requirements, while location-specific ARARs are restrictions placed on the chemical contaminant or the remedial activities based on the site's geographic or ecological features. The action-specific ARARs presented in the OU 2 ROD and OU 2 ROD Amendment were evaluated for protectiveness (Table 6-3). No changes to the action-specific ARARs were identified that affect the protectiveness of the remedy, and no location-specific ARARs were documented in the OU 2 ROD or OU 2 ROD Amendment.

There are no new action- or location-specific requirements that have a bearing on the protectiveness of the selected remedy for the TCE sites. The action-specific ARARs continue to support the protectiveness of the remedy for TCE in soil.

6.4.2.2 Changes in Exposure Pathways

Inhalation exposure to VOCs that have migrated from the subsurface into the indoor air of overlying structures (the "vapor intrusion pathway") is a now well-recognized exposure pathway that was not well understood, nor evaluated, during development of the original risk assessment for the OU 2 ROD (ESE, 1996). The first five-year review, second five-year review, OU 2 ROD Amendment, and additional studies have provided quantitative analyses of the vapor intrusion pathway within the framework of evaluating remedy protectiveness at each TCE site (URS, 2004; 2009a; 2011a; 2012g).

As land use at the Sharpe Site has not changed since the second five-year review, there are not new, previously unconsidered, exposure pathways relevant to the TCE sites. The vapor intrusion pathway remains potentially complete in the presence of overlying structures, which is not true for most of the areas of the TCE sites. An A Zone groundwater plume with TCE concentrations ranging from approximately 5 to less than 100 µg/L underlies Site P-1E and Building 649, but analyses using soil vapor data from samples collected below Building 649 (as documented in the OU 2 ROD Amendment; URS, 2011a) demonstrated that the vapor intrusion pathway was insignificant for the expected use conditions at Building 649 (i.e., occupied approximately 1 hour per day).

6.4.2.3 Changes in Toxicity and Other Contaminant Characteristics

There have been changes to the toxicity characterizations of eight VOCs, as indicated previously in Subsection 6.4.2.1. As mathematical components of equations used to derive risk estimates or cleanup goals, any change in a value affects any derived values. As noted previously (Subsection 6.4.2.1), a revision to TCE toxicity values has resulted in a lowering of EPA's carcinogen-based and noncancer-based site screening values (RSLs) for residential ambient air. At present, however, while these toxicity value changes are becoming integrated within the current discipline of risk assessment (including URS, 2012g), there are no enforceable standards for soil vapor.

[5] RSLs are used for site "screening" and are developed using risk assessment guidance from the EPA Superfund program. They are generic, long-term health-protective concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data and are calculated without site-specific information. Residential ambient air RSLs are safe concentrations for essentially continuous lifetime exposure.

Table 6-3. Evaluation of Action-Specific ARARs, OU 2 TCE Sites, Sharpe Site

Regulation	Citation	Description	Requirement	ROD Reference	Comment
SJVAPCD Rules and Regulations	Rule 2201 - New and Modified Stationary Source Review Rule	Applies to new emissions from stationary sources.	Comply by implementing BACT.	OU 2 ROD	The treatment systems will employ a BACT (i.e., carbon adsorption) for emission treatment, if necessary. Currently, emissions from the air strippers are below the de minimis threshold for BACT.
Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins	Porter-Cologne Water Quality Act § 13240	Requires development of a basin plan. The act and the basin plan protect the beneficial uses of groundwater. Defines beneficial use levels for constituents in groundwater.	Surface water and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	OU 2 ROD	The existing groundwater extraction and treatment systems are capturing and treating VOC plumes. Remediation will be conducted at locations where it is determined to be cost effective for treatment.
Water Quality Monitoring and Response Programs for Permitted Facilities	22 CCR § 66264.90 et seq.	Requires monitoring to detect, characterize, and respond to releases from waste management units.	If releases are detected, appropriate corrective action must be taken to achieve compliance with water quality protection standards.	OU 2 ROD	Groundwater downgradient of TCE source areas will be monitored to assess compliance with MCLs.
SWRCB Sources of Drinking Water Policy	SWRCB Resolution No. 88-63	Protection of groundwater and surface water for beneficial uses.	Surface waters and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water.	OU 2 ROD	Remediation of TCE-contaminated soils must protect the beneficial uses of groundwater. Remediation will be conducted at locations where it is determined to be cost effective for treatment.

Table 6-3. (Continued)

Regulation	Citation	Description	Requirement	ROD Reference	Comment
Requirements for Land Use Covenants	California Civil Code § 1471(a&e); 22 CCR § 67390.2-67391.1	Established for state remedial actions where hazardous substances remain on site at concentrations that do not allow for unlimited use and unrestricted exposure.	California cannot concur with any decision document (e.g., ROD, RD, closure plan) that does not have LUCs or ICs for these types of properties. For federal to nonfederal entity transfers, California will not find the site suitable for transfer unless a land use covenant is executed with the County recorder. For federal-to-federal entity transfers, a land use covenant is not feasible. In these situations, California and the federal agency will use other methods to ensure future land use compatibility (e.g., facility master plan, MOU, MOA).	OU 2 ROD Amendment	California and federal regulatory agencies will be notified at least 6 months prior to any transfer or sale of any property subject to LUCs.

ARAR = Applicable or Relevant and Appropriate Requirement
BACT = best available control technology
CCR = California Code of Regulations
IC = institutional control
LUC = land use control
MCL = maximum contaminant level
MOA = memorandum of agreement
MOU = memorandum of understanding
OU = operable unit
RD = remedial design
ROD = record of decision
SJVAPCD = San Joaquin Valley Air Pollution Control District
SWRCB = State Water Resources Control Board
TCE = trichloroethene
VOC = volatile organic compound
§ = Section

6.4.2.4 Changes in Risk Assessment Methods

During the period of this third five-year review, there have been two substantial changes in risk assessment methodology affecting (1) the inhalation exposure methodology and (2) toxicity mechanisms of action for mutagenic carcinogens.

Inhalation Exposure. The EPA updated its methods for the evaluation of inhaled chemicals in 2009 (EPA, 2009a). Previous methods utilized predictive equations that used inhalation rates and body weights of typical receptors to derive an inhaled mass-based dose of chemical (that is, mass of inhaled chemical per kg of body weight per day). Current methods recognize that the exposure concentration, the pattern of exposure (e.g., intermittent versus continuous), and the ultimate organ or organ system that is affected by an inhaled chemical, all interact to affect the response in an exposed receptor. Consequently, the new methods derive concentration-based exposures for inhaled compounds averaged over a given exposure period, (e.g., 8-hour average concentration, 30-year average concentration, or lifetime average concentration). Although this new approach is markedly different from prior methods, the mathematical outcome (i.e., estimating risk or deriving cleanup goals) does not produce significant quantitative differences.

Mutagenic Mode Of Action. The *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens* published by the EPA (2005) evaluated cancer risks from early-life exposure and compared them to cancer risks associated with exposures occurring later in life. The agency concluded that additional safety factors should be used when quantitatively evaluating childhood exposure contributions to lifetime cancer risk for those chemicals that induce cancer through a mutagenic mode of action.[6] This is accomplished through the additional multiplication of ADAFs for particular intervals of childhood exposure (e.g., a factor of 10 is included in exposure estimates if exposure occurs during the first 2 years of life).

Currently, EPA recognizes 29 compounds as possessing a mutagenic mode of action (e.g., see EPA, 2013b). Three VOCs detected in soil vapor at the TCE sites are considered to have a mutagenic mode of action: trichloroethene (detected frequently), and the rarely detected methylene chloride and vinyl chloride. In general, the inclusion of ADAFs results in an approximate 3- to 5-fold increase in estimated cancer risks, although there are some specific technical differences in the treatment of vinyl chloride as a mutagen (see, for example, EPA, 2013b). The mutagenic mode of action is an emerging substantive difference in how some carcinogens are treated within the risk assessment process but has not yet been incorporated into enforceable regulatory criteria. However, under current Sharpe Site operations, as well as the LUCs for the TCE sites, childhood exposure is essentially precluded and the mutagenic mode of action is immaterial for occupational worker exposures.

6.4.2.5 Expected Progress Toward Meeting RAOs

SVE treatment systems were constructed in accordance with the requirements of the selected remedy set forth in the OU 2 ROD and were confirmed to be effective (URS, 2002b). VOC concentrations in soil vapor at the SVE treatment sites decreased to less than detection limits or reached concentrations that would not significantly impact groundwater (URS, 2002b). The results of soil vapor sampling conducted in 2011, however, indicated residual TCE mass is present at Sites P-1A, P-1B and P-1C (URS, 2012g). Further investigation at these sites will be required during the fourth five-year review period to determine whether the RAO to prevent further degradation of groundwater and minimize aquifer cleanup time by

[6] A mutagenic carcinogen is a chemical or its metabolite which reacts with or binds to DNA in a manner that causes mutations leading to formation of tumors; nonmutagenic carcinogens act via other mechanisms, for example, by stimulation of processes that result in uncontrolled cell division and cell proliferation.

reducing the mass of TCE that reaches groundwater is no longer being met. In September 2012, three groundwater monitoring wells (MW328A, MW329A, and MW330A) were installed at Sites P-1A and P-1B to monitor COC concentrations at the water table (shallow A Zone). The wells were sampled for the first time in 4Q12, and TCE concentrations were less than the ACL, suggesting the residual TCE mass is not migrating to groundwater at concentrations greater than the ACL.

An SVE treatment system was installed at Site P-5A during the third five-year review period. The SVE system operated from April 2010 through September 2012, when the system was shut down for a 6-month rebound evaluation. The most recent sample results collected during the 2012 monitoring period showed TCE concentrations have decreased to less than the OU 2 ROD cleanup standard of 350 ppbv in all but one well (VEW-5A005) (URS, 2013a). The rebound evaluation at Site P-5A will be completed in 2013 and will assess progress toward meeting the OU 2 ROD RAO.

As required by the OU 2 ROD Amendment, LUCs have been implemented to meet the RAO of protecting human health from the potential unacceptable risk associated with inhalation of VOCs via the vapor intrusion pathway at the five TCE sites (P-1A, P-1B, P-1C, P-1G, and P-5A) that do not allow for unlimited use and unrestricted exposure. Annual site inspections are performed to ensure that these five sites are not developed for uses such as schools, child care facilities, playgrounds, and residential housing.

6.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the soil remedies for the OU 2 TCE sites?

There have been no impacts to the soil remedial actions due to natural disasters during this time period that could jeopardize the protectiveness of the remedies at the OU 2 TCE sites. However, other concerns have emerged during this third five-year review period, as discussed below.

6.4.3.1 New Ecological Concerns

During the development of the OU 2 ROD Amendment (URS, 2011a), EPA raised concerns about the potential for subsurface VOC vapors (originating within the vadose zone or from shallow A Zone groundwater) to affect resident burrowing owls (*Athene cunicularia*), a California Species of Special Concern. Ensuring protection of ecological resources at OU 2 soils sites affected by residual VOCs was addressed in a memorandum prepared by DTSC and CDFG (DTSC and CDFG, 2010). These agencies concluded that burrowing owls are present at the Sharpe Site, that burrowing owls are successfully reproducing at OU 2 Site P-3A, and there is de minimis inhalation risk to a surrogate burrow-occupying receptor—the California ground squirrel (*Spermophilus beecheyi*)—using the standardized quotient method of indicating ecological hazard. While this was a new concern within the period of this third five-year review, the concern was addressed by DTSC in conjunction with the resource agency CDFG (known as the California Department of Fish and Wildlife, effective 1 January 2013) and retired (DTSC and CDFG, 2010).

6.4.3.2 Dynamics of Toxicity Values and Risk Assessment Methods

A variety of changes have occurred within the risk assessment process during the period of this third five-year review, including toxicity value changes (increases and decreases) and methodological changes. Each change has an influence on derived mathematical results for risk estimates or derivation of cleanup goals. However, current remedial actions remain compliant with current enforceable standards related to protection of groundwater. Although there are no enforceable standards for soil vapor and the vapor intrusion pathway, revisions in toxicity values are being incorporated into vapor intrusion evaluations at the Sharpe Site (e.g., URS, 2012g).

6.5 Metals Remedial Action

This section briefly describes remedies selected for the OU 2 metals sites and implementation of those remedies, with emphasis on events that occurred during the third five-year review period.

6.5.1 Remedy Selection

The OU 2 ROD was signed in February 1996 by DLA, EPA, DTSC, and CVWB (ESE, 1996). For metals contamination in soil, the ROD identified 14 areas that required remedial action and/or further characterization to determine whether remedial action was necessary. These 14 metals areas were consolidated into 5 metals sites (S-3, S-26, S-30, S-33/29, and S-36).

The selected remedy for metals sites was excavation with off-site disposal. The RAO is to remove soil with concentrations of lead and chromium that could pose a threat to on-site adult workers (ESE, 1996). As specified in Subsection 9.1.3 of the OU 2 ROD, the maximum depth of the excavation would be 2 feet, which represents a depth by which humans could be expected to come into contact with soils. Following removal of contaminated soils, the OU 2 ROD required evaluating the impact or threat of impact to groundwater from the residual lead and chromium in the vadose zone (ESE, 1996). The cleanup standards for lead and chromium identified in the OU 2 ROD are:

- Total lead: 1,000 mg/kg (reduced in 2005 to 800 mg/kg for Site S-26, Area 6)
- Total chromium: 300 mg/kg

The OU 2 ROD remedy for total lead- or chromium-contaminated soils specifies the following activities:

- Collect additional samples to delineate soils contaminated with total lead or chromium at concentrations exceeding the cleanup standards.
- Excavate soils within 2 feet of the existing ground surface that exceed cleanup standards.
- Analyze excavated soils to determine if any soils are hazardous by toxicity characteristic, transport the soils to a Class I or II landfill, as appropriate.
- Complete confirmation sampling to ensure that soils with total lead and chromium concentrations exceeding cleanup standards have been removed within 2 feet of the existing ground surface.
  - As a part of confirmation sampling, perform metals analyses using deionized water waste extraction test (DI-WET) to determine the concentrations of soluble metals left in place and to evaluate the impact or threat of impact to groundwater from the residual total lead and chromium in the vadose zone.
  - If the DI-WET analysis reports samples with total lead at concentrations greater than 150 µg/L and/or total chromium at concentrations greater than 50 µg/L, perform an attenuation study.
  - If the soils attenuation study shows the residual soil concentrations threaten to impact water quality above the MCLs, DLA, EPA, DTSC, and CVWB will determine the need for any additional characterization or remedial actions and modify the OU 2 ROD, if necessary.
- Return the site to the existing grade by backfilling the excavation with clean fill.

- Complete a groundwater statistical analysis to be included as part of the annual groundwater monitoring report to determine if groundwater has been statistically impacted at levels above background or above MCLs.
  - The groundwater monitoring plan will specify the frequency, locations, and duration of metals sampling and analyses.
  - If the annual groundwater statistical analysis identifies a statistically significant impact to water quality above the conditions that exist at the time of signature of this ROD, then DLA, EPA, DTSC, and CVWB will determine the need for any additional action (which may include continued monitoring, groundwater data trend analysis, soil sampling, or additional remedial actions) and modify the OU 2 ROD, if necessary.

The OU 2 ROD Amendment, signed in 2011, required implementation of LUCs at all five metals sites (S-3, S-26, S-30, S-33/29, and S-36) to protect human health and monitoring at two of the metals sites (S-3 and S-26) to protect ecological receptors, specifically burrowing owls (a California Species of Special Concern) (URS, 2011a). The LUCs prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing, and the burrowing owl monitoring ensures that burrowing owls do not inhabit Site S-3 or Site S-26.

6.5.2 Remedy Implementation

The selected remedial actions for the metals sites have been fully implemented where required. Figure 6-2 shows the five metals sites and illustrates their current status. Table 6-4 summarizes the remedial action history for the metals sites, and Table 6-5 summarizes the status of each metals site.

Table 6-4. Remedial Actions at Metals Sites, Sharpe Site

Type of Action	Year Started	Nature of Action	Status
Soil Excavation and Off-Site Disposal	1998	Excavation of soil at Sites S-3 and S-26, Areas 1 through 5.	Completed in 1998.
Soil Excavation and Off-Site Disposal	2006	Excavation of soil and railroad ballast at Site S-26, Area 6.	Completed in 2006.
LUCs	2011	LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36.	Implemented in 2011 following signature of OU 2 ROD Amendment. LUC signs installed in 2012.
Burrowing Owl Monitoring	2011	Burrowing owl monitoring at Sites S-3 and S-26.	Implemented in 2011 following signature of OU 2 ROD Amendment.

LUC = land use control
OU = operable unit
ROD = Record of Decision

The first five-year review confirmed that remedial actions completed prior to or during the first five-year review period were designed and implemented in accordance with the OU 2 ROD (URS, 2004). These actions included excavation and off-site disposal of soil at Site S-3 and Site S-26, Areas 1 through 5. The first five-year review also confirmed that the investigations performed at Sites S-30, S-33/29, and S-36 were sufficient to conclude that no remedial action was required at these sites (Table 6-5).

Table 6-5. Status of Metals Sites, Sharpe Site

Site No.	Status	References
S-3	In 1998, a total of 183 cubic yards of soil was excavated from Site S-3. Thirty-five cubic yards of soil were disposed of in a Class I landfill, and 148 cubic yards were disposed of in a Class II landfill.	*Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26, DDJC-Sharpe* (Radian, 2000b)
	All total chromium and total lead concentrations in the post excavation confirmation samples were less than cleanup standards. In addition, the results for soluble chromium and lead did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limits. Therefore, the extent of the excavation at Site S-3 was the same as predetermined in the final design. Sample density and results were considered sufficient to reach a decision that the OU 2 ROD requirements had been achieved and that no further action was needed at Site S-3.	
	Concentrations of total chromium and lead in soil at Site S-3 are less than the OU 2 ROD industrial-based cleanup standards. However, those cleanup standards do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	Burrowing owls conceivably could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in an ecological risk evaluation, which concluded that concentrations of lead at a few individual sample locations at Site S-3 exceed effect-based soil screening levels for three site-specific scenarios. Burrowing owl monitoring was added to the remedy at Site S-3 to ensure burrowing owls do no inhabit the site.	*Technical Memorandum: Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2011f) *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
S-26	In 1998, a total of 758 cubic yards of soil was excavated from Areas 1 through 5. Six hundred eighty cubic yards were disposed of in a Class I landfill, and 78 cubic yards were disposed of in a Class II landfill. Excavation of Area 6 was deferred because the impact to human health was considered minimal since the site was covered with railroad tracks and ballast, and the cost to relocate the railroad tracks was considered excessive at that time. In 2006, excavation of Area 6 was completed. Approximately 115 tons (87 cubic yards) of soil and railroad ballast were excavated from Site S-26, Area 6. Seventeen tons of soil and ballast were disposed of in a Class I landfill, and 98 tons were disposed of in a Class II landfill.	*Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26, DDJC-Sharpe* (Radian, 2000b) *DDJC-Sharpe Operable Unit 2, Metals Remedial Action Report, Site S-26, Area 6* (URS, 2008c)

(continued) (continued)

Table 6-5. (Continued)

Site No.	Status	References
S-26 (cont'd)	(continued)	(continued)
	All total chromium and lead concentrations in the post excavation confirmation samples were less than cleanup standards at the final excavation limits. In addition, the results for soluble chromium and lead did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limit, except for one sidewall sample from Area 6, which had a leachable lead concentration of 613 µg/L (at 1 foot bgs). One follow-up attenuation sample was collected in January 2007 at 2 feet bgs, and the sample concentrations were less than the cleanup standards and soluble action levels. Sample density and results were considered sufficient to reach a decision that the OU 2 ROD requirements had been achieved and that no further action was needed at Site S-26.	*Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26, DDJC-Sharpe* (Radian, 2000b). *Operable Unit 2, Metals Remedial Action Report, Site S-26, Area 6* (URS, 2008c)
	Concentrations of total chromium and lead in soil at Site S-26 are less than the OU 2 ROD industrial-based cleanup standards. However, those cleanup standards do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health.	*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	Burrowing owls conceivably could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in an ecological risk evaluation, which concluded that concentrations of lead at a few individual sample locations at Site S-26 exceed effect-based soil screening levels for three site-specific scenarios. Burrowing owl monitoring was added to the remedy at Site S-26 to ensure burrowing owls do no inhabit the site.	*Technical Memorandum: Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2011f) *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
S-30	Lead and chromium concentrations in post-ROD samples were less than the cleanup standards; the maximum concentrations of total chromium (130 mg/kg) and total lead (340 mg/kg) were detected in surface soil (less than 6 inches bgs). All DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their respective soluble action levels. In 1999, an additional surface soil sample was collected to confirm the 1996 sampling results. The total chromium and lead results were less than the cleanup standards.	*Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe* (Radian, 1997a) *Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	(continued)	(continued)

Table 6-5. (Continued)

Site No.	Status	References
S-30 (cont'd)	(continued)	(continued)
	Results of samples collected in 1996 and 1999 indicated no threat to on-site adult workers or groundwater quality at Site S-30 because all chromium and lead concentrations were less than their respective cleanup standards and soluble action levels. Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site. However, the OU 2 ROD industrial-based cleanup standards do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a) *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	Burrowing owls conceivably could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in an ecological risk evaluation, which concluded that available data for Site S-30 do not indicate any discernible or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.	*Technical Memorandum: Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2011f)
S-33/29	Lead and chromium concentrations in post-ROD samples were less than the cleanup standards; the maximum concentrations of total chromium (32 mg/kg) and total lead (670 mg/kg) were detected in surface soil (less than 6 inches bgs). All DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their respective soluble action levels. In 1998, additional soil sampling was conducted at the request of CVWB. Maximum concentrations of total chromium (59.9 mg/kg at 4 feet bgs) and total lead (509 mg/kg at 8 feet bgs) were both less than the cleanup standards. Soluble chromium was detected in a groundwater sample at 50.8 µg/L, which slightly exceeded the action level of 50 µg/L but was the only exceedance at Site S-33/29. Soluble lead concentrations in DI-WET extracts were less than the 150 µg/L action level.	*Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe* (Radian, 1997a) *Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a) *Engineering Technical Memorandum Site S-33/29 Metals Investigation, DDJC-Sharpe* (Radian, 1999)
	Results of samples collected in 1996 and 1998 indicated no threat to on-site adult workers or groundwater quality at Site S-33/29 because all chromium and lead concentrations were less than their respective cleanup standards and soluble action levels (except one soluble chromium concentration as noted above). Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site. However, the OU 2 ROD industrial-based cleanup standards do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a) *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	(continued)	(continued)

Table 6-5. (Continued)

Site No.	Status	References
S-33/29 (cont'd)	(continued)	(continued)
	Burrowing owls conceivably could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in an ecological risk evaluation, which concluded that available data for Site S-33/29 do not indicate any discernible or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.	*Technical Memorandum: Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin Sharpe Site* (URS, 2011f)
	During this review period, low-level radiological readings were detected at Site S-33/29. A radiological survey of the site was performed in January 2012 but a site investigation has not yet been completed. As a temporary safety measure, a fence was installed around the area of potential radiological concern and warning signs were installed reading "Caution: Radioactive Material."	*Phase I Historical Review, Scoping Survey, and Remedial Recommendations Report for the DLA Defense Depot Joaquin Center, Sharpe Site, Lathrop, California* (Tidewater, Inc., 2012)
Site S-36	Lead and chromium concentrations in post-ROD samples were less than the cleanup standards; the maximum concentrations of total chromium (110 mg/kg) and lead (370 mg/kg) were detected in surface soil (less than 6 inches bgs). The soluble chromium concentration (51 µg/L) in one sample was slightly greater than the action level but was the only exceedance at Site S-36. At the request of CVWB, additional surface soil samples were collected in 1999 at Site S-36 to confirm the 1996 sampling results. All results were less than the cleanup standards, and all DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their respective soluble action levels.	*Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe* (Radian, 1997a) *Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a)
	Results of samples collected in 1996 and 1999 indicated no threat to on-site adult workers or groundwater quality at Site S-36 because all chromium and lead concentrations were less than the cleanup standards and soluble action levels (except one soluble chromium concentration as noted above). Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site. However, the OU 2 ROD industrial-based cleanup standards do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health.	*Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe* (Radian, 2000a) *Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site (Operable Unit 2 – Soils)* (URS, 2011a)
	Burrowing owls conceivably could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in an ecological risk evaluation, which concluded that available data for Site S-36 do not indicate any discernible or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.	*Technical Memorandum: Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2011f)

Table 6-5. (Continued)

bgs	=	below ground surface
CVWB	=	Central Valley Regional Water Quality Control Board
DI-WET	=	deionized water waste extraction test
LUC	=	land use control
mg/kg	=	milligrams per kilogram
OU	=	operable unit
Radian	=	Radian International.
ROD	=	record of decision
URS	=	URS Group, Inc.
µg/L	=	micrograms per liter

During the second five-year review period, the remedial action at Site S-26, Area 6, was completed (URS, 2008c). In 2005, a revised cleanup standard for total lead was established at 800 mg/kg (URS, 2005b). The revised cleanup standard was based on the October 2004 EPA industrial preliminary remediation goal for lead. The revised total lead cleanup standard only applied to Site S-26, Area 6.

During this third five-year review period, LUCs were implemented at the five metals sites, and burrowing owl monitoring was implemented at Sites S-3 and S-26. LUC implementation included the installation of LUC signs and completion of annual inspections. LUC warning signs were installed in 2012 at each of the five metals sites and included a general "Area of Restricted Land Use" sign, notifying interested parties that all excavation and construction activities within the site must be approved by the Installation Master Planner and the Environmental Office, and a site-specific sign providing a site figure showing the limits of the site and surrounding roads and/or buildings for reference. Photographic documentation of the sign installation at each location was provided to DLA Installation Support San Joaquin, California, in the technical memorandum *Documentation of Operable Unit 2 Land Use Control Sign Installation at Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2012i).

Annual site inspections for LUC compliance were completed for the metals sites in September 2011 and September 2012. Results of the inspections were reported in the 2011 and 2012 FFA Annual Progress Reports (URS, 2012c; 2013a, respectively). The annual inspections of the metals sites with LUCs found no deficiencies or inconsistent land uses and no property transfers. LUC signs that had not been installed at the time of the 2011 inspections were in place during the 2012 inspection. Annual inspections for burrowing owls at Sites S-3 and S-26 were also completed in 2011 and 2012. The 2011 annual inspection identified two occupied burrows at Site S-3; one-way doors were installed and the burrows were subsequently collapsed. No occupied burrows were observed at either site during the 2012 annual inspection.

6.5.3 System O&M

There is no routine O&M activity associated with metals soil sites. Annual LUC inspections are being conducted by DLA at the five metals sites to ensure that the required land use restrictions are being enforced and that the signs indicating areas of restricted land use are maintained. As needed, LUC signs will be replaced, added, moved, or removed, to reflect site conditions and address deterioration due to weathering over the years.

Annual burrowing owl monitoring is also being conducted by DLA at Sites S-3 and S-26 to ensure that burrowing owls do not inhabit the sites. If burrows or burrowing owls are observed at Site S-3 or Site S-26 during the annual inspections, DLA will passively relocate the burrowing owls and collapse the burrows during the non-breeding season in accordance with the management recommendations outlined in the *Burrowing Owl Management Plan* (Albion Environmental, Inc., 1997).

Activities associated with the LUCs, burrowing owl monitoring, and annual inspections are reported in the FFA Annual Progress Reports.

6.6 Progress Since Last Review

6.6.1 Protectiveness Statement from the Second Five-Year Review

The protectiveness statement for OU 2 metals soil sites in the Second Five-Year Review Report states:

> *The OU 2 ROD remedy for metals in soil currently protects human health and the environment in the short-term because remedial actions have been implemented and completed at metals-contaminated sites identified in the OU 2 ROD. Because the cleanup standards for metals are*

based on industrial land use and do not allow for unlimited use and unrestricted exposure, LUCs are required for long-term protection of human health and the environment. The draft Amendment to the Record of Decision Basewide Remedy for DDJC-Sharpe (Operable Unit 2 – Soils) documents the addition of LUCs to prohibit residential development and use at Sites S-3, S-26, S-30, S-33/29, and S-36.

Since the second five-year review, the OU 2 ROD Amendment has been finalized and signed (URS 2011a). LUCs to prohibit residential development and other land uses requiring cleanup more stringent than industrial use have been implemented at Sites S-3, S-26, S-30, S-33/29, and S-36. In addition, burrowing owl monitoring and passive relocation, if needed, has been implemented for Sites S-3 and S-26.

6.6.2 Status of Recommendations from the Second Five-Year Review

Recommendation: Implement LUCs to prohibit residential development and use at the five metals sites. As a follow-up action, monitor that the LUCs are in place and effective. Report the results in the FFA Annual Progress Reports.

Status: Complete and ongoing. DLA Installation Support at San Joaquin submitted a ROD amendment (*Amendment to the Record of Decision Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site [Operable Unit 2 – Soils]*) (URS, 2011a) to add LUCs at five metals sites (S-3, S-26, S-30, S-33/S-29, S-36) because the cleanup standards for lead and chromium are based on industrial land use; therefore, the cleanup standards do not allow for unlimited use and unrestricted exposure. The ROD Amendment was signed in October 2011. LUC signs were installed at the five metals soil sites in June 2012. Annual LUC inspections were performed in September 2011 and September 2012 and documented in the 2011 and 2012 FFA Annual Progress Reports (URS, 2012c; 2013a, respectively).

6.7 Five-Year Review Process

In a conversation on 12 February 2013, Mr. Brian Cole, the depot's Master Planner, confirmed that he understands the RPMPD addendum addressing LUCs for the five metals sites and that the addendum is accessible.

The OU 2 metals sites were visited on 24 January 2013 by the RPMs from DLA Installation Support at San Joaquin, EPA, DTSC, and the CVWB. Appendix B provides site inspection forms for Sites S-3, S-26, S-30, S-33/29, and S-36. Photographs taken during the site inspection are included at the end of this section.

No significant issues were identified during the site inspection. LUC warning signs were in good condition, and land use has not changed. At Site S-33/29 in the South Balloon, temporary fencing has been erected around an area of potential radiological concern (see Subsection 6.8.3.1).

6.8 Technical Assessment

6.8.1 Question A: Are the soil remedies for the OU 2 metals sites functioning as intended by the OU 2 ROD?

Yes. The remedy for metals sites is functioning as intended by the OU 2 ROD and OU 2 ROD Amendment.

Excavation and off-site disposal of contaminated soil exceeding cleanup standards was completed in 2006. Soil metals concentrations have been reduced to acceptable levels for industrial land use, and no

further excavation is planned. Further remediation would be required to allow for unlimited use and unrestricted exposure, such as for residential development or a child care facility.

LUCs required by the OU 2 ROD Amendment (URS, 2011a) are in place and effective. LUC signs are installed at all five metals sites. Procedures for implementation of the LUCs were established in the Addendum to the RPMPD (URS, 2011a). Two annual inspections were conducted to ensure LUCs are being maintained and enforced. Two annual inspections have also been conducted at Sites S-3 and S-26 to ensure burrowing owls do not inhabit those sites. Inspection results and any follow-up actions are reported in the 2011 and 2012 FFA Annual Progress Reports (URS, 2012c; 2013a, respectively). There are no outstanding issues associated with the LUC or burrowing owl monitoring requirements at the metals sites.

6.8.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the selection of the remedies for the OU 2 metals sites still valid?

Since the OU 2 ROD was signed (in 1996), there have been changes in exposure assumptions, toxicity data, and methods of standardized risk assessment processes, and additional data have been collected.

6.8.2.1 Changes in Standards and TBCs for Metals in Soil

Chemical-Specific ARARs for Lead and Chromium. A soil cleanup standard of 300 mg/kg for total chromium in soil is specified for the Sharpe Site in the OU 2 ROD, based primarily on the threat to groundwater. A health risk-based acceptable concentration was then-determined to be 500 mg/kg for total chromium. During the period covered by this third five-year review, EPA has eliminated screening values for total chromium and is instead encouraging the collection of valence-specific chromium data (i.e., as CrIII and CrVI) (EPA, 2013b). The EPA's regional screening levels for soil under an industrial land use are 5.6 mg/kg as CrVI and 1,500,000 mg/kg as CrIII (greater than EPA's ceiling limit[7] of 100,000 mg/kg) (EPA, 2013b). Thus, CrIII is essentially nontoxic to people. Speciation data have not been collected for chromium in soil at the Sharpe Site.

The OU 2 ROD also established a soil cleanup standard of 1,000 mg/kg for lead in soil at the Sharpe Site. A supplemental cleanup standard of 800 mg/kg for the excavation of Area 6 at Site S-26 was established in 2005 (URS, 2005b). The 800 mg/kg concentration is health protective (under commercial or industrial land use) based on EPA's Adult Lead Methodology (ALM) (EPA, 2009b; 2009c). The ALM estimates the fetal blood-lead concentration associated with occupational exposure of a mother to lead-contaminated soil. For the EPA, an "acceptable level" is a soil concentration that results in a predicted 95th-percentile blood-lead concentration that does not exceed 10 micrograms of lead per deciliter (µg/dL) of blood. In California, the metric of interest is the exposure concentration that results in an incremental change in blood-lead concentration of 1 µg/dL of blood for a relevant receptor (California Office of Environmental Health Hazard Assessment [OEHHA], 2007). In September 2009, OEHHA updated its lead screening value to 320 mg/kg for an occupational adult worker, as based on a modified implementation of the ALM (OEHHA, 2009).

Action- and Location-Specific ARARs. Action-specific ARARs are usually technology- or activity-based requirements, while location-specific ARARs are restrictions placed on the chemical contaminant

[7] EPA identifies a non-risk based "ceiling limit" concentration of 100,000 mg/kg for relatively less-toxic contaminants. This concentration is equivalent to a chemical constituting 10 percent by weight of the soil sample, which may violate certain exposure assumptions used in deriving an RSL. Also note that concentrations greater than 1,000,000 mg/kg (greater than 1 kg per kg) represent a physical impossibility, but EPA mathematically derives such screening values for use in alternative risk-management scenarios.

or the remedial activities based on the site's geographic or ecological features. The action- and location-specific ARARs presented in the OU 2 ROD and OU 2 ROD Amendment were evaluated for protectiveness (Table 6-6). No changes to the action- or location-specific ARARs were identified that affect the protectiveness of the remedy.

There are no new action- or location-specific requirements that would have a bearing on the protectiveness of the selected remedy for the metals sites. The action- and location-specific ARARs continue to support the protectiveness of the remedy for metals in soil.

6.8.2.2 Changes in Exposure Pathways

There have been no changes since completion of the second five-year review in the characteristics of exposure pathways relevant to the metals sites.

6.8.2.3 Changes in Toxicity and Other Contaminant Characteristics

There have been changes to the toxicity characterizations of chromium and lead, as indicated previously in Subsection 6.8.2.1. Screening-level concentrations for total chromium are no longer available and California interprets lead toxicity differently than EPA.

CrIII is essentially non-toxic, while CrVI has a low screening concentration (5.6 mg/kg), relative to the cleanup criterion (total chromium: 300 mg/kg). Speciation data for chromium in Sharpe Site soil are not available, although organic matter in soil likely would reduce CrVI to CrIII (EPA, 1998).

An additional consideration for CrVI is a revision to the understanding of the compound's mechanism of action (i.e., how the molecule exerts toxicity). The EPA's *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens* (2005) evaluated cancer risks from early-life exposure and compared those to cancer risks associated with exposures occurring later in life. The agency concluded that additional safety factors should be used when quantitatively evaluating childhood exposure contributions to lifetime cancer risk for those chemicals that induce cancer through a mutagenic mode of action.[8] This is accomplished through the additional multiplication of ADAFs for particular intervals of childhood exposure (e.g., a factor of 10 is included in exposure estimates if exposure occurs during the first 2 years of life). CrVI is now recognized as a mutagen for exposure via the ingestion and inhalation pathways (EPA, 2013b); however, under current Sharpe Site operations, as well as the LUCs for the soil metals sites, childhood exposure is essentially precluded and the mutagenic mode of action is immaterial for occupational worker exposures.

In July 2011, OEHHA established a PHG of 0.02 µg/L for hexavalent chromium in groundwater. The CVWB has concerns that concentrations greater than the PHG may not be protective. The PHG represents a de minimis lifetime cancer risk from exposure to hexavalent chromium in drinking water, based on studies in laboratory animals. The availability of the PHG enabled the DPH to proceed with setting a primary drinking water standard. On 23 August 2013, DPH proposed an MCL for hexavalent chromium of 10 µg/L and announced the availability of the proposed MCL for public comment. The public comment period closed on 11 October 2013. According to DPH, completion of the rulemaking process may take up to 12 months after the proposal. In the absence of any major delays, an enforceable MCL is anticipated to be established in 2014.Without an enforceable cleanup goal for groundwater, a soil cleanup

[8] A mutagenic carcinogen is a chemical or its metabolite which reacts with or binds to DNA in a manner that causes mutations leading to formation of tumors; nonmutagenic carcinogens act via other mechanisms, for example, by stimulation of processes that result in uncontrolled cell division and cell proliferation.

Table 6-6. Evaluation of Action-Specific and Location-Specific ARARs, OU 2 Metals Sites, Sharpe Site

Regulation	Citation	Description	Requirement	ROD Reference	Comment
Action-Specific ARARs					
Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins	Porter-Cologne Water Quality Act § 13240	Requires development of a basin plan. The act and the basin plan protect the beneficial uses of groundwater. Defines beneficial use levels for constituents in groundwater.	Surface water and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	OU 2 ROD	The existing groundwater extraction and treatment systems are capturing and treating VOC plumes. All soils with designated levels of metals are located within capture zones of extraction wells. Groundwater will be monitored to assure the beneficial use of groundwater is protected.
Water Quality Monitoring and Response Programs for Permitted Facilities	22 CCR § 66264.90 et seq.	Requires monitoring to detect, characterize, and respond to releases from waste management units.	If releases are detected, appropriate corrective action must be taken to achieve compliance with water quality protection standards.	OU 2 ROD	Groundwater downgradient of metals sites will be monitored to assure protections of the beneficial uses of groundwater.
SWRCB Sources of Drinking Water Policy	SWRCB Resolution No. 88-63	Protection of groundwater and surface water for beneficial uses.	Surface waters and groundwater of the state meeting specific criteria are considered existing or potential sources of drinking water.	OU 2 ROD	Remediation of lead-and chromium-contaminated soils must protect the beneficial uses of groundwater.

Table 6-6. (Continued)

Regulation	Citation	Description	Requirement	ROD Reference	Comment
Requirements for Land Use Covenants	California Civil Code § 1471(a&e); 22 CCR § 67390.2-67391.1	Established for state remedial actions where hazardous substances remain on site at concentrations that do not allow for unlimited use and unrestricted exposure.	California cannot concur with any decision document (e.g., ROD, RD, closure plan) that does not have LUCs or ICs for these types of properties. For federal to nonfederal entity transfers, California will not find the site suitable for transfer unless a land use covenant is executed with the County recorder. For federal-to-federal entity transfers, a land use covenant is not feasible. In these situations, California and the federal agency will use other methods to ensure future land use compatibility (e.g., facility master plan, MOU, MOA).	OU 2 ROD Amendment	California and federal regulatory agencies will be notified at least 6 months prior to any transfer or sale of any property subject to LUCs.

Table 6-6. (Continued)

Regulation	Citation	Description	Requirement	ROD Reference	Comment
Location-Specific ARARs					
Migratory Bird Treaty Act	16 United States Code § 703	Establishes federal responsibility for the protection of migratory bird resources (e.g., burrowing owls [*Athene cunicularia*]).	Except as permitted by regulations, it is unlawful to pursue, hunt, take, capture, possess, offer to sell, barter, purchase, or deliver any migratory bird, nest, or egg.	OU 2 ROD Amendment	If burrows or burrowing owls are observed at Site S-3 or Site S-26 during the annual inspections (conducted during the non-breeding season [September through January]), the burrowing owls will be passively relocated, and the burrows will be collapsed in accordance with the management recommendations outlined in the *Burrowing Owl Management Plan* (Albion Environmental, Inc., 1997) and subsequent updates.
Migratory Nongame Birds	California Fish and Game Code § 3513	Establishes California responsibility for the protection of any migratory nongame birds (e.g., burrowing owls [*Athene cunicularia*]).	Except as permitted by regulations, it is unlawful to take or possess any migratory nongame bird, or any part of such migratory nongame bird, as designated in the Migratory Bird Treaty Act.	OU 2 ROD Amendment	Same as above.
Birds-of-Prey	California Fish and Game Code § 3503.5	Establishes California responsibility for the protection of any birds-of-prey (e.g., burrowing owls [*Athene cunicularia*]) or their nests or eggs.	Except as permitted by regulations, it is unlawful to take, possess, or destroy any birds-of-prey or their nests or eggs.	OU 2 ROD Amendment	Same as above.

ARAR = Applicable or Relevant and Appropriate Requirement
CCR = California Code of Regulations
IC = institutional control
LUC = land use control
MOA = memorandum of agreement
MOU = memorandum of understanding
OU = operable unit
RD = remedial design
ROD = record of decision
SWRCB = State Water Resources Control Board
VOC = volatile organic compound
§ = Section

goal for hexavalent chromium currently cannot be established on the basis of the potential impact on groundwater.

Lastly for chromium, the cleanup goal in the OU 2 ROD was based on a concentration protective of groundwater (300 mg/kg total chromium), with a concurrent derived health-protective concentration of 500 mg/kg total chromium. Current health-based toxicity values and derived soil screening levels are based on speciated chromium (CrIII and CrVI). The current range of soil screening values spans the cleanup goal (5.6 mg/kg CrVI up to a mathematical value representing more than 100 percent CrIII). Speciation data for Sharpe Site soil is, however, unavailable. While it is likely that chromium in soil at the Sharpe Site is predominantly CrIII, it currently is not possible to characterize a potential health threat for 300 mg/kg total chromium in soil.

For lead, EPA's interpretation of an acceptable screening concentration for occupational exposure remains the same as for the second five-year review: 800 mg/kg. California has revised its interpretation and derived an occupational exposure screening concentration of 320 mg/kg.

6.8.2.4 Changes in Risk Assessment Methods

During the third five-year review period, there have been two substantial changes in risk assessment methodology affecting (1) inhalation exposure methodology and (2) toxicity mechanisms of action for mutagenic carcinogens.

Inhalation Exposure – In 2009, the EPA updated its methods for the evaluation of inhaled chemicals (EPA, 2009a). Previous methods utilized predictive equations that used inhalation rates and body weights of typical receptors to derive an inhaled mass-based dose of chemical (i.e., mass of inhaled chemical per kg of body weight per day). Current methods recognize that the exposure concentration, the pattern of exposure (e.g., intermittent versus continuous), and the ultimate organ or organ system that is affected by an inhaled chemical, all interact to affect the response in an exposed receptor. Consequently, the new methods derive concentration-based exposures for inhaled compounds averaged over a given exposure period, (e.g., 8-hour average concentration, 30-year average concentration, or lifetime average concentration). Although this new approach is markedly different from prior methods, the mathematical outcome (i.e., estimating risk or deriving cleanup goals) does not produce significant quantitative differences in outcomes.

Mutagenic Mode of Action – As indicated previously (Subsection 6.8.2.3), CrVI is now recognized as exerting a mutagenic mode of action and additional age-dependent adjustment factors should be included in the exposure assessment for childhood exposures. However, under current Sharpe Site operations, as well as the LUCs for the metals sites, childhood exposure is essentially precluded and the mutagenic mode of action is immaterial for occupational worker exposures. In addition, CrIII is expected to be the dominant form of residual chromium in Sharpe Site soil, further reducing the potential influence of this toxicity mechanism.

6.8.2.5 Expected Progress Toward Meeting RAOs

In accordance with the OU 2 ROD, the RAO has been met for lead and chromium contamination in soil. The removal actions taken as part of the lead and chromium excavation effort at Sites S-3 and S-26 were completed in accordance with the OU 2 ROD (Radian, 2000b; URS, 2008c), and for the three other metals sites (S-30, S-33/29, and S-36), a remedial action was not required because concentrations of lead and/or chromium did not exceed cleanup standards (Radian, 2000a). However, because soil cleanup standards were based on an industrial exposure scenario and do not allow for unlimited use and unrestricted exposure (e.g., residential use), LUCs and burrowing owl monitoring were implemented to protect human health and the environment.

6.8.3 Question C: Has any other information come to light that could call into question the protectiveness of the soil remedies for the OU 2 metals sites?

There have been no impacts to the soil remedial actions due to natural disasters during this time period that could jeopardize the protectiveness of the remedies at the OU 2 metals sites. However, other concerns have emerged during this third five-year review period, as discussed below.

6.8.3.1 Radiological Concerns

During this review period, low-level radiological readings were detected at Site S-33/29. A radiological survey of the site in January 2012 by Tidewater, Inc., determined that the area around this site is at background levels and that a worker within the site would likely receive a radiation dose similar to a standard chest x-ray (opinion of preliminary report, unpublished). The source of the radiation is thought to be radium paint and/or dials in the ground, perhaps associated with a prior burn pit, although formal investigation of the site has not been completed. As a temporary safety measure, a fence was installed around the area of potential radiological concern and warning signs were installed reading "Caution: Radioactive Material." Because the investigation of the source of these readings has not been completed, it is not possible to evaluate what, if any, effect there may be to the remedial action for metals in soil at Site S-33/29.

6.8.3.2 New Ecological Concerns

During the development of the OU 2 ROD Amendment (URS, 2011a), EPA raised concerns about the potential for chromium and lead at OU 2 metals sites to affect resident burrowing owls. Ensuring protection of ecological resources at OU 2 soils affected by residual chromium and lead was addressed (URS, 2011f) and annual monitoring has been implemented (URS, 2012c; 2013a).

6.9 Issues Identified During This Five-Year Review, Recommendations, and Follow-Up Actions

Subsections 6.9.1 and 6.9.2 discuss the issues identified during this five-year review period for OU 2 and provide recommendations and follow-up actions to address those issues. Table 6-7 summarizes the issues, recommendations, and follow-up actions.

6.9.1 Issues That May Affect OU 2 Remedy Protectiveness and Recommendations to Address Those Issues

6.9.1.1 Sites P-1A, P-1B, and P-1C

Issue. TCE concentrations in soil vapor samples collected in 2011 indicate that residual TCE mass present in the vadose zone at Sites P-1A, P-1B, and P-1C may pose a threat to groundwater quality. Human health is protected because LUCs are in place and effective. TCE concentrations in 14 of 27 soil vapor samples were greater than the OU 2 ROD cleanup standard of 350 ppbv, and TCE concentrations in 6 of 14 HydroPunch samples collected from the shallowest groundwater were greater than the ACL of 5 µg/L (URS, 2012g). The highest TCE concentration in soil vapor was detected at Site P-1A at 20,000 ppbv; however, concentrations exceeding 10 times the cleanup standard were detected at all three sites. Although SVE was conducted at Sites P-1A, P-1B, and P-1C between 1998 and 2002, TCE concentrations in soil vapor have rebounded. The rebound likely is due to diffusion and advection of TCE desorbed from silt and clay deposits to more permeable sandy deposits and/or volatilization from the groundwater.

Table 6-7. Issues Identified for OU 2 Soil Sites During This Five-Year Review, Recommendations, and Follow-Up Actions, Sharpe Site

Issues	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Current Protective-ness (Yes/No)	Affects Future Protectiveness (Yes/No)
Sites P-1A, P-1B, and P-1C. TCE concentrations in soil vapor samples collected in 2011 indicate that residual TCE mass present in the vadose zone at Sites P-1A, P-1B, and P-1C may pose a threat to groundwater quality and human health.	Conduct soil vapor sampling at Sites P-1A, P-1B and P-1C to delineate the extent of TCE concentrations in the vadose zone greater than the cleanup standard and evaluate whether further remedial action is needed to prevent degradation of groundwater.	DLA	EPA, DTSC, CVWB	31 December 2015	No	Yes
Site S-33/29. Radiological detections at Site S-33/29 have not been fully characterized.	Complete investigation of the area of potential radiological concern at Site S-33/29; select, document, and implement remedial action, if necessary; and ensure remedy is consistent with the OU 2 ROD remedy, as amended, for metals sites.	DLA	EPA, DTSC, CVWB	31 December 2015	No, with respect to metals contamination	Unknown
Other Issue						
Site P-1G. Based on 2011 soil vapor samples, 1,3-butadiene, a VOC that is not a Sharpe Site COC, is the dominant contributor to cumulative risk estimates greater than the de minimis threshold of 1×10^{-6} cancer risk at Site P-1G.	Install and sample VMWs at Site P-1G to determine whether 1,3-butadiene detected is actually present at the site. Recalculate the risk at Site P-1G to determine whether the LUCs can be terminated.	DLA	EPA, DTSC, CVWB	31 December 2013	No	No

COC = contaminant of concern
CVWB = Central Valley Regional Water Quality Control Board
DLA = Defense Logistics Agency
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
LUC = land use control
OU = operable unit
ROD = record of decision
TCE = trichloroethene
VMW = vapor monitoring well
VOC = volatile organic compound

Recommendation. Conduct additional soil vapor sampling at Sites P-1A, P-1B and P-1C to delineate the extent of TCE concentrations in the vadose zone greater than the OU 2 ROD cleanup standard, and evaluate whether further remedial action is needed to prevent degradation of groundwater. Three groundwater monitoring wells (MW328A, MW329A, MW330A) installed in the shallow A Zone in September 2012 are being sampled quarterly during the 2013 monitoring period. Initial sample results less than the TCE ACL at all three wells during the 4Q12 sampling event suggest that residual TCE mass is not migrating to groundwater at concentrations greater than the ACL.

Status. The additional soil vapor sampling at Sites P-1A, P-1B, and P-1C was conducted in July and August 2014 in accordance with the *Work Plan for Sampling at Operable Unit 2 TCE Sites P-1A, P-1B, and P-1C, Defense Distribution Depot San Joaquin–Sharpe Site* (URS, 2014b). Results will be documented in a forthcoming report. In addition, TCE has not been detected at concentrations greater than the ACL at MW328A, MW329A, or MW330A in samples collected through 3Q13.

6.9.1.2 Site S-33/29

Issue. Radiological detections at Site S-33/29 have not been fully characterized. What, if any, effect the radiological detections may have on the OU 2 remedy has not been determined.

Recommendation. Complete investigation of the area of potential radiological concern at Site S-33/29. Document findings and selected remedial action, if any, in appropriate document(s) to the signatories of the FFA. Ensure that the remedial action is consistent with the OU 2 ROD remedy, as amended, for metals sites.

6.9.2 Issue Identified and Recommendation Completed Prior to Finalization of Third Five-Year Review

6.9.2.1 Site P-1G

Issue. In analysis of 2011 soil vapor data, 1,3-butadiene emerged as the dominant contributor to the cumulative risk estimates for 11 of the 12 samples collected from Site P-1G and is responsible, by itself, for risk estimates greater than the de minimis threshold of 1×10-6 cancer risk (URS, 2012g). However, this VOC has not been historically associated with the Sharpe Site, nor are there any known or suspected sources of this compound associated with Sharpe Site operations. Monitoring to confirm the presence or absence of 1,3-butadiene in soil vapor at Site P-1G is needed. However, human health and the environment are protected because LUCs are in place and effective, and 1,3-butadiene has never been detected in groundwater at the Sharpe Site.

Recommendation. Perform confirmation sampling at Site P-1G to determine if 1,3-butadiene detected in soil vapor samples collected in 2011 is actually present at the site. A work plan for the installation and sampling of two VMWs has been prepared (URS, 2013e). Both VMWs will be sampled four times in the 6-month period following construction. Following completion of the sampling, the potential risk to human health from the vapor intrusion pathway will be recalculated to determine whether LUCs can be terminated.

Status. Soil vapor samples were collected from each of two VMWs installed at Site P-1G in two sampling events during 2013. 1,3-Butadiene was less than the method detection limit in all samples collected. DLA submitted a Memorandum to the Site File that included the VMW sample results and revised risk estimates and documented regulatory agency concurrence with termination of LUCs and no further action at Site P-1G (DLA, 2013).

6.10 Protectiveness Statement

The remedy for OU 2 protects human health and the environment in the short term. For the OU 2 remedies to be protective in the long term, the following actions need to be taken: delineate the extent of TCE concentrations in the vadose zone greater than the soil vapor cleanup standard and evaluate the need and feasibility for remedial action (SVE) at Sites P-1A, P-1B, and P-1C, and collect additional soil vapor samples in the MW326 cluster area to determine whether remedial action is warranted and establish this area as a new OU 2 site with LUCs. Furthermore, the area of potential radiological concern at Site S-33/29 needs to be investigated to determine whether a remedial action is necessary and feasible.

6.11 Next Five-Year Review

The fourth five-year review for the Sharpe Site will evaluate the remedies at TCE Sites P-1A, P-1B, P-1C, P-1G, and P-5A and metals Sites S-3, S-26, S-30, S-33/29, and S-36 for the time period between 2013 and 2017 and is required to be completed no later than five years from the date of this final third five-year review. Because Sites P-1D, P-1E, P-1F, P-2A, P-2B, P-3A, P-4A, P-4B, P-4C, P-6A, and P-8A are suitable for unlimited use and unrestricted exposure, these sites will not be evaluated in future five-year reviews for the Sharpe Site.

Photo 1. Sites P-1A, P-1B, and P-1C

Photo 2. Site P-1G

Photo 3. SVE System at Site P-5A

Photo 4. Site S-3

Photo 5. Site S-26

Photo 6. Site S-30

Photo 7. Site S-33/29

Photo 8. Site S-36

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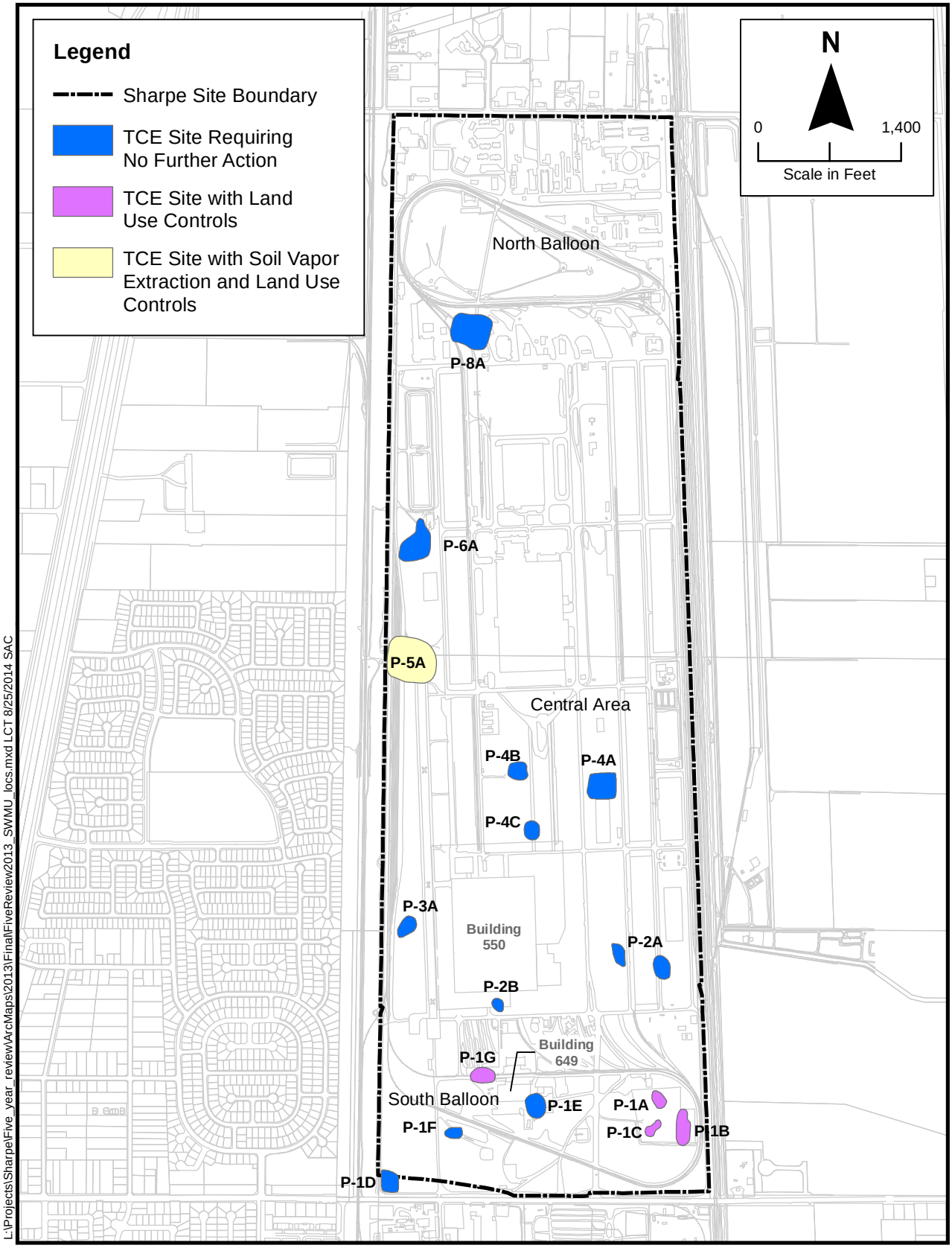

Figure 6-1. Status of TCE Soil Sites, Sharpe Site

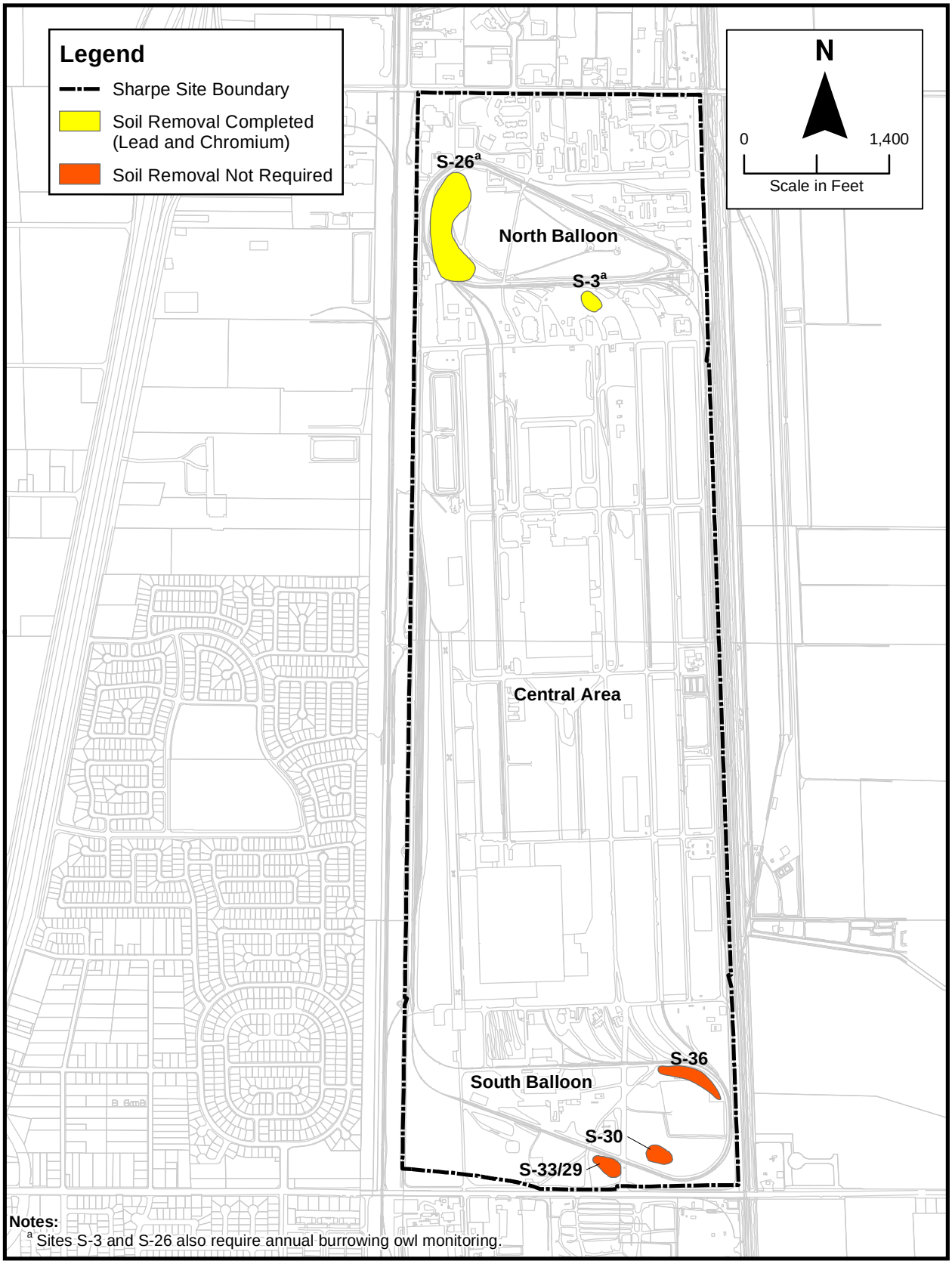

Figure 6-2. Metals Soil Sites with Land Use Controls, Sharpe Site

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APPENDIX A

Interview Records

DEFENSE LOGISTICS AGENCY
DLA INSTALLATION SUPPORT AT SAN JOAQUIN
P.O. BOX 960001
STOCKTON, CALIFORNIA 95296-0001

Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833, or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Maurice Benson
Affiliation	DLA San Joaquin Remedial Project Manager
Date	8Feb13

1. **What is your overall impression of the remedies selected for the Sharpe Site's Installation Restoration Program (IRP) (e.g., excavation, soil vapor extraction, groundwater extraction and treatment, and land use controls)?**

Considering the nature and extent of the contamination and the limited availability of funding, it is more than adequate.

2. **Are the groundwater and soil remedies functioning as expected? How well are the remedies performing? Do you have any concerns regarding the function of these remedies?**

The remedies seem to functioning to meet reasonable expectations. The groundwater extraction system by nature becomes less efficient and cost-effective over time. However, there are no viable alternative remedies available within the government budget process.

3. **What do the groundwater and soil vapor monitoring data show? Are there any trends that show contaminant levels are decreasing?**

Absolutely. Groundwater contaminant concentrations are decreasing overall. We are constantly looking for ways to optimize the treatment systems and reduce sources wherever possible.

4. **Have there been unexpected operations and maintenance (O&M) difficulties or costs at the Sharpe Site since startup or in the last 5 years? If so, please provide details.**

No. Any O & M difficulties have been generally foreseen and planned for due to the age of the system.

5. **Has the Sharpe Site been in compliance with permitting and reporting requirements?**

Absolutely. It's always been our highest priority.

6. **Has the Sharpe Site reported the status of land use controls as required? What type of monitoring is currently being conducted or has been conducted to determine land us control compliance? Have any deficiencies or violations of the land use controls occurred?**

The areas with LUCs are inspected regularly. There has been no construction or any proposed construction on sites with LUCs. It should be noted that as contamination has abated, we were able to reduce the number of LUC sites.

7. **Do you have any comments, suggestions, or recommendations regarding implementation of the IRP remedies, or how the program has been conducted in general?**

No. Nothing that increased funding and/or relaxed regulatory processes couldn't improve.

8. Do you have any comments or recommendations about the operation of the IRP remedies related to future effectiveness or optimization of operations?

No, because the effectiveness is constantly being monitored and processes optimized to the degree only limited by available funding or protracted regulatory processes.

9. What is your single greatest concern regarding ongoing performance of the IRP remedies?

The lack of discharge capacity which limits the number and/or flow rates of extraction wells which has a direct impact on the time to achieve complete cleanup of the existing contamination.

10. Have any new or emerging contaminants of concern been identified? If so, have they impacted the effectiveness of the remedies?

Some new contaminants have been identified, none of which directly impacts the effectiveness of the remedies. An example would be the radium 226 found in an area of existing land use controls

11. Would you say that operations and maintenance and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

The increase or decrease in sampling frequency of appropriate wells is proposed on an annual basis to the regulatory agencies with general agreement most of the time. This has resulted in an overall cost reduction.

Thank you for your feedback.

If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

8 February 2013

TIFFANY MENDOZA
URS Corporation
2870 Gateway Oaks Drive, Suite 150
Sacramento, California 95833

FIVE-YEAR REVIEW COMMUNITY INTERVIEW, DEFENSE LOGISTICS AGENCY, DEFENSE DISTRIBUTION DEPOT SAN JOAQUIN, SHARPE SITE

Dear Mr. Benson:

I have completed the attached 2013 Five-Year Review Survey, dated 28 January 2013, and mailed by Annette Silva of the Defense Logistics Agency Enterprise Support (DLA). The survey is for the third Five-Year Review of the cleanup remedies implemented at DLA's supply depot located in the city of Lathrop, San Joaquin County. The attachment includes a copy of the three-page survey and a separate page with my answers to the 11 survey questions.

If you have any questions, please contact me at (916) 464-4675, or by email at jbrownell@waterboards.ca.gov.

Sincerely,

James R. Brownell

James R. Brownell, P.G.
Associate Engineering Geologist

cc: Mr. John Lucey, USEPA Region 9, San Francisco
Mr. Christopher Sherman, DTSC Region 1, Sacramento
Mr. Maurice Benson, DLA, Tracy
Ms. Annette Silva, DLA, Tracy
Ms. Nanette Werner, DLA, Fort Belvoir, Virginia
Mr. Gregory Korose, URS, Sacramento

Attachment

Defense Distribution Depot San Joaquin, Sharpe Site
Five-Year Review Community Interview
James R. Brownell
Central Valley Regional Water Quality Control Board
8 February 2013

1. The remedy for groundwater cleanup has been very effective at reducing the concentrations of volatile organic compounds (VOCs). By pumping groundwater from wells, treating it above ground, and then allowing the cleaned groundwater to percolate back into the ground, DLA has greatly reduced the VOC concentrations that remain. Excavation and offsite disposal of soil contaminated with metals appears to have removed most of the contamination at sites where DLA has implemented this remedy. While soil vapor extraction (SVE) has been effective at reducing the VOC concentrations in soil vapor to levels that no longer threaten groundwater, it has been less effective at reducing concentrations to safe levels for human inhalation. The inhalation pathway was not anticipated when the State and Federal agencies signed the Record of Decision (ROD) for soil cleanup. Subsequently, Land Use Controls (LUCs) have been implemented in areas where VOC concentrations in soil vapor are a human health concern; also, LUCs have been implemented in areas that are above existing VOC plumes in groundwater because VOCs could volatilize and enter soil vapor.
2. In some areas, VOCs are not being captured by the groundwater extraction remedy and have migrated off of the depot property. Also, unrestricted use of some soil sites contaminated by VOCs is not possible at this time because of the human inhalation risk.
3. Decreasing VOC concentration trends have been observed in groundwater. Decreasing VOC trends in soil vapor have been observed in areas where the SVE remedy has been implemented. However, it may be too soon to observe residual VOC concentration trends in areas where SVE has been shut down and LUCs have been implemented.
4. There have been various operation and maintenance difficulties typical of groundwater extraction and SVE systems; however, there have been few if any unexpected difficulties.
5. During the last five years, the Sharpe Site has been in compliance.
6. To my knowledge, DLA has complied with reporting requirements for LUCs. Also, it is my belief that DLA performed regular, periodic inspections of LUC requirements.
7. I have none at this time.
8. I anticipate that DLA will be able to determine whether or not other remedies, such as monitored natural attenuation, are feasible and can be added to the RODs.
9. Threat to human health from exposure to VOCs in drinking water is a concern; continued implementation of the October 2009 Revision of the Sharpe Site Potable Water Contingency Plan and the June 2010 Off-Depot Potable Well Contingency Plan is essential due to the new USEPA Regional Screening Level for TCE in tap water. Revision of the June 2010 *Notification*, *Trigger*, and *Action* levels for TCE is necessary and should be implemented as soon as possible.
10. In 2011, DLA detected 1,3-butadiene in soil vapor samples during a VOC investigation at one of the southern soil contamination sites. This contaminant detection may have been the result of certain sampling equipment use and may not have actually been in the soil vapor samples. DLA plans to resample the site in early 2013.
11. Infiltration pond discharge capacity should be increased, should one of the ponds become unusable. In January 2013, the Central Area north pond began to leak. This caused DLA to temporarily shut off some groundwater extraction wells. To avoid such shutdowns in the future, DLA should implement its plan to expand the Building 404 percolation pond as soon as possible.

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DLA INSTALLATION SUPPORT AT SAN JOAQUIN
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Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833, or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Chris Sherman
Affiliation	DTSC
Date	02/11/2013

1. **What is your overall impression of the remedies selected for the Sharpe Site's Installation Restoration Program (IRP) (e.g., excavation, soil vapor extraction, groundwater extraction and treatment, and land use controls)?**

The remedies selected are appropriate for the COCs, their concentrations, and the sites intended use.

2. **Are the groundwater and soil remedies functioning as expected? How well are the remedies performing? Do you have any concerns regarding the function of these remedies?**

The remedies are performing well however offsite groundwater contamination is a concern.

3. **What do the groundwater and soil vapor monitoring data show? Are there any trends that show contaminant levels are decreasing?**

The trends generally show that contaminant concentrations in both groundwater and soil vapor are decreasing.

4. **Have there been unexpected operations and maintenance (O&M) difficulties or costs at the Sharpe Site since startup or in the last 5 years? If so, please provide details.**

There have been minor glitches typical of all complicated treatment systems. Nothing severe and all corrected quickly.

5. Has the Sharpe Site been in compliance with permitting and reporting requirements?

Yes, the Site has been in compliance.

6. Has the Sharpe Site reported the status of land use controls as required? What type of monitoring is currently being conducted or has been conducted to determine land us control compliance? Have any deficiencies or violations of the land use controls occurred?

Yes, the status has been reported as required. The typical LUC monitoring undertaken is an annual inspection. No violations to my knowledge.

7. Do you have any comments, suggestions, or recommendations regarding implementation of the IRP remedies, or how the program has been conducted in general?

The program has been managed very professionally and the remedies have been designed and implemented as specified in the decision documents.

8. Do you have any comments or recommendations about the operation of the IRP remedies related to future effectiveness or optimization of operations?

Not at this time other than I have confidence that DLA will approach any remedy refinements in a professional manner and communicate their actions well.

9. What is your single greatest concern regarding ongoing performance of the IRP remedies?

Off-site migration of contaminated groundwater impacting drinking water. Not fully maintaining hydraulic control of the contaminant plume.

10. Have any new or emerging contaminants of concern been identified? If so, have they impacted the effectiveness of the remedies?

The recent detection of 1,3-butadiene is the only new potential COC identified. No impact on remedy effectiveness has been noted.

11. Would you say that operations and maintenance and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Yes, I would say that O & M and sampling have been optimized. DLA and their contractor have been very responsive in sharing O & M information with stakeholders and repairing or upgrading equipment to keep operations running smoothly.

Thank you for your feedback.

If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email .

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Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833, or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	John Clark, P.E.
Affiliation	URS Group, Inc.
Date	28 January 2013

1. **What is your overall impression of the remedies selected for the Sharpe Site's Installation Restoration Program (IRP) (e.g., excavation, soil vapor extraction, groundwater extraction and treatment, and land use controls)?**

The selected remedies seem appropriate. Proposed additions to the remedy selection should enhance the remedial effort.

2. **Are the groundwater and soil remedies functioning as expected? How well are the remedies performing? Do you have any concerns regarding the function of these remedies?**

The selected remedies are functioning as planned and expected.

3. **What do the groundwater and soil vapor monitoring data show? Are there any trends that show contaminant levels are decreasing?**

Both the groundwater and soil vapor monitoring data show overall decreasing concentration trends within the active treatment areas, while rebound has occurred in some inactive treatment areas, as would be expected.

4. **Have there been unexpected operations and maintenance (O&M) difficulties or costs at the Sharpe Site since startup or in the last 5 years? If so, please provide details.**

Discharge capacity for the groundwater treatment systems has been a difficulty since discharge capacity was reduced due to changing regulatory requirements that eliminated offsite discharge.

5. Has the Sharpe Site been in compliance with permitting and reporting requirements?

Yes, with the exception of infrequent pH excursions slightly above treated groundwater discharge limits. Because the treated groundwater is recharged to the ground on site, the excursions should not be a concern and no impact to the groundwater has been identified.

6. Has the Sharpe Site reported the status of land use controls as required? What type of monitoring is currently being conducted or has been conducted to determine land us control compliance? Have any deficiencies or violations of the land use controls occurred?

The status of land use controls are reported in the FFA annual report. Land use control signs were installed in 2012 and will be inspected annually. No unauthorized excavation or other land disturbance has occurred within the land use control areas.

7. Do you have any comments, suggestions, or recommendations regarding implementation of the IRP remedies, or how the program has been conducted in general?

The IRP program seems to be proceeding as expected, with an appropriate level of regulatory oversight. As the program is in the long-term O&M and monitoring phase, dramatic changes are not expected.

8. Do you have any comments or recommendations about the operation of the IRP remedies related to future effectiveness or optimization of operations?

Implementation of proposed additions to the groundwater remedy for in-situ dechlorination should proceed to help reduce cleanup time. Minor modifications of the groundwater pump and treat remedy are expected as plume concentrations change.

9. What is your single greatest concern regarding ongoing performance of the IRP remedies?

Sufficient funding to maintain aging systems.

10. Have any new or emerging contaminants of concern been identified? If so, have they impacted the effectiveness of the remedies?

No.

11. Would you say that operations and maintenance and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Yes. Significant cost saving have occurred due to reductions in groundwater monitoring well sampling to reflect plume stability. The groundwater pump and treat remedy has been optimized for plume containment, and to address rebound with inactive treatment areas. Continued monitoring for natural attenuation will help with evaluation of plume containment in areas without active remediation.

Thank you for your feedback.

If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

DEFENSE LOGISTICS AGENCY
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Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833, or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Andrew Archuleta
Affiliation	On-Site Manager
Date	2/14/13

1. **What is your overall impression of the remedies selected for the Sharpe Site's Installation Restoration Program (IRP) (e.g., excavation, soil vapor extraction, groundwater extraction and treatment, and land use controls)?**

My impression is that the implemented remedies are effective.

2. **Are the groundwater and soil remedies functioning as expected? How well are the remedies performing? Do you have any concerns regarding the function of these remedies?**

Yes, the groundwater and soil remedies are functioning as expected.

3. **What do the groundwater and soil vapor monitoring data show? Are there any trends that show contaminant levels are decreasing?**

Data show that contaminant levels are decreasing at most groundwater and soil vapor monitoring wells.

4. **Have there been unexpected operations and maintenance (O&M) difficulties or costs at the Sharpe Site since startup or in the last 5 years? If so, please provide details.**

The aging Groundwater Treatment Systems demand increased frequency of inspections, maintenance, and the replacement of equipment and parts.

5. **Has the Sharpe Site been in compliance with permitting and reporting requirements?**

Yes, with the exception of a couple of high pH readings that were recorded during biweekly groundwater treatment plant sampling of the effluent sampling ports.

6. **Has the Sharpe Site reported the status of land use controls as required? What type of monitoring is currently being conducted or has been conducted to determine land us control compliance? Have any deficiencies or violations of the land use controls occurred?**

Yes. Annual monitoring has been performed per the OU2 ROD Amendment. No deficiencies or violations of the land use controls have occurred.

7. **Do you have any comments, suggestions, or recommendations regarding implementation of the IRP remedies, or how the program has been conducted in general?**

No.

8. Do you have any comments or recommendations about the operation of the IRP remedies related to future effectiveness or optimization of operations?

No.

9. What is your single greatest concern regarding ongoing performance of the IRP remedies?

No concerns.

10. Have any new or emerging contaminants of concern been identified? If so, have they impacted the effectiveness of the remedies?

No new COCs have been identified, but there have been a few locations that have shown either increased levels of COCs or unexpected expansion of plumes. These items have been identified and proper controls and/or plans for mitigation have been implemented.

11. Would you say that operations and maintenance and/or sampling efforts have been optimized? Please describe how improved efficiency has or has not occurred.

Optimization is continually being evaluated; operations are changing based on data collection and investigation such as CPT investigations and off-base private well production well analysis.

Thank you for your feedback.

If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

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Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833 or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Omar Ornelas
Affiliation	City of Lathrop
Date	5-8-13

1. **How long have you lived, worked, or been associated with the community adjacent to the Sharpe Site? What is your current role as it relates to the site (e.g., are you a local resident, local business representative, city council member, etc.)?**

   21 years
   Vice-Mayor & local Resident

2. **What is your overall impression of the environmental work conducted at the Sharpe Site to date?**

   Not to informed; first live heard of this so no feelings.

3. **What effects have Sharpe Site environmental operations had on the surrounding community?**

   First live heard of these actions and measures being done.
   No opinion.

4. **Are you aware of any community concerns regarding the Sharpe Site or its environmental operation and administration? If so, please give details.**

NO

5. **Do you feel well informed about the Sharpe Site's environmental cleanup activities and progress?**

No, first time heard of this.

6. **Do you have any comments, suggestions, or recommendations regarding the Sharpe Site's environmental management or operation?**

Try to get more information out to the community.

Thank you for your feedback.

Your response will help ensure continued community awareness of ongoing environmental restoration efforts. If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

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Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833 or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Greg Gibson
Affiliation	City of Lathrop
Date	1/30/13

1. **How long have you lived, worked, or been associated with the community adjacent to the Sharpe Site? What is your current role as it relates to the site (e.g., are you a local resident, local business representative, city council member, etc.)?**

I have worked for almost ten years as a civil engineer in the City of Lathrop Public Works Department. I have worked on some water studies and a well replacement project that were related to the Sharpe site

2. **What is your overall impression of the environmental work conducted at the Sharpe Site to date?**

It appears that Sharpe is doing a good job cleaning up the environmental contamination at the site.

3. **What effects have Sharpe Site environmental operations had on the surrounding community?**

The City had to install a replacement well, Well 10, for City's Well 5 that was threatened by contaminated GW from the Sharpe site

4. **Are you aware of any community concerns regarding the Sharpe Site or its environmental operation and administration? If so, please give details.**

No.

5. **Do you feel well informed about the Sharpe Site's environmental cleanup activities and progress?**

Yes, this outreach letter, survey and newsletter makes me feel well informed.

6. **Do you have any comments, suggestions, or recommendations regarding the Sharpe Site's environmental management or operation?**

No.

Thank you for your feedback.

Your response will help ensure continued community awareness of ongoing environmental restoration efforts. If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

DEFENSE LOGISTICS AGENCY
DLA INSTALLATION SUPPORT AT SAN JOAQUIN
P.O. BOX 960001
STOCKTON, CALIFORNIA 95296-0001

Defense Distribution Depot San Joaquin – Sharpe Site (Sharpe Site) 2013 Five-Year Review Survey

Please answer the following questions and return this survey by mail or email to Tiffany Mendoza, 2870 Gateway Oaks Drive, Ste. 150, Sacramento, CA 95833 or tiffany.mendoza@urs.com by **February 6, 2013**.

Name	Jason Messer
Affiliation	Manteca Unified
Date	1/31/13

1. **How long have you lived, worked, or been associated with the community adjacent to the Sharpe Site? What is your current role as it relates to the site (e.g., are you a local resident, local business representative, city council member, etc.)?**

   12 years - Superintendent of Manteca Unified,

2. **What is your overall impression of the environmental work conducted at the Sharpe Site to date?**

   Unknown I have not been ~~[illegible]~~ past.

3. **What effects have Sharpe Site environmental operations had on the surrounding community?**

   Aware of some traffic issues but seem to be minor.

4. **Are you aware of any community concerns regarding the Sharpe Site or its environmental operation and administration? If so, please give details.**

No.

5. **Do you feel well informed about the Sharpe Site's environmental cleanup activities and progress?**

No.

6. **Do you have any comments, suggestions, or recommendations regarding the Sharpe Site's environmental management or operation?**

No.

Thank you for your feedback.

Your response will help ensure continued community awareness of ongoing environmental restoration efforts. If you have any questions about this survey or the work being performed, please contact Tiffany Mendoza, Public Affairs Specialist, by telephone at (916) 679-2376, or via email at tiffany.mendoza@urs.com.

APPENDIX B

Site Inspection Forms

Site Inspection Checklist

I. SITE INFORMATION	
Site name: OU 1 Groundwater Treatment Plants (North, South, Central)	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- o Institutional controls
- ✓ Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

4. **Other interviews** (optional) o Report attached.

*See appendix for Interviews.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ✓ O&M manual — ✓ Readily available — o Up to date — o N/A
   - ✓ As-built drawings — ✓ Readily available — o Up to date — o N/A
   - ✓ Maintenance logs — ✓ Readily available — ✓ Up to date — o N/A

   Remarks

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

   Remarks

3. **O&M and OSHA Training Records** — ✓ Readily available — ✓ Up to date — o N/A

   Remarks

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - ✓ Effluent discharge — ✓ Readily available — ✓ Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits ____ — o Readily available — o Up to date — o N/A

   Remarks

5. **Gas Generation Records** — o Readily available — o Up to date — ✓ N/A

   Remarks

6. **Settlement Monument Records** — o Readily available — o Up to date — ✓ N/A

   Remarks

7. **Groundwater Monitoring Records** — ✓ Readily available — ✓ Up to date — o N/A

   Remarks

8. **Leachate Extraction Records** — o Readily available — o Up to date — ✓ N/A

   Remarks

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - ✓ Water (effluent) — ✓ Readily available — ✓ Up to date — o N/A

   Remarks

10. **Daily Access/Security Logs** — o Readily available — o Up to date — ✓ N/A

    Remarks GWTPs are located on site, which has 24-hour security.

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Other_____

o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility

2. **O&M Cost Records**

o Readily available o Up to date
✓ Funding mechanism/agreement in place
Original O&M cost estimate ——— o Breakdown attached

Total annual cost by year for review period if available

From 10/2007 (Date)	To 9/2008 (Date)	991,275 (Total cost)	o Breakdown attached
From 10/2008 (Date)	To 9/2009 (Date)	1,107,899 (Total cost)	o Breakdown attached
From 10/2009 (Date)	To 9/2010 (Date)	1,188,675 (Total cost)	o Breakdown attached
From 10/2010 (Date)	To 9/2011 (Date)	1,610,166 (Total cost)	o Breakdown attached
From 10/2011 (Date)	To 9/2012 (Date)	1,237,889 (Total cost)	o Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map ✓ Gates secured o N/A

Remarks_____

B. Other Access Restrictions

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

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented o Yes o No o N/A

Site conditions imply ICs not being fully enforced o Yes o No o N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date o Yes o No o N/A

Reports are verified by the lead agency o Yes o No o N/A

Specific requirements in deed or decision documents have been met o Yes o No o N/A

Violations have been reported o Yes o No o N/A

Other problems or suggestions: o Report attached

ICs are not formalized, an ESD is currently being prepared to implement ICs for groundwater.

2. **Adequacy** o ICs are adequate o ICs are inadequate ✓ N/A

Remarks See above

D. General

1. **Vandalism/trespassing** o Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads o Applicable o N/A

1. **Roads damaged** o Location shown on site map o Roads adequate o N/A

Remarks

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** O Location shown on site map O No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ O No obstructions
O Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
O No evidence of excessive growth
O Vegetation in channels does not obstruct flow
O Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations O Applicable O N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES ✓ Applicable ○ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ✓ Applicable ○ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ✓ Good condition ✓ All required wells properly operating ○ Needs Maintenance ○ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ✓ Good condition ✓ Needs Maintenance
   Remarks Central Area Percolation pond had Minor leak that was temporarily fixed. Need permanent fix. Also need more discharge capacity.

3. **Spare Parts and Equipment**
   ✓ Readily available ✓ Good condition ○ Requires upgrade ○ Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ○ Applicable ✓ N/A

1. **Collection Structures, Pumps, and Electrical**
   ○ Good condition ○ Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ○ Good condition ○ Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   ○ Readily available ○ Good condition ○ Requires upgrade ○ Needs to be provided
   Remarks

C. Treatment System ✓ Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   ✓ Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   ✓ Good condition o Needs Maintenance
   ✓ Sampling ports properly marked and functional
   ✓ Sampling/maintenance log displayed and up to date
   ✓ Equipment properly identified
   ✓ Quantity of groundwater treated annually 292,974,000 (2012)
   o Quantity of surface water treated annually_____
   Remarks_____

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

3. **Tanks, Vaults, Storage Vessels**
   o N/A ✓ Good condition o Proper secondary containment o Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   o N/A ✓ Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   ✓ Properly secured/locked o Functioning ✓ Routinely sampled ✓ Good condition
   ✓ All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The GWTS is designed to capture the COC plumes; "Mitigate potential long-term contaminant migration and protect human health and the environment." The GWTP has been effective in the past 5 years. There are areas of partial capture that are being evaluated.

Preparing ESD to Implement LUCs; planned for completion in mid-2013.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The GWTS are >15 years old. The SCADA computers and program are in need of replacement. An effort is funded to update the systems to improve data capture and operations.

Limited effluent discharge (perc ponds) is available to provide optimized extraction and avoid high water levels in perc ponds during rainy season.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None. SCADA software/computers were outdated and failing. Software/computers are being updated currently. Perc Pond (North-Central Area Perc Pond) had leak in early 2013 due to ground squirrel burrows. A permanent fix is planned in 2013.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Preparing ESD to add in situ remediation to P&T remedy. The in situ remedy would be focused in the A/B aquitard, which the P&T system is ineffective at remediating.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Sites P-1A, P-1B, P-1C	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks_____

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

   Remarks_____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks_____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits_____ — o Readily available — o Up to date — o N/A

   Remarks_____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks_____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks_____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks_____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks_____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks_____

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

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Other_____

o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A

Remarks_____

B. Other Access Restrictions

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

Remarks LUC signs are visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ○ Yes ✓ No ○ N/A

Site conditions imply ICs not being fully enforced ○ Yes ✓ No ○ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes ○ No ○ N/A

Reports are verified by the lead agency ✓ Yes ○ No ○ N/A

Specific requirements in deed or decision documents have been met ✓ Yes ○ No ○ N/A

Violations have been reported ○ Yes ○ No ✓ N/A

Other problems or suggestions: ○ Report attached

2. **Adequacy** ✓ ICs are adequate ○ ICs are inadequate ○ N/A

Remarks

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ○ Applicable ✓ N/A

1. **Roads damaged** ○ Location shown on site map ○ Roads adequate ○ N/A

Remarks

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	o Wet areas/water damage not evident	
	o Wet areas	o Location shown on site map	Areal extent_____
	o Ponding	o Location shown on site map	Areal extent_____
	o Seeps	o Location shown on site map	Areal extent_____
	o Soft subgrade	o Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** o Slides	o Location shown on site map	o No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	o Applicable	o N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	o Location shown on site map	o N/A or okay
	Remarks_____		
2.	**Bench Breached**	o Location shown on site map	o N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	o Location shown on site map	o N/A or okay
	Remarks_____		
C. Letdown Channels	o Applicable	o N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	o Location shown on site map	o No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	o Location shown on site map	o No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	o Location shown on site map	o No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** O Location shown on site map O No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ O No obstructions
O Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
O No evidence of excessive growth
O Vegetation in channels does not obstruct flow
O Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations O Applicable O N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines o Applicable o N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** o Good condition o All required wells properly operating o Needs Maintenance o N/A Remarks_____
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** o Good condition o Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** o Readily available o Good condition o Requires upgrade o Needs to be provided Remarks_____
B. Surface Water Collection Structures, Pumps, and Pipelines o Applicable o N/A	
1.	**Collection Structures, Pumps, and Electrical** o Good condition o Needs Maintenance Remarks_____
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** o Good condition o Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** o Readily available o Good condition o Requires upgrade o Needs to be provided Remarks_____

C. Treatment System o Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   o Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   o Good condition o Needs Maintenance
   o Sampling ports properly marked and functional
   o Sampling/maintenance log displayed and up to date
   o Equipment properly identified
   o Quantity of groundwater treated annually_____
   o Quantity of surface water treated annually_____
   Remarks_____

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

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

4. **Discharge Structure and Appurtenances**
   o N/A o Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   o Properly secured/locked o Functioning o Routinely sampled o Good condition
   o All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

LUCs are in place to prevent residential use of the site, thus preventing exposure to TCE contamination. The LUCs are effective and appropiate, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NA
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Re-implementation of SVE may reduce concentrations to acceptable residential levels.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site P-1G	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Manager (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks_____

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

   Remarks_____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks_____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits_____ — o Readily available — o Up to date — o N/A

   Remarks_____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks_____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks_____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks_____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks_____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks_____

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

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility
o Other_____

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** o Location shown on site map o N/A
Remarks LUC sign visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented o Yes ✓ No o N/A

Site conditions imply ICs not being fully enforced o Yes ✓ No o N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes o No o N/A

Reports are verified by the lead agency ✓ Yes o No o N/A

Specific requirements in deed or decision documents have been met ✓ Yes o No o N/A

Violations have been reported o Yes o No ✓ N/A

Other problems or suggestions: o Report attached

2. **Adequacy** ✓ ICs are adequate o ICs are inadequate o N/A

Remarks

D. General

1. **Vandalism/trespassing** o Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads o Applicable ✓ N/A

1. **Roads damaged** o Location shown on site map o Roads adequate o N/A

Remarks

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

E. Gas Collection and Treatment	o Applicable o N/A
1.	**Gas Treatment Facilities** o Flaring o Thermal destruction o Collection for reuse o Good condition o Needs Maintenance Remarks_____
2.	**Gas Collection Wells, Manifolds and Piping** o Good condition o Needs Maintenance Remarks_____
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) o Good condition o Needs Maintenance o N/A Remarks_____
F. Cover Drainage Layer	o Applicable o N/A
1.	**Outlet Pipes Inspected** o Functioning o N/A Remarks_____
2.	**Outlet Rock Inspected** o Functioning o N/A Remarks_____
G. Detention/Sedimentation Ponds	o Applicable o N/A
1.	**Siltation** Areal extent_____ Depth_____ o N/A o Siltation not evident Remarks_____
2.	**Erosion** Areal extent_____ Depth_____ o Erosion not evident Remarks_____
3.	**Outlet Works** o Functioning o N/A Remarks_____
4.	**Dam** o Functioning o N/A Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
o Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** o Functioning o N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines o Applicable o N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** o Good condition o All required wells properly operating o Needs Maintenance o N/A Remarks_____
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** o Good condition o Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** o Readily available o Good condition o Requires upgrade o Needs to be provided Remarks_____
B. Surface Water Collection Structures, Pumps, and Pipelines o Applicable o N/A	
1.	**Collection Structures, Pumps, and Electrical** o Good condition o Needs Maintenance Remarks_____
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** o Good condition o Needs Maintenance Remarks_____
3.	**Spare Parts and Equipment** o Readily available o Good condition o Requires upgrade o Needs to be provided Remarks_____

C. Treatment System	o Applicable o N/A
1.	**Treatment Train** (Check components that apply) o Metals removal o Oil/water separation o Bioremediation o Air stripping o Carbon adsorbers o Filters_____ o Additive (*e.g.*, chelation agent, flocculent)_____ o Others_____ o Good condition o Needs Maintenance o Sampling ports properly marked and functional o Sampling/maintenance log displayed and up to date o Equipment properly identified o Quantity of groundwater treated annually_____ o Quantity of surface water treated annually_____ Remarks_____
2.	**Electrical Enclosures and Panels** (properly rated and functional) o N/A o Good condition o Needs Maintenance Remarks_____
3.	**Tanks, Vaults, Storage Vessels** o N/A o Good condition o Proper secondary containment o Needs Maintenance Remarks_____
4.	**Discharge Structure and Appurtenances** o N/A o Good condition o Needs Maintenance Remarks_____
5.	**Treatment Building(s)** o N/A o Good condition (esp. roof and doorways) o Needs repair o Chemicals and equipment properly stored Remarks_____
6.	**Monitoring Wells** (pump and treatment remedy) o Properly secured/locked o Functioning o Routinely sampled o Good condition o All required wells located o Needs Maintenance o N/A Remarks_____
D. Monitoring Data	
1.	Monitoring Data o Is routinely submitted on time o Is of acceptable quality
2.	Monitoring data suggests: o Groundwater plume is effectively contained o Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

LUCs are in place to prevent residential use of the site, thus preventing exposure for TCE contamination. The LUCs are effective and appropiate, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

NA.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. N/A
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. LUCs may not be necessary, confirmation of detections of 1,3-butadiene in 2011 sample planned for 2013.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site P-5A	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA82I0020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- ✓ Other SVE
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	✓ O&M manual	✓ Readily available	o Up to date	o N/A
	o As-built drawings	✓ Readily available	o Up to date	o N/A
	o Maintenance logs	✓ Readily available	o Up to date	o N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	✓ Readily available	o Up to date	o N/A
	o Contingency plan/emergency response plan	✓ Readily available	o Up to date	o N/A
	Remarks			
3.	**O&M and OSHA Training Records**	✓ Readily available	o Up to date	o N/A
	Remarks			
4.	**Permits and Service Agreements**			
	o Air discharge permit	o Readily available	o Up to date	✓ N/A
	o Effluent discharge	✓ Readily available	o Up to date	o N/A
	o Waste disposal, POTW	o Readily available	o Up to date	✓ N/A
	o Other permits	o Readily available	o Up to date	✓ N/A
	Remarks			
5.	**Gas Generation Records**	o Readily available	o Up to date	✓ N/A
	Remarks			
6.	**Settlement Monument Records**	o Readily available	o Up to date	✓ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	o Readily available	o Up to date	✓ N/A
	Remarks			
8.	**Leachate Extraction Records**	o Readily available	o Up to date	✓ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	o Air	o Readily available	o Up to date	✓ N/A
	o Water (effluent)	o Readily available	o Up to date	✓ N/A
	Remarks			
10.	**Daily Access/Security Logs**	o Readily available	o Up to date	✓ N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   - o State in-house
   - o PRP in-house
   - o Federal Facility in-house
   - o Contractor for State
   - o Contractor for PRP
   - ✓ Contractor for Federal Facility
   - o Other_____

2. **O&M Cost Records**
   - ✓ Readily available
   - o Up to date
   - ✓ Funding mechanism/agreement in place

   Original O&M cost estimate_____ o Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ o Breakdown attached
   Date Date Total cost

   From_____ To_____ _____ o Breakdown attached
   Date Date Total cost

   From_____ To_____ _____ o Breakdown attached
   Date Date Total cost

   From_____ To_____ _____ o Breakdown attached
   Date Date Total cost

   From_____ To_____ _____ o Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** o Location shown on site map o N/A
   Remarks LUCs signs in place, visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented o Yes ✓ No o N/A

Site conditions imply ICs not being fully enforced o Yes ✓ No o N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes o No o N/A

Reports are verified by the lead agency ✓ Yes o No o N/A

Specific requirements in deed or decision documents have been met ✓ Yes o No o N/A

Violations have been reported o Yes o No ✓ N/A

Other problems or suggestions: o Report attached

2. **Adequacy** ✓ ICs are adequate o ICs are inadequate o N/A

Remarks

D. General

1. **Vandalism/trespassing** o Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads o Applicable ✓ N/A

1. **Roads damaged** o Location shown on site map o Roads adequate o N/A

Remarks

B. Other Site Conditions / SVE System

Remarks SVE system began operation in 2010. Currently in rebound status. Will be evaluated in 6 months.

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	o Wet areas/water damage not evident	
	o Wet areas	o Location shown on site map	Areal extent_____
	o Ponding	o Location shown on site map	Areal extent_____
	o Seeps	o Location shown on site map	Areal extent_____
	o Soft subgrade	o Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** o Slides	o Location shown on site map	o No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	o Applicable	o N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	o Location shown on site map	o N/A or okay
	Remarks_____		
2.	**Bench Breached**	o Location shown on site map	o N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	o Location shown on site map	o N/A or okay
	Remarks_____		
C. Letdown Channels	o Applicable	o N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	o Location shown on site map	o No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	o Location shown on site map	o No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	o Location shown on site map	o No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System	o Applicable o N/A
1.	**Treatment Train** (Check components that apply) o Metals removal o Oil/water separation o Bioremediation o Air stripping o Carbon adsorbers o Filters_____ o Additive (*e.g.*, chelation agent, flocculent)_____ o Others_____ o Good condition o Needs Maintenance o Sampling ports properly marked and functional o Sampling/maintenance log displayed and up to date o Equipment properly identified o Quantity of groundwater treated annually_____ o Quantity of surface water treated annually_____ Remarks_____
2.	**Electrical Enclosures and Panels** (properly rated and functional) o N/A o Good condition o Needs Maintenance Remarks_____
3.	**Tanks, Vaults, Storage Vessels** o N/A o Good condition o Proper secondary containment o Needs Maintenance Remarks_____
4.	**Discharge Structure and Appurtenances** o N/A o Good condition o Needs Maintenance Remarks_____
5.	**Treatment Building(s)** o N/A o Good condition (esp. roof and doorways) o Needs repair o Chemicals and equipment properly stored Remarks_____
6.	**Monitoring Wells** (pump and treatment remedy) o Properly secured/locked o Functioning o Routinely sampled o Good condition o All required wells located o Needs Maintenance o N/A Remarks_____
D. Monitoring Data	
1.	Monitoring Data o Is routinely submitted on time o Is of acceptable quality
2.	Monitoring data suggests: o Groundwater plume is effectively contained o Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

SVE system was installed and began operation in 2010. The system was installed to reduce TCE concentrations to <350 ppbv. Concentrations are at or below those levels and system is shut down for rebound evaluation. It has been effective; however, issues w/ rising water levels has reduced its effectiveness.

LUCs are in place to prevent residential use of the site, thus preventing exposure to TCE contamination. The LUCs are effective and appropriate, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

None

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NA
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Results from the rebound evaluation may allow the LUCs to be deleted from Site P-5A.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site S-3	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- ✓ Other burrowing owl monitoring
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks_____

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

   Remarks_____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks_____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits_____ — o Readily available — o Up to date — o N/A

   Remarks_____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks_____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks_____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks_____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks_____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks_____

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

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility
o Other_____

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A

Remarks_____

B. Other Access Restrictions

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

Remarks LUC sign visible and in good condition

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ○ Yes ✓ No ○ N/A

Site conditions imply ICs not being fully enforced ○ Yes ✓ No ○ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes ○ No ○ N/A

Reports are verified by the lead agency ✓ Yes ○ No ○ N/A

Specific requirements in deed or decision documents have been met ✓ Yes ○ No ○ N/A

Violations have been reported ○ Yes ○ No ✓ N/A

Other problems or suggestions: ○ Report attached

2. **Adequacy** ✓ ICs are adequate ○ ICs are inadequate ○ N/A

Remarks

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ○ Applicable ✓ N/A

1. **Roads damaged** ○ Location shown on site map ○ Roads adequate ○ N/A

Remarks

B. Other Site Conditions - Burrowing Owl Monitoring / Excavation

Remarks
No burrows (active or inactive) were located within S-3.

Site S-3 was excavated and documented in previous 5YR ~~report~~ as to acceptable industrial use levels.

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System o Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   o Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   o Good condition o Needs Maintenance
   o Sampling ports properly marked and functional
   o Sampling/maintenance log displayed and up to date
   o Equipment properly identified
   o Quantity of groundwater treated annually_____
   o Quantity of surface water treated annually_____
   Remarks_____

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

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

4. **Discharge Structure and Appurtenances**
   o N/A o Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   o Properly secured/locked o Functioning o Routinely sampled o Good condition
   o All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

- The LUCs are in place to prevent residential use of the Site, thus preventing exposure from lead and chromium contamination. The LUCs are effective and appropiate, no issues.
- The burrowing owl monitoring is in place to ensure that burrowing owls do not inhabit/breed in burrows within Site S-3. Two inspections are conducted yearly and have been effective
- ~~Excavation completed prior to 3rd 5YR.~~ (because of lead/chromium contamination)

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NA
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site S-26	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- ✓ Other Burrowing Owl Monitoring / excavation
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See Appendix for Interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	o O&M manual	o Readily available	o Up to date	o N/A
	o As-built drawings	o Readily available	o Up to date	o N/A
	o Maintenance logs	o Readily available	o Up to date	o N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	✓ Readily available	o Up to date	o N/A
	o Contingency plan/emergency response plan	o Readily available	o Up to date	o N/A
	Remarks			
3.	**O&M and OSHA Training Records**	✓ Readily available	o Up to date	o N/A
	Remarks			
4.	**Permits and Service Agreements**			
	o Air discharge permit	o Readily available	o Up to date	o N/A
	o Effluent discharge	o Readily available	o Up to date	o N/A
	o Waste disposal, POTW	o Readily available	o Up to date	o N/A
	o Other permits	o Readily available	o Up to date	o N/A
	Remarks			
5.	**Gas Generation Records**	o Readily available	o Up to date	o N/A
	Remarks			
6.	**Settlement Monument Records**	o Readily available	o Up to date	o N/A
	Remarks			
7.	**Groundwater Monitoring Records**	o Readily available	o Up to date	o N/A
	Remarks			
8.	**Leachate Extraction Records**	o Readily available	o Up to date	o N/A
	Remarks			
9.	**Discharge Compliance Records**			
	o Air	o Readily available	o Up to date	o N/A
	o Water (effluent)	o Readily available	o Up to date	o N/A
	Remarks			
10.	**Daily Access/Security Logs**	o Readily available	o Up to date	o N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility
o Other_____

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A

Remarks_____

B. Other Access Restrictions

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

Remarks LUC signs visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ○ Yes ✓ No ○ N/A

Site conditions imply ICs not being fully enforced ○ Yes ✓ No ○ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes ○ No ○ N/A

Reports are verified by the lead agency ✓ Yes ○ No ○ N/A

Specific requirements in deed or decision documents have been met ✓ Yes ○ No ○ N/A

Violations have been reported ○ Yes ○ No ✓ N/A

Other problems or suggestions: ○ Report attached

2. **Adequacy** ✓ ICs are adequate ○ ICs are inadequate ○ N/A

Remarks

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ○ Applicable ✓ N/A

1. **Roads damaged** ○ Location shown on site map ○ Roads adequate ○ N/A

Remarks

B. Other Site Conditions Burrowing Owl Monitoring / Excavation

Remarks
No burrows (active/inactive) were observed within S-26.

Site S-26 was excavated and documented in previous 5-Year Reviews to acceptable industrial use levels.

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
o Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

E. Gas Collection and Treatment	o Applicable o N/A
1.	**Gas Treatment Facilities** o Flaring o Thermal destruction o Collection for reuse o Good condition o Needs Maintenance Remarks_____
2.	**Gas Collection Wells, Manifolds and Piping** o Good condition o Needs Maintenance Remarks_____
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) o Good condition o Needs Maintenance o N/A Remarks_____
F. Cover Drainage Layer	o Applicable o N/A
1.	**Outlet Pipes Inspected** o Functioning o N/A Remarks_____
2.	**Outlet Rock Inspected** o Functioning o N/A Remarks_____
G. Detention/Sedimentation Ponds	o Applicable o N/A
1.	**Siltation** Areal extent_____ Depth_____ o N/A o Siltation not evident Remarks_____
2.	**Erosion** Areal extent_____ Depth_____ o Erosion not evident Remarks_____
3.	**Outlet Works** o Functioning o N/A Remarks_____
4.	**Dam** o Functioning o N/A Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System o Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   o Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   o Good condition o Needs Maintenance
   o Sampling ports properly marked and functional
   o Sampling/maintenance log displayed and up to date
   o Equipment properly identified
   o Quantity of groundwater treated annually_____
   o Quantity of surface water treated annually_____
   Remarks_____

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

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

4. **Discharge Structure and Appurtenances**
   o N/A o Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   o Properly secured/locked o Functioning o Routinely sampled o Good condition
   o All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

- The LUCs are in place to prevent residential use of the site, thus preventing exposure from lead and chromium contamination. The LUCs are effective and appropiate, no issues
- The burrowing owl monitoring is in place to ensure burrowing owls do not inhabit/breed in burrows within Site S-26 because of the lead/chromium contamination. Two inspections are conducted yearly and have been effective
- Excavation completed prior to 3rd 5YR.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. N/A
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site S-30	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See Appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks_____

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

   Remarks_____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks_____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits_____ — o Readily available — o Up to date — o N/A

   Remarks_____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks_____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks_____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks_____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks_____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks_____

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

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**
   - o State in-house
   - o PRP in-house
   - o Federal Facility in-house
   - o Contractor for State
   - o Contractor for PRP
   - ✓ Contractor for Federal Facility
   - o Other _____

2. **O&M Cost Records**
   - o Readily available
   - o Up to date
   - o Funding mechanism/agreement in place

   Original O&M cost estimate _____ o Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ o Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ o Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ o Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ o Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ o Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A

   Remarks _____

B. Other Access Restrictions

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

   Remarks LUC signs visible and in good condition

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ○ Yes ✓ No ○ N/A

Site conditions imply ICs not being fully enforced ○ Yes ✓ No ○ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes ○ No ○ N/A

Reports are verified by the lead agency ✓ Yes ○ No ○ N/A

Specific requirements in deed or decision documents have been met ✓ Yes ○ No ○ N/A

Violations have been reported ○ Yes ○ No ✓ N/A

Other problems or suggestions: ○ Report attached

2. **Adequacy** ✓ ICs are adequate ○ ICs are inadequate ○ N/A

Remarks

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ○ Applicable ✓ N/A

1. **Roads damaged** ○ Location shown on site map ○ Roads adequate ○ N/A

Remarks

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** O Location shown on site map O No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ O No obstructions
O Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
O No evidence of excessive growth
O Vegetation in channels does not obstruct flow
O Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations O Applicable O N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System o Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   o Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   o Good condition o Needs Maintenance
   o Sampling ports properly marked and functional
   o Sampling/maintenance log displayed and up to date
   o Equipment properly identified
   o Quantity of groundwater treated annually_____
   o Quantity of surface water treated annually_____
   Remarks_____

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

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

4. **Discharge Structure and Appurtenances**
   o N/A o Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   o Properly secured/locked o Functioning o Routinely sampled o Good condition
   o All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The LUCs are in place to prevent residential use of the site, thus preventing exposure from lead/chromium contamination. The LUCs are effective and appropiate, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site S-33/29	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks_____

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

   Remarks_____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks_____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits_____ — o Readily available — o Up to date — o N/A

   Remarks_____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks_____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks_____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks_____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks_____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks_____

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

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility
o Other_____

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map ✓ Gates secured o N/A

Remarks_____

B. Other Access Restrictions

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

Remarks LUC sign visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ○ Yes ✓ No ○ N/A

Site conditions imply ICs not being fully enforced ○ Yes ✓ No ○ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact	Maurice Benson	DLA RPM	24 January 2013	209.839.4065
	Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes ○ No ○ N/A

Reports are verified by the lead agency ✓ Yes ○ No ○ N/A

Specific requirements in deed or decision documents have been met ✓ Yes ○ No ○ N/A

Violations have been reported ○ Yes ○ No ✓ N/A

Other problems or suggestions: ○ Report attached

None

2. **Adequacy** ✓ ICs are adequate ○ ICs are inadequate ○ N/A

Remarks

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks None

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ○ Applicable ✓ N/A

1. **Roads damaged** ○ Location shown on site map ○ Roads adequate ○ N/A

Remarks

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** o Wet areas/water damage not evident

o Wet areas o Location shown on site map Areal extent_____

o Ponding o Location shown on site map Areal extent_____

o Seeps o Location shown on site map Areal extent_____

o Soft subgrade o Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** o Slides o Location shown on site map o No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches o Applicable o N/A

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

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

Remarks_____

2. **Bench Breached** o Location shown on site map o N/A or okay

Remarks_____

3. **Bench Overtopped** o Location shown on site map o N/A or okay

Remarks_____

C. Letdown Channels o Applicable o N/A

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

1. **Settlement** o Location shown on site map o No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. **Material Degradation** o Location shown on site map o No evidence of degradation

Material type_____ Areal extent_____

Remarks_____

3. **Erosion** o Location shown on site map o No evidence of erosion

Areal extent_____ Depth_____

Remarks_____

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

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

1. **Gas Treatment Facilities**
   o Flaring o Thermal destruction o Collection for reuse
   o Good condition o Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   o Good condition o Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   o Good condition o Needs Maintenance o N/A
   Remarks_____

F. Cover Drainage Layer o Applicable o N/A

1. **Outlet Pipes Inspected** o Functioning o N/A
   Remarks_____

2. **Outlet Rock Inspected** o Functioning o N/A
   Remarks_____

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

1. **Siltation** Areal extent_____ Depth_____ o N/A
   o Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   o Erosion not evident
   Remarks_____

3. **Outlet Works** o Functioning o N/A
   Remarks_____

4. **Dam** o Functioning o N/A
   Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System	o Applicable o N/A
1.	**Treatment Train** (Check components that apply) o Metals removal o Oil/water separation o Bioremediation o Air stripping o Carbon adsorbers o Filters_____ o Additive (*e.g.*, chelation agent, flocculent)_____ o Others_____ o Good condition o Needs Maintenance o Sampling ports properly marked and functional o Sampling/maintenance log displayed and up to date o Equipment properly identified o Quantity of groundwater treated annually_____ o Quantity of surface water treated annually_____ Remarks_____
2.	**Electrical Enclosures and Panels** (properly rated and functional) o N/A o Good condition o Needs Maintenance Remarks_____
3.	**Tanks, Vaults, Storage Vessels** o N/A o Good condition o Proper secondary containment o Needs Maintenance Remarks_____
4.	**Discharge Structure and Appurtenances** o N/A o Good condition o Needs Maintenance Remarks_____
5.	**Treatment Building(s)** o N/A o Good condition (esp. roof and doorways) o Needs repair o Chemicals and equipment properly stored Remarks_____
6.	**Monitoring Wells** (pump and treatment remedy) o Properly secured/locked o Functioning o Routinely sampled o Good condition o All required wells located o Needs Maintenance o N/A Remarks_____
D. Monitoring Data	
1.	Monitoring Data o Is routinely submitted on time o Is of acceptable quality
2.	Monitoring data suggests: o Groundwater plume is effectively contained o Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The land use controls are put into place to prevent residential use of the site, thus preventing exposure from lead/Chromium; The LUCs are effective, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Radiation contamination was discovered at the site in 2012. DLA currently evaluating site. A fence was contructed around site to prevent access.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site S-36	**Date of inspection: 24 January 2013**
Location and Region: DLA-Sharpe Site, CA	**EPA ID: CA8210020832**
Agency, office, or company leading the five-year review: URS	**Weather/temperature: Overcast / ~ 50° F**

Remedy Includes: (Check all that apply)

- o Landfill cover/containment
- o Access controls
- ✓ Institutional controls
- o Groundwater pump and treatment
- o Surface water collection and treatment
- o Other _____
- o Monitored natural attenuation
- o Groundwater containment
- o Vertical barrier walls

Attachments: ✓ Inspection team roster attached o Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Archuleta (Name) O&M Operator (Title) 1/24/2013 (Date)
   Interviewed ✓ at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached See appendix for interview

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed o at site o at office o by phone Phone no. _____
   Problems, suggestions; o Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; o Report attached _____
_____

4. **Other interviews** (optional) o Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - o O&M manual — o Readily available — o Up to date — o N/A
   - o As-built drawings — o Readily available — o Up to date — o N/A
   - o Maintenance logs — o Readily available — o Up to date — o N/A

   Remarks _____

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

   Remarks _____

3. **O&M and OSHA Training Records** — ✓ Readily available — o Up to date — o N/A

   Remarks _____

4. **Permits and Service Agreements**
   - o Air discharge permit — o Readily available — o Up to date — o N/A
   - o Effluent discharge — o Readily available — o Up to date — o N/A
   - o Waste disposal, POTW — o Readily available — o Up to date — o N/A
   - o Other permits _____ — o Readily available — o Up to date — o N/A

   Remarks _____

5. **Gas Generation Records** — o Readily available — o Up to date — o N/A

   Remarks _____

6. **Settlement Monument Records** — o Readily available — o Up to date — o N/A

   Remarks _____

7. **Groundwater Monitoring Records** — o Readily available — o Up to date — o N/A

   Remarks _____

8. **Leachate Extraction Records** — o Readily available — o Up to date — o N/A

   Remarks _____

9. **Discharge Compliance Records**
   - o Air — o Readily available — o Up to date — o N/A
   - o Water (effluent) — o Readily available — o Up to date — o N/A

   Remarks _____

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

    Remarks _____

IV. O&M COSTS

1. **O&M Organization**

o State in-house
o PRP in-house
o Federal Facility in-house
o Contractor for State
o Contractor for PRP
✓ Contractor for Federal Facility
o Other_____

2. **O&M Cost Records**

o Readily available o Up to date
o Funding mechanism/agreement in place
Original O&M cost estimate_____ o Breakdown attached

Total annual cost by year for review period if available

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

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable o N/A

A. Fencing

1. **Fencing damaged** o Location shown on site map o Gates secured ✓ N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** o Location shown on site map o N/A
Remarks LUC signs visible and in good condition.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented o Yes ✓ No o N/A

Site conditions imply ICs not being fully enforced o Yes ✓ No o N/A

Type of monitoring (*e.g.*, self-reporting, drive by) – Self-Reporting in Annual Well Monitoring Report

Frequency - Yearly

Responsible party/agency - DLA

Contact

Maurice Benson	DLA RPM	24 January 2013	209.839.4065
Name	Title	Date	Phone no.

Reporting is up-to-date ✓ Yes o No o N/A

Reports are verified by the lead agency ✓ Yes o No o N/A

Specific requirements in deed or decision documents have been met ✓ Yes o No o N/A

Violations have been reported o Yes o No ✓ N/A

Other problems or suggestions: o Report attached

2. **Adequacy** ✓ ICs are adequate o ICs are inadequate o N/A

Remarks

D. General

1. **Vandalism/trespassing** o Location shown on site map ✓ No vandalism evident

Remarks

2. **Land use changes on site** ✓ N/A

Remarks

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads o Applicable ✓ N/A

1. **Roads damaged** o Location shown on site map o Roads adequate o N/A

Remarks

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS o Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) o Location shown on site map o Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** o Location shown on site map o Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** o Location shown on site map o Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** o Grass o Cover properly established o No signs of stress
   o Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** o N/A
   Remarks_____

7. **Bulges** o Location shown on site map o Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	o Wet areas/water damage not evident	
	o Wet areas	o Location shown on site map	Areal extent_____
	o Ponding	o Location shown on site map	Areal extent_____
	o Seeps	o Location shown on site map	Areal extent_____
	o Soft subgrade	o Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** o Slides	o Location shown on site map	o No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	o Applicable	o N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	o Location shown on site map	o N/A or okay
	Remarks_____		
2.	**Bench Breached**	o Location shown on site map	o N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	o Location shown on site map	o N/A or okay
	Remarks_____		
C. Letdown Channels	o Applicable	o N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	o Location shown on site map	o No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	o Location shown on site map	o No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	o Location shown on site map	o No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** o Location shown on site map o No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ o No obstructions
o Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
o No evidence of excessive growth
o Vegetation in channels does not obstruct flow
o Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations o Applicable o N/A

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

2. **Gas Monitoring Probes**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

4. **Leachate Extraction Wells**
o Properly secured/locked o Functioning o Routinely sampled o Good condition
o Evidence of leakage at penetration o Needs Maintenance o N/A
Remarks_____

5. **Settlement Monuments** o Located o Routinely surveyed o N/A
Remarks_____

E. Gas Collection and Treatment	o Applicable o N/A
1.	**Gas Treatment Facilities** o Flaring o Thermal destruction o Collection for reuse o Good condition o Needs Maintenance Remarks_____
2.	**Gas Collection Wells, Manifolds and Piping** o Good condition o Needs Maintenance Remarks_____
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) o Good condition o Needs Maintenance o N/A Remarks_____
F. Cover Drainage Layer	o Applicable o N/A
1.	**Outlet Pipes Inspected** o Functioning o N/A Remarks_____
2.	**Outlet Rock Inspected** o Functioning o N/A Remarks_____
G. Detention/Sedimentation Ponds	o Applicable o N/A
1.	**Siltation** Areal extent_____ Depth_____ o N/A o Siltation not evident Remarks_____
2.	**Erosion** Areal extent_____ Depth_____ o Erosion not evident Remarks_____
3.	**Outlet Works** o Functioning o N/A Remarks_____
4.	**Dam** o Functioning o N/A Remarks_____

H. Retaining Walls o Applicable o N/A

1. **Deformations** o Location shown on site map o Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** o Location shown on site map o Degradation not evident
   Remarks_____

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

1. **Siltation** o Location shown on site map o Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** o Location shown on site map o N/A
   o Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** o Location shown on site map o Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** o Functioning o N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS o Applicable ✓ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES o Applicable ✓ N/A

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

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

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

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

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

1. **Collection Structures, Pumps, and Electrical**
   o Good condition o Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   o Good condition o Needs Maintenance
   Remarks_____

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

C. Treatment System o Applicable o N/A

1. **Treatment Train** (Check components that apply)
   o Metals removal o Oil/water separation o Bioremediation
   o Air stripping o Carbon adsorbers
   o Filters_____
   o Additive (*e.g.*, chelation agent, flocculent)_____
   o Others_____
   o Good condition o Needs Maintenance
   o Sampling ports properly marked and functional
   o Sampling/maintenance log displayed and up to date
   o Equipment properly identified
   o Quantity of groundwater treated annually_____
   o Quantity of surface water treated annually_____
   Remarks_____

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

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

4. **Discharge Structure and Appurtenances**
   o N/A o Good condition o Needs Maintenance
   Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
   o Properly secured/locked o Functioning o Routinely sampled o Good condition
   o All required wells located o Needs Maintenance o N/A
   Remarks_____

D. Monitoring Data

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

o Properly secured/locked o Functioning o Routinely sampled o Good condition

o All required wells located o Needs Maintenance o N/A

Remarks

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The LUCs are in place to prevent residential use of the site, thus preventing exposure from lead and chromium contamination. The LUCs are effective and appropriate, no issues.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

DLA-SHARPE SITE THIRD FIVE-YEAR REVIEW SITE INSPECTION
24 JANUARY 2013

Inspection Team Roster

Name	Agency/Company
Maurice Benson	Defense Logistics Agency, Enterprise Support, San Joaquin California
Brenda Mahan	Defense Logistics Agency, Enterprise Support, San Joaquin California
John Lucey	U.S. Environmental Protection Agency, Region 9
Christopher Sherman	California Department of Toxic Substances Control
James Brownell	California Regional Water Quality Control Board–Central Valley Region
Gregory Korose	URS Group, Inc
Tiffany Mendoza	URS Group, Inc
Andrew Archuleta	URS Group, Inc

APPENDIX C

Regulatory Agency Comments and Responses to Comments

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 25 June 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		General Comments	
1.	Sec. 5.4.2	Please revise the Draft 5YR Report in accordance with DLA's proposed changes for Section 5.4.2 (revised text for trichloroethene) emailed to our office on 7 May 2013.	The following text replaces the sixth sentence of the last paragraph of Section 5.4.2: "In September 2011, the EPA revised its TCE non-cancer toxicity values. In November 2011, the non-cancer reassessment resulted in a new RSL value of 2.6 µg/L for domestic use of tap water (i.e., drinking, washing), which is less than the 1993 OU 1 ROD-specified ACL of 5 µg/L. The California CVWB has concerns that the TCE MCL may not be protective; however, to the best of DLA's knowledge there has been no effort by California or EPA to promulgate a new MCL."
2.	Sec. 7	Section 7 suggests the risk posed by chromium in site soils can't be quantified because speciation data has not been collected. Please explain why it is unnecessary to collect speciation data and why it is unnecessary to quantify the risks posed to human and ecological health and water quality.	DLA does not intend to collect additional chromium speciation data because there is minimal potential for human or ecological health risk at the sites with chromium contamination. Soils to a depth of two feet were excavated, disposed off site, and replaced with clean fill in the most contaminated areas. LUCs were implemented at all five metal sites in 2011. The LUCs prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing, markedly limiting the potential for human exposure.

(continued)

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	25 June 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)	Sec. 7		(continued) With respect to ecological health and species of special concern (i.e., burrowing owls), the two metals sites in the North Balloon are monitored to ensure that burrowing owls do not inhabit the sites that had a few isolated sample locations with elevated concentrations of lead (not total chromium) in soil. A California Department of Toxic Substances Control-accepted ecological risk assessment of exposures of burrowing owls to chromium (cited as "URS, 2011f" in the draft Third Five-Year Review Report) concluded that representative exposure concentrations of chromium do not pose an ecological hazard. Hexavalent chromium has been detected in groundwater samples at concentrations greater than 0.1 µg/L (current laboratory method detection limit). In the 2006 FFA Annual Report, DLA proposed discontinuing routine sampling and analysis for arsenic, selenium, and hexavalent and total chromium in monitoring and extraction wells on the Sharpe Site because detections were inconsistent, no plumes could be identified, and there were no ACLs established for those constituents in the OU 1 ROD. In its 20 February 2007 comments on the 2006 annual report, CVWB staff concurred with the proposal to discontinue routine analyses for the four constituents in well samples. However, CVWB staff required continued compliance sampling for the WDRs for the discharge of treated groundwater. (continued)

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	25 June 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)	Sec. 7	The Draft 5YR Report does not consider the new California Public Health Goal adopted for hexavalent chromium in 2011. Revise the report to add discussion of this new information. Also, DLA should assess whether the remedies selected for chromium sites are still protective of water quality.	(continued) The following text has been added to Section 6.8.2.3: "In July 2011, OEHHA established a PHG of 0.02 µg/L for hexavalent chromium in groundwater. The CVWB has concerns that concentrations greater than the PHG may not be protective. The PHG represents a de minimis lifetime cancer risk from exposure to hexavalent chromium in drinking water, based on studies in laboratory animals. The availability of the PHG enabled the DPH to proceed with setting a primary drinking water standard. On 23 August 2013, DPH proposed an MCL for hexavalent chromium of 10 µg/L and announced the availability of the proposed MCL for public comment. The public comment period closed on 11 October 2013. According to DPH, completion of the rulemaking process may take up to 12 months after the proposal. In the absence of any major delays, an enforceable MCL is anticipated to be established in 2014. Without an enforceable cleanup goal for groundwater, a soil cleanup goal for hexavalent chromium currently cannot be established on the basis of the potential impact on groundwater." DLA acknowledges the presence of hexavalent chromium in groundwater and potentially in soil; however, there is minimal potential that it poses a risk to public or Sharpe Site workers through those media. Therefore, the remedies implemented for chromium sites are protective under current site conditions.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	25 June 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Specific Comments	
1.	Pg. 5-30, Sec. 5.4.3.2	Potable Well Detections: For clarity, identify the hydrogeologic zones (if known) in which these potable wells are screened.	Text has been added to Section 5.4.3.2 stating that PW020 has screens in both the C Zone and the D Zone; the screen interval in PW006 is not known but is less than 163 feet below ground surface; and the screen interval in PW021 is not known.
2.	Pg. 5-31, Sec. 5.4.3.2	Potable Well Detections: PW021: Revise this subsection to briefly explain what DLA does to maintain the activated carbon treatment unit on this well and, thereby, ensure the residents are protected.	The following text has been added to the end of the first paragraph of **PW021** in Section 5.4.3.2: "The carbon treatment system consists of two canisters of granular activated carbon (GAC); groundwater samples are collected each quarter for VOC analysis from the pipeline connecting the first and second canisters (between carbon vessels) and the pipeline connecting the second canister and the residence (post-treatment). If a VOC is detected at a concentration exceeding its ACL in the sample collected between the first and second canisters, the GAC in both canisters is replaced with fresh GAC."
3.	Pg. 5-34, Tbl. 5-11	This table indicates Sharpe Depot supply well PW038, which is a potential conduit for vertical migration of the groundwater plumes, has milestone date for decommissioning of 31 December 2015. Explain why this milestone is 2.5 years away or revise the Draft 5YR Report to provide a more aggressive one.	Since the draft Third Five-Year Review Report was submitted, DLA has decommissioned PW038 (November 2013). Therefore, it is no longer a potential conduit for vertical migration of ground-water plumes. The milestone date has been changed to 31 December 2013, and an update on the status of this recommendation has been added to Section 5.6.
4.	Pg.6-19, Sec. 6.4.2.5	Expected Progress Toward Meeting RAOs: For clarity, identify the three groundwater monitoring wells installed at Sites P-1A and P-1B to monitor CoC concentrations at the water table.	Text in the fifth sentence has been revised to state: "In September 2012, three groundwater monitoring wells (MW328A, MW329A, and MW330A) were installed at Sites P-1A and P-1B to monitor COC concentrations at the water table (shallow A Zone)."

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 25 June 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5.	Pg. 7-8, Sec. 7.1.3, 2nd para.	System O&M: In the second paragraph, insert “monitoring” after “Annual burrowing owl”.	The word “monitoring” has been added to the sentence as requested.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 28 October 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME John Lucey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1.	Sec. ES.0.1	Please add a new bullet to reference the draft OU1 ESD	DLA disagrees with the addition of the bullet because the ESD was not finalized during the five-year period that ended in 2012. The ESD is described in ES.1.1, ES.2.1, ES.3.1, and in the body of the report.
2.	Sec. ES.0.1	Please add a new bullet to reference the groundwater contingency plan. Also add some of the description for the contingency plan found on page 5-8. This is an important document for the groundwater operable unit and it is referenced as the guiding document for groundwater actions.	DLA disagrees with the addition of the contingency plan because it is not a ROD or a modification of a ROD. It is a guiding document for off-depot potable wells only.
3.	Sec. ES.0.2	The second bullet item describes the purpose of the OU2 ROD Amendment. Please clarify if this ROD amendment addressed LUCs and protection for the vapor intrusion pathway and impact of soil contamination migrating to groundwater. Or conversely the original ROD may have addressed these issues.	The second sentence of the bullet was revised in the following way: "This amendment modifies the remedy for TCE and metals soil sites by adding land use controls (LUCs) at eight TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A) to protect human health from the vapor intrusion pathway, LUCs at all five metals sites (S-3, S-26, S-30, S-33/29, and S-36) to protect human health from residual metals contamination in soil, and monitoring at two of the metals sites (S-3 and S-26) to protect burrowing owls from residual metals contamination in soil." The following text was added to the second sentence in the first bullet in Sec ES.02 describing the OU 2 remedy: "…to protect the health of potential on-site workers and the beneficial use of groundwater, respectively."
4.	ES.1.1	The last bullet item mentions natural attenuation but it does not appear to be described anywhere else in the report. I suggest you remove this bullet item if it does impact the protectiveness of the remedy.	The bullet has been removed.
5.	ES.2.1	Please see the following revised text in bold italics. (continued)	The text "potable" has been replaced with "industrial supply." (continued)

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	ES.2.1	**Plume Migration to Off-Depot *Industrial Supply* Well PW020.** Increased TCE concentrations at off-depot potable well PW020 (industrial-use well) during the third five-year review period suggest that a portion of the TCE plume has migrated as a result of hydraulic influences from the pumping of this well. To prevent the migration from resulting in a reduction in long-term protectiveness, mitigation is necessary. DLA has implemented response actions established in the ***C***ontingency ***P***lan and installed a guard well cluster (MW539) upgradient of PW020 ***which is used to supply industrial process water to a nearby industrial facility. The*** well owner supplies bottled water for human consumption and no employee is consuming water from PW020. ***Additional remedial*** action may be necessary to maintain long-term protectiveness if higher concentration portions of the TCE plume continue to be drawn toward PW020. Water from PW020 is being used for industrial processes.	All other text revisions suggested in the comment have been made.
		LUCs. ~~If groundwater from Sharpe Site VOC plumes is tapped by future water supply wells, the potential for unacceptable human health risk would exist for groundwater users.~~The establishment of LUCs for OU 1 on government property ***will*** reduce the potential for exposure of those users, thereby ensuring their protection from groundwater VOCs. LUCs have been established for VOCs in vadose zone soils (URS, 2011a), and LUCs for groundwater have been proposed in a draft ESD (URS, 2012a).	DLA has made the revisions suggested in the comment.
6.	Sec. ES.3.1	Please see the following revised text in bold italics.	
		Plume Migration to Off-Depot *Industrial Supply* Well PW020. Identify and implement appropriate and feasible response actions to ensure protection of users of groundwater at off-depot potable well PW020. Response actions may include shutting down PW020, replacement of water supply, wellhead treatment, and/or installation of additional extraction wells.	In the title, "potable" has been replaced with "Industrial supply."

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
7.	Sec. ES.4.1	The remedy for OU 1 is short term protective for human health. For the remedy to be protective in the long term, the following actions need to be taken: Implement appropriate and feasible response actions to ensure protection of the users of PW020 groundwater or groundwater from other potable wells that may become impacted by Sharpe Site VOC plumes; establish LUCs in the OU 1 ESD; decommission PW038; and identify additional potential discharge locations for treated groundwater.	The following text replaces all of Section ES.4.1: "The remedy for OU 1 protects human health and the environment in the short term. For the remedy to be protective in the long term, the following actions need to be taken to ensure protection of on-depot and off-depot groundwater users: implement appropriate and feasible response actions to ensure protection of users of groundwater from PW020 or groundwater from other potable wells that may become impacted by Sharpe Site VOC plumes; decommission depot supply well PW038; establish LUCS for groundwater use and potential vapor intrusion from groundwater in the OU 1 ESD; and identify additional potential discharge locations for treated groundwater."
8.	Sec. ES.4.2	**Operable Unit 2** OU 2 should have only one protectiveness statement for the entire operable unit. Please use the following revised protectiveness statement for OU2: The remedy for OU 2 is short term protective for human health. For the remedy to be protective in the long term, the following actions need to be taken: Delineation of the extent of TCE soil concentrations greater than the soil vapor cleanup standard; evaluation of whether further remedial action (SVE) is needed; implementation of the remedial action, if needed; and continued implementation of LUCs. In addition, the area of potential radiological concern at Site S-33/29 will be investigated to determine if a remedial action is required.	DLA concurs with the request for one protectiveness statement. The following is the revised protective-ness statement for OU 2: "The remedy for OU 2 protects human health and the environment in the short term. For the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: delineation of the extent of TCE concentrations in the vadose zone greater than the soil vapor cleanup standard and evaluation of the need and feasibility for remedial action (SVE) at Sites P-1A, P-1B, and P-1C, and continued implementation of LUCs at five TCE and five metal sites. Furthermore, the area of potential radiological concern at Site S-33/29 needs to be investigated to determine whether a remedial action is necessary and feasible."

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
9.	Pg. SF-2	**Five Year Review Summary Form** The first item under "Issues/Recommendations" for OU1 should say: **Issue:** The TCE plume has migrated off depot to ***industrial*** supply well PW020.	The text cited in the comment has been revised as recommended.
10.	Pg. SF-4	**Five Year Review Summary Form** One protectiveness statement should be provided for each operable unit as described in Comments 6 & 7 above.	The new text in the responses to Comments #7 and #8 has replaced the protectiveness statements for OU 1 and OU 2, respectively, on page SF-4.
11.	Sec. 1.0, pg. 1-1	The description of OU1 should include a new bullet to reference the draft OU1 ESD.	DLA disagrees with the addition of the bullet because the ESD was not finalized during the third five-year period that ended in 2012. The ESD is described in ES.1.1, ES.2.1, ES.3.1, and in the body of the report.
12.	Sec. 1.0, pg. 1-1	The second bullet item for OU2 describes the purpose of the OU2 ROD Amendment. Please clarify if this ROD amendment addressed LUCs and protection for the vapor intrusion pathway and impact of soil contamination migrating to groundwater. Or conversely the original ROD may have addressed these issues.	The response to this comment is the same as the response to Comment #3.
13.	Sec. 1.0, pg. 1-1	The last sentence on page 1-1 says the Third Five Year Review covers the period from 2008 through 2012. This should be changed here and throughout the report to indicate the correct period from 2009 to 2014.	DLA disagrees with the recommendation. Although the Second Five-Year Review Report was signed by EPA in 2009, the review covered the period 2003 through 2007. Consequently, the Third Five-Year Review Report covers the period 2008 through 2012. The Third Five-Year Review Report cannot ignore 2008 and does not need to cover 2013 or 2014, which will be included in the Fourth Five-Year Review Report.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	28 October 2013
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	John Lucey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
14.	Sec. 1.0	A new bold heading subsection should be added with the title "Previous Five Year Reports". Under this heading you can reference the two previous 5YR reports and describe the current report.	The following text has been added to Section 1.0: "**1.1 Previous Five-Year Review Reports**. Five-year reviews were conducted in 2003 and 2008. The first review was documented in *DDJC-Sharpe Five-Year Review Report* (URS, 2004) and is referred to in this report as the First Five-Year Review Report. The second review was documented in *DDJC-Sharpe Second Five-Year Review Report* (2009a) and is referred to in this report as the Second Five-Year Review Report. The content of those reports can be accessed at http:\cumulis.epa.gov/fiveyear/." DLA does not agree that this new subsection addressing previous reports should include a description of the Third Five-Year Review Report.
15.	Sec. 1.0, pg. 1-2	The following text should be moved to the new heading for Previous 5Yrs. As this is the third five-year review of remedial actions at the Sharpe Site, this review evaluated changes in remedy implementation during this five-year period and actions taken in response to recommendations in the *DDJC-Sharpe Second Five-Year Review Report* (URS, 2009a), herein referred to as the Second Five-Year Review Report. The Second Five-Year Review Report for the Sharpe Site is available at http://cumulis.epa.gov/fiveyear/.	A portion of the text recommended in the comment has been inserted into the new Section 1.1 which is provided in the response to Comment #14
16.	Sec. 1.0, pg. 1-3	The last two paragraphs on page 1-3 should be revised as shown below in red and then moved to the new bold heading to describe the previous 5Yrs. This third five-year review was prepared using the guidelines provided in *Comprehensive Five-Year Review Guidance* (EPA, 2001) and supplements (EPA, 2011; 2012a; 2012b). The triggering action for this review is the date of EPA's concurrence on the second five-year review, which was 24 September 2009. ~~This third five-year review was initiated in January 2013, and the planned completion date for this five-year review~~ (continued)	The two paragraphs with suggested revisions have been moved to the new Section **1.2. Third Five-Year Review Report**. However, the text suggested for deletion presents pertinent facts regarding the time interval of the third five-year review. That text is documented in the following: The Third Five-Year Review Report was initiated in January 2013, and the planned completion date for this five-year review (i.e., the final document with EPA concurrence) was 27 September 2013, which included review, (continued)

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 28 October 2013
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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
16. (cont'd)		(continued) ~~(i.e., the final document with EPA concurrence) is 27 September 2013. This date is only four years since EPA concurrence was received on the second five-year review; however, this third fiveyear review does span the five-year period of time from 2008 through 2012. The second five-year review completion date was extended to allow the results of an extraction well optimization test and a groundwater investigation that were ongoing at the end of 2007 to be incorporated into that review.~~ This five-year review addresses the IRP sites at the Sharpe Site that trigger a statutory review or a policy review. Five-year statutory reviews are required by statute for all sites for which a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Policy reviews are conducted for sites that, upon completion of remedial action, will allow unlimited use and unrestricted exposure, but that will require at least five years to attain the cleanup levels specified in the ROD. The five-year review is the same, however, regardless of whether it is required by statute or identified in EPA guidance as a site to be reviewed as a matter of policy. Table 1-1 lists the Sharpe Site IRP sites for which a five-year review is required. Figure 1-1 shows these sites and current (through the third quarter of 2012 [3Q12]) groundwater plumes.	(continued) comment, and response to comment periods for draft, draft final, and final document versions in accordance with the FFA. Although this date was only four years since EPA concurrence and signature was received on the Second Five-Year Review Report, this third five-year review spans the five-year period of time from 2008 through 2012 (the second five-year review spanned the five-year time period 2003 through 2007). The completion date for the Second Five-Year Review Report was extended to allow the results of an extraction well optimization test and a groundwater investigation that were ongoing at the end of 2007 to be incorporated into that review.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
17.	Sec. 4.1, pg. 4-1	Please delete table 4-1 and the sentence before the table because it will be out of context when the report is read in the future.	Although the EPA guidance for preparing five-year reviews states that the schedule for the five-year review should be included as a topic in the process section of the five-year review report, the table and associated text have been deleted as requested.
18.	Sec. 5.4.3.2	The “contingency plan” should have capital letters because it is a referenced document.	The change requested in the comment has been made.
19.	Sec. 5.5 and 5.6	Please combine Table 5-10 and 5-11 into one table since these are the issues and recommendations identified for OU1.	DLA disagrees with the request in the comment. The separate tables are in compliance with EPA guidance on preparation of five-year review reports which suggests one table for issues in Exhibit 4-3 and another for recommendations and follow-up actions in Exhibit 4-4.
20.	Sec. 5.7	Please use the OU1 protectiveness statement from Comment 6 above.	The protectiveness statement in the response to Comment #7 will be inserted into Section 5.7.
21.	Sec. 5.8	Please indicate the due date for the next review as 2019 based on a five year period from the date of EPA’s concurrence letter.	DLA disagrees. The Third Five-Year Review was to be completed and signed in 2013. If 2019 is the due date for the fourth five-year review, it will cover six years 2013 through 2018.
22.	Sec. 6.5 and 6.6	Please combine Table 6-4 and 6-5 and 7-4 and 7-5 into one table since these are the issues and recommendations identified for OU2.	DLA disagrees with the request in the comment. EPA guidance on preparation of five-year review reports suggests one table for issues in Exhibit 4-3 and another for recommendations and follow-up actions in Exhibit 4-4.
23.	Sec. 6.7	Please use the OU2 protectiveness statement from Comment 7 above.	The OU 2 protectiveness statement in the response to Comment #8 will be inserted into Section 6.11.
24.	Sec. 6.8	Please indicate the due date for the next review as 2019 based on a five year period from the date of EPA’s concurrence letter.	See the response to Comment #21.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Third Five-Year Review Report, DLA Defense Distribution Depot San Joaquin – Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
25.	Sec. 7.5, 7.6, 7.7 and 7.8	These sections should explain that only one protectiveness statement is provided for each operable unit and refer to the corresponding tables and sections found in Section 6.	DLA concurs. The content of Sections 6.0 and 7.0 have been combined; therefore, the protectiveness statements, issues, and recommendations text have been combined.
26.	Sec. 7.0	This report divides OU2 into TCE and metal sites. Sections 6 and 7 should be combined since each operable unit can only have one protectiveness statement that describes the protectiveness for the entire operable unit. This will help to clarify the document for the next five year report.	DLA concurs. See the response to Comment #25.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 30 January 2014
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Marcus Pierce, CVWB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		General Comments	
1.		Central Valley Water Board staff concurs with the recommendations and protectiveness statements for Operable Units 1 and 2 in the Draft Final 5YR Report.	Comment acknowledged.
2.		Central Valley Water Board staff recalls that DLA and the regulatory team agreed the State does not need to sign the Final 5YR Report (documented in quarterly meeting minutes for 2013). Please remove the State signature blocks from the Draft Final 5YR Report.	Concur. The California Central Valley Regional Water Quality Control Board and Department of Toxic Substances Control signature blocks have been removed from the signature page.
		Specific Comments	
1.	Pg. 5-11, Sec. 5.2.2	Status of Recommendations for the Second Five-Year Review: The third paragraph on this page states the amendments tested to enhance the OU1 remedy had no detrimental impacts on groundwater. This statement is not fully supported by the 2013 groundwater monitoring data that indicates some metals like hexavalent chromium are still elevated above baseline levels. Please delete “and none had detrimental impacts on groundwater” from the fourth sentence in this paragraph.	Concur. The text has been revised as requested.
2.	Pg. 5-35, Tbl. 5-11	Recommendations and Follow-Up Actions for OU1 Groundwater: Based on recent communications with DLA, the recommended actions for the MW326 cluster area will not occur in the first half of 2014. Revise “30 June 2014” to a more realistic milestone date.	Concur. The milestone date for the recommended actions related to the MW326 Well Cluster Area has been changed to 30 September 2015.
3.	Fig. 6-2	Sites S-30, S-33/29, and S-36 are sites where land use controls have been implemented; however the figure indicates “No Remedial Action Required” at these sites. Implementation of land use controls is considered a remedial action, so the figure is confusing. For clarity, we recommend revising the Legend in this figure to clarify that only implementation of land use controls was necessary at these sites.	Concur. The legend text for Sites S-30, S-33/29, and S-36 has been revised to state: “Soil Removal Not Required.” The title of the figure indicates that the sites have land use controls.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 3 April 2014
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME John Lucey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1.	Signature Page	The EPA signature block should be changed from Michael Montgomery to Angeles Herrera. All other information on the signature block is correct.	DLA concurs. The signature block has been updated as requested.
2.	Sec. ES.0	The last paragraph on page ES-1 begins, "This review evaluates…". This paragraph should be moved to be the first paragraph of Section ES.0 because it applies to both of the following subsections.	DLA concurs that the paragraph applies to both subsections. Organizationally, however, DLA prefers to leave the paragraph where it is; therefore, the subsection numbers have been removed.
		This paragraph incorrectly says the 3rd 5YR covers the period from 2008 to 2012. There seems to be a mix up of terminology between the time period for the "five year review" and the time period for the "data evaluated in the report". The correct dates for the five year review period should be 2009 through 2014 as predicated by EPA's concurrence date of September 24, 2009 on the previous five year review report.	Although DLA disagrees that the time period covered by this third five-year review should be 24 September 2009 through 24 September 2014, DLA has revised the text in this paragraph as follows: "Five-year reviews of remedial actions at the Sharpe Site are required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. This third five-year review for the Sharpe Site covers the period from 24 September 2009 through 24 September 2014 based on the United States Environmental Protection Agency's Region 9 (EPA) concurrence of the second five-year review on 24 September 2009. As the lead agency, DLA has conducted its reviews no less often than every five years since initiation of the selected remedial action, as required by CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Therefore, data evaluated by DLA for this third five-year review cover the five-year period from 2008 through 2012. This five-year dataset follows the five-year dataset (2003 through 2007) covered by the

(continued)

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	3 April 2014
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	John Lucey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) second five-year review. Due to the time needed to prepare a five-year review in accordance with the *Comprehensive Five-Year Review Guidance* (EPA, 2001) and complete the review cycle process in accordance with the Federal Facility Agreement (FFA), including draft, draft final, and final versions of the report, evaluating data collected through 24 September 2014 for this third five-year review is not feasible. Data collected from 2013 through 24 September 2014 that were not evaluated for this third five-year review will be evaluated in the fourth five-year review."
		The report should explain that a limited set of data was used for five year review analysis and only data collected through September 2011 was used in the analysis. Also clarify that this limited data set included the FFA Annual Progress Report, dated May 2012. Even though the 3rd 5YR only evaluated data up until September 2011, the five year review period is still from 2009 to 2014	For clarification, the third five-year review evaluates data collected through the end of 2012 and not through September 2011 as noted in the comment. Although the figures in the third five-year review show results from wells sampled during the more comprehensive annual sampling event (third quarter 2012) completed in September 2012 and reported in the final 2012 FFA Annual Progress Report dated April 2013, data collected through the end of 2012 are discussed in the text. As one example, in Section ES.3.2, fourth quarter 2012 results for three A Zone groundwater monitoring wells in the South Balloon are discussed under the subheading Sites P-1A, P-1B, and P-1C. The text revision provided in the response to comment in the above paragraph explains what data DLA evaluated for the third five-year review.
		Please revise the last paragraph to use the correct five year review period from 2009 to 2014 and move the paragraph to the beginning of the section. In addition, the entire report should be revised to use the correct dates for the five year review period.	Please see above responses. The text revisions noted above will be made throughout the document, where warranted.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	3 April 2014
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	John Lucey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
3.	Sec. ES.1.1	The fourth bullet in this section references the draft OU1 ESD but it should be revised to reference the final OU1 ESD. Even though the 3rd 5YR only evaluated data up until September 2011 the five year review period is still from 2009 to 2014. It is preferred and appropriate for the 3rd 5YR to be as current as possible at the time of publication. If possible, the 3rd 5YR should identify all reports that are completed up until the date the 3rd 5YR is finalized. Especially if it allows omission of outstanding issues that would otherwise need to be identified in the report. Therefore, the 3rd 5YR should acknowledge and reference the final OU1 ESD.	DLA does not concur. As of August 2014, additional comments and text changes from EPA and revisions by DLA on the final OU 1 ESD are still being addressed, and EPA has not signed the OU 1 ESD. In addition, the state regulatory agencies will require the opportunity to review and approve the final changes to the document before the OU 1 ESD is finalized. Consequently, DLA will submit a revised final OU 1 ESD. The word “draft” has been deleted from the bullet referenced in the comment and “(revised final pending as of August 2014)” was added after the word “(ESD)”. An update to the status of any issues and recommendations related to the OU 1 ESD will be provided, but they will not be omitted from the document.
		The 3rd 5YR should reference the final OU1 ESD dated March 19, 2014 and the associated ICs for groundwater use and vapor intrusion (VI). If the Final ESD is not referenced in the 3rd 5YR, the lack of ICs must be identified in the 3rd 5YR as an outstanding issue that must be resolved. Then, immediately after the 3rd 5YR is finalized, EPA and the Army must perform administrative actions to rectify and change the status of noncompliance for ICs that actually were previously resolved in the Final ESD and therefore are no longer outstanding issues. This is double work for a non-issue. The 3rd 5YR should reference the Final OU1 ESD dated March 19, 2014 and should not identify ICs as an outstanding issue which needs to be resolved. Please make these changes throughout the report	Please see above responses. DLA agrees that the LUCs issue soon will be resolved once the revised final OU 1 ESD is submitted, and all parties to the FFA have approved the changes and signed the document. However, at the time of preparation of this final third five-year review, the OU 1 ESD had not been finalized. Therefore, the proposed LUCs are not yet legally enforceable and still warrant being noted as an issue with a follow-up recommendation in the third five-year review.
4.	Sec. ES.1.1	The third bullet in this section says DLA tested three in situ amendment technologies. It may be more accurate to say three pilot studies were conducted.	The bullet has been revised to state: “Conducted three in situ amendment treatment technology pilot studies, including potassium permanganate ($KMnO_4$), redox compound (EHC), and emulsified oil substrate (EOS)”.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5.	Sec. ES.2.1	The second paragraph in this section references CERCLIS. Please remove this reference since CERCLIS no longer is used by EPA. Please remove all references to CERCLIS in the report.	All references to CERCLIS have been removed from the document.
6.	ES.2.1	The first sentence of the second paragraph in this section refers to PW020 as a potable well. Please change it to “industrial supply well”.	The change has been made as requested and elsewhere throughout the document, where warranted.
7.	ES.2.1	The third paragraph in this section describes the LUCs as an issue. Please do not describe the LUCs as an issue since the OU1 ESD in complete (See comment 3 above).	DLA does not concur. Please see response to EPA Comment No. 3.
8.	ES.2.1	The fourth paragraph in this section references the draft version of the 3rd 5YR. Please remove this paragraph because it is very confusing and out of context in the final report.	DLA does not concur. Because nearly 1.5 years have passed since the submittal of the draft third five-year review, some of the issues identified in the draft version of the document have been addressed and their accompanying recommendations have been completed. A reader (e.g., public) that compared the draft, draft final, and final versions of the third five-year review might question why an issue was removed between the versions without explanation. Therefore, DLA prefers to continue to include issues/recommendations identified in the draft document and provide a status update on the completion of those recommendations rather than removing them from the final document. However, completed issues/recommendations have been removed from EPA’s five-year review summary form, and protectiveness statements have been updated, where warranted.
9.	ES.2.1	The last three paragraphs in this section are complete actions and should be moved to Section ES.1.1.	DLA does not concur. Please see response to EPA Comment No. 8. In addition, the issue identified in the last paragraph has not been completed.
10.	ES.2.2	The last paragraph on Site P-1G should be moved to Section ES.1.2.	DLA does not concur. Please see response to EPA Comment No. 8.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
11.	ES.3.1	Remove the reference to LUCs.	DLA does not concur. Please see response to EPA Comment No. 3.
12.	ES.3.2	Remove the reference to Site P-1G.	DLA does not concur. Please see response to EPA Comment No. 8.
13.	ES.4.1	Please remove the reference to establishing ICs in the OU 1 ESD.	DLA does not concur. Please see response to EPA Comment No. 3.
14.	Five-Year Review Summary Form	Remove the ICs Issue on page SF-2.	DLA does not concur. Please see response to EPA Comment No. 3.
15.	Five-Year Review Summary Form	Remove the LUCs Issue in the OU1 Protectiveness Statement on page SF-4.	DLA does not concur. Please see response to EPA Comment No. 3.
16.	Sec. 1.0, pg. 1-1	The description of OU1 should include a new bullet to reference the final OU1 ESD.	DLA does not concur. Please see response to EPA Comment No. 3.
17.	Sec. 1.1	This Section should be revised to be consistent with Comment 2 & 3 above.	Changes to the text of Section 1.1 are not necessary based on EPA Comments No. 2 and 3.
18.	Sec. 1.2	This Section should be revised to be consistent with Comment 2 & 3 above.	Changes to the text of Section 1.2 are not necessary based on EPA Comments No. 2 and 3.
19.	Tbl. 2-1	Change the draft OU1 ESD to the final ESD.	Table 2-1 has been updated to note that the revised final OU 1 ESD is pending as of August 2014.
20.	Tbl. 4-1a	Change the draft OU1 ESD to the final ESD.	Table 4-1a has been updated to note that the revised final OU 1 ESD is pending as of August 2014.
21.	Tbl. 4-1c	Add the off base well contingency plan to Table 4-1c.	The *DDJC-Sharpe Off-Depot Potable Well Contingency Plan* (URS, 2010e) is already included in Table 4-1c.
22.	Sec. 4.5	The last sentence in the third paragraph describes the draft OU1 ESD and LUCs. Please revise to final OU1 ESD.	The sentence has been updated to note that the revised final OU 1 ESD is pending as of August 2014.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
23.	Sec. 5.0	This Section should be revised to describe the final OU1 ESD and the associated ICs. In addition, it should describe the three pilot studies.	DLA does not concur that the text in Section 5.0 should be revised because the OU 1 ESD has not been finalized. However, where the OU 1 ESD is referenced, a note has been added that the revised final is pending as of August 2014. Please also see response to EPA Comment No. 3. In addition, the three pilot studies are already discussed in Section 5.2.2 on page 5-11, as well as in Section 4.4.2.6.
24.	Tbls. 5-10 and 5-11	EPA Comment 19 and on the draft 5YR was not addressed adequately. This is a format comment from EPA Headquarters. Please combine Tables 5-10 and 5-11 into one table since these are the issues and recommendations identified for OU1.	Although DLA followed EPA guidance on preparation of five-year review reports which suggests one table for issues in Exhibit 4-3 and another for recommendations and follow-up actions in Exhibit 4-4, DLA has combined the tables as requested and has also combined Sections 5.5 and 5.6 into one section titled: “5.5 Issues Identified During Five-Year Review, Recommendations, and Follow-Up Actions”. Subsequent sections have been re-numbered.
25.	Sec. 5.8	Please indicate the due date for the next review as 2019 based on a five year period from the date of EPA’s concurrence letter.	The following text has been added to the end of the first sentence of Section 5.7 (formerly 5.8): ”…and is required to be completed no later than five years from the date of this final third five-year review.”
26.	Tbls. 6-7 and 6-8	EPA Comment 22 and on the draft 5YR was not addressed adequately. This is a format comment from EPA Headquarters. Please combine Tables 6-7 and 6-8 into one table since these are the issues and recommendations identified for OU2.	Although DLA followed EPA guidance on preparation of five-year review reports which suggests one table for issues in Exhibit 4-3 and another for recommendations and follow-up actions in Exhibit 4-4, DLA has combined the tables as requested and has also combined Sections 6.9 and 6.10 into one section titled: “6.9 Issues Identified During Five-Year Review, Recommendations, and Follow-Up Actions”. Subsequent sections have been re-numbered.

UNITED STATES ARMY CORPS OF ENGINEERS (USACE) – TULSA DISTRICT

DESIGN REVIEW COMMENTS Project: Draft Final Third Five-Year Review Report, Sharpe Site

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
27.	Sec. 6.9	This Section should not include Site P-1G. Please remove it.	DLA does not concur. Please see response to EPA Comment No. 8.
28.	Sec. 6.10	This Section should not include Site P-1G. Please remove it.	DLA does not concur. Please see response to EPA Comment No. 8.
29.	Sec. 6.12	Please indicate the due date for the next review as 2019 based on a five year period from the date of EPA's concurrence letter.	The following text has been added to the end of the first sentence of Section 6.11 (formerly 6.12): "…and is required to be completed no later than five years from the date of this final third five-year review."