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5. Title

Final Third Five-Year Review Report

6. Abstract (maximum 200 words)

This Third-Five Year Review report evaluates sites at the Tracy Site where where hazardous substances remain at levels that do not allow for unlimited use and unrestricted exposure.

7. Keywords (for example, OU 1, SVE, remedial action, ROD amendment, O&M, PCBs)

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

18 September 2015

U.S. Environmental Protection Agency, Region 9
ATTN: Mr. John Lucey (SFD-8)
75 Hawthorne Street
San Francisco, CA 94105-3901

SUBJECT: Final Third Five-Year Review Report
Defense Distribution Depot San Joaquin

Dear Mr. Lucey:

The Defense Logistics Agency (DLA) has prepared this Third Five-Year Review Report (Report) to comply with Section (§) 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act to review remedies at Defense Distribution Depot San Joaquin where hazardous substances remain at concentrations that do not allow for unlimited use and unrestricted exposure. Comments on the draft final report from United States Environmental Protection Agency (U.S. EPA) were incorporated and responses to comments are included in Appendix E.

If you have any questions or comments on the enclosed Report, please call me at (209) 839-4065.

Sincerely,

Maurice Benson

MAURICE BENSON
Remedial Project Manager

Enclosure

cc:
Mr. Marcus Pierce, RWQCB
Mr. Christopher Sherman, DTSC
Ms. Maria Hoidal, DLA
Ms. Jacqueline O'Connell, HDR
Mr. Charlie O'Neill, HDR
Administrative Record

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

SEP 3 0 2015

Jonathan E. Mathews
Site Director
Defense Logistics Agency
DLA Installation Support
San Joaquin, DS-FJ
P.O. Box 960001
Stockton, CA 95296

SUBJECT: THIRD FIVE-YEAR REVIEW REPORT FOR THE DEFENSE LOGISTICS AGENCY (DLA) DISTRIBUTION SAN JAUQUIN, CALIFORNIA - TRACY SITE

Dear Mr. Mathews,

The U.S. Environmental Protection Agency (EPA) Region IX received the Final Third Five-Year Review Report for the Defense Logistics Agency (DLA) Distribution San Joaquin, California-Tracy Site (5YR Report), dated September 2015. EPA reviewed the 5YR Report along with other supporting documents. 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, DLA must take the following steps. First, define the leading edge of the Banta Road TCE plume. This plume has low levels of contamination, only slightly above the Maximum Contaminant Level (MCL), and there is no direct pathway of human or environmental exposure to the contaminated groundwater. Second, optimize and restart the existing Soil Vapor Extraction (SVE) system at Area 3. Third, additional gravel is needed to comply with the remedy for the Northern Depot Soils Area requiring gravel cover with a minimum thickness of three inches, and the remedy should be reviewed to determine if the gravel cover should be replaced with a more permanent asphalt cover. Fourth, contaminated soil at SMU 27 was excavated in 1999 but the laboratory detection limits for confirmation samples were above the new January 2015 residential Remedial Screening Levels (RSLs). Therefore, DLA must establish Land Use Controls (LUCS) or perform sampling to confirm that the remedy is still protective. Finally, DLA must submit a work plan for collection of indoor air samples at Building 237 and update the risk assessment for the vapor intrusion pathway.

Northwestern Corner (NWC) OU – The remedy at the NWC Dieldrin Plume is protective of

human health and the environment.

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 two guidance documents: 1) EPA's memorandum entitled *Program Priorities for Federal Facility Five-Year Review,* dated August 1, 2011; and 2) EPA's clarification memorandum entitled *Correction to the Memorandum "Program Priorities for Federal Facility Five-Year Reviews"*, dated February 22, 2012. According to EPA guidance, the next Five Year Review is due no later than September 30, 2020 and should evaluate the protectiveness of all remedial actions at the Site. 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), DLA and the regulators need to develop a mutually acceptable timeline for completion of the actions described above. The actions described in this letter should be initiated within 6o days of the signing of the 5YR Report. If you have questions regarding this letter please call me at (415) 972-3144 or you may contact John Lucey of my staff at (415) 972-3145.

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

Cc: Daniel Ziarkowski, California DTSC
Ms. Marie McCrink, California RWQCB

DLA DISTRIBUTION SAN JOAQUIN, CALIFORNIA
DEFENSE DISTRIBUTION DEPOT SAN JOAQUIN – TRACY SITE

FINAL

THIRD FIVE-YEAR REVIEW REPORT

Prepared for:

U.S. Army Corps of Engineers, Fort Worth District
819 Taylor Street, Room 3B09
Fort Worth, TX 76102

Prepared by:

2365 Iron Point Road, Suite 300
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September 2015

Third Five-Year Review Report, Defense Distribution Depot San Joaquin
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.

30 OCT 2015

JONATHAN E. MATHEWS — Date
Site Director
DLA Installation Support San Joaquin

PHILLIP R. DAWSON — Date
Staff Director
DLA Installation Support Environmental Management

Refer to U.S. EPA Concurrence Letter dated 30 September 2015

ANGELES HERRERA — Date
Chief
Federal Facilities and Site Cleanup Branch
Region 9
U.S. Environmental Protection Agency

Third Five-Year Review Report, Defense Distribution Depot San Joaquin
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JONATHAN E. MATHEWS Date
Site Director
DLA Installation Support San Joaquin

Nanette Werner 12/1/15
NANETTE CHEVRIER WERNER Date
Acting Staff Director
DLA Installation Support Environmental Management

Refer to U.S. EPA Concurrence Letter:

ANGELES HERRERA Date
Chief
Federal Facilities and Site Cleanup Branch
Region 9
U.S. Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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SEP 30 2015

Jonathan E. Mathews
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San Joaquin, DS-FJ
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Stockton, CA 95296

SUBJECT: THIRD FIVE-YEAR REVIEW REPORT FOR THE DEFENSE LOGISTICS AGENCY (DLA) DISTRIBUTION SAN JOAQUIN, CALIFORNIA - TRACY SITE

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

Cc: Daniel Ziarkowski, California DTSC
Ms. Marie McCrink, California RWQCB

Defense Logistics Agency
Defense Distribution Depot San Joaquin – Tracy Site
Third Five-Year Review Report

September 2015

This report was prepared by the staff of HDR under the supervision of registered professionals. Interpretation, conclusions, and recommendations in the report are based upon high quality data and information obtained from investigations and Defense Distribution Depot San Joaquin – Tracy Site files. The data interpretation, conclusions, and recommendations presented in this report were governed by HDR experience and professional judgment.

September 28, 2015

Charles O'Neill, P.G.
Professional Geologist No. 6401

Date

CONTENTS

Page

ABBREVIATIONS AND ACRONYMS ix
EXECUTIVE SUMMARY ES-1
FIVE-YEAR REVIEW SUMMARY FORM SF-1
1.0 INTRODUCTION 1-1
1.1 Purpose and Statement of Authority 1-1
1.2 Scope and Nature of Third Five-Year Review 1-3
2.0 CHRONOLOGY 2-1
2.1 Tracy Site Chronology 2-1
3.0 BACKGROUND 3-1
3.1 Physical Characteristics 3-1
3.2 Land and Resource Use 3-3
3.3 History of Contamination 3-4
3.4 Initial Responses 3-5
3.5 Basis for Taking Action 3-9
4.0 REMEDIAL ACTIONS 4-1
4.1 OU 1: Operable Unit 1 4-1
4.2 OU 1: SWMU 1/Area 2 4-5
4.3 OU 1: SWMU 2/SWMU 3 4-9
4.4 OU 1: SWMU 4 4-12
4.5 OU 1: SWMU 6 4-14
4.6 OU 1: SWMU 7 4-16
4.7 OU 1: SWMU 8 4-18
4.8 OU 1: SWMU 20 4-19
4.9 OU 1: SWMU 24 4-24
4.10 OU 1: SWMU 27 4-26
4.11 OU 1: SWMU 33 4-27
4.12 OU 1: Building 30 Drum Storage Area 4-30
4.13 OU 1: Site 72 4-31
4.14 OU 1: Northern Depot Soils Area 4-32
4.15 OU 1: Eastern Depot Soils Area 4-33
4.16 OU 1: Southern Depot Soils Area 4-34
4.17 OU 1: Area 1 Building 237 4-35
4.18 OU 1: Area 3 4-39
4.19 NWC OU: Northwestern Corner Operable Unit 4-43
5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW 5-1
5.1 Protectiveness Statements from Previous Review 5-1
5.2 Issues, Recommendations, and Status 5-2
5.3 Additional Actions since Second Five-Year Review 5-12
6.0 FIVE-YEAR REVIEW PROCESS 6-1
6.1 Administrative Components 6-1
6.2 Community Involvement and Notification 6-1
6.3 Document Review 6-2
6.4 Data Review 6-2

6.5 Site Inspection and Land Use Control Management 6-2
6.6 Interviews 6-3
7.0 TECHNICAL ASSESSMENT 7-1
7.1 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAO used at the time of the remedy selection still valid? 7-1
7.2 OU 1: Operable Unit 1 7-5
7.3 OU 1: SWMU 1/Area 2 7-11
7.4 OU 1: SWMUs 2 and 3 7-14
7.5 OU 1: SWMU 4 7-15
7.6 OU 1: SWMU 6 7-16
7.7 OU 1: SWMU 7 7-18
7.8 OU 1: SWMU 8 7-20
7.9 OU 1: SWMU 20 7-21
7.10 OU 1: SWMU 24 7-23
7.11 OU 1: SWMU 27 7-25
7.12 OU 1: SWMU 33 7-26
7.13 OU 1: Building 30 Drum Storage Area 7-28
7.14 OU 1: Site 72 7-29
7.15 OU 1: Northern Depot Soils Area 7-30
7.16 OU 1: Eastern Depot Soils Area 7-32
7.17 OU 1: Southern Depot Soils Area 7-33
7.18 OU 1: Area 1 Building 237 7-34
7.19 OU 1: Area 3 7-36
7.20 NWC OU: Northwestern Corner Operable Unit 7-39
8.0 ISSUES 8-1
8.1 OU 1 8-1
8.2 NWC OU 8-1
9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS 9-1
10.0 PROTECTIVENESS STATEMENTS 10-1
10.1 OU 1 10-1
10.2 NWC OU 10-1
10.3 Site Wide 10-1
11.0 NEXT FIVE-YEAR REVIEW 11-1
12.0 REFERENCES 12-1

APPENDICES

Appendix A: Conceptual Site Model
Appendix B: Well Construction Details and Monitoring Well Sampling Information
Appendix C: Third Five-Year Review Questionnaires
Appendix D: ProUCL Output Data
Appendix E: Site Inspection Forms
Appendix F: Response to Agency Comments

TABLES

Page

ES.1-1 Issues and Recommendations ES-3

1.0-1 Description of Decision Documents 1-5
1.2-1 Sites Included in this Five-Year Review 1-7
1.2-2 Sites not Included in this Five-Year Review 1-10

2.0-1 Environmental Program Milestones 2-4

3.5-1 OU 1 COCs and Cleanup Standards 3-11
3.5-2 NWC OU COCs and Cleanup Standards 3-18

4.1-1 Groundwater Treatment Plant 2 Extraction Well Operational Status 4-46
4.1-2 Groundwater Extraction and Treatment System Performance for the 2010 - 2014 Monitoring Years 4-47
4.2-1 Findings During Annual Inspection of Land Use Control Sites 4-49

6.1-1 Third Five-Year Review Schedule 6-4
6.3-1 Documents Reviewed – Basis for the Response Action 6-4
6.3-2 Documents Reviewed – Implementation of the Response 6-5
6.3-3 Documents Reviewed – Remedy Performance 6-6
6.3-4 Documents Reviewed – Operation and Maintenance 6-6
6.3-5 Documents Reviewed – Legal Documents 6-7
6.3-6 Documents Reviewed – Community Involvement 6-7

7.1-1 Review of Toxicity Reference Values 7-43
7.1-2 Groundwater Cleanup Standards, RSLs, EPCs, and the Estimated Residential Cancer Risk from Groundwater Ingestion 7-45
7.1-3 Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure 7-46
7.1-4 Soil Gas Cleanup Standards EPCs, and the Calculated Cancer Risk from Industrial Exposure. 7-55
7.1-5 Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits 7-56
7.1-6 Comparison of Risk-Based/Site-Specific Cleanup Standards to January 2015 U.S. EPA Regional Screening Levels 7-61

9.0-1 Recommendations and Follow-up Actions 9-2

FIGURES

1.2-1 Third Five-Year Review Sites and Groundwater Plumes
1.2-2 OU 1 Groundwater Plumes
1.2-3 Northwestern Corner OU Plume

3.1-1 Site Location
3.1-2 Site Location and Local Areas
3.1-3 Site Map

4.1-1 Well Permit Application Notification Boundary
4.1-2 Groundwater Treatment Plant 2 Features
4.2-1 SWMU 1/Area 2 Monitoring Well Locations and LUC Boundary
4.3-1 SWMU 2/SWMU 3 Monitoring Well Locations and LUC Boundary
4.4-1 SWMU 4 Monitoring Well Locations and LUC Boundary
4.5-1 SWMU 6 Monitoring Well Locations and LUC Boundary
4.6-1 SWMU 7 Monitoring Well Locations and LUC Boundary
4.8-1 SWMU 20 Monitoring Well Locations and LUC Boundary
4.9-1 SWMU 24 Monitoring Well Locations and LUC Boundary
4.11-1 SWMU 33 Monitoring Well Locations and LUC Boundary
4.12-1 Building 30 Drum Storage Area Monitoring Well Locations and LUC Boundary
4.13-1 Site 72 Monitoring Well Locations and LUC Boundary
4.14-1 Northern Depot Soils Area Monitoring Well Locations and LUC Boundary
4.15-1 Eastern Depot Soils Area Monitoring Well Locations and LUC Boundary
4.16-1 Southern Depot Soils Area Monitoring Well Locations and LUC Boundary
4.17-1 Area 1 Building 237 Monitoring Well Locations and LUC Boundary
4.18-1 Area 3 Monitoring Well Locations and LUC Boundary

7.2-1 Interpreted Contaminant Plumes and Capture Zones for the Upper Hydrologic Zone Third Quarter 2014
7.2-2 Interpreted Contaminant Plumes and Capture Zones for the Middle Hydrologic Zone Third Quarter 2014
7.2-3 Comparison Map – TCE All Hydrologic Zones 2010-2014
7.2-4 Comparison Map – PCE All Hydrologic Zones 2010-2014
7.2-5 Comparison Map – Dieldrin All Hydrologic Zones 2010-2014

Plate 1 Well Locations

ABBREVIATIONS AND ACRONYMS

ACL	aquifer cleanup level
AG	agricultural well
AIW	air inlet well
ARAR	Applicable or Relevant and Appropriate Requirements
AWQC	ambient water quality criteria
bgs	below ground surface
BRA	baseline risk assessment
Cal/EPA	California Environmental Protection Agency
CASRN	Chemical Abstracts Service registry number assigned to each chemical
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
CPT	cone penetrometer test
CRQL	contract-required quantitation limit
CSM	conceptual site model
CVRWQCB	Central Valley Regional Water Quality Control Board
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDJC	Defense Distribution Depot San Joaquin California
DDRW	Defense Distribution Region West
DDT	dichlorodiphenyltrichloroethane
DDX	the sum of DDT + dichlorodiphenyldichloroethene [DDE] + dichlorodiphenyldichloroethane [DDD
DLA	Defense Logistics Agency
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
ECC	Environmental Chemical Corporation
EE/CA	engineering evaluation/cost analysis
EQPL	equilibrium partitioning limit
ERA	ecological risk assessment
ESD	Explanation of Significant Difference
EU	exposure unit
EW	extraction well
FFA	Federal Facility Agreement
FS	feasibility study

ABBREVIATIONS AND ACRONYMS (CONTINUED)

GAC	granular activated carbon
gal	gallon
gal/lb	gallons per pound
gpm	gallons per minute
GPW	General Purpose Warehouse
GWTP	groundwater treatment plant
HQ	hazard quotient
IG	infiltration gallery
IMP	Installation Master Plan
IRIS	Integrated Risk Information System
IRM	interim remedial measure
IRP	Installation Restoration Program
IUR	Inhalation Unit Risk
IW	injection well
IWPL	industrial waste pipeline
kg	kilogram
lb	pound
LGAC	liquid granular activated carbon
LUC	land use control
MCL	maximum contaminant level
MCPA	2-methyl-4-chlorophenoxyacetic acid
MDL	method detection limit
MEK	2-butanone
mg/kg	milligrams per kilogram
MMOA	mutagenic MOA
MOA	mode of action
msl	mean sea level
MTF	Memorandum to the Site File
MW	monitoring well
NA	not applicable
NC	not calculated
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NE	not established
NFA	no further action
ng/kg	nanogram/kilogram
NPL	National Priorities List
NTCRA	non-time critical removal action
NV	no value
NWC	Northwestern Corner

ABBREVIATIONS AND ACRONYMS (CONTINUED)

OC	organochlorine
O&M	operation and maintenance
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCP	pentachlorophenol
PEL	permissible exposure limit
POW	prisoner of war
ppbv	parts per billion by volume
PPE	personal protective equipment
PQL	practical quantitation limit
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFA	RCRA Facility Assessment
RfC_i	inhalation reference concentration
RfD_o	oral reference dose
RI	remedial investigation
RL	reporting limit
ROD	Record of Decision
RPM	remedial project manager
RPMP	Real Property Master Plan
RSL	regional screening level
Rust	Rust Environmental & Infrastructure
SFO	oral slope factor
Shaw	Shaw Environmental, Inc.
SJCEHD	San Joaquin County Environmental Health Department
SSL	sanitary sewage lagoon
STOP	SVE Termination and Optimization Protocol
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
SWRCB	State Water Resources Control Board
TBC	to be considered
TCE	trichloroethene
THQ	target hazard quotient
TPH	total petroleum hydrocarbons

ABBREVIATIONS AND ACRONYMS (CONTINUED)

TPHD	total petroleum hydrocarbons in the diesel range
TPHG	total petroleum hydrocarbons in the gasoline range
TPHMO	total petroleum hydrocarbons in the motor oil range
TR	target risk
Tracy Site	Defense Distribution Depot San Joaquin
UCL	upper confidence limit
URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Toxic and Hazardous Materials Agency
USC	United States Code
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VE	vapor extraction
VI	vapor intrusion
VLEACH	Vadose Zone Leaching Model
VOC	volatile organic compound
VMP	vapor monitoring point
WCC	Woodward-Clyde Consultants
WDR	waste discharge requirement
WMP	Well Monitoring Program
1,2-DCA	dichloroethane
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
2,4-D	dichlorophenoxy acetic acid
2,4,5-T	trichlorophenoxy acetic acid
3Q14	third quarter 2014
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
$/lb	cost per pound

EXECUTIVE SUMMARY

This is the Third Five-Year Review Report for remedial actions performed at the Defense Distribution Depot San Joaquin (Tracy Site) in accordance with the following records of decision (RODs), explanations of significant differences (ESDs) and memoranda to the site file. A detailed description of the decision document purpose is presented on Table 1.0-1.

- *Operable Unit No. 1, Record of Decision, DDRW-Tracy, California* (Woodward-Clyde Consultants [WCC], 1993), herein referred to as the OU 1 ROD.
- *DDRW-Tracy, Operable Unit 1 Explanation of Significant Difference* (Montgomery Watson, 1995), herein referred to as the 1995 ESD.
- *DDJC-Tracy Site-Wide Comprehensive Record of Decision* (Radian International, 1998a), herein referred to as the 1998 OU 1 ROD.
- *DDJC-Tracy Explanation of Significant Differences to the Selected Remedies in the ROD for SWMUs 2, 3, 7, and 33, Building 30 Drum Storage Area, and the Northern Depot Soils Area* (URS Group, Inc. [URS], 2001a), herein referred to as the 2001 ESD.
- *DDJC-Tracy Amendment to the Site-Wide Comprehensive Record of Decision* (URS, 2003a), herein referred to as the 2003 ROD Amendment.
- *DDJC-Tracy 2004 Explanation of Significant Differences to the Site-Wide Comprehensive Record of Decision* (URS, 2004a), herein referred to as the 2004 ESD.
- *2011 Explanation of Significant Differences to the 1998 Record of Decision, Defense Distribution San Joaquin–Tracy Site* (HDR, 2011a), herein referred to as the 2011 ESD.
- *Defense Distribution Depot San Joaquin–Tracy Site, Record of Decision, Remedy for Northwestern Corner Groundwater Operable Unit* (URS, 2011), herein referred to as the NWC OU ROD.
- *Memorandum to the Site File Documenting Five Minor Modifications to the DDJC-Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2013a), herein referred to as the 2013 Memorandum to the Site File (2013 MTF).
- *Memorandum to the Site File Documenting the Addition of LGAC for Treatment of VOCs to the DDJC – Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2014a), herein referred to as the 2014 MTF.

Five-year reviews of remedial actions at the Tracy Site are required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because hazardous substances, pollutants, or contaminants remain at the Tracy 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 covers the period from June 2010 through September 2014 and was selected to include data collected after the Second Five-Year Review period, but is less than five years to allow sufficient time for agency review prior to the September 29, 2015 signature date.

ES.1 Progress Since Second Five-Year Review

Components of the OU 1 remedy (groundwater extraction and treatment) were fully implemented prior to the period of this Third Five-Year Review. Significant OU 1 remedy optimization and actions taken to address contaminants at the NWC of the Tracy Site are identified below:

ES.1.1 OU 1

- Prepared the 2013 MTF which modified the 1998 OU 1ROD in the following ways:
    - Removed groundwater extraction as part of the remedy for SWMU 8,
    - Added pesticides the Area 1 Building 237 land use control (LUC) and modified the extent of the LUC,
    - Modified the SWMU 20 LUC boundary,
    - Removed SWMU 23/Building 26 LUCs, and
    - Used statistical models to estimate the time necessary for trichloroethene (TCE) to reach the aquifer cleanup level (ACL) east of Banta Road.
- Prepared the 2014 MTF which modified the 1998 OU-1 ROD to allow for the use of granular activated carbon as the treatment method for volatile organic compounds (VOCs) and pesticides at groundwater treatment plant (GWTP) 2.
- Prepared the 2011 ESD which modified the 1998 OU-1 ROD as follows:
    - Incorporated vapor intrusion mitigation into the LUCs at Area 1 Building 237, SWMU 1/Area 2, Area 3, and SWMU 20,
    - Modified the remedial action objectives for soil vapor extraction (SVE) termination criteria, and
    - Modified the remedy at SWMU 20 to include operation of a SVE system.
- Decommissioned 10 groundwater extraction and 50 groundwater monitoring wells.
- Excavated and disposed of pesticide impacted soil at Area 1 Building 237.
- Evaluated indoor air quality to determine whether VOCs in the vadose zone present an unacceptable risk to occupants of Building 231.
- Installed, operated, and shutdown the SVE system at SWMU 20.

ES.1.2 NWC OU

- Prepared the NWC OU ROD which identified the remedy for the NWC OU.
- Implemented, operated, and shut down the groundwater extraction remedy specified in the NWC OU ROD.

ES.1.3 Issues and Recommendations

OU 1

The following minor issues and recommendations were identified for OU 1.

Table ES.1-1 Issues and Recommendations

Number	Issue	Recommendation
1	**Banta Road TCE Plume.** The remedy for the portion of the TCE plume east of Banta Road is dispersion; however, the lateral extent is unknown. In 2015, DLA performed site characterization activities and delineated the lateral and vertical extent of the Banta Road TCE plume.	**Banta Road TCE Plume** Install monitoring wells downgradient of the Banta Road TCE Plume. In April 2015, groundwater samples were collected from soil borings advanced east of Banta Road. The results from this investigation will be presented in a report, used to delineate the extent of TCE in groundwater, and determine the preferred new monitoring well locations. Once installed, the monitoring wells will provide data to assess protectiveness.
2	**Area 3.** TCE and/or PCE continue to be detected in groundwater at Area 3 greater than the ACL and extend off the Depot to the north. In 2013, DLA conducted a soil gas investigation at Area 3 which indicated that TCE and PCE are present in the vadose zone at concentrations greater than the 1998 OU 1 ROD cleanup goals; therefore, it is probable that VOCs in the vadose zone are a source of groundwater contamination.	**Area 3.** Restart SVE at Area 3. In February 2015, DLA submitted a work plan to perform vadose zone remediation by restarting SVE, enhanced with pneumatic fracturing. The remedy is anticipated to be installed in the third quarter of 2015 and operational by the end of 2015.
3	**Northern Depot Soils Area**. The remedy at the Northern Depot Soils Area is a LUC that requires three inches of gravel or an asphalt cover. During the 2014 LUC inspection, deficiencies were observed in the gravel thickness. The gravel is used to mitigate exposure pathways and human health impacts.	**Northern Depot Soils Area.** Add gravel to areas where the thickness is less than three inches. In addition, the DLA may be removing railroad tracks that are present within the boundaries of the Northern Depot Soils Area. This provides the opportunity to evaluate protectiveness / effectiveness of the current remedy and possibly replace the aggregate with an asphalt cover.

Table ES.1-1 Issues and Recommendations (Continued)

Number	Issue	Recommendation
4	**SWMU 27.** In 1999, the excavation remedy at SWMU 27 was implemented. However, laboratory analytical detection limits for the confirmation samples exceed the January 2015 RSL for benzo(a)pyrene. Therefore, despite non-detect sample results it is unknown whether contaminants are present at SWMU 27 at concentrations that prevent unrestricted use / unrestricted exposure.	**SWMU 27.** Prepare a decision document to establish LUCs that prevent residential and daycare center land use or perform confirmation soil sampling to determine whether concentrations prevent unrestricted use / unrestricted exposure.
5	**Institutional Controls**. LUCs have not been established for some areas where COCs are present which do not allow for unrestricted use or unrestricted exposure. In addition, LUC requirements (e.g., required posting of signs) vary from site to site.	**Institutional Controls.** Conduct a comprehensive review of all sites with COCs which do not allow for unrestricted use or unrestricted exposure, establish LUCs, and apply consistent requirements across LUC sites, as appropriate.
6	**Building 237.** In March 2011, indoor air samples were collected from Building 237 to evaluate protectiveness of the remedy. Results from this sampling event indicate that the 0.5 ppbv laboratory reporting limit is greater than the 0.30 ppbv May 2015 California-modified commercial / industrial RSL; therefore, it is unknown whether occupants of Building 237 are being exposed to PCE concentrations greater than the California-modified commercial / industrial RSL, but less than the 0.5 ppbv laboratory reporting limit.	**Building 237.** Assess indoor air at Building 237 to evaluate protectiveness of the remedy.

Notes:
ACL = aquifer cleanup level
COC = contaminant of concern
DLA = Defense Logistics Agency
ESD = Explanation of Significant Difference
LUC = land use control
PCE = tetrachloroethene
ROD = Record of Decision
SVE = soil vapor extraction
TCE = trichloroethene
VOC = volatile organic compound

NWC OU

No issues were identified for the NWC OU; therefore, there is no recommendation for future actions.

ES.2 Protectiveness Statements

ES.2.1 OU 1

The remedy at OU 1 currently protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term LUCs should be established at SWMU 27 to prevent residential and daycare center land use or confirmation sampling should be performed.

ES.2.2 NWC OU

The remedy at the NWC OU is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

ES.2.3 Site Wide

Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.

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FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Defense Distribution Depot San Joaquin		
EPA ID: CA4971520834		
Region: 9	**State:** CA	**City/County:** Tracy/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 San Joaquin
Review period: 8/26/2014 – 9/29/2015
Date of site inspection: 8/26/2014
Type of review: Statutory
Review number: 3
Triggering action date: 09/29/2010
Due date *(five years after triggering action date)*: 09/29/2015

Five-Year Review Summary Form (Continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
Northwestern Corner (NWC) OU does not have any issues at this time

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Banta Road TCE Plume. The remedy for the portion of the TCE plume east of Banta Road is dispersion; however, the lateral extent is unknown. In 2015, DLA performed site characterization activities and delineated the lateral and vertical extent of the Banta Road TCE plume.			
	Recommendation: Banta Road TCE Plume. Install monitoring wells downgradient of the Banta Road TCE Plume. In April 2015, groundwater samples were collected from soil borings advanced east of Banta Road. The results from this investigation will be presented in a report, used to delineate the extent of TCE in groundwater, and determine the preferred new monitoring well locations. Once installed, the monitoring wells will provide data to assess protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

OU(s): 1	Issue Category: Remedy Performance			
	Issue: Area 3. TCE and/or PCE continue to be detected in groundwater at Area 3 greater than the ACL and extend off the Depot to the north. In 2013, DLA conducted a soil gas investigation at Area 3 which indicated that TCE and PCE are present in the vadose zone at concentrations greater than the 1998 OU 1 ROD cleanup goals; therefore, it is probable that VOCs in the vadose zone are a source of groundwater contamination.			
	Recommendation: Area 3. Restart SVE at Area 3. In February 2015, DLA submitted a work plan to perform vadose zone remediation by restarting SVE, enhanced with pneumatic fracturing. The remedy is anticipated to be installed in the third quarter of 2015 and operational by the end of 2015.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

OU(s): 1	Issue Category: Operations and Maintenance			
	Issue: Northern Depot Soils Area. The remedy at the Northern Depot Soils Area is a LUC that requires three inches of gravel or an asphalt cover. During the 2014 LUC inspection, deficiencies were observed in the gravel thickness. The gravel is used to mitigate exposure pathways and human health impacts.			
	Recommendation: Northern Depot Soils Area. Add gravel to areas where the thickness is less than three inches. In addition, the DLA may be removing railroad tracks that are present within the boundaries of the Northern Depot Soils Area. This provides the opportunity to evaluate protectiveness / effectiveness of the current remedy and possibly replace the aggregate with an asphalt cover.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

OU(s): 1	Issue Category: Institutional Controls			
	Issue: SWMU 27. In 1999, the excavation remedy at SWMU 27 was implemented. However, laboratory analytical detection limits for the confirmation samples exceed the January 2015 RSL for benzo(a)pyrene. Therefore, despite non-detect sample results it is unknown whether contaminants are present at SWMU 27 at concentrations that prevent unrestricted use / unrestricted exposure.			
	Recommendation: SWMU 27. Prepare a decision document to establish LUCs that prevent residential and daycare center land use or perform confirmation soil sampling to determine whether concentrations prevent unrestricted use / unrestricted exposure.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Institutional Controls. LUCs are inspected annually and results of the inspections are documented in the Annual Report. During review of the Annual Report, the regulatory agencies noted that LUC requirements vary from site to site.			
	Recommendation: Institutional Controls. Conduct a comprehensive review of LUC sites and apply consistent requirements as appropriate for protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

OU(s): 1	Issue Category: Monitoring			
	Issue: Building 237. In March 2011, indoor air samples were collected from Building 237 to evaluate vapor intrusion risk from VOCs. At the time, results from this sampling event indicated the risk was acceptable; however, U.S. EPA now recommends using the California-modified commercial / industrial RSL for PCE (0.30 ppbv). The 0.5 ppbv laboratory reporting limit from the March 2011 sampling is greater than the California-modified commercial / industrial RSL. Therefore, it is unknown whether occupants of Building 237 are being exposed to PCE at concentrations which could present impacts to human health.			
	Recommendation: Building 237. Submit a work plan to collect indoor air samples at Building 237 and reevaluate vapor intrusion risk.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	U.S. EPA/State	September 30, 2020

Protectiveness Statement(s)		
Operable Unit: 1	*Protectiveness Determination:* Protective in the short term	*Addendum Due Date*
Protectiveness Statement: The remedy at OU 1 currently protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term the following actions should be taken: • Conduct a groundwater investigation to assess protectiveness at the Banta Road TCE Plume. • Restart and enhance the SVE system at Area 3. • Evaluate the protectiveness of the original remedy at the Northern Depot Soils Area and submit a work plan for additional work, if needed. • Evaluate the protectiveness of the original remedy at SWMU 27 and submit a work plan for additional work, if needed. • Submit a work plan to collect indoor air samples at Building 237 and reevaluate vapor intrusion risk.		

Operable Unit: NWC	*Protectiveness Determination:* Protective	*Addendum Due Date*
Protectiveness Statement: *The remedy at the NWC OU is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.*		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date*
Protectiveness Statement: The remedy at Defense Distribution Depot San Joaquin currently protects human health and the environment in the short term. For the remedy to be protective in the long term the following actions should be taken in OU1: • Conduct a groundwater investigation to assess protectiveness at the Banta Road TCE Plume. • Restart and enhance the SVE system at Area 3. • Evaluate the protectiveness of the original remedy at the Northern Depot Soils Area and submit a work plan for additional work, if needed. • Evaluate the protectiveness of the original remedy at SWMU 27 and submit a work plan for additional work, if needed. • Submit a work plan to collect indoor air samples at Building 237 and reevaluate vapor intrusion risk.	

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1.0 INTRODUCTION

This is the Third Five-Year Review for remedial actions performed at the Defense Distribution Depot San Joaquin (Tracy Site) in accordance with the following records of decision (RODs), explanations of significant differences (ESDs) and memoranda to the site file (MTF). A detailed description of the decision document purpose is presented on Table 1.0-1.

- *Operable Unit No. 1, Record of Decision, DDRW-Tracy, California* (Woodward-Clyde Consultants [WCC], 1993), herein referred to as the 1993 ROD.
- *DDRW-Tracy, Operable Unit 1 Explanation of Significant Difference* (Montgomery Watson, 1995), herein referred to as the 1995 ESD.
- *DDJC-Tracy Site-Wide Comprehensive Record of Decision* (Radian International, 1998a), herein referred to as the 1998 OU 1 ROD. The 1998 OU 1 ROD included a comprehensive evaluation of all groundwater issues and addressed all sites with soil contamination.
- *DDJC-Tracy Explanation of Significant Differences to the Selected Remedies in the ROD for SWMUs 2, 3, 7, and 33, Building 30 Drum Storage Area, and the Northern Depot Soils Area* (URS Group, Inc. [URS], 2001a), herein referred to as the 2001 ESD.
- *DDJC-Tracy Amendment to the Site-Wide Comprehensive Record of Decision* (URS, 2003a), herein referred to as the 2003 ROD Amendment.
- *DDJC-Tracy 2004 Explanation of Significant Differences to the Site-Wide Comprehensive Record of Decision* (URS, 2004a), herein referred to as the 2004 ESD.
- *2011 Explanation of Significant Differences to the 1998 Record of Decision, Defense Distribution San Joaquin–Tracy Site* (HDR, 2011a) herein referred to as the 2011 ESD.
- *Defense Distribution Depot San Joaquin–Tracy Site, Record of Decision, Remedy for Northwestern Corner Groundwater Operable Unit* (URS, 2011), herein referred to as the NWC OU ROD.
- *Memorandum to the Site File Documenting Five Minor Modifications to the DDJC-Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2013a), herein referred to as the 2013 MTF.
- *Memorandum to the Site File Documenting the Addition of LGAC for Treatment of VOCs to the DDJC – Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2014a), herein referred to as the 2014 MTF.

Five-year reviews of remedial actions at the Tracy 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.

1.1 Purpose and Statement of Authority

The purpose of a five-year review is to determine whether the remedial response actions are protective of human health and the environment and, as necessary, to provide recommendations for attaining and/or

maintaining sustainable protection. As this is the Third Five-Year Review for remedial actions at the Tracy Site, this review evaluated changes in remedy implementation during the review period and actions taken in response to recommendations in the *Defense Distribution Depot San Joaquin-Tracy Site Second Five-Year Review of Remedial Actions* (URS, 2012). The Second Five-Year Review for the Tracy Site is located online at http://cumulis.epa.gov/fiveyear.

Executive Order 12580 delegates review responsibility to Federal facilities that control the sole source of the release. This Third Five-Year Review for the Tracy Site was conducted by the Defense Logistics Agency (DLA) Installation Support at San Joaquin using HDR under contract to the U.S. Army Corps of Engineers (USACE), Forth Worth District.

DLA is responsible for managing regional and local environmental programs at the Tracy Site, including the Installation Restoration Program (IRP). The IRP at the Tracy Site is managed in accordance with a Federal Facility Agreement (FFA) developed specifically for the Tracy Site. 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 a team of Remedial Project Managers (RPMs) from DLA Installation Support at San Joaquin; the United States Environmental Protection Agency, Region 9 (U.S. EPA); and the California Environmental Protection Agency (Cal/EPA), including the Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board (CVRWQCB). DLA is the lead agency responsible for funding and implementing remedial actions. U.S. EPA provides final approval for decisions regarding remedial actions taken at the Tracy Site. U.S. EPA, DTSC, and CVRWQCB also provide regulatory oversight, including technical support, review, and comment on investigative and remedial work at the Tracy Site.

DLA is providing this five-year review report in accordance with CERCLA Section (§) 121(c) (42 United States Code [USC] § 9621[c]) and the National Oil and Hazardous Substances Pollution Contingency Plan (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 judgment 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 U.S. EPA interpreted this requirement further in the NCP; Title 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.

The trigger for this five-year review is the signing of the Second Five-Year Review by U.S. EPA on 29 September 2010. This Third Five-Year Review, evaluates IRP sites at the Tracy Site that trigger a statutory or a policy review. This Third Five-Year Review was conducted in accordance with the

Comprehensive Five-Year Review Guidance (U. S. EPA, 2001) and *Recommended Evaluation of Institutional Controls: Supplement to the "Comprehensive Five-Year Guidance"* (U.S. EPA, 2011a).

1.2 Scope and Nature of Third Five-Year Review

This Third Five-Year Review covers the period from June 2010 through September 2014 and addresses the IRP sites that trigger a statutory review. Five-year statutory reviews are required for sites for which a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at above levels that allow for unlimited use and unrestricted exposure.

A list of sites that require a statutory review consistent with CERCLA §121 (c) are provided in Table 1.2-1. These sites and current (through 3Q14) plumes are shown on Figures 1.2-1, 1.2-2 and 1.2-3. Sites which have received no further action (NFA) determination, are presented on Table 1.2-2.

As outlined in Appendix E of *Comprehensive Five-Year Review Guidance* (U.S. EPA, 2001), this five-year review report is organized as follows:

Section 1.0 Introduction: Identifies the purpose of the review, the authority for conducting the review, the areas of the site addressed in the review, and the action that triggered the review.

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

Section 3.0 Background: Provides a succinct description of site characteristics. The purpose of this section is to identify 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 is intended to address.

Section 4.0 Remedial Actions: Provides a concise description of implementation history and the status of the remedy.

Section 5.0 Progress Since Last Review: Restates the recommendations from the Second Five-Year Review and discusses actions taken or relevant events that have occurred since.

Section 6.0 Five-Year Review Process: Describes activities performed during the five-year review (e.g., site inspections, interviews, and document review) and summarizes the findings, as appropriate.

Section 7.0 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 other information come to light that could call into question the protectiveness of the remedy?)

Section 8.0 Issues: Identifies issues related to current site operations, conditions, or activities, noting which issues, if any, prevent the remedy from being protective of human health and the environment, currently or in the future.

Section 9.0 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.

Section 10.0 Protectiveness Statement: Provides a protectiveness statement for each OU at which a remedial action has begun.

Section 11.0 Next Five-Year Review: Identifies the necessity and period for the next five-year review.

Section 12.0 References: Provides reference information for sources cited in the document.

This Third Five-Year Review report is supplemented with the following appendices:

Appendix A: Conceptual Site Model

Appendix B: Well Construction Details and Monitoring Well Sampling Information

Appendix C: Third Five-Year Review Questionnaires

Appendix D: Site Inspection Forms

Appendix E: Response to Agency Comments on the draft Third Five-Year Review

Table 1.0-1. Description of Decision Documents, Tracy Site

Date	Title	Purpose
Aug-93	*Operable Unit No. 1 Record of Decision, DDRW-Tracy, California*	Set ACLs for PCE (5 µg/L), TCE (5 µg/L), and DCE (6 µg/L), and Established groundwater extraction, treatment via air stripping and GAC, and disposal of the treated water by returning it to the aquifer from which it had been extracted.
Dec-95	*DDRW-Tracy, Operable Unit 1 Explanation of Significant Difference*	Modified the effluent treatment standards for total chromium and pesticides, and Modified the groundwater treatment remedy to include dispersion.
Apr-98	*DDJC-Tracy Site-Wide Comprehensive Record of Decision*	Recommended no further action required for 21 sites Recommended further action required at 16 sites and identified the selected remedy for these sites, and Identified the need for Five-Year Reviews at sites where contaminants remain in place at concentrations sufficient to pose a risk to human health or the environment.
Jun-01	*DDJC-Tracy Explanation of Significant Differences to the Selected Remedies in the ROD for SWMUs 2, 3, 7 and 33, Building 30 Drum Storage Area, and the Northern Depot Soils Area.*	Revised the cleanup standards for SWMU 2/3 Corrected cleanup standards for the Northern Depot Soils Area and modified the cover requirements Clarified institutional controls for SWMU 7, SWMU 33, and the Building 30 Drum Storage Area, and Clarified that institutional controls are required at all sites with soil contamination in the event of a change in land use
Dec-03	*DDJC-Tracy Amendment to the Site-Wide Comprehensive Record of Decision*	Revised cleanup standards for SWMU 4 based on the results of a risk assessment. Added option for overland flow discharge of treated groundwater to supplement the remedy for OU 1 groundwater, and Selected LUCs as the remedy for Site 72, which was discovered after signing of the 1998 OU 1 ROD.
Sep-04	*DDJC-Tracy 2004 Explanation of Significant Differences to the Site-Wide Comprehensive Record of Decision*	Implemented LUCs at SWMU 6 and SWMU 20 Revised the soil cleanup standards for DDT and dieldrin to 103 µg/Kg and 5 µg/Kg, respectively Implemented supplemental LUCs at Site 67, and Removed SVE as a remedy for SWMU 20

Table 1.0-1. Description of Decision Documents (Continued)

Date	Title	Purpose
Apr-11	*Record of Decision, Remedy for the Northwestern Corner Groundwater Operable Unit*	Established the remedy for dieldrin impacted groundwater in the northwestern corner.
Sep-11	*2011 Explanation of Significant Differences to the 1998 Record of Decision, Defense Distribution San Joaquin-Tracy Site*	Modify the RAOs to allow for SVE system shutdown Revise the LUCs at Area 1 Building 237, SWMU /Area 2, Area 3, and SWMU 20 Modify the remedy for SWMU 20 from LUC only to the addition of enhanced SVE
Mar-13	*Memorandum to the Site File Documenting Five Minor Modification to the DDJC-Tracy Site-Wide Comprehensive Record of Decision*	Removed 1,1-DCE as a groundwater contaminant of concern for the Tracy Site Removed groundwater extraction as part of the remedy for SWMU 8. Added pesticides as a contaminant of concern for LUCs and modified the LUC boundary at Area 1 Building 237. Removed LUC at SWMU 23. Extended time estimate for TCE to reach ACL east of Banta Road.
Apr-14	*Memorandum to the Site File Documenting the Addition of LGAC for the Treatment of VOCs to the DDJC-Tracy Site-Wide Comprehensive Record of Decision*	Modified the groundwater treatment remedy for VOCs, as presented in the 1998 OU-1 ROD, from air stripping to air stripping and/or LGAC

Notes:

ACL	=	aquifer cleanup level	SVE	=	soil vapor extraction
DCE	=	dichloroethene	SWMU	=	solid waste management unit
DDJC	=	Defense Distribution Depot San Joaquin California	TCE	=	trichloroethene
DDRW	=	Defense Distribution Region West	µg/Kg	=	micrograms per kilogram
DDT	=	dichlorodiphenyltrichloroethane	µg/L	=	micrograms per liter
GAC	=	granular activated carbon			
LGAC	=	liquid granular activated carbon			
LUC	=	land use control			
OU	=	operable unit			
PCE	=	tetrachloroethene			
RAO	=	remedial active objective			
ROD	=	Record of Decision			

Table 1.2-1. Sites Included in this Five-Year Review

Site Name	OU	Site Description	Status of Remedial Action
OU 1	**OU 1**	TCE and PCE plumes in groundwater emanating from multiple sites on the Tracy Site and comingling with other contaminants.	Pump and treat and dispersion remedy in progress.
		Dieldrin only plumes in groundwater, on and off the Depot, emanating from the SSLs on the Tracy Site. Referred to as the SSL Dieldrin Plume.	LUCs established and groundwater monitoring is ongoing.
SWMU 1/ Area 2	**OU 1**	Old Sewage Lagoon and Former Drum Storage Area. This area was used as a drum storage area from 1957 through 1984. Chemicals in drums possibly leaked or were discharged accidentally.	SVE remedy completed, LUCs established and groundwater monitoring is ongoing.
SWMU 2/3	**OU 1**	Sewage (SWMU 2) and Former Industrial Waste Lagoons (SWMU 3). The wastewater treatment plant has a permitted discharge to the sewage lagoons. SWMU 3 formerly received discharge from the industrial waste pipeline (SWMU 33). The lagoons have been in operation since 1942. Sometime between 1971 and 1979, industrial wastes from SWMU 3 overflowed into SWMU 2.	Soil excavation completed, LUCs established and groundwater monitoring is ongoing.
SWMU 4	**OU 1**	Storm Pond Lagoon. Storm water has been discharged to the lagoon since 1971. The storm drain lagoon reportedly received rinse water from paint-stripping, degreasing, and steam cleaning operations. The area was used for open storage before 1952. Manganese ore was stockpiled northeast of the lagoon area from 1957 to 1968.	Soil excavation completed, LUCs established and groundwater met 1998 OU-1 ROD monitoring requirements
SWMU 6	**OU 1**	Building 28 Sump. The sump operated from 1968 to 1977. A portion of Building 28 was used for repackaging. Wastes from the repackaging operations collected in the sump. The sump was initially abandoned in place and then removed in 1988. Former UST Site 31 was also in this area.	Soil excavation completed, LUCs established and groundwater met 1998 OU-1 ROD monitoring requirements.
SWMU 7	**OU 1**	Burn Pit No. 1. Site of seven former burn pits (Pits A-G) that were used between 1942 and 1954 to dispose of medical supplies, narcotics, pharmaceuticals, radiological supplies, and electron tubes. The pits are partially or completely covered by Buildings 15, 19, and 21.	LUCs established and groundwater met 1998 OU-1 ROD monitoring requirements.

Table 1.2-1. Sites Included in this Five-Year Review (Continued)

Site Name	OU	Site Description	Status of Remedial Action
SWMU 8	**OU 1**	Burn Pit No. 2. A single large burn pit was operated between 1942 and 1971. Various containers, crates, wooden pallets, trash, unknown liquids and solids, and narcotics were burned in the pit. Explosions attributed to pressurized containers were reported intermixing liquid chemicals or burning.	Soil excavation completed and groundwater met 1998 ROD monitoring requirements.
SWMU 20	**OU 1**	Aboveground Abandoned Solvent Tank/Building 26 Recoup Operations, Area 1 Building 10, and UST 13.	Excavation and SVE completed, LUCs established and groundwater monitoring is ongoing.
SWMU 24	**OU 1**	Contaminated Area 1, Building 247 Petroleum Laboratory, and UST 21 (petroleum waste oil tank).	Bioventing completed, LUCs established, and groundwater met 1998 OU-1 ROD monitoring requirements.
SWMU 27	**OU 1**	Building 206 Roundhouse Sump, Building 206-Fluids used to clean locomotives were reportedly drained into the sump. Pesticides were reportedly stored in Building 206. A service pit in Building 206 may have been used to transfer fuel oil from UST Site 7 to the boiler room.	Excavation completed and groundwater met 1998 OU-1 ROD monitoring requirements.
SWMU 33	**OU 1**	The IWPL was constructed in 1972. Discharges to the IWPL included paint spray wastewater, phosphoric acid and sodium hydroxide from strippers and rinse tanks, pesticide wastewaters, cleaning tank washwaters, steam cleaner washwater, and acid washwater.	Excavation completed, LUCs established and groundwater met 1998 OU-1 ROD monitoring requirements.
Building 30 Drum Storage Area	**OU 1**	Drum Storage Area-Petroleum hydrocarbons and metals wastes were previously stored at this site. Solvents may have been stored here. The site is partially covered by the Consolidated Subsistence Facility (constructed in 1992).	LUCs established and groundwater met 1998 OU-1 ROD monitoring requirements.
Site 72	**OU 1**	Pesticide Spill Area.	LUCs established.
Northern Depot Soils Area	**OU 1**	Former storage area for the National Stockpile of Strategic Metals.	LUCs established.
Eastern Depot Soils Area	**OU 1**	Nonvegetated areas on the eastern side of the Depot historically used for grader-training exercises.	LUCs established.

Table 1.2-1. Sites Included in this Five-Year Review (Continued)

Site Name	OU	Site Description	Status of Remedial Action
Southern Depot Soils Area	**OU 1**	Nonvegetated areas on the southern side of the Depot historically used for grader-training exercises.	LUCs established.
Area 1 Building 237	**OU 1**	Former solvent storage building. Cleaning asphalt application tools occurs here.	Excavation and SVE completed, LUCs in place, and groundwater monitoring is ongoing.
Area 3	**OU 1**	Drum Storage Area-Former drum storage area. Some drums may have leaked or spills may have occurred.	SVE to be restarted in 2015, LUCs established, and groundwater monitoring ongoing.
NWC OU	**NWC OU**	Dieldrin plume in groundwater, on and off the Depot, emanating from the NWC of the Tracy Site. Referred to as the NWC Dieldrin Plume, which does not contain VOCs.	Pump and treat remedy completed, LUCs in place and groundwater met NWC OU ROD monitoring requirements

Notes:
Bold type indicates the site name used in this Report.
IWPL = industrial waste pipeline
LUC = land use control
NWC = northwestern corner
OU = operable unit
PCE = tetrachloroethene
ROD = Record of Decision
SSL = sanitary sewage lagoon
SVE = soil vapor extraction
SWMU = solid waste management unit
TCE = trichloroethene
UST = underground storage tank
VOC = volatile organic compound

Table 1.2-2. Sites not Included in this Five-Year Review

Site Name	OU	Site Description	Closure Status	Basis for no Action Determination, Decision Document
SWMU 5	OU 1	Old Industrial Lagoon, Building 255-The site was constructed by 1952. The lagoon received rinse water from the paint-spraying and paint-stripping operations in Building 255. The lagoon was enlarged in 1963 and existed until at least 1971.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 9	OU 1	Subsistence Waste Pit-Subsistence waste, primarily food, was buried in the pit beginning in 1947. Packaging materials were also buried.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 10	OU 1	Medical Waste Burial Pit-Former medical waste and burial pit. Outdated medical supplies, narcotics, mercury compounds, and phosphate compounds were buried. The pit operated from approximately 1949 until 1965. Since 1967, this area has been used for the storage of truck trailers.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 10A	OU 1	Possible Medical Waste Burial Pit-A former pit was reportedly used to bury medical wastes. Possible trenches are visible in aerial photographs from 1945 to 1967.	Closed	No adverse human health risk. Remediation to address potential threat to groundwater would require $2 million to $4 million (1998 OU 1 ROD).
SWMU 11	OU 1	Burial of Lime/Foot Bath-Site was reportedly used to dispose of lime materials associated with lime foot baths. Area is currently covered with asphalt.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 12	OU 1	Embalming Fluid Dump-An unknown, but substantial quantity of embalming fluid containing formaldehyde was buried just east of Building 30.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 14	OU 1	Lube Oil Dump-Reported site of a former lube oil dump. Reportedly 150 drums of new lube oil were emptied into a trench in 1976. The trench was backfilled in 1976. Oil seepage was visible in aerial photographs. A black viscous surface was reported by construction workers in 1992.	Closed	No threat to groundwater and no adverse human health risk from chemicals of potential concern in soils (1998 OU 1 ROD).
SWMU 15	OU 1	Pesticide Waste Trench-Former pesticide waste trench from 1977 or 1978 until 1979. Rodenticide, crushed cans that formerly contained pesticides, phosgene (or phostoxin)slurry, and empty DDT containers may have been buried. Between 1979 and 1980, the trench was excavated and the contents were disposed off site.	Closed	No contamination identified at this site (1998 OU 1 ROD).

Table 1.2-2. Sites not Included in this Five-Year Review (Continued)

Site Name	OU	Site Description	Closure Status	Basis for no Action Determination, Decision Document
SWMU 16	OU 1	Possible Waste Disposal Area-Possible waste disposal area from 1952 til 1967. Possible wastes include asbestos, mercury, fluorescent bulbs, and medical supplies.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 21	OU 1	Battery Acid Dump-Neutralized solution from the battery shop was discharged to the ground and a sump behind Building 201.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 22	OU 1	Previous Hazardous Materials Storage Area-Former storage area from 1979 until 1985. Leaking containers of hazardous materials (i.e., ammonium thiosulfate) were stored here prior to repackaging or off-site disposal. The holding area was lined with bentonite clay.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 23	OU 1		Closed	No threat to groundwater and no adverse human health risk from chemicals of potential concern in soils (1998 OU 1 ROD).
SWMU 25	OU 1	Boundary Roads-Waste motor oil may have been used as a dust suppressant in the 1940s and 1050s. Most of the roads are presently paved.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 29	OU 1	Used Motor Oil Pit-Former motor disposal pit. Period of operation is uncertain.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 30	OU 1	Salvage Area-Former salvage area. No information regarding the types or volumes of wastes is available.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 31	OU 1	Wood Preservation Area-Site was used for wood preservation operations from the mid-1950s until 1960. Wood products were dipped into vats of phenolic compounds and carbolic acid to prevent the wood from rotting. The vats were covered with canvas tarps. Spills from the vats were reported.	Closed	No contamination identified at this site (1998 OU 1 ROD).
SWMU 64	OU 1	Waste Oil Pit. A 1,000 gallon metal tank (UST 8) that contained waste oils from the automotive maintenance shop was located at this location. The tank was installed in 1975 and removed in 1988.	Closed	No contamination identified at this site (1998 OU 1 ROD).
Drum Storage Area Building 15	OU 1	Drum Storage Area-Petroleum hydrocarbons and metals wastes were previously stored at this site. The site includes a concrete slab where materials are stored.	Closed	No contamination identified at this site (1998 OU 1 ROD).

Table 1.2-2. Sites not Included in this Five-Year Review (Continued)

Site Name	OU	Site Description	Closure Status	Basis for no Action Determination, Decision Document
Drum Storage Area Building 22	OU 1	Drum Storage Area-Site includes a paved area where materials are stored. Drums of solvents may have been stored here in the past.	Closed	No contamination identified at this site (1998 OU 1 ROD).
Building 23	OU 1	Area is adjacent to several open storage areas. Previously called Containment Area 5.	Closed	No contamination identified at this site (1998 OU 1 ROD).
Day Care Center	OU 1	A 1,200-gallon UST containing No. 2 fuel oil was previously located at this site from 1956 until 1988. Pesticide contamination was also found in soil samples.	Closed	Recommended for No Further Action Required in the 1996 RI/FS.

Notes:
DDT = dichlorodiphenyltrichloroethane
FS = Feasibility Study
OU = operable unit
RI = Remedial Investigation
ROD = Record of Decision
SWMU = solid waste management unit
UST = underground storage tank

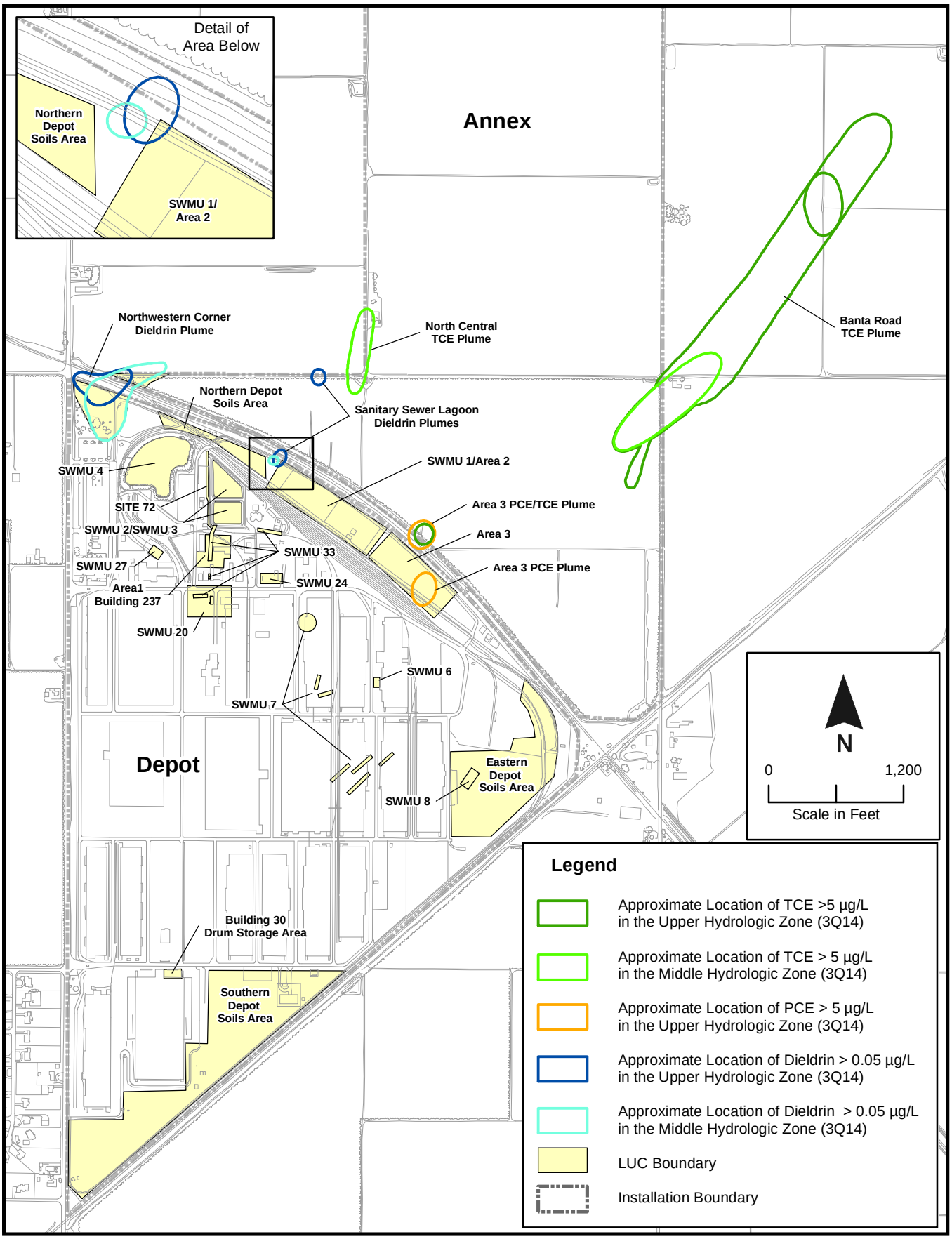

Figure 1.2-1 Third Five-Year Review Sites and Groundwater Plumes

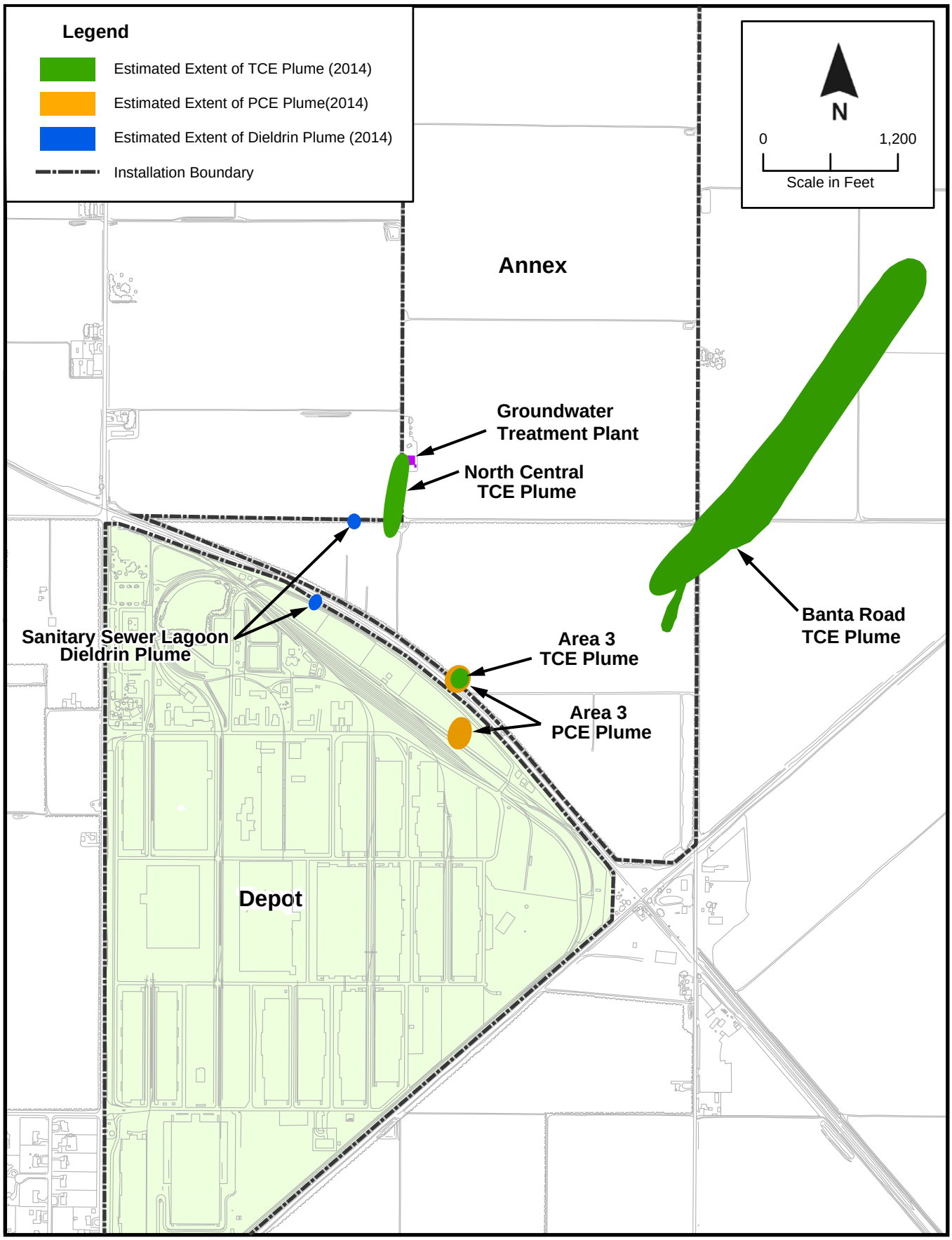

Figure 1.2-2 OU 1 Groundwater Plumes

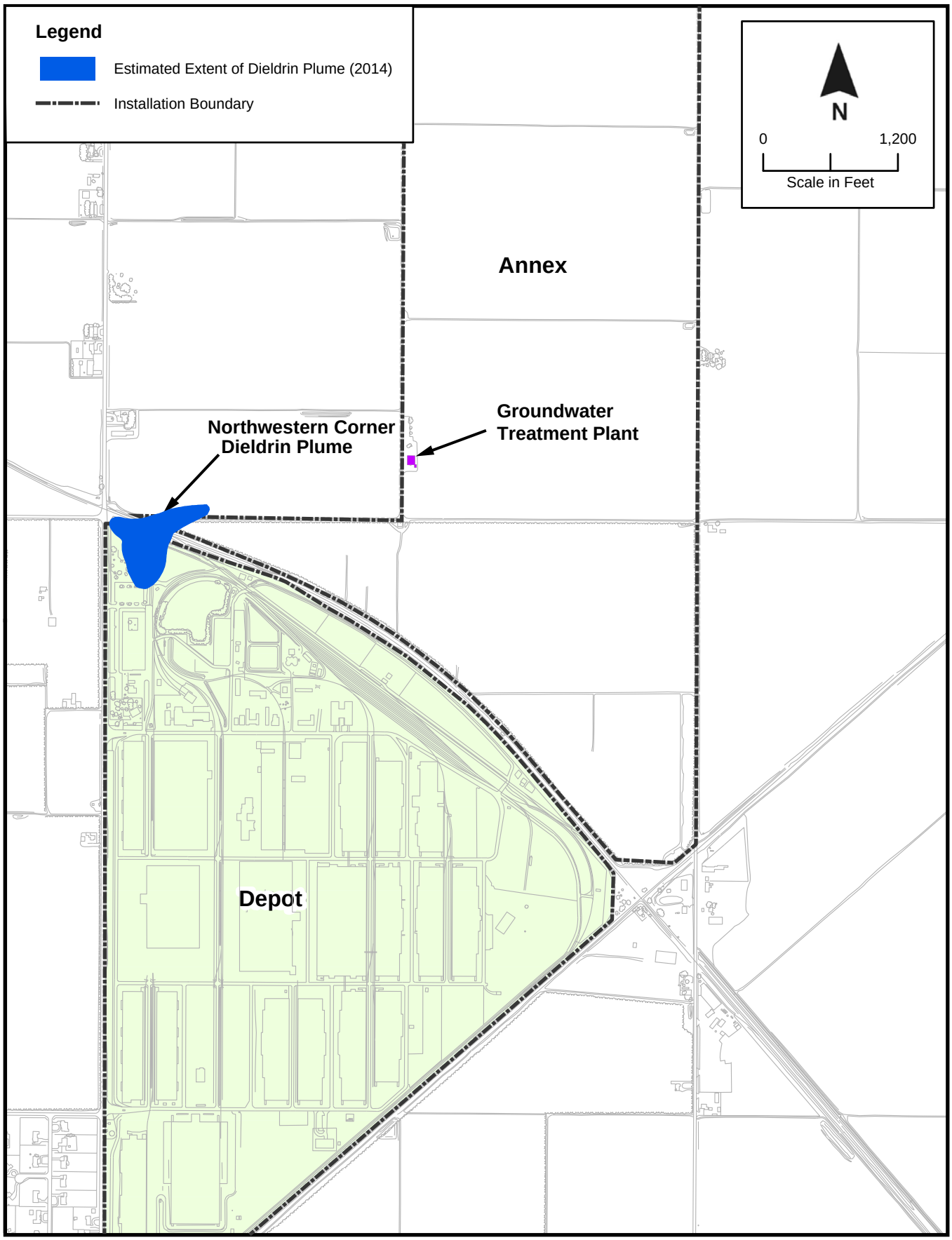

Figure 1.2-3 Northwestern Corner OU Plume

2.0 CHRONOLOGY

This section documents chronology and actions which led to the preparation of decision documents at the Tracy Site. Significant environmental program milestones are presented on Table 2.0-1.

2.1 Tracy Site Chronology

In early 1980, the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) conducted a records search for waste sites at the Tracy Site, emphasizing those sites that were thought to pose a potential for migration of contaminants to off Depot locations. A review of the Tracy Site records identified the major areas of concern as burning sites, burial grounds, and unlined drainage and sewage leaching ponds. Twenty-five potential waste sites (SWMUs 1 though 23, 2A, and 10A) were identified. The results of this investigation were presented in the *Installation Assessment of Defense Distribution Depot Tracy, California No. 181* (USATHAMA, 1980).

In May 1984, the CVRWQCB was advised that trichloroethene (TCE) and tetrachloroethene (PCE) concentrations in three monitoring wells exceeded the California Department of Public Health (CDPH) state action level of 5 micrograms per liter (µg/L) (Montgomery Watson, 1996b). As a result, in 1985 a hydrogeologic study was conducted by *U.S. Army Environmental Hygiene Agency* (USAEHA) that included in the installation of 14 groundwater monitoring wells. Results of the study were presented in the *Geohydrological Study No. 30-26-0488-85, Defense Depot Tracy* (USAEHA, 1985). The study concluded that the uppermost aquifer in the northern part of the Depot was contaminated with volatile organic compounds (VOCs) (USAEHA, 1985).

In 1985 and 1986, Radian Corporation reviewed existing records and conducted soil gas and groundwater sampling at the Tracy Site. The results of the Radian investigation were presented in the *Geohydrological Investigations – Final Engineering Report, Defense Distribution Depot Tracy* (Radian, 1986). Radian concluded that among other organic constituents, TCE and PCE were consistently found in the greatest concentrations and with the greatest lateral extent (Radian, 1986).

Between 1986 and 1992, WCC conducted a remedial investigation (RI) at the Tracy Site in accordance with CERCLA (and subsequent Superfund Amendments and Reauthorization Act) guidance. Because of the RI/Remedial Action (RA), OU 1 was identified. The *Draft Final Operable Unit No. 1 RI/RA Report, DDRW-Tracy California* (WCC, 1992a) included a description of the activities conducted and a discussion of the physical characteristics and the nature and extent of soil and groundwater contamination, the fate and transport of contaminants, and a baseline risk assessment (BRA) for OU 1 at the Tracy Site. In 1990, the results of the RI led to the Tracy Site being listed on CERCLA's National Priorities List (NPL) as a Superfund site. In 1991, DLA, U.S. EPA, DTSC, and CVRWQCB signed the FFA for the Tracy Site (DLA, 1991).

Starting in 1990, ENSOTECH, Inc. installed the OU 1 interim remedial measure (IRM) system. The IRM system controlled the migration of the contamination, reduced levels of VOCs, and provided data to evaluate the effectiveness and potential use of the selected remedial technology for the full-scale design (Radian International, 1998a).

The *Draft Final Operable Unit 1 Feasibility Study* (OU 1 FS) (WCC, 1992b) accompanied the OU 1 RI/RA and included background information used for the development and screening of remedial technologies for OU 1 groundwater contamination. The alternatives were screened against the evaluation criteria specified by the U. S. EPA (WCC, 1992b).

The *Operable Unit No. 1, Record of Decision, DDRW-Tracy* (OU 1 ROD), signed in 1993, states that the OU 1 remedial action will address the principal threat posed by the groundwater contaminant plume by prioritizing action at OU 1 over additional cleanup associated with other potential sources of contamination at the Depot (WCC, 1993). As the OU 1 ROD describes, the selected alternative was to extract, treat, and reinject the contaminated groundwater. In addition, the OU 1 ROD set aquifer cleanup levels (ACLs) of 5 µg/L for TCE and PCE and 6 µg/L for 1,1-dichloroethene (DCE). The OU 1 ROD also specified effluent treatment standards for carbon tetrachloride, chloroform, 1,1-DCE, dieldrin, PCE, TCE, and total VOCs (halogenated hydrocarbons).

In addition to the effluent treatment standards specified in the OU 1 ROD, the CVRWQCB specified effluent treatment standards in a Waste Discharge Requirements (WDR) permit based on the State Water Resources Control Board (SWRCB) Resolution 92-49 ("Policies and Procedures for Investigation and Cleanup and Abatement of Discharge"). The effluent treatment standards for several VOCs and pesticides not included in the OU 1 ROD were adopted into the OU 1 ROD through an ESD (Montgomery Watson, 1995). The OU 1 ESD also modified the technology for removing VOCs from the aquifer to include dispersion (encompassing metabolism and volatilization).

From 1993 through 1995, a comprehensive RI and FS was conducted at the Tracy Site (Montgomery Watson, 1996). The goals of this RI and FS were to identify and investigate potential sources of contamination at the Tracy Site and to collect data to support the evaluation and selection of remedial alternatives, the BRA, the ecological risk assessment (ERA), and the design of the selected remedies (Montgomery Watson, 1996). The *Comprehensive Remedial Investigation/Feasibility Study* (Comprehensive RI/FS) (Montgomery Watson, 1996) report reevaluated and reaffirmed the OU 1 ROD and OU 1 ESD and addressed areas that were not included as part of the OU 1 RI/FS.

The results from the Comprehensive RI/FS were used to help develop the *DDJC-Tracy Site-Wide Comprehensive Record of Decision* (1998 OU 1 ROD) (Radian International, 1998a). The 1998 OU 1 ROD was prepared to address sites that were not included in the OU 1 ROD and serves as the Final Remedial Action Plan for the Tracy Site. The 1998 OU 1 ROD includes a comprehensive evaluation of groundwater issues, addresses sites with soil contamination, includes a BRA, and established cleanup standards to protect background groundwater quality. The 1998 OU 1 ROD modified the remedy for OU 1 groundwater to address soil contamination at the Tracy Site.

In 2001, the *DDJC-Explanation of Significant Differences to the Selected Remedies in the ROD for SWMUs 2, 3, 7 and 3, the Building Drum Storage Area, and Northern Depot Soils Area* (2001 ESD) (URS, 2001a) was prepared. The 2001 ESD revised cleanup standards at SWMUs 2 and 3, corrected cleanup standards for the Northern Depot Soils, modified the cover requirements at the Northern Depot Soils Area, and clarified land use control (LUC) requirements for a number of sites.

In June 2004, the *Amendment to the Sitewide Comprehensive Record of Decision* (ROD Amendment) (URS, 2003a) modified the remedy at SWMU 4, included overland flow as an option for disposal of treated OU 1 groundwater, and addressed Site 72 which was discovered after the 1998 OU 1 ROD was signed.

In September 2004, the *DDJC-Tracy 2004 Explanation of Significant Differences to Sitewide Comprehensive ROD* (2004 ESD) (URS, 2004a) implemented LUCs at SWMUs 6 and 20, revised the soil cleanup standards for dichlorodiphenyltrichloroethane (DDT) and dieldrin, implemented supplemental LUCs at the Northern Depot Soils Area, and removed soil vapor extraction (SVE) as the remedy for SWMU 20.

In 2007, DLA proposed monitored natural attenuation with institutional controls as the remedy for dieldrin in the NWC (URS, 2010a). DLA conducted an FS for the remediation of dieldrin in groundwater which identified LUCs as the preferred remedial alternative. However, the State of California did not concur and on 1 July 2009 initiated the informal dispute process with DLA, as prescribed in the FFA. Resolution was not attained during the informal dispute period, and U.S EPA invoked formal dispute on 13 October 2009. The dispute was resolved through an agreement on 14 April 2010. In resolution of the dispute, another remedial alternative was added and was agreed upon as the preferred alternative. The preferred alternative consisted of removing dieldrin from groundwater in the NWC using extraction and treatment to the extent technically and economically feasible, but for no longer than three years, consistent with the 14 April 2010 dispute resolution agreement. The selected remedy for the NWC Groundwater OU was identified in the *Record of Decision Remedy for the Northwestern Corner Groundwater Operable Unit* (URS, 2011).

In September 2011, the *2011 Explanation of Significant Differences to the 1998 ROD* (HDR, 2011a) modified the RAOs in the 1998 OU 1 ROD, clarified SVE system shutdown criteria, revised the LUCs at Area 1 Building 237, SWMU 1/Area 2, Area 3, and SWMU 20, and modified the remedy for SWMU 20 from only LUCs to the addition of enhanced SVE.

On September 26, 2012, the Tracy Site achieved construction completion meaning that remedial actions have been constructed consistent with plans and specifications documented in RODs, other Decision Documents, and Remedial Design/Remedial Action work plans (U.S. EPA, 2012b).

In March 2013, the *Memorandum to the Site File Documenting Five Minor Modifications to the DDJC-Tracy Site-Wide Comprehensive Record of Decision* removed 1,1-DCE as a groundwater contaminant of concern (COC), removed groundwater extraction as part of the remedy for SWMU 8, added pesticides as a COC for LUCs and modified the LUC boundary at Area 1 Building 237, removed LUCs at SWMU 23, and extended the time estimate for TCE to reach the ACL east of Banta Road.

In April 2014, *Memorandum to the Site File Documenting the Addition of LGAC for Treatment of VOCs to the DDJC-Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2014a) modified the groundwater treatment remedy for VOCs presented in the 1998 OU 1 ROD from air stripping to air stripping and/or liquid granular activated carbon (LGAC).

Table 2.0-1. Environmental Program Milestones

1990	Installation added to NPL.
1990	Installation of IRM system for the OU 1 groundwater plume.
1991	FFA signed.
1991	OU 1 IRM brought online.
1992	Draft final OU 1 RI/RA report produced.
1992	OU 1 FS and proposed plan distributed.
1992	IRM treatment system repaired, tested, and operated.
1993	FFA amended and OU 1 ROD signed.
1994	Final comprehensive RI/FS Phase I site characterization report produced.
1994	OU 1 RA plan produced.
1995	Draft comprehensive RI/FS report produced.
1995	Environmental baseline study for OU 1 easements conducted.
1995	Draft UST closure report produced.
1995	EE/CA conducted for the IWPL and sewage and industrial waste lagoons.
1996	Final comprehensive RI/FS report produced.
1996	Final UST closure report produced.
1996	ESD provided.
1997	Final 100% design produced for removal action for the sewage and industrial waste lagoons and industrial waste pipeline.
1998	Site-Wide Comprehensive ROD signed.
1998	Installation and startup of GWTP2 for OU 1 groundwater plume.
1998	Removal action completed for the sewage and industrial waste lagoons and IWPL.
1998	Low-flow pumps installed in monitoring wells.
2000	Final SVE sites system designs produced.
2000	Final ICs sites RA report produced.
2000	Final SWMU ecological risk assessment produced.
2000	SVE remedy installed for SWMU 1/Area 2, Area 1 Building 237, and Area 3.
2000	Bioventing remedy installed for SWMU 24.
2001	Startup and operation of SVE at SWMU 1/Area 2, Area 1 Building 237, and Area 3 began.
2001	Startup and operation of bioventing system at SWMU 24 began.
2001	Final ESD provided for selected remedies (SWMUs 2, 3, 7, and 23, Building 30 Drum Storage Area, and the Northern Depot Soils Area).
2002	Final pesticide remediation design completed.
2002	Source removal wells in Area 3 began operation (in fourth quarter 2002).
2003	Final UST preferred alternatives report accepted.
2003	Pesticide extraction wells in the sanitary sewage lagoon plume installed and operational.
2003	IRM plant dismantled and replaced with GWTP1 granular activated carbon system.
2004	Amendment to the 1998 OU 1 ROD produced for modification of selected remedial actions (SWMU 4, Site 72, and OU 1).
2004	Final RA report, SWMU 8 produced.
2004	Final RA report, SWMU 4, 6, and 20 small excavations, produced.
2004	No further action status granted for 12 UST sites.
2004	ESD to the 1998 OU 1 ROD produced for institutional controls.
2004	Final RA report, SWMU 27, produced.
2004	Final RA report, Northern Depot Soils Area cover, produced.
2005	SVE tested at biovent area – ICs recommended.
2005	Five-Year Review Report produced.
2006	GWTP1 shut down.
2006	Characterization of NWC dieldrin plume and natural attenuation.
2006	Groundwater flow and transport model developed, calibrated, and verified.

Table 2.0-1. Environmental Program Milestones (Continued)

2008	Response Completion Plan.
2008	Focused extraction at four groundwater monitoring wells conducted.
2008	SWMU 20 investigation conducted.
2008	Dieldrin mass removal pump test in the NWC conducted.
2009	Draft final NWC dieldrin plume FS submitted.
2009	Formal dispute of draft final NWC dieldrin plume FS invoked.
2009	Groundwater remedy enhancement investigation conducted.
2009	NFA at SWMU 1/Area 2 and Area 3 recommended.
2009	Pneumatic fracturing implemented at Area 1 Building 237 and SVE restarted.
2009	SWMU 20 FS.
2010	NFA at Area 1 Building 237 recommended.
2010	Formal dispute resolved and NWC dieldrin plume FS completed.
2011	Final Off-Depot Private Water Supply Well Contingency Plan submitted.
2011	Area 1 Building 237 shallow soil pesticide investigation.
2011	Finalization of the NWC OU ROD.
2011	Finalization of the 2011 ESD.
2011	SWMU 20 SVE remedy in place.
2012	NWC remedy in place.
2012	Removal action at Area 1 Building 237 complete.
2012	Preliminary Close Out Report signed.
2012	Final Second Five-Year Review Report complete.
2013	Final Memorandum to the Site File Documenting Five Minor Modifications to the DDJC – Tracy Site-Wide Comprehensive ROD
2013	NFA UST 25 Site Closure Letter
2014	Final Memorandum to the Site File Documenting the Addition of LGAC for the Treatment of VOCs to the DDJC – Tracy Site-Wide Comprehensive ROD.

DDJC	=	Defense Distribution Depot San Joaquin California	RA	=	remedial action
EE/CA	=	engineering evaluation/cost analysis	RI	=	Remedial Investigation
ESD	=	Explanation of Significant Differences	ROD	=	Record of Decision
FFA	=	Federal Facility Agreement	SVE	=	soil vapor extraction
FS	=	Feasibility Study	SWMU	=	solid waste management unit
GWTP	=	groundwater treatment plant	Tracy Site	=	Defense Distribution Depot San Joaquin – Tracy Site
IC	=	institutional control			
IRM	=	interim remedial measure	UST	=	underground storage tank
IWPL	=	industrial waste pipeline	VOC	=	volatile organic compound
LGAC	=	liquid granular activated carbon			
NFA	=	No Further Action			
NPL	=	National Priorities List			
NWC	=	northwestern corner			
OU	=	operable unit			

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3.0 BACKGROUND

This section documents the activities that resulted in contamination at the Tracy Site and the physical characteristics that influence contaminant behavior and remediation are described in this section. The initial response actions taken prior to signing of the RODs are also described, as are the results of risk evaluations. Integration of this information into a conceptual site model (CSM) is important for an overall understanding of the site and for determining whether collection of additional information is necessary for a remedy. This section provides an overview of the Tracy Site CSM; but omits many of the details provided in the Tracy Site CSM (Appendix A) for brevity, which is referenced as appropriate throughout this Third Five-Year Review Report.

3.1 Physical Characteristics

The Tracy Site is a distribution Depot operated by DLA to supply military services with the equipment needed to fulfill its mission. The Tracy Site is located in California's San Joaquin Valley (Figure 3.1-1). The Tracy Site lies in San Joaquin County, approximately 1.5 miles southeast and outside the city limits of the City of Tracy, a community that was incorporated in 1910 (Figure 3.1-2). The area surrounding the City of Tracy is used primarily for agriculture. Unincorporated areas of San Joaquin County, the unincorporated community of Banta, and other rural neighborhoods are within a 3-mile radius of the Tracy Site. Nearby large urban communities include the City of Stockton, approximately 15 miles to the northeast, and the City of Modesto, approximately 25 miles southeast.

The operating portion of the Tracy Site covers a 448-acre triangular parcel, herein referred to as the Depot. In 1993, the Annex was purchased and consists of 460 acres of agricultural land north of the Depot (Figure 3.1-3). The ground surface at the Tracy Site ranges in elevation from 110 feet above mean sea level (msl) on the southwest to 45 feet above msl on the northeast. Chrisman Road borders the western edge of the Tracy Site, Banta Road borders the east, and Eleventh Street borders the north. At the eastern corner of the Depot, two major railroad lines intersect. A Union Pacific track parallels the northern boundary of the Depot, and a second Union Pacific track parallels the southeastern boundary (Figures 3.1-2 and 3.1-3). Approximately 75 percent of the operating portion of the Depot is covered with buildings (primarily warehouses), asphalt, or concrete. Numerous smaller buildings in the northwestern portion of the Depot house administration and operations. In addition, a day care center, recreational facilities, and other facility infrastructures are located at the Depot. The only landscaped area is in the NWC, north of Building 100. Other unpaved surfaces contain weeds and grass, which historically have been removed regularly with herbicides and/or by grading.

3.1.1 Surface Water Hydrology

The Tracy Site is located on the distal portion of an alluvial fan sloping northeasterly from the Diablo Range that lies west and southwest of the Depot. The principal drainages are Tom Paine Slough north of the Depot, Corral Hollow Creek south of the Depot, and the San Joaquin River east of the Depot. Stormwater runoff from within the Depot is collected in drains that lead to the unlined storm water detention pond located in the northwestern portion of the Depot, referred to as SWMU 4 (Figure 1.2-1). Beneath the unlined pond, water infiltrates and migrates toward the water table. If the storm water detention pond levels are too high, then storm water can be discharged off Depot. Wastewater from the Depot is treated at the Depot's wastewater treatment plant prior to discharge to the unlined sanitary sewage lagoons(SSLs) in the northern portion of the Depot (SWMUs 2 and 3), southeast of the storm water detention pond (Figure 1.2-1).

The agricultural farmland on the Annex and surrounding area are watered by flood or drip irrigation. Unlined ditches between farm fields and roads convey storm water runoff and irrigation drainage to local percolation swales.

3.1.2 Regional Hydrogeology

The Tracy Site is located within the Tracy Subbasin of the San Joaquin Valley Basin. Section 3.1.3 presents the stratigraphic and hydrostratigraphic nomenclature in use at the Tracy Site. This section also provides the approximate depths of the regional stratigraphy and other relevant zones. At the Tracy Site, the geological deposits from the surface to a depth of 20 to 30 feet below ground surface (bgs) originated from materials eroded from the Diablo Range and carried east by streams or winds. These deposits of primarily silt and clay layers are named the Younger Alluvium, but are difficult to distinguish from the underlying deposits of Older Alluvium and the Upper Tulare Member of the Tulare Formation. The Tulare Formation, divided into Upper, Middle, and Lower Members, consists of poorly sorted, discontinuous deposits of clay, silt, sand, and gravel (California Department of Water Resources [DWR], 2006). Only the Upper Member has been described during fieldwork associated with RI/FS activities.

One braided stream channel in the Older Alluvium or Upper Tulare has been identified from boring logs (Montgomery Watson, 1996). The stream channel deposits trend approximately northeasterly across the Depot and the Annex. In spite of the interbedded and heterogeneous nature of the subsurface beneath the water table, hydraulic communication existed between the hydrologic zones, and therefore, groundwater and dissolved VOCs could migrate horizontally and vertically from depths of approximately 15 feet bgs (or the top of the saturated zone) to approximately 180 feet bgs, if a sufficient vertical hydraulic gradient was active (HDR, 2014b).

The Upper and Lower Members are transmissive zones in the Tulare Aquifer that are important to the water supply in the San Joaquin Valley. The Middle Tulare is the poorly transmissive Corcoran Clay Member, which is estimated to be 80 to 100 feet thick. The upper surface of the Corcoran Clay Member occurs at an approximate depth of 220 feet bgs at the Tracy Site. Sedimentary deposits of the Lower Tulare Member have not been encountered in soil borings or wells at the Depot. However, the top of the Middle Tulare Member may have been penetrated in the boring for extraction well EW030C in 1996.

3.1.3 Tracy Site Geology and Groundwater Hydrology

The geology of subsurface deposits to a depth of approximately 211 feet bgs at the Depot has been compiled from data collected during monitoring well logging, cone penetrometer testing (CPT) logs, time-domain electromagnetic surveys, evaluation of agricultural well logs, and logging of extraction well and piezometer borings. Data collection has focused on geology in the Upper Tulare Member and the overlying alluvial deposits; therefore, no additional information on the Corcoran Clay and Lower Tulare Member is presented in this description. Surface soils are loams to sandy loams that have been disturbed by agricultural development followed by industrial development.

For classification and organization, the subsurface is divided into three Hydrologic Zones in the vicinity of the Tracy Site. Each of these zones has at least one significant coarse grained unit (aquifer), but also contains significant clay strata. These Hydrologic zones are defined as:

Upper Hydrologic Zone: 62 to -9 feet msl

Middle Hydrologic Zone: 25 to -34 feet msl

Lower Hydrologic Zone: -14 to -100 feet msl

Each of the Hydrologic Zones is characterized by thickening and thinning portions of the zone. In addition, the depths to each interface between zones vary. The overlap in elevations between the Hydrologic Zones is due to the configuration of each zone and depth variances.

The depth to groundwater ranges from greater than 40 feet in the southern portion of the Depot to approximately 10 feet in the northeastern portion of the Annex. Groundwater beneath the Depot and Annex is generally unconfined. The CSM in Appendix A provides a detailed description of the Hydrologic horizons beneath the southern and northern portions of the Tracy Site.

Historically, groundwater flow in the vicinity of the Tracy Site has generally been to the northeast. Currently, groundwater flow is generally north-northwest to northeast at the Tracy Site with local variations caused by groundwater extraction (pumping) and infiltration. Vertical gradients are generally downward from the Upper to Middle Hydrologic Zones and neutral between the Middle and Lower Hydrologic Zones.

Annual peak groundwater elevations occur during the third quarter of each year. The data suggest that the rise in water levels occurs approximately 18 months after rainfall levels increased. Examples of this are the August 2007 water elevations in zones in areas following a year (3Q06 to 3Q07) of much lower total rainfall than in 4Q04 through 2Q06. The delay in water level response to rainfall may represent the time necessary for rainfall to percolate to groundwater or time necessary for groundwater recharge in the Diablo range to reach the Tracy Site. The hydrographs included in Appendix A illustrate declining groundwater surface elevations which were at or near recent historical lows during 3Q14.

3.2 Land and Resource Use

Prior to the construction of the Tracy Site, the historic land use was primarily agricultural (irrigated cropland and orchards and pasture for livestock grazing) and industrial (railroad transportation). During the 1870s, Southern Pacific Railroad founded the City of Tracy and developed it as a maintenance and supply facility for trains moving to and from the San Francisco Bay Area.

In 1942, the Tracy Site originated as a “sub depot” of the United States Army’s Quartermaster Corps, Oakland Army Depot. In 1963, operational control of the site was transferred to DLA, though the Army retains ownership of the property. In 1990, a United States Department of Defense reorganization placed supply depots under DLA. As a result, the Tracy Site and its sister site (Sharpe) were consolidated under DLA’s Defense Distribution Region West (DDRW), which was headquartered at the Sharpe Site. In 1997, DDRW and Defense Distribution Region East were consolidated into Defense Distribution Center, headquartered in New Cumberland, Pennsylvania, and the Tracy Site became known as Defense Distribution Depot San Joaquin California.

In 1942, the oldest buildings at the Tracy Site were built. During World War II, there was a German prisoner of war (POW) camp in the southern corner of the Depot, but only written records, including plan drawings, of this POW camp remain. No building or location at the site is being considered for the National Registry of Historic Sites.

Current supply activities at the Tracy Site include storage, handling, preservation, packaging, and shipment of food, medical, construction, clothing, electronic, industrial, and general supplies, and equipment to military services within the western United States and throughout the Pacific region. Purchase of the Annex assured that the land would not be developed and simplified the process of installing extraction and treatment facilities.

The Tracy Site Depot land is designated as a public facility in the *City of Tracy General Plan* and is located outside of the Tracy city limits (Figure 3.1-2). In 1950 and 1992, three water supply wells installed in the southern portion of the Depot provide potable water, process water, and fire suppression water for the Tracy Site. From October 1994 to June 1995, the three agricultural water supply wells (AG-1, AG-2, and AG-3) located on the Annex were decommissioned.

The area surrounding the Tracy Site comprises mixed-use light industrial, agricultural, and residential areas. At the eastern corner of the Depot, two major Union Pacific railroad lines intersect; small parcels to the south and east of the railroad intersection are designated for industrial or commercial use. Other areas outside of the City of Tracy's jurisdiction include agricultural land consisting of orchards and row crops. These agricultural lands lie to the north (including the Annex), east, and south of the Depot; scattered rural single-family residences are also present in these areas. To the west of the Depot and within the City of Tracy limits are single-family residences in a low-density residential development. To the northwest of the Depot and within the City of Tracy jurisdiction is an area designated for urban reserve.

The unincorporated areas of Tracy, the unincorporated community of Banta, and other rural neighborhoods are within a 3-mile radius of the Tracy Site. In each of these areas, private water supply wells provide drinking water. The installation of future water supply wells is governed by San Joaquin County Ordinance Code Section 9-1115. The community of Banta, 2 miles northeast of the Depot, includes an elementary school, about 30 residences, and commercial and industrial businesses. Another rural residential development (Stoneridge) 2.5 miles northeast of the Depot contains 60 residences.

3.3 History of Contamination

Past Depot mission activities that resulted in environmental contamination included vehicle maintenance, material stockpiling, drum storage, waste disposal, wastewater management, and pesticide application. Prior to the mid-1970s, many wastes were disposed on site in accordance with standard industrial practices commonly in use at that time, such as burning, surface disposal, and burial. Identified disposal sites which include burn pits, medical supplies burial, construction materials burial, pesticide waste disposal trenches, lube/oil dumps, battery acid sumps, maintenance areas, fuel storage tanks, and other hazardous waste disposal.

In November 1980, DDRW submitted notice as a hazardous waste generator and a treatment storage and disposal facility. The Part A application submitted that month listed treatment in surface impoundments, treatment by incineration and storage in containers. In September 1983, DDRW received a Resource Conservation and Recovery Act (RCRA) permit for covered storage in tanks and containers through the CDPH, which had authorization from U.S. EPA. The permit also specified that the two surface impoundments would continue under interim status. Correspondence in U.S. EPA files indicated that incineration was considered for hazardous waste disposal but was not implemented. In May 1984, the industrial wastewater treatment surface impoundments were determined to be exempt from RCRA based on pond analyses by the CDPH.

In 1987, DDRW submitted a revised Part A deleting treatment in surface impoundments and disposal by incineration and adding storage in tanks (one 250-gallon tank), and providing an expanded list of wastes handled. In September 1988, DDRW submitted a RCRA permit renewal application. On June 30, 1989, a RCRA hazardous waste storage permit for containerized hazardous waste was issued by the CDPH.

Releases of chemicals and hydrocarbon fuels have contaminated Depot soils and groundwater with degreasing solvents, heavy metals, pesticides, and petroleum-based oils and lubricants. Contaminants entered groundwater by dissolution in percolating water and volatilization into soil gas that migrated through soil pores to the water table.

3.4 Initial Responses

In 1980, the USATHAMA conducted a records search for waste sites at the Site, emphasizing sites with potential for contaminant migration to off Depot locations. The results were presented in the *Installation Assessment of Defense Depot Tracy, California No. 181* (USATHAMA, 1980). The review identified major areas of concern as areas used for burning or burial, and unlined drainage and sewage leaching ponds with the primary waste materials being outdated medical items, sandblasting residue, pesticides, oil, and solvents. Twenty-five potential waste sites were identified (Sites 1 through 23, 2A and 10A); the sites were not necessarily hazardous waste sites, and included burial areas for food wastes and construction materials. The most likely sources of contamination were identified as past waste disposal operations from the 1940s through the mid-1970s, including the use of underground sumps/tanks and burning and/or burial of outdated and unserviceable stocks. Tracy Site geology and potential contaminant source areas indicated potential for contaminant migration via the uppermost aquifer.

In July 1980, the USAEHA installed 12 on-site monitoring wells (LM1A through LM12A); samples were only analyzed metals and conventional water quality parameters. The report, *Solid Waste Special Study No. 10-61-01-0165-81, Defense Depot Tracy* (USAEHA, 1980), include a brief description of well installation and sampling and subsurface conditions.

In May 1984, the CVRWQCB was notified that TCE and PCE concentrations in three monitoring wells (LM2A, LM3A, and LM5A) exceeded the CDPH action level of 5 µg/L. In 1985, USAEHA performed a hydrogeologic study which including installation of 14 monitoring wells (LM15A through LM26A). The report, *Geohydrological Study No. 30-26-0488-85, Defense Depot Tracy* (USAEHA, 1985), concluded VOC contamination was present in the uppermost aquifer in the northern part of the Tracy Site.

In 1985, Radian Corporation reviewed existing records and performed soil gas and groundwater sampling to determine whether there was off Depot migration of contaminated groundwater, to locate on Depot contaminant source and to define requirements for assessing environmental impacts of the groundwater contamination. The soil gas investigation was conducted in two phases. The initial samples were collected on a relatively unbiased grid over the entire Depot; the second phase samples were collected in areas where contaminants were detected in the initial samples with the locations based on potential source areas including the 25 sites identified by USATHAMA.

The soil gas investigation resulted in identification of six contaminant areas:

- Area 1 included the northern area of the developed portion of the Depot including the maintenance areas and the northeastern corner of Building 10. The contaminant was considered to result from numerous undocumented spills in the area, primarily from locomotive maintenance and repairs in Building 206 (SWMU 27) and cleaning of asphalt tools and equipment north of Building 237. Other potential source areas were the industrial waste lagoons (SWMU 3), the industrial waste pipeline (IWPL) (SWMU 33), and Building 26 Recoup Operations (SWMU 23).

- Area 2 was north of Building 255 along the boundary of the original Depot downgradient from Area 1 and included former drum storage areas near the old sewage lagoons (SWMU 1).

- Area 3 was located along the fence line of the original Depot just west of Building 259, including a former drum storage area.

- Area 4 included the recoup facility in Building 28, including its sump (SWMU 6).

- Area 5 was located at Building 23 including a possible drum storage area identified in areal photographs.

- Area 6 was located in the southeastern corner of the Depot downgradient from a drum storage area identified in areal photographs.

Seventeen monitoring wells (LM27A through LM43A) were installed to determine the nature and lateral extent of groundwater contamination on the Depot based on the soil gas investigation results. Groundwater samples were collected from the new wells and the 26 existing wells. A test well and three piezometers were installed for a groundwater pump test (Radian, 1986).

The investigation was documented in *Geohydrological Investigations, Final Engineering Report, DDRW-Tracy, California* (Radian, 1986). TCE and PCE were the volatile constituents in six areas of soil gas contamination. Contaminants detected in groundwater above maximum contaminant levels (MCLs) and the CDPH action levels were arsenic, chromium, iron, manganese, selenium, TCE, PCE, 1,1-DCE and 1,2-dichloroethane (1,2-DCA). The report concluded that: waste disposal practices at Tracy do not appear to have impacted metal concentrations in groundwater, with the possible exception of arsenic; and TCE and PCE were consistently found at the highest concentrations and the greatest lateral extent.

From 1986 to 1992, the initial RI/FS at the Tracy Site was conducted by WCC. The investigation included geophysical surveys to locate suspected source areas, soil gas surveys in 1987 and 1991, groundwater sampling at 15 privately owned wells in 1987, sampling at 93 soil borings between 1987 and 1990, installation of 46 monitoring wells (LM47C through LM92C) in 1987 through 1990, and groundwater sampling at the new wells and 43 existing wells.

Following receipt of the RCRA permit in 1989, a RCRA Facility Assessment (RFA) was performed by the CDPH, Toxic Substance Control Program. The 1990 RFA consisted of a preliminary review of site documents and agency files and a Visual Site Inspection.

The RFA referenced the 1980 Installation Assessment by USATHAMA, which listed 25 known or suspected locations of waste materials (Sites 1 to 23 plus 2A and 10A). The RFA identified most of these sites as SWMUs, updated information for each SWMU and added five SWMUs (24 to 28). The RFA report stated that the following sites were not SWMUs:

- 17-Active Wells and 18-Inactive Wells

- 19-Building 206 Fuel Storage Tanks

- 20-Underground Abandoned Tanks at Building 10 – The tanks were not considered waste management units. The 500-gallon tank inside Building 10 was aboveground and an underground fuel storage tank at the northeast corner of the building was removed in October 1988.

The RFA described the six Contaminant Areas identified in soil gas surveys by Radian and Woodward-Clyde and described the soil gas results at the sites identified by USATHAMA. The RFA concluded that many of the listed SWMUs have had releases resulting from design, construction, and/or operations. Past releases and potential for future releases were identified for 26 SWMUs (1 to 16, 21 to 28, 2A and 10A). The report noted that most of the sampling conducted at the Tracy Site concentrated on VOCs and were therefore not adequate to fully assess potential contaminants. Ongoing RI/FS was expected to address areas that had not been adequately characterized. Additional monitoring was recommended at 16 SWMUs.

3.4.1 Initial OU 1 Response Actions

In 1992, OU 1 was identified because of the investigation and consists of contaminated groundwater emanating from the Tracy Site; contaminants of concern (COCs) are VOCs, primarily TCE and PCE, and potentially pesticides and metals. The report, *Draft Final Operable Unit No. 1 RI/RA Report, DDRW-Tracy, California* (WCC, 1992a), described the investigation activities, physical characteristics of the site, nature and extent of soil and groundwater contamination, fate and transport of Depot-related contaminants and a BRA for OU 1.

The groundwater investigation included analyses for organic compound, minerals, and metals. TCE and PCE were most frequently detected COCs; the maximum concentrations were 560 µg/L for TCE and 410 µg/L for PCE. The plumes, defined by a concentration of 5 µg/L, extended north-northeast up to 2,500 feet from the boundary of the operating portion of the Depot. Metals and other inorganic compounds were also detected in groundwater but elevated concentrations were generally found in turbid samples and may not have been representative of aquifer conditions. Pesticides and other constituents were detected in groundwater occasionally, but were not defined as part of OU 1. Dieldrin and simazine were present in sufficient samples and concentrations to be included in the BRA. Other VOCs, including 1,1-DCE, 1,2-DCE and carbon tetrachloride were also detected within the OU 1 Plume.

Potential source areas were investigated during RI activities. The primary conclusion was that TCE and PCE in soil and groundwater were due to past solvent storage, handling and use on the Depot with suspected releases from leaking drums, pierced containers and accidental spillage; specific source areas were not identified.

The OU 1 BRA concluded that risks to Depot personnel, off Depot agricultural workers and consumers of agricultural crops appeared to be insignificant. Off Depot residents living downgradient of the Depot had a potential level of risk associated with use of well water and proximity to the groundwater plume. The primary exposure pathway for plants and animals was considered to be through flood irrigation waters supplied by agricultural wells located on private property immediately north of the Depot.

The *Draft Operable Unit No. 1 Feasibility Study* (WCC, 1992b) developed and screened remedial technologies to address OU 1 groundwater contamination. The remedial alternatives selected for evaluation were: no action with continued groundwater monitoring; institutional controls with continued groundwater monitoring; extraction at 1,000 gallons per minute (gpm), treatment with air stripping and vapor phase granular activated carbon (GAC), and re-injection; and extraction at 1,000 gpm, treatment with air stripping, vapor phase GAC and in-situ biological treatment, and re-injection.

Between 1986 and 1992, an initial RI was conducted at the Tracy Site. In 1990, the Tracy Site was listed on CERCLA's NPL as a Superfund site. In 1991, DLA, U.S. EPA, DTSC, and RWQCB signed the FFA for the Tracy Site (DLA, 1991). The FFA has enforceable schedules and ensures that environmental impacts from past and present operations are thoroughly investigated and that appropriate cleanup actions are taken to protect human health, welfare, and the environment. The U.S. EPA, DTSC, and RWQCB provide regulatory oversight consisting of technical support, review, and comment on investigative work and cleanup work at the Tracy Site.

In 1990, the OU 1 IRM system was installed. The IRM consisted of a groundwater extraction system and an air stripper with vapor control that was put into operation to control migration of VOC contaminated groundwater, reduce VOC concentrations, and provide data to evaluate the effectiveness and potential use of the selected remedial technology for full-scale design. The system included six extraction wells, an air stripper with vapor-phase carbon absorbers, three injection wells, two piezometers, and 10 monitoring wells.

In May 1991, the Tracy Site implemented a Well Monitoring Program (WMP). The primary objectives are to provide a complete and current set of groundwater data from wells throughout the Depot and vicinity to further evaluate seasonal variation of groundwater levels and to determine the nature and extent of groundwater quality variations. Beginning in September 1992, the WMP was divided into quarterly, semiannual, and annual sampling rounds. The quarterly rounds were designed to provide performance monitoring for the IRM system and to document TCE and PCE plume migration. The semiannual round included additional wells for VOC analysis and metals analyses. The annual round was intended to provide a comprehensive review of groundwater quality for wells in the WMP. The current WMP is presented on Table B-2 in Appendix B.

Between March and May 1999, the following additional investigations were conducted:

- Pesticide/groundwater turbidity correlation;
- Define top of the Corcoran clay and other major stratigraphic breaks;
- Cone penetrometer testing and CPT groundwater sampling to provide information on lithology and the leading edge of the OU 1 plume;
- Pumping tests to provide information on aquifer characteristics;
- Foundation studies for the treatment plant; and
- Injection well treatability study.

The OU 1 RI/FS identified three agricultural supply wells (AG-1, AG-2, and AG-3) that may have served as conduits and created a vertical hydraulic gradient for downward migration of contaminants. Several MWs were abandoned due to history of turbid samples. Other wells that were found to be damaged, improperly installed or dry for several years were recommended for decommissioning in the *Final Well Abandonment Work Plan* (Montgomery Watson, 1994).

3.4.2 Initial Site-Wide Response Actions

Environmental studies have been underway at the Tracy Site since 1980 when soil and groundwater contamination was first detected. A records search performed by the USATHAMA first identified 25 waste sites (SWMUs 1 through 23, 2A, and 10A) that contained contaminants that could potentially have migrated to off Depot locations (USATHAMA, 1980). In 1985, six additional contaminant areas were identified (Areas 1 through 6). Additional SWMUs were identified in a RCRA assessment report (U.S. EPA, 1990).

For some IRP sites, cleanup activities were conducted prior to a final remedial action being authorized by a signed ROD. In 1992, soil and buried drums were excavated at the southern end of the Depot prior to the construction of the Consolidated Subsistence Facility at the Building 30 Drum Storage Area. (TELIC, Engineering Corporation, 1991). In 1995, a time-critical removal action was conducted at the Day Care Center to reduce the potential cancer risk estimated as part of the BRA (Radian Corporation, 1996a; Montgomery Watson, 1996). Consequently, the 1998 OU 1 ROD stated that NFA was required at the Day Care Center because no further threat to human health, ecological receptors, or background groundwater quality remained at the site (Radian International, 1998a). Between 1997 and 1998, a non-time critical removal action (NTCRA) was conducted at SWMUs 2, 3, and 33 to expedite cleanup because those sites posed a threat to groundwater quality (Montgomery Watson, 1996; URS, 2002a). The final remedy and cleanup standards for SWMUs 2, 3, and 33 are documented in the 1998 OU 1 ROD.

In 1998, the 1998 OU 1 ROD was signed, designating 22 sites for NFA and selecting remedial actions for 15 soil sites. Remedial actions for three additional sites were selected in the 2003 OU 1 ROD Amendment (one site) and the 2001 ESD (two sites). The selected remedial actions for each site requiring a five-year review are presented in their respective site-specific section of this report.

3.5 Basis for Taking Action

Environmental contaminants that require cleanup at the Tracy Site have been discovered in soil, sediment, surface water, and groundwater. A list of the COCs and the cleanup standards for each site requiring a five-year review are presented on Table 3.5-1. Cleanup standards were established to protect human health, ecological receptors, background groundwater quality, and beneficial uses. Cleanup standards protective of human health (industrial worker) are risk-based standards to reduce the incremental cancer risk at a site to 1×10^{-6}. Cleanup standards to protect ecological receptors were developed with input from U.S. EPA. Cleanup standards for groundwater are based on beneficial use limits (e.g., MCLs), and cleanup standards for soil gas to protect background groundwater quality were developed through vadose zone modeling and equilibrium partitioning limits (EQPLs) developed in the Comprehensive RI/FS. COCs and cleanup standards were established or modified in the various RODs and/or ESDs.

Exposure to significant concentrations of contaminants in soil, sediment, surface water, and/or groundwater is associated with unacceptable human health risks and/or ecological health risks. Cleanup has been required for contamination for which chemical concentrations exceed regulated thresholds or for which concentrations exceed management criteria developed or accepted by DLA and the regulatory agencies. The over-riding basis for taking action at the Tracy Site is protection of human health and the environment.

3.5.1 Basis for OU 1 ROD Action

Contaminant concentrations in groundwater beneath the Tracy Site exceed risk-based cleanup levels (WCC, 1992a). The BRA results indicated that health risks could result if on Depot concentrations of VOCs were to migrate to areas of the groundwater system used for domestic water supply and were subsequently ingested by off Depot residents. This prompted the remedial actions identified in the OU 1 ROD. The carcinogenic risk to human health calculated in the risk assessment resulted in the selection of ACLs for three VOC COCs (WCC, 1992a). The ACLs for each COC are provided in Table 3.5-1. The BRA concluded that the primary potential exposure pathway for plants and animals from OU 1 is through flood irrigation water supplied by the agricultural wells (WCC, 1992a).

This exposure pathway does not pose a potential existing or future risk to biota from the existing agricultural wells based on the assumptions and uncertainties presented in the BRA. Between 1994 and 1995, agricultural wells on the Annex were decommissioned.

3.5.2 Basis for 1998 OU 1 ROD Actions

As part of the Comprehensive RI/FS for the Tracy Site, a BRA was conducted (Montgomery Watson, 1996). The BRA grouped the SWMUs, USTs, and soil contamination areas at the Tracy Site into 15 exposure units (EUs) based on location and similarities in contaminants and pathways. Also evaluated as three separate EUs were groundwater beneath the Depot, the Annex, and property east of the Annex; dieldrin was added as a COC for OU 1.

Both existing and potential future risks (e.g., residential use) to human health were estimated. However, because there is little potential for the Depot to become a residential development in the foreseeable future, potential future residents were evaluated solely to provide benchmarks for evaluating receptors

with higher potential risk and to help determine suitable uses for parcels of land on the active Depot and Annex. Consequently, the risks to potential future residents were not considered in determining whether remediation was necessary. The results of the baseline human health risk assessment are provided in detail in Appendix R of the Comprehensive RI/FS Report (Montgomery Watson, 1996) and summarized in the sections of this report specifically addressing the sites requiring a five-year review. The ERA evaluated the actual or potential effects of a site on plants and animals (Montgomery Watson, 1996). The objective of the ERA was to estimate the chemical risks to wildlife on the site for those areas where wildlife habitat existed and contamination had been documented. The Depot has very few areas suitable for wildlife habitat because of the industrial/ commercial land use at the facility. Approximately 75 percent of the Depot is covered with buildings, roadways, and paved parking areas. No known rare or endangered species of wildlife have been documented at the Depot, and no critical habitats or habitats of endangered species have been identified. There are no sensitive habitats, such as natural high quality wetlands, or aquatic or terrestrial natural areas that provide habitat for wildlife species on the Depot. However, three on Depot areas, though they are man-made, can provide habitat to wildlife. The three areas include Depot-wide surface soil, surface water, and sediment in the SWMU 2 sewage waste lagoons, and surface water and sediment in the SWMU 4 storm water detention pond. The results of the ERA are provided in detail in Appendix R of the Comprehensive RI/FS Report (Montgomery Watson, 1996) and summarized in the sections of this report specifically addressing the sites requiring a five-year review.

Most of the cleanup standards in the 1998 OU 1 ROD correspond to concentrations protective of water quality. The cleanup standards for DDX (the sum of DDT + dichlorodiphenyldichloroethene [DDE] + dichlorodiphenyldichloroethane [DDD]), lead, and selenium at SWMUs 2 and 4 were risk-based standards to protect ecological receptors, but these standards were estimated using literature-derived values rather than site-specific bioaccumulation factors. The 1998 OU 1 ROD acknowledged that the data available to develop cleanup standards were limited at the time of the Comprehensive RI/FS ERA and that additional data would be collected to obtain site-specific bioaccumulation factors. Consequently, additional data were collected to further characterize the concentrations of chemicals of potential concern (COPCs) in sediment, provide site-specific data for characterizing the concentrations of COPCs in elements of the food-web (aquatic invertebrates, plants, and fish), and better evaluate the effects of COCs on ecological receptors. An updated ERA was completed using the additional data collected at SWMUs 2 and 4 (URS, 2001a; 2001b), and cleanup standards were revised and/or deleted (URS, 2001a; 2003a). These modifications at SWMUs 2 and 4 are noted in the site-specific sections of this five-year review report. COCs and cleanup standards identified in RODs as modified by a ROD Amendment and ESDs and clarified by memoranda to file are presented in Table 3.5-1.

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site

Site	COC	Cleanup Standard	Source Document
OU 1	**Groundwater**	**µg/L**	
	Dieldrin	0.05	1998 Sitewide ROD, Section 9.5.5, CA Action Level
	PCE	5	1998 Sitewide ROD, Section 9.5.5, Federal MCL
	TCE	5	1998 Sitewide ROD, Section 9.5.5, Federal MCL
SWMU 2/3	**Soil**	**µg/kg**	
	2,4-Dichlorophenoxyacetic acid	47	1998 Sitewide ROD, Table 10-16, EQPL.
	2,4-dimethylphenol	330	1998 Sitewide ROD, Table 10-16, RL.
	4-methylphenol	330	1998 Sitewide ROD, Table 10-16, RL.
	Aldrin	3	1998 Sitewide ROD, Table 10-16, EQPL.
	Aluminum	3	RI/FS Vol 1, Table 8-15, PQL.
	Beryllium	NE	NE
	Bis(2-ethylhexyl)phthalate	330	1998 Sitewide ROD, Table 10-16, RL.
	Chlordane	10	1998 Sitewide ROD, Table 10-16, EQPL.
	DDD	1,600	1998 Sitewide ROD, Table 10-16, EQPL.
	DDE	1,800	1998 Sitewide ROD, Table 10-16, EQPL.
	DDT	1,700	1998 Sitewide ROD, Table 10-16, EQPL.
	DDX (total)	2,800	1998 Sitewide ROD, Table 10-16, RBC. Removed per 2001 ESD.
	Dieldrin	370	1998 Sitewide ROD, Table 10-16, RBC.
	Di-n-butylphthalate	330	1998 Sitewide ROD, Table 10-16, RL.
	Diuron	260	1998 Sitewide ROD, Table 10-16, RL.
	Endrin	3	1998 Sitewide ROD, Table 10-16, RL.
	Heptachlor	1.5	1998 Sitewide ROD, Table 10-16, RL for heptachor epoxide.
	Lead	28,300	1998 Sitewide ROD, Table 10-16, RBC.
	Lindane	1.7	1998 Sitewide ROD, Table 10-16, RL.
	Linuron	NE	NE
	Mercury	NE	NE
	Monuron	260	1998 Sitewide ROD, Table 10-16, RL.
	Oxamyl	NE	NE
	Selenium	616	1998 Sitewide ROD, Table 10-16, RBC. Removed per 2001 ESD
	Simazine	NE	NE
	Stirofos	NE	NE

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
SWMU 4	**Soil**	**µg/kg**	
	2,4-Dichlorophenoxyacetic acid	3	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	Aluminum	NE	NE
	Arsenic	NE	NE
	Bis(2-ethylhexyl)phthalate	122	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	Carbaryl	550	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	Carbofuran	1,000	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	Chlordane	20	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	DDD	241	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
	DDE	241	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
	DDT	241	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
	DDX (total)	241	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
	Dieldrin	3	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	Lead	5,130	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
	Manganese	NE	NE
	PAHs	70	RI/FS Vol 1, Table 8-6. Removed per 2004 ROD Amendment.
	PCBs	NE	NE
	Selenium	616	1998 Sitewide ROD, Table 10-7, Ecological RBC. Removed per 2004 ROD Amendment.
SWMU 6	**Soil**	**µg/kg**	
	2,3,7,8-TCDD	5	2004 ESD, Appendix F.
	2,4,5-Trichlorophenoxyacetic acid	13	2004 ESD, Table 3-3.
	Benzo(a)anthracene	NE	NE
	Benzo(a)pyrene	NE	NE
	Beryllium	NE	NE
	Dicamba	10	1998 Sitewide ROD, Table 10-9, RL.

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
	Dieldrin	3	1998 Sitewide ROD, Table 10-9, Model-derived from SWMU 7.
	Endrin	3	1998 Sitewide ROD, Table 10-9, RL.
	Heptachlor	1.5	1998 Sitewide ROD, Table 10-9, RL.
	Lindane	5	1998 Sitewide ROD, Table 10-9, RL.
	PCBs	NE	NE
SWMU 7	**Soil**	**µg/kg**	
	1,2-Dichloroethene	10	1998 Sitewide ROD, Table 10-10, RL.
	2,3,7,8-TCDD	NE	NE
	2,4-Dichlorophenoxyacetic acid	25	1998 Sitewide ROD, Table 10-10, RL.
	Benzo(a)anthracene	NE	NE
	Benzo(a)pyrene	NE	NE
	Beryllium	NE	NE
	Bis(2-ethylhexyl)phthalate	330	1998 Sitewide ROD, Table 10-10, RL.
	Chlordane	NE	NE
	DDD	NE	NE
	DDE	NE	NE
	Dieldrin	3	1998 Sitewide ROD, Table 10-10, RL.
	Linuron	200	1998 Sitewide ROD, Table 10-10, RL.
	Manganese	NE	NE
	PAHs	NE	NE
	PCBs	NE	NE
	Simazine	10	1998 Sitewide ROD, Table 10-10, RL.
	TPH-diesel	100,000	1998 Sitewide ROD, Table 10-10, CA Tri-Regional Guidance.
	TCE	5	1998 Sitewide ROD, Table 10-10, RL.
SWMU 8	**Soil**	**µg/kg**	
	2,4-Dichlorophenoxyacetic acid	25	1998 Sitewide ROD, Table 10-11, RL.
	2,4-dinitrotoluene	330	1998 Sitewide ROD, Table 10-11, RL.
	Bis(2-ethylhexyl)phthalate	330	1998 Sitewide ROD, Table 10-11, RL.
	Chlordane	10	1998 Sitewide ROD, Table 10-11, EQPL.
	DDD	81	1998 Sitewide ROD, Table 10-11, EQPL.
	DDE	NE	NE
	DDT	47	2004 ESD, Table 4-3, maximum residual concentration.
	DDX (total)	30,000	1998 Sitewide ROD, Table 10-11, RBC.
	Dieldrin	4	2004 ESD, Table 4-3, maximum residual concentration.

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
	Diethylphthalate	330	1998 Sitewide ROD, Table 10-11, RL.
	Lindane	1.7	1998 Sitewide ROD, Table 10-11, RL.
	Linuron	200	1998 Sitewide ROD, Table 10-11, RL.
	MCPA 2-Methyl-4-chlorophenoxyacetic acid	5,000	1998 Sitewide ROD, Table 10-11, RL.
	Naphthalene	330	1998 Sitewide ROD, Table 10-11, RL.
	Simazine	10	1998 Sitewide ROD, Table 10-11, RL.
	TPH-diesel	10,000	1998 Sitewide ROD, Table 10-11, CA Tri-Regional Guidance.
	TPH-gasoline	1,000	1998 Sitewide ROD, Table 10-11, CA Tri-Regional Guidance.
	TPH-motor oil	10,000	1998 Sitewide ROD, Table 10-11, CA Tri-Regional Guidance.
SWMU 20	**Soil**	**µg/kg**	
	2,4-dinitrophenol	830	2012 Second Five-Year Review, Table 12-1.
	2,4,6-trichlorophenol	330	1998 Sitewide ROD, Table 10-12, RL.
	Aluminum	NE	NE
	Dieldrin	2	1998 Sitewide ROD, Table 10-12, RL.
	Diethylphthalate	330	1998 Sitewide ROD, Table 10-12, RL.
	Ethylbenzene	5	1998 Sitewide ROD, Table 10-12, RL.
	Linuron	200	1998 Sitewide ROD, Table 10-12, RL.
	MCPA 2-Methyl-4-chlorophenoxyacetic acid	5,000	1998 Sitewide ROD, Table 10-12, RL.
	Methiocarb	500	1998 Sitewide ROD, Table 10-12, RL.
	PAHs	NE	NE
	PCBs	NE	NE
	Pentachlorophenol	830	1998 Sitewide ROD, Table 10-12, RL.
	TPH-diesel	10,000	1998 Sitewide ROD, Table 10-12, CA Tri-Regional Guidance.
	TCE	5	1998 Sitewide ROD, Table 10-12, derived using target soil-gas standard.
	Xylenes	5	1998 Sitewide ROD, Table 10-12, RL.
SWMU 20	**Soil Gas**	**ppbv**	
	TCE	350	2012 Second Five-Year Review, Table 12-1.
SWMU 24	**Soil**	**µg/kg**	
	2-butanone	10	1998 Sitewide ROD, Table 10-13, RL.
	2-hexanone	10	1998 Sitewide ROD, Table 10-13, RL.
	2-methylnaphthalene	330	1998 Sitewide ROD, Table 10-13, RL.
	2,4-dimethylphenol	330	1998 Sitewide ROD, Table 10-13, RL.

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
	4-methyl-2-pentanone (MIBK)	10	1998 Sitewide ROD, Table 10-13, RL.
	4-methylphenol	330	1998 Sitewide ROD, Table 10-13, RL.
	Acetone	10	1998 Sitewide ROD, Table 10-13, RL.
	Aluminum	NE	1998 Sitewide ROD, Table 10-13, RL.
	Carbofuran	500	1998 Sitewide ROD, Table 10-13, RL.
	Ethylbenzene	10	1998 Sitewide ROD, Table 10-13, RL.
	Fluoranthene	330	1998 Sitewide ROD, Table 10-13, RL.
	Lindane	1.7	1998 Sitewide ROD, Table 10-13, RL.
	Manganese	NE	NE
	Naphthalene	330	1998 Sitewide ROD, Table 10-13, RL.
	PAHs	NE	NE
	PCBs (Aroclor 1260)	30	1998 Sitewide ROD, Table 10-13, RL.
	Phenanthrene	330	1998 Sitewide ROD, Table 10-13, RL.
	Phenol	330	1998 Sitewide ROD, Table 10-13, RL.
	Phorate	20	1998 Sitewide ROD, Table 10-13, RL.
	Pyrene	330	1998 Sitewide ROD, Table 10-13, RL.
	Ronnel	35	1998 Sitewide ROD, Table 10-13, RL.
	Toluene	5	1998 Sitewide ROD, Table 10-13, RL.
	TPH-diesel	10,000	1998 Sitewide ROD, Table 10-13, CA Tri-Regional Guidance.
	TPH-gasoline	1,000	1998 Sitewide ROD, Table 10-13, CA Tri-Regional Guidance.
	Xylenes	5	1998 Sitewide ROD, Table 10-13, RL.
SWMU 24	**Soil Gas**	**ppbv**	
	TCE	350	2012 Second Five-Year Review, Table 13-1.
	PCE	780	2012 Second Five-Year Review, Table 13-1.
SWMU 27	**Soil**	**µg/kg**	
	2,4-Dichlorophenoxyacetic acid	25	1998 Sitewide ROD, Table 10-14, RL.
	2,4,5-Trichlorophenoxyacetic acid	5	1998 Sitewide ROD, Table 10-14, RL.
	Benzo(a)pyrene	1,000	1998 Sitewide ROD, Table 10-14, RBC.
	MCPA 2-Methyl-4-chlorophenoxyacetic acid	5,000	1998 Sitewide ROD, Table 10-14, RL.
	Total PAHs	15,000	1998 Sitewide ROD, Table 10-14, RBC.
	PCBs (Aroclor 1260)	1,000	1998 Sitewide ROD, Table 10-14, RBC.
	TPH-motor oil	10,000	1998 Sitewide ROD, Table 10-14, CA Tri-Regional Guidance.
	TCE	5	1998 Sitewide ROD, Table 10-14, RL.

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
SWMU 33	**Soil**	**µg/kg**	
	Aldrin	1.7	1998 Sitewide ROD, Table 10-17, RL.
	Carbaryl	400	1998 Sitewide ROD, Table 10-17, RL.
	Dieldrin	2	1998 Sitewide ROD, Table 10-17, RL.
	Diethylphthalate	330	1998 Sitewide ROD, Table 10-17, RL.
	Di-n-butylphthalate	330	1998 Sitewide ROD, Table 10-17, RL.
	Methiocarb	500	1998 Sitewide ROD, Table 10-17, RL.
	Naphthalene	330	1998 Sitewide ROD, Table 10-17, RL.
	TPH-diesel	100,000	1998 Sitewide ROD, Table 10-17, CA Tri-Regional Guidance.
	Xylenes	5	1998 Sitewide ROD, Table 10-17, RL.
Northern Depot Soils Area	**Soil**	**µg/kg**	
	Arsenic	48	2001 ESD, Table 3-2, RBC.
	Manganese	812,500	2001 ESD, Table 3-2, RBC.
Building 30 Drum Storage Area	**Soil**	**µg/kg**	
	Benzyl Alcohol	330	1998 Sitewide ROD, Table 10-15, RL.
	Bis(2-ethylhexyl)phthalate	330	1998 Sitewide ROD, Table 10-15, RL.
	Diethylphthalate	330	1998 Sitewide ROD, Table 10-15, RL.
	Di-n-butylphthalate	330	1998 Sitewide ROD, Table 10-15, RL.
Site 72	**Soil**		
	Chlordane	NE	NE
	DDD	NE	NE
	DDE	NE	NE
	DDT	NE	NE
	Dieldrin	NE	NE
	Endrin	NE	NE
	Selenium	NE	NE
	TPH-motor oil	NE	NE
Eastern Depot Soils Area	**Soil**		
	Aluminum	NE	NE
	Arsenic	NE	NE
	Chlordane	NE	NE
	DDD	NE	NE
	DDE	NE	NE
	DDT	NE	NE
	Dieldrin	NE	NE
	PCBs	NE	NE

Table 3.5-1. OU 1 COCs and Cleanup Standards, Tracy Site (Continued)

Site	COC	Cleanup Standard	Source Document
Southern Depot Soils Area	**Soil**		
	Dieldrin	NE	NE
SWMU 1/Area 2	**Soil**	**µg/kg**	
	Beryllium	NE	NE
	PAHs	NE	NE
	PCBs	NE	NE
SWMU 1/Area 2	**Soil Gas**	**ppbv**	
	PCE	780	1998 Sitewide ROD, Table 10-4, derived using target soil gas standard.
	TCE	350	1998 Sitewide ROD, Table 10-4, derived using target soil gas standard.
Area 1 Building 237	**Soil Gas**	**ppbv**	
	DDD	NE	NE
	DDE	NE	NE
	DDT	7000	2012 Area 1 Bldg 237 RAR, Section 2.6, Commercial/Industrial Soil RSL
	Dieldrin	NE	NE
	PCE	780	1998 Sitewide ROD, Table 10-5, derived using target soil gas standard.
	TCE	350	1998 Sitewide ROD, Table 10-5, derived using target soil gas standard.
Area 3	**Soil Gas**	**ppbv**	
	PCE	780	1998 Sitewide ROD, Table 10-6, derived using target soil gas standard.
	TCE	350	1998 Sitewide ROD, Table 10-6, derived using target soil gas standard.

Notes:

µg/L = micrograms per liter
µg/kg = micrograms per kilogram
CA = California
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
ESD = Explanation of Significant Differences
EQPL = equilibrium partitioning limit
FS = Feasibility Study
NE = not established
OU = operable unit
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PCE = tetrachloroethene
PQL = practical quantitation limit
ppbv = parts per billion by volume
RBC = risk-based concentration
RI = Remedial Investigation
RL = reporting limit
ROD = Record of Decision
RSL = USEPA Regional Screening Level
SWMU = solid waste management unit
TCE = trichloroethene

Table 3.5-2. NWC OU COCs and Cleanup Standards, Tracy Site

Site	COC	Cleanup Standard	Source Document
NWC OU	**Groundwater**	**µg/L**	
	Dieldrin	0.05 (goal)	2011 NWC ROD, Section 2.4, CA Action Level, TBC

Notes:
µg/L = micrograms per liter
NWC = northwestern corner
OU = operable unit
ROD = Record of Decision
TBC = to be considered

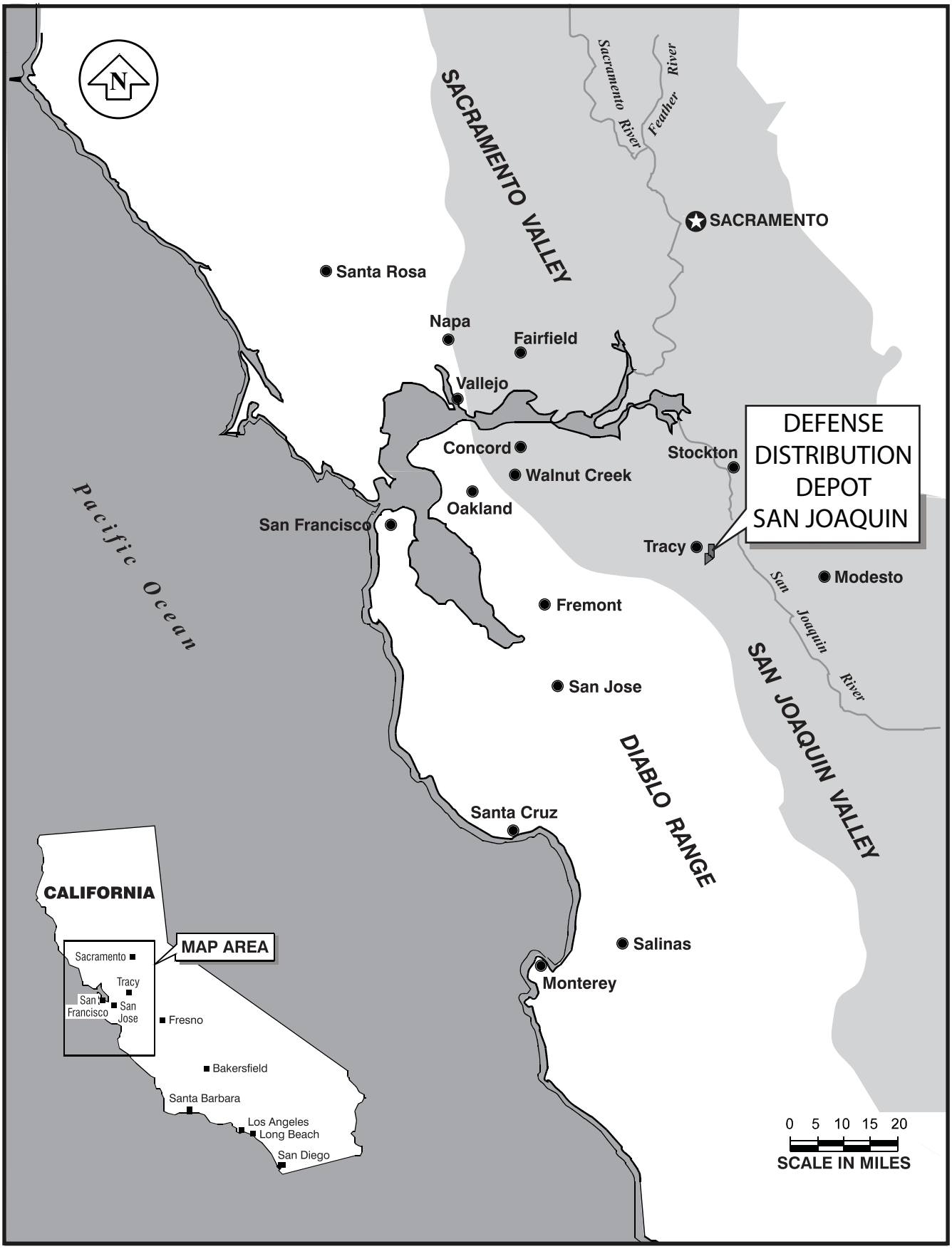

Figure 3.1-1 Site Location

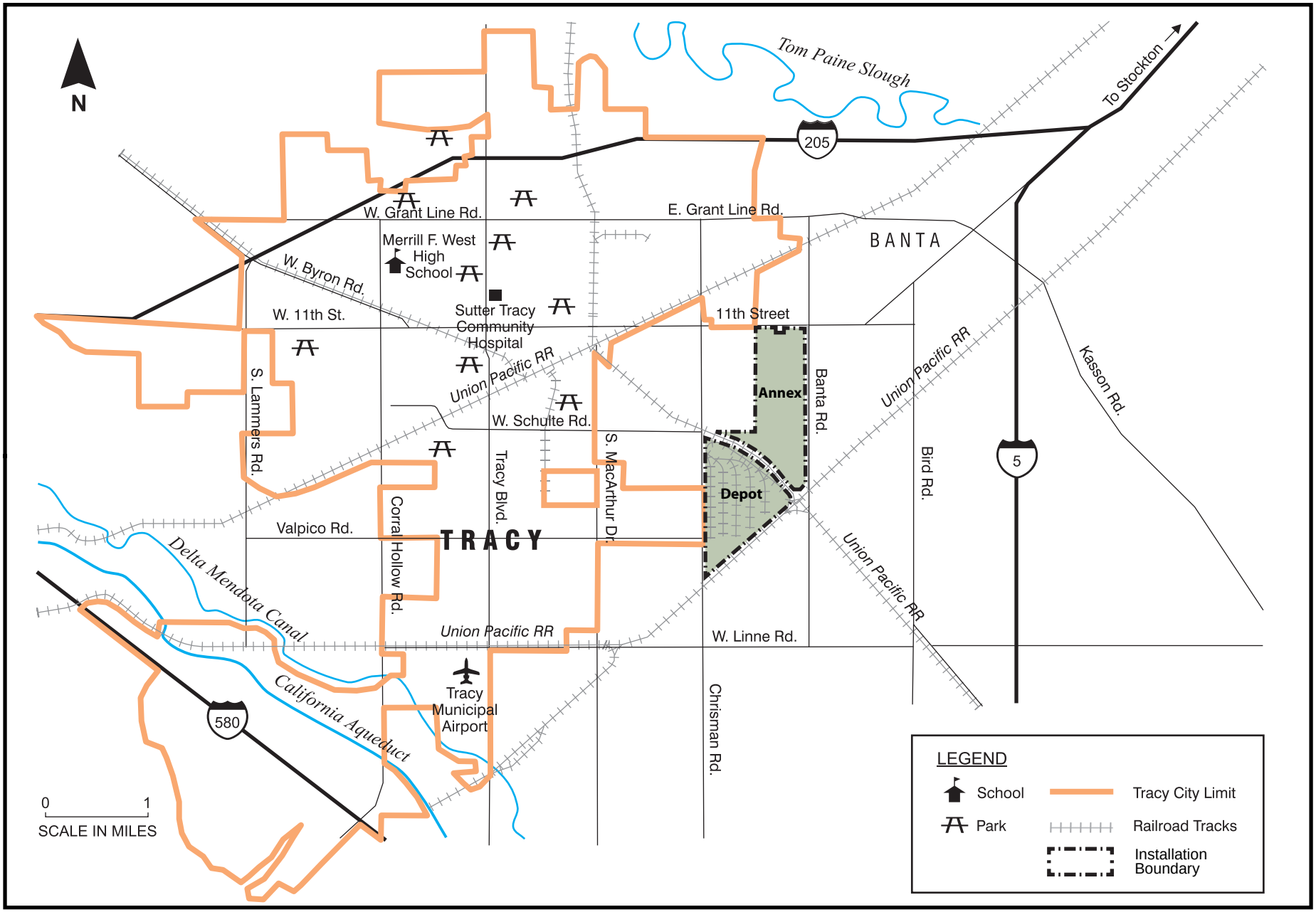

Figure 3.1-2 Site Location and Local Areas

Figure 3.1-3 Site Map

4.0 REMEDIAL ACTIONS

This section describes the remedial actions taken at the Tracy Site in accordance with the three RODs as modified by a ROD Amendment, revised by four ESDs and clarified by two MTFs. The following sections identify the RAOs established in decision documents, present the chronology of the selected remedies, their implementation, and discuss system operation and maintenance (O&M) where applicable.

4.1 OU 1: Operable Unit 1

4.1.1 Remedy Selection

The OU 1 ROD defined OU 1 as contaminated groundwater plumes emanating from the Tracy Site primarily characterized by PCE and TCE, secondarily by other VOCs, and potentially by inorganics and pesticides. The OU 1 plume consists of VOC and pesticide plumes. The OU 1 ROD identified the following RAOs:

- Remediate hot spots (i.e., the portions of plumes with the highest concentrations of VOCs and dieldrin in groundwater).
- Minimize contaminant transport off Depot.
- Remediate TCE, PCE, and 1,1-DCE to cleanup standards consistent with Federal MCLs or the California MCL (for 1,1-DCE).

The selected remedy for OU 1 includes groundwater extraction, ex situ treatment using air stripping, and infiltration of treated groundwater. The remedy includes up to 30 years of groundwater monitoring subject to evaluations of treatment effectiveness and cost effectiveness.

The 1995 ESD modified the OU 1 remedy to include dispersion with metabolism and volatilization as a remedy for removing VOCs from groundwater in the portion of the plumes, off Depot east of Banta Road.

The 1998 OU 1 ROD confirmed the remedy for VOCs in groundwater, established an ACL (0.05 µg/L) for dieldrin in groundwater, and included extraction wellhead carbon treatment to remove dieldrin from groundwater. The 1998 OU 1 ROD identified the following RAOs for dieldrin in groundwater:

- Remediate hot spots (i.e., areas with the highest levels of dieldrin contamination in groundwater);
- Minimize contaminant transport off Depot; and
- Minimize dieldrin migration and remediate to the ACL of 0.05 µg/L based on the California Action level.

Dieldrin was identified as a COC in the 1998 OU 1 ROD at the following sites: SWMU 2/3, SWMU 4, SWMU 6, SWMU 7, SWMU 8, SWMU 20, SWMU 33, and Area 1. The remedy for dieldrin in groundwater was groundwater extraction and treatment from two existing extraction wells and one additional extraction well at SWMUs 2 and 3, two extraction wells at SWMU 8, and at least four extraction wells on the Annex. The dieldrin extraction wells were not installed at SWMU 8 because dieldrin was not detected in groundwater at the monitoring well downgradient from the site. Groundwater extraction was formerly removed from the remedy at SWMU 8 in the 2013 MTF.

The 2004 ESD added LUCs for OU 1 with the purpose of mitigating human exposure to contaminated groundwater on the Depot and Annex. DLA is responsible for implementing the LUCs documented in Appendix G of the Real Property Master Plan (RPMP) and summarized below:

- Prevent domestic use of contaminated groundwater (untreated);
- Protect infrastructure associated with OU 1 groundwater monitoring, extraction treatment, and disposal;
- Establish notification procedure for construction activities or land use changes in the Installation Master Plan (IMP);
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance controls and to correct deficiencies in the notification procedure; and
- Follow defined procedures in the event of a change in land use.

In August 2010, DLA met with the San Joaquin County Environmental Health Department (SJCEHD) to discuss implementation of well notification procedures in areas potentially impacted with COCs. These procedures identify well construction details and require the notification of DLA and CVRWQCB in the event that a well construction permit is applied within the notification boundary. The notification boundary is defined as the area between 11th Street, Chrisman Road, Linne Road, and S. Bird Road (Figure 4.1-1).

The 2013 MTF modified the OU 1 remedy by removing 1,1-DCE as a groundwater COC;1,1-DCE has not been detected above the ACL since 2Q05 and has not been detected above the method detection limit (MDL) since 2Q09 (HDR, 2013a). The 2013 MTF also increased the time necessary for TCE to reach the ACL through dispersion east of Banta Road, based on data collected since signing of the 1995 ESD.

The 2014 MTF changed the treatment remedy for VOCs from air stripping to air stripping and/or LGAC. This change was necessary as GWTP 2 flows have decreased from approximately 750 gpm in 2004 to 90 gpm in 2014 (HDR, 2014a). Treatment via LGAC instead of air stripping reduces operating costs for GWTP 2 while meeting WDR criteria.

4.1.2 Remedy Implementation

In 1991, the IRM began operation as a response action with the objective of reducing additional migration of contamination emanating from the Depot. The IRM consisted of a groundwater extraction and treatment system (GWTP1) designed to collect groundwater from the Upper Hydrologic Zone, treat the groundwater via air stripping, treat volatile organic air emissions using a vapor-phase GAC unit, and discharge the treated groundwater to the Upper Hydrologic Zone through injection wells and surface impoundments. The LGAC unit was designed to treat up to 500 gpm of pesticide- and VOC contaminated groundwater. Treated water was discharged to the southern infiltration gallery (IG), IG1, and the chimney drain. On 16 January 2006, GWTP1 was taken out of service.

In 1998, construction of the second groundwater treatment plant (GWTP2), located in the Annex, was completed. GWTP2 is designed to treat up to 800 gpm of VOC contaminated groundwater in a packed media air stripping tower and discharge the treated groundwater into nine IGs. During this Third Five-Year Review period, GWTP2 flow rates ranged from 300 gpm in 2010 to 90 gpm in 2014. The decrease

in treatment flow is due to the shutdown of extraction wells after meeting the criteria established in the 1998 OU 1 ROD. Figure 4.1-2 shows the current and former locations of the treatment plants, extraction wells, IGs, and the overland flow area.

The 1998 OU 1 ROD selected extraction and LGAC treatment for dieldrin-contaminated groundwater related to SWMUs 2 and 3. Three inline LGAC units are used to treat pesticide-contaminated groundwater extracted by EW047AU (inactive), EW048AU (active) (LGAC 1), EW028B (inactive) and EW044AU (inactive) (LGAC 2), and EW042AU (inactive) (LGAC 3) before passing through the GWTP2 air stripper. Groundwater extraction well EW027B extracts dieldrin contaminated groundwater with concentrations below the ACL and discharges the water to GWTP2; however, this water is not treated by LGAC.

The ROD Amendment revised the remedy to allow for the discharge of treated water to the 8.8-acre overland flow area (Figure 4.1-2). In January 2001, discharge to the overland flow plots was started. As of September 2014, the majority of the GWTP2 effluent is discharged to the northern IGs (IG7 through IG9); the southern IGs (IG2 through IG6) are generally no longer used for discharge, but are available if necessary.

No on Depot water supply wells are pumping water from OU 1. Appendix G of the RPMP clarifies LUCs for groundwater areas impacted by volatile COCs or dieldrin contamination. Groundwater plumes beyond the Depot boundaries have been identified with TCE and dieldrin concentrations greater than the ACL. The only off-Depot potable well (PW001) at which TCE concentrations have exceeded the ACL has been equipped with LGAC for treatment at the point of use.

4.1.3 Groundwater Monitoring Program

Groundwater monitoring at the Tracy Site is performed to evaluate the effectiveness of the remedies specified in decision documents and to comply with MRP 98-053. The OU 1 ROD, modified by the 2013 MTF, established cleanup standards for PCE and TCE for the groundwater plumes comprising OU 1. The 1998 OU 1 ROD established a cleanup standard for dieldrin within the OU 1 plume from SWMU 2/3 and the NWC OU ROD established a cleanup goal for dieldrin in the NWC Dieldrin Plume.

The 1998 OU 1 ROD also identified water quality criteria to protect the beneficial uses of groundwater (Table B-2 in Appendix B). If groundwater quality criteria for a site are exceeded, the appropriateness of the selected remedy is evaluated in the Annual Monitoring Report (Radian International, 1998a). The WMP is reviewed annually, in accordance with the 1998 OU 1 ROD, to ensure that the well locations, monitoring frequency, water level measurements, and analytes are optimized for the long term protectiveness of human health and the environment.

Wells at sites that do not have waste remaining in place are required to be monitored no less than three years for 1998 OU 1 ROD designated monitoring wells and two years for other wells after groundwater cleanup standards have been attained. For sites that do have waste remaining in place, wells will be monitored until an acceptable rationale (e.g., data from the monitoring program) demonstrates that there is no further threat to groundwater quality (Radian International, 1998a). Wells are decommissioned or no longer sampled in accordance with the recommendation presented in the annual monitoring reports.

As of September 2014, there are 205 wells in the Well Monitoring Program at the Tracy Site: 108 monitoring wells (MWs), 31 extraction wells, 2 injection wells (IWs no longer used for injection), 25 observation wells, 22 piezometers, 14 privately owned domestic-use wells, and 3 water supply wells. The well locations are presented on Plate 1 and the well construction details are documented in Appendix B.

During the Third Five-Year Review period, three new monitoring well (LM196AU, LM197B, and LM203A) and three new extractions wells (EW057A, EW058A, and EW059A) were installed. LM203A was installed at Area 3 and LM196AU and LM197B were installed at SWMU 20 to evaluate groundwater VOC concentrations. Extraction wells EW057A, EW058A, and EW059A were installed in the NWC Dieldrin Plume to implement the groundwater extraction and treatment remedy selected in the NWC OU ROD (URS, 2011).

During the Third Five-Year Review period, 50 monitoring wells and 10 extraction wells were decommissioned at the Tracy Site. The monitoring and extraction well decommissioning activities were presented in Appendix E of the *2013 First Quarter Monitoring Report* (HDR, 2013b), Appendix E of the *2014 Second Quarter Monitoring Report* (HDR, 2014c), and the *2013 Annual Monitoring Report* (HDR, 2014d).

4.1.4 Groundwater Treatment System Operations and Maintenance

The groundwater remedies are operated in accordance with the following O&M manuals:

- *Operations and Maintenance Manual for Groundwater Treatment Plant 2* (URS, 2006),
- *Addendum to the Groundwater Treatment Plant 2 Operations and Maintenance Manual* (HDR, 2012b),
- *Northwestern Corner Groundwater Operable Unit Remedial System Operation and Maintenance Manual* (HDR, 2012c).

Extraction wells have generally operated 24 hours per day, 7 days per week, except when shutdown for maintenance or suspended because concentrations decreased to less than ACLs. During this Third Five-Year Review period, communications and Supervisory Control and Data Acquisition functions at GWTP 2 generally operated properly with 94% uptime.

In September and October 2011, four groundwater extraction wells (EW056A, EW057A, LM174AU, and EW059A) were connected to GWTP2 as part of the NWC OU remedy. As of September 2014, thirty extraction wells (EWs) are currently connected to GWTP 2 (Table 4.1-1). In accordance with the *Extraction Well Decision Logic* (HDR, 2014e), groundwater extraction from 21 OU 1 wells was stopped and 10 groundwater extraction wells have been decommissioned during this Third Five-Year Review period.

The Extraction Well Decision Logic was adopted to allow for evaluation of extraction wells for effective and efficient operation at the Tracy Site. This evaluation is used to optimize the system by determining which extraction wells may not be necessary or efficient at achieving the ACL or the RAOs (e.g., wells pumping groundwater with contaminant concentrations less than ACLs), and establishes protocols for suspending pumping, monitoring, and restart. Table 4.1-1 summarizes OU 1 extraction wells that have been shutdown and those that continue to operate.

With the exception of EW027B, groundwater extracted from the pesticide-impacted wells undergoes pre-treatment for dieldrin before being conveyed to the air stripper at GWTP 2 for VOC treatment. The LGAC systems consist of two 1,000-pound carbon beds operating in series. The inline systems are monitored monthly to ensure the removal of dieldrin complies with effluent limitations.

Carbon in the lead vessel (and lag vessel where indicated) of the four inline LGAC systems were replaced as follows during this Third Five-Year Review period:

- LGAC #1 - June 2010, April, September, and December 2011 (includes lag)
- LGAC #2 - June 2010 and April 2011
- LGAC #3 - June 2010, April 2011 (includes lag), and August 2012
- LGAC #4 - December 2011 (includes lag), August 2012, and February 2013

Figure 4.1-2 presents the location of each LGAC system and the wells connected to each system. LGAC system #1 services both NWC and OU 1 wells, LGAC systems #2 and #3 service OU 1 wells only, and LGAC system #4 services NWC wells only.

RWQCB Order No. 98-053 established the Tracy Site groundwater treatment system effluent limits (WDRs) for discharge to injection wells, IGs, the storm water detention pond, and sewage lagoons. By agreement with RWQCB, these limits also apply to discharge to the overland flow plots. During this Third Five-Year Review period, GWTP 2 discharge was compliant with WDRs for daily maximum and monthly median criteria for VOCs, pesticides, pH, and metals with four exceptions:

- April 2011 - monthly median concentration criterion for total VOCs was exceeded due to the accidental switching of the influent and effluent samples.
- In August 2011 - monthly median concentration criterion for total VOCs was exceeded due to acetone, a common laboratory contaminant that is not indicative of the water quality in the effluent samples.
- July 2014 - monthly median concentration criterion for total VOCs was slightly exceeded due to acetone, a common laboratory contaminant that is not indicative of the water quality in the effluent samples.

During this Third Five-Year Review period, the GWTP 2 flow rate decreased from approximately 300 gpm in 3Q10 to approximately 90 gpm in the 3Q14 (Table 4.1-2). During this period, the GWTP 2 operated with 94% average uptime and removed approximately 23 pounds of COPCs from groundwater. Due to the absence of LGAC pretreatment at well EW027B, dieldrin was detected in GWTP 2 effluent, but at concentrations less than the WDR effluent limitation.

In 1992, an LGAC system was installed at a residential well located on private property east of Banta Road. This residential LGAC system is installed and operated to mitigate the ingestion of VOCs in groundwater at concentrations greater than MCLs. Water samples are collected from the influent, effluent, and between carbon vessels (PW001, FW001, and BC001, respectively) of the LGAC system quarterly and analyzed for drinking water standards via U.S. EPA Method E524.2. During this Third Five-Year Review Period, samples collected from the effluent of the private wellhead LGAC system did not yield VOCs at concentrations grater than MCLs. O&M of the residential wellhead LGAC system is performed in accordance with *Addendum to the Groundwater Treatment Plant 2 Operations and Maintenance Manual* (HDR, 2012b).

4.2 OU 1: SWMU 1/Area 2

Area 2 is located along the northern Site Depot boundary (Figure 1.2-1). Two sewage lagoons, referred to as SWMU 1, were formally located at Area 2. Treated effluent was discharged to the lagoons from 1942 until they were abandoned and backfilled in 1944 (WCC, 1992a). Area 2 was also reportedly an outdoor drum storage area where leakage of stored drums and/or accidents in the handling of drums may have

occurred. SWMU 1 and Area 2 were evaluated together in the 1996 RI/ FS due to their geographical proximity and similarities in suspected contaminants.

4.2.1 Remedy Selection

The 1998 OU 1 ROD established the RAO of preventing the migration of PCE and TCE from soil to groundwater, selected SVE as the remedy, and established soil gas cleanup standards that represent calculated concentrations of TCE and TCE in soil gas that, when in equilibrium with groundwater, will not result in groundwater concentrations above their respective ACLs; the concentrations are assumed protective of groundwater quality.

4.2.2 Remedy Implementation

In the fall of 1998, predesign soil vapor samples were collected from 40 CPT locations at three depths ranging from 5 to 15 feet bgs. TCE concentrations ranged from less than detection limits to 7,000 ppbv. PCE concentrations ranged from less than detection limits to 3,400 ppbv. The estimated initial mass of TCE and PCE at SWMU 1/Area 2 was 1.6 and 1.0 pounds, respectively (URS, 2003b).

In January 1999, SVE pilot tests were conducted at SWMU 1/Area 2 to estimate soil vapor permeability values and radius of influence. The SVE pilot test was conducted by Rust with the results presented in *DDJC-Tracy Bioventing/Soil Vapor Extraction Sites, Remedial Design, Appendix E* (Radian International, 2000a).

A total of seven vapor extraction wells and 18 vapor monitoring probes were installed at SWMU 1/Area 2. The SVE system was started in November 2000, and was operated continuously until 2002. During this period, 1.9 pounds of TCE and 7.3 pounds of PCE were removed from the vadose zone via SVE (URS, 2003b).

Site optimization sampling was performed in September 2002. The results, which were presented in the *DDJC-Tracy Soil Vapor Extraction Optimization Work Plan* (URS, 2003b), indicated that the remediation effort was ready to proceed to “focused operations,” to progress the site toward complete site restoration and ultimately meeting the remedial objectives and goals. System operation was temporarily suspended in August 2003 to evaluate potential rebound effects from the COCs. Closure/confirmation sampling was conducted in November and December 2003 in accordance with the *DDJC-Tracy Soil Vapor Closure/Confirmation Sampling Work Plan* (URS, 2003c) to assess whether remediation was complete.

Based on residual concentrations exceeding the 1998 OU 1 ROD cleanup goals the SVE system was restarted in late January 2004. Focused operations continued during the spring of 2004, with various extraction and monitoring wells connected to the vacuum extraction pipelines. Based on declining blower influent concentrations, the SVE systems was shutdown in June 2004 and allowed to rebound for eight weeks. Second round closure/confirmation sampling was conducted in August 2004 in accordance with the *DDJC-Tracy Second Round Soil Gas Closure/Confirmation Sampling Work Plan* (URS, 2004b) to assess whether remediation was complete. The sampling results were documented in a Technical Memorandum (URS, 2004c).

The results from the August 2004 closure/confirmation sampling exceeded 1998 OU 1 ROD cleanup goals for TCE at two direct push sampling locations and for PCE at one direct push sampling location. Two monitoring wells had TCE concentrations slightly above the 1998 OU 1 ROD cleanup standards; PCE was not detected above the cleanup standard. The highest TCE concentration measured by direct

push was 2,100 ppbv, but that concentration was obtained within 8 feet of a monitoring well that was below ACLs (URS, 2005a).

The results from the August 2004 closure/confirmation sampling indicate that though the sites are being remediated, it is still possible to detect areas that have not been fully remediated with the existing SVE system. Detectable concentrations at two to five times the ROD action level can be found within 15 feet of areas that have been identified as clean (URS, 2005a).

Preliminary modeling of the SVE sites were conducted, with special attention to areas that displayed high concentrations at the 6-foot and 12-foot intervals. Modeling results indicated that TCE concentrations in the leachate at the groundwater capillary fringe do not exceed aquifer cleanup standards at 30 years, but are still increasing; therefore, some additional SVE was warranted (URS, 2005a).

In 2005, SVE pulsing operations were performed at shallow air inlet wells (AIWs) at SWMU 1/Area 2. Pulsing operations occurred until influent SVE concentrations indicated that COC concentrations were consistently less than cleanup standards. The SVE system was then shutdown for a year. Pulsing operations were started again in December 2006. During that time, the AIWs were open to the atmosphere for passive venting.

In 2008, soil gas and groundwater samples were collected from four CPT borings. Laboratory analysis indicated that PCE or TCE in soil gas was not present in CPT borings at levels exceeding cleanup standards; however, one groundwater sample had PCE (8.8 µg/L) above the ACL of 5 µg/L.

In January 2009, DLA recommended to discontinue SVE operations at SWMU 1/Area 2 in the *Remedy Enhancement Decisions at SVE Sites Area 1 Building 237, SWMU 1/Area 2, and Area 3.* This recommendation was based on the SVE Termination and Optimization Protocol (STOP) analysis and the results of vadose zone modeling, which concluded that remaining soil gas would not have a significant impact to groundwater quality, thereby protecting groundwater in accordance with the RAOs of the Site-Wide Comprehensive 1998 (URS, 2009b). Based on the results of the STOP analysis and the vadose zone modeling, the SVE system was shutdown.

In May 2013, soil vapor samples were collected from soil borings and vapor monitoring at SWMU 1/Area 2 to assess concentrations of TCE and PCE since shutdown of the SVE system. Laboratory analysis of these samples indicated the presence of PCE and TCE at concentrations greater than the 1998 OU 1 ROD cleanup standard, implying that PCE may present an unacceptable risk to groundwater (HDR, 2013c). Groundwater monitoring wells, with the exception of well LM030AUA, did not yield TCE or PCE above the ACL; therefore, it was implied that TCE and PCE in soil vapor does not pose an unacceptable risk to groundwater (HDR, 2013c). The *Area 1, 2, and 3, Soil Gas Optimization Report* did indicate that the PCE detections in groundwater at well LM030AUA can likely be attributed to screening of the well into the vadose zone, which acts as a preferential pathway for the migration of VOCs from the vadose zone to the saturated zone.

4.2.3 Groundwater Monitoring

Well LM030AUA, LM040B, LM041B, and LM094AU were identified in the 1998 OU 1 ROD for sampling and analysis to determine the effectiveness of the remedy. As part of this Third Five-Year Review, groundwater analytical results from 2010 through 2014 were reviewed to evaluate the likelihood of residual contamination impacting groundwater at SWMU 1/Area 2. Monitoring well locations are shown on Figure 4.2-1.

LM030AUA

During the 2010 through 2014 period, well LM030AUA yielded PCE at concentrations greater than the ACL. The highest PCE concentration was 16 µg/L reported in 3Q14. During this period, TCE was not detected above the ACL, but does exhibit an increasing trend.

Review of the complete sampling history of well LM030AUA indicates a decreasing PCE and TCE trend after startup of the SVE system in November 2000, followed by an increasing TCE and PCE concentration trend after shutdown of continuous operations in 2004 and more prominently after focused SVE operations were stopped in 2007.

LM030AUA is screened from 10 to 20 feet bgs, with an average of 7 feet of screen exposed through the vadose zone. The exposed screen would allow soil gas to migrate into the well and filter pack and have direct contact with the groundwater. During the 3Q14 monitoring event, well LM030AUA yielded PCE at 16 µg/L and TCE at 2 µg/L. This represents a historical high PCE concentration detected in groundwater at Area 2 after shutdown of the SVE system.

Soil gas and groundwater samples collected in 2008 did not yield TCE or PCE greater than the 1998 OU 1 ROD cleanup objectives; however, the recent historical high PCE concentration detected in the groundwater sample collected from LM030AUA suggests that the PCE concentration in soil gas has rebounded significantly since shutdown of the SVE system.

Well LM149A located approximately 15 feet to the northwest of well LM030AUA, is screened from 25 to 35 feet bgs, provides a better representation of PCE impacts in groundwater, and has not yielded TCE or PCE above the ACL since 4Q94 (HDR, 2014b).

LM040B

Well LM040B met the 1998 OU 1 ROD monitoring requirements for 1,1-DCE, TCE and PCE in 3Q09 (Table B-2 in Appendix B). This well was decommissioned in 2013.

LM041B

Well LM041B met the 1998 OU 1 ROD monitoring requirements for 1,1-DCE, TCE and PCE in 3Q13 (Table B-2 in Appendix B). This well is no longer recommended for sampling based on the Groundwater Monitoring Well Decision Logic; however, it is being retained in the monitoring program for water level information.

LM094AU

Well LM094AU met the 1998 OU 1 ROD monitoring for 1,1-DCE, TCE and PCE. The requirements were met for PCE in 2Q97, TCE in 3Q03, and 1,1-DCE has never exceeded the ACL (Table B-2 in Appendix B). This well is no longer recommended for sampling; however, it is being retained in the monitoring program for water level information.

4.2.4 Soil Vapor Monitoring

In May and June 2013, seven soil vapor samples were collected from soil borings and 16 soil gas samples were collected from monitoring points at SWMU 1/Area 2. The propose of this investigation was to evaluate concentrations of TCE and PCE in the vadose zone after shutdown of the SVE system and to determine whether VOC concentrations present a risk to human health via vapor intrusion to

commercial/industrial occupants of existing and/or future buildings. The results of this investigation indicated that PCE and TCE was present at concentrations greater than 1998 OU 1 ROD cleanup standards.

To estimate whether PCE or TCE presents a vapor intrusion risk, a soil gas screening level was calculated from the indoor air RSL using attenuation factors (0.1 for shallow or 0.01 for deep samples) as published in *OSWER Draft Guidance for Evaluation of the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (U.S. EPA, 2002). Based on this assessment, TCE and PCE are present in shallow soil gas at concentrations that present a vapor intrusion risk to commercial/industrial occupants of future buildings. The results from this sampling event are documented in the *Final Areas 1, 2, and 3 Soil Gas Optimization Report* (HDR, 2013c).

4.2.5 Land Use Controls

LUCs were established for SWMU 1/Area 2 in the 2001 ESD, as the excess cancer risk for residential receptors was determined to be 5.0×10^{-5} with a hazard index of less than 1.0. The 2004 ESD modified the LUCs to prohibit residential, day care, play area, or school use and established the following LUCs to mitigate exposure to beryllium and polycyclic aromatic hydrocarbons (PAHs) in soil:

- Establishment notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from future excavation activities.

Based on the results from the 2008 soil gas sampling, the 2011 ESD indicated that future building constructed over areas where soil gas concentrations exceed the U.S. EPA industrial soil gas screening level, calculated from the U.S. EPA indoor air RSL, may pose a human health risk to future occupants. To mitigate this risk the 2011 ESD modified the LUC boundary, added PCE and TCE as COCs, and modified the LUC requirements to include the following:

- Future buildings to be constructed with engineered controls specifically designed to prevent the migration of soil vapor to indoor air.

The LUCs at SWMU 1/Area 2 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies. The findings are presented in annual monitoring reports. During this five-year review period, no deficiencies were noted for SWMU 1/Area 2. The inspection findings are presented in Table 4.2-1 and the LUC boundary is depicted on Figure 4.2-1.

4.3 OU 1: SWMU 2/SWMU 3

SWMU 2 (sewage lagoons) and SWMU 3 (industrial lagoons) are in the northern part of the Depot, west of and adjacent to the sewage treatment plant (Figure 1.2-1). The industrial waste lagoons were lined prior to their removal in 1997. The area previously occupied by the industrial waste lagoons has been

incorporated into the southern sewage lagoon. The Tracy Site wastewater treatment plant discharges treated water to these currently unlined sewage lagoons.

4.3.1 Remedy Selection

In 1996, an engineering evaluation/cost analysis (EE/CA) was performed to evaluate alternatives and select a NTCRA for SWMUs 2 and 3 (Radian Corporation, 1996b). In 1997 and 1998, the removal action was completed and was adopted as the selected remedy in the 1998 OU 1 ROD.

RAOs established in the 1998 OU 1 ROD and later modified in the 2001 and 2004 ESD are:

- Prevent the migration of dieldrin, DDT, DDD, DDE, di-n-butylphthalate, and bis(2-ethylhexyl) phthalate in post-removal-action soil that could cause groundwater contamination to exceed appropriate regulatory standards and health-based concentrations.
- Prohibit residential, day care, play area, or school use.
- Prevent unprotected exposure of construction workers to contaminated soil.

4.3.2 Remedy Implementation

Remedial actions for SWMUs 2 and 3 are described in the *Remedial Action Report for Solid Waste Management Units 2, 3, and 33* (URS, 2002a). On 15 September 1997, the remedial efforts at SWMUs 2 and 3 began and were completed on 12 June 1998. First, the dried sludge that remained in industrial waste lagoons was scraped and consolidated. Then the liners from both lagoons were cut and removed. The cut sections of liners were placed into a 20-cubic-yard roll-off bin and managed as RCRA hazardous waste. On 19 September 1997, the removal of the liner from the industrial waste lagoons was completed.

On 22 September 1997, excavation of the south sewage lagoon and industrial waste lagoons began. The inner berms that separated the industrial waste lagoons from the south sewage lagoon were excavated first. After the inner berms were removed, the inside slope of the outer berm and the floor of the lagoon were excavated. Four pesticide “pockets” were then excavated. On 10 October 1997, the excavation of the initial cuts specified in the excavation plans for the south lagoon was completed. Soil excavated from the south lagoon was stockpiled in the north lagoon. The stockpiles contained approximately 100 tons of soil and were covered with plastic sheeting to suppress dust. The total quantity of soil excavated from the south lagoon was 7,344 cubic yards.

During excavation of the south lagoon, asbestos and concrete drainpipes were encountered on the west side of the lagoon, just beneath the surface of the original grade. Triad Environmental of Martinez, California, was contracted to remove asbestos encountered at the site. Both pipes were removed and disposed of on 4 October 1997.

On 11 October 1997, excavation work began on the north sewage lagoon. The inside slopes of the outer berms of the north sewage lagoon were excavated first, followed by excavation of two known pesticide “pockets.” After the soil stockpiles placed on the north sewage lagoon floor had been fully characterized and removed, the floor was excavated. On 23 October 1997, the initially planned excavation of the north sewage lagoon was completed. Soil excavated from the north lagoon was stockpiled in an area just northeast of this lagoon. The stockpiles contained approximately 100 tons of soil and were covered with plastic sheets to suppress dust. The total quantity of soil excavated from the north sewage lagoon was 3,163 cubic yards.

Most of the confirmation samples collected after the initial excavation were found to have soil concentrations that exceeded the cleanup standards; therefore, additional excavation was performed. After the second round of excavation had been completed, 13 of the 139 confirmation samples were found to have COC concentrations in excess of the cleanup standards specified in the 1998 OU 1 ROD. Additional soil was excavated from the locations where these 13 samples were collected. The total quantity of soil removed from the sewage and industrial waste lagoons as part of the additional excavations was 1,280 cubic yards.

At the conclusion of the excavation, after fill and grading activities were completed, Radian International collected soil samples for the analysis of lead and selenium to support a re-evaluation of the ERA. The confirmation sample results for lead and selenium were below their respective cleanup standards. Following completion of the removal action, cleanup standards presented in the 1998 OU 1 ROD, as modified by the 2001 ESD, were attained and wastes were disposed at the appropriate designated disposal facilities, based on their characterization results.

4.3.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established site-specific sampling requirements for wells LM003AA and LM015AA to determine the effectiveness of the selected remedy on water quality. A discussion of the sampling results is presented below. Well locations are shown on Figure 4.3-1.

LM003AA

Well LM003AA has not met the 1998 OU 1 ROD monitoring requirements for dieldrin and therefore continues to be sampled during semiannual monitoring events. Since installation in 1994, well LM003AA has exhibited decreasing concentrations of dieldrin with 8 of the last 12 detections reported at concentrations less than the ACL. This well will continued to be monitored for dieldrin in accordance with the 1998 OU 1 ROD. Based on declining dieldrin concentration, it is likely that 1998 OU 1 ROD monitoring requirements will be met in a reasonable amount of time.

LM0015AA

LM015AA has met the 1998 OU 1 ROD monitoring requirements (Table B-2 in Appendix B); therefore, this well is no longer sampled; however, depths to groundwater are measured in this well during semiannual monitoring events.

4.3.4 Land Use Controls

LUCs were established in the 2001 ESD and modified by the 2004 ESD for dieldrin, beryllium, and aluminum at SWMUs 2 and 3 with the following purposes:

- Prohibit residential, day care, play area, or school use; and
- Prevent unprotected exposure of construction workers to contaminated soil.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);

- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure; and

- Follow defined procedures in the event of a change in land use.

The LUCs for SWMU 2 and 3 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this five-year review period, no deficiencies were noted at SWMU 2 and 3. The inspection findings are presented in Table 4.2-1 and the LUC boundaries are depicted on Figure 4.3-1.

4.4 OU 1: SWMU 4

SWMU 4 is an unlined storm water detention pond in the northwestern portion of the Depot (Figure 1.2-1). Since 1971, storm water has been discharged to the detention pond through a network of underground storm drains and open surface drainage ditches. The detention pond is bounded by earthen berms approximately 6 feet high and approximately 6 feet below grade. The storm water detention pond receives runoff through inlets in the southern and northeastern portions of the pond. The pond reportedly received rinse water from former paint stripping, degreasing, and steam-cleaning operations. Storm water is discharged from the detention pond into the West Side Irrigation District Canal when necessary to avoid flooding of the facility.

4.4.1 Remedy Selection

The RAOs identified in the 1998 OU 1 ROD are:

- Prevent the release of COCs (DDT and dieldrin) from sediments that would cause surface water concentrations to exceed Federal freshwater chronic ambient water quality criteria (AWQC) for the protection of aquatic life.

- Prevent ecological receptors from being exposed to COCs (DDT, lead, and polychlorinated biphenyls [PCBs]) in surface water above aquatic standards.

- Prevent ecological receptors from being exposed to COCs in sediment.

The 1998 OU 1 ROD identifies the remedy at SWMU 4 as including limited excavation and disposal, construction of an overflow weir and sediment trap, and evaluation of storm water discharge. However, the 1998 OU 1 ROD also identifies uncertainties (data gaps) in the ERA. Subsequent investigations to address those data gaps resulted in the development of a revised BRA (URS, 2001b), and the remedy was modified in the 1998 OU 1 ROD Amendment. The ROD Amendment eliminated the cleanup standards for SWMU 4 and deleted excavation from the remedy. The remedy was again modified in the 2001 and 2004 ESDs with the addition of LUCs and the RAO of prohibiting residential, day care, play area, or school use. DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in the appendix to the RPMP.

The remedy for SWMU 4 includes the following elements:

- Continued groundwater monitoring.

- LUCs.

- Installation of an overflow weir to prevent potentially contaminated sediment from being discharged from the pond.
- Installation of a sediment trap. (Note: the overflow weir was designed to enable the pond to function as a sediment trap.)
- Stormwater monitoring to ensure the overflow weir and sediment trap are effective.

4.4.2 Remedy Implementation

Construction of the overflow weir to prevent the discharge of potentially contaminated sediment from SWMU 4 is documented in the *Project Closeout Plan (Remedial Action Report): SWMU 6 and SWMU 20 Small Excavation Sites and SWMU 4 Wet Season Controls* (Shaw Environmental, Inc. [Shaw], 2004). From 28 June to 10 August 1999, remedial construction activities were performed. Remedial activities included the following.

- Pumping water remaining in the drainage lagoon into the sewage lagoons in preparation for construction.
- Clearing and grubbing adjacent to the existing inlet structure. Approximately 9 cubic yards of soil were excavated during clearing activities and deposited into a single roll-off bin for off-site disposal.
- Retrofitting the existing concrete structure to raise the intake for the discharge pumps by approximately 2.5 feet to reduce the likelihood of contaminated sediment being discharged from the bottom of the pond.
- Placing riprap material around the overflow weir to reduce erosion.

Approximately 14 tons of soil removed during the modifications to the outlet structure was disposed of at the Allied Waste Companies Forward Landfill in Manteca, California.

4.4.3 Storm Water Monitoring

DLA samples the discharge from the storm water detention pond as part of its storm water pollution prevention program, to comply with the requirements of California's General Permit for Industrial Activities to discharge storm water. Based on the review of monitoring reports for the 2010 through 2014 Third Five-Year Review reporting period, storm water was not discharged from the detention pond.

4.4.4 Groundwater Monitoring Program

The 1998 OU 1 ROD established site-specific monitoring requirements for wells LM004AU and LM027AUA to determine the effectiveness of the selected remedy on water quality. In 1996, well LM004AU met the 1998 OU 1 ROD monitoring requirements. In February 2013, well LM004AU was decommissioned. Well LM027AUA never yielded TCE or PCE above laboratory detection limits and dieldrin had not been detected since 1994. In May 2014, well LM027AUA was decommissioned. Well locations are shown on Figure 4.4-1.

4.4.5 Land Use Controls

LUCs were established in the 2001 ESD and modified by the 2004 ESD for DDX, lead, arsenic, aluminum, manganese, PCBs, PAHs, and dieldrin with the following purpose:

- Prohibit residential, day care, play area, or school use.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for SWMU 4 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at SWMU 4. The inspection findings are presented in Table 4.2-1 and the LUC boundary is depicted on Figure 4.4-1.

4.5 OU 1: SWMU 6

SWMU 6 consisted of a 250-gallon concrete sump on the western side of Building 28 (Figure 1.2-1). This building was used to repackage materials from damaged containers. Wastes from this recoup operation were collected in the concrete sump, pumped into 55-gallon drums, and then removed to a Class I or other disposal site. in 1977, the sump was removed. 1996 RI/FS soil sample results indicated that pesticide and herbicide contamination in the soil was limited to the area immediately adjacent to the sump excavation and from depths below the sump excavation to directly above the groundwater table. The BRA results showed potential human health risks less than 1×10^{-6} (current Depot worker scenario) and no ecological risks at SWMU 6. Vadose zone migration modeling results indicated that pesticides (dicamba, dieldrin, endrin, heptachlor, trichlorophenoxy acetic acid [2,4,5-T], and lindane) could introduce constituents to the groundwater at concentrations greater than those detected in background conditions (URS, 2012).

4.5.1 Remedy Selection

The RAO identified for SWMU 6 in the 1998 OU 1 ROD is to prevent the migration of pesticides (dicamba, dieldrin, endrin, heptachlor, lindane, and 2,4,5-T) in soil that could cause groundwater contamination. The selected remedy was excavation and off-site disposal of approximately 100 cubic yards of soil potentially contaminated with pesticides and herbicides (Radian International, 1998a). The 1998 OU 1 ROD also required compliance monitoring of groundwater monitoring wells LM017A and LM092C for semi-volatile organic compounds (SVOCs) and pesticides/herbicides as part of the WMP.

The selected remedy in the 1998 OU 1 ROD includes excavating approximately 100 cubic yards of soil contaminated with pesticides from SWMU 6. The 1998 OU 1 ROD estimated that approximately 60 cubic yards of soil would be transported to a Class I or Class II off-site disposal facility, depending on the level of contamination. The 2004 ESD added LUCs to the selected remedy for SWMU 6 to address the risk from residual contamination under the construction and residential-use scenarios and modified the 1998 OU 1 ROD cleanup standards for 2,4,5-T and lindane. The revision to the cleanup standards was based on

the Seasonal Soil Compartment Model and Vadose Zone Leaching Model (VLEACH) modeling, which indicated that concentrations reaching groundwater would not exceed beneficial use limits.

DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in Appendix G of the RPMP.

The RAOs for SWMU 6 are:

- Prevent the migration of pesticides (dicamba, dieldrin, endrin, heptachlor, lindane, and 2,4,5-T) in soil that could cause groundwater contamination.
- Prevent unprotected exposure of construction workers to contaminated soil.
- Prohibit residential, day care, play area, or school use.

4.5.2 Remedy Implementation

On 22 June 1999, excavation activities began within the proposed excavation footprint (10 feet by 15 feet). The bottom of the initial excavation was 18 feet bgs, as required by the 1998 OU 1 ROD. Six soil samples were collected, one from each of the four excavation sidewalls and two from the excavation bottom (Shaw, 2004).

Analytical results for three of the initial confirmation samples showed concentrations of COCs exceeding 1998 OU 1 ROD cleanup standards. Additional contaminated soil was excavated from the northern bottom and southern sidewall of the excavation. Additional excavation was not conducted on the western sidewall because of an adjacent, in-service, 48-inch storm drain line.

Analytical results for the final round of confirmation sampling (step-out sampling) showed residual contamination in the eastern and western portions of the southern sidewall over-excavation. No additional excavation could be conducted because of the proximity to Building 28 to the east and the 48-inch storm drain line to the west (Shaw, 2004).

On 15 July 1999, excavation and confirmation soil sampling activities were completed. The final excavation depth was approximately 19 feet bgs. On 9 September 1999, backfilling of the excavation and waste off-hauling were completed and the surface was restored to its pre-construction condition, including asphalt paving. Approximately 245 cubic yards of soil were excavated, transported, and disposed of off site at a Class II disposal facility (Shaw, 2004).

Cleanup standards for lindane and 2,4,5-T were met; however, dieldrin concentrations in excess of the 1998 OU 1 ROD cleanup standards were detected in the vicinity of the storm drain line and under Building 28, which may pose a risk to construction workers or future residents.

4.5.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established compliance monitoring requirements for well LM017A, replaced by well LM017AA in 1997, and upgradient well LM092C, replaced by well LM092CC in 1997 to determine the effectiveness of the selected remedy on water quality. 1998 OU 1 ROD groundwater monitoring requirements were met for wells LM017AA and LM092CC in 2010 and 2009, respectively; sampling of these wells is no longer performed. Well locations are shown on Figure 4.5-1.

4.5.4 Land Use Controls

LUCs were established in the 2004 ESD for dieldrin, beryllium, benzo(a)pyrene, benzene(a)antharcene, PCBs, and 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) with the following purpose:

- Prohibit residential, day care, play area, or school use; and
- Prevent unprotected exposure for construction workers to contaminated soil.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for SWMU 6 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at SWMU 6. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.5-1.

4.6 OU 1: SWMU 7

SWMU 7 reportedly consists of seven pits that were operated before the construction of Buildings 15, 19, and 21 (Figure 1.2-1). The pits were used for the disposal of medical supplies, narcotics, general pharmaceuticals, radiological supplies, and electron tubes. The pits may have been as deep as 16 feet; ashes were removed and transported to off-site landfills during the later years of operation (WCC, 1992a).

4.6.1 Remedy Selection

The remedy selected in the 1998 OU 1 ROD included LUCs to prevent impacts to human health and compliance monitoring of existing and proposed monitoring wells to demonstrate protection of groundwater. The 2001 ESD clarified the LUCs imposed by the 1998 OU 1 ROD to require that the existing structures and pavement at SWMU 7 be maintained. Maintaining the existing structures and pavement prevents the infiltration of surface runoff that could otherwise transport contaminants to groundwater (URS, 2001a). The 2004 ESD amended the requirements for LUCs at SWMU 7 as follows:

- Establish notification procedure for construction activities or land use changes in the IMP
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure
- Follow defined procedures in the event of a change in land use

- Install warning signs
- Ensure controls are restored following construction activities

The 2004 ESD also included an appendix for inclusion in the RPMP that identified the LUC requirements at SWMU 7. DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in the Appendix G of the RPMP.

4.6.2 Remedy Implementation

As prescribed by the 1998 OU 1 ROD, additional wells LM166AU and LM167AU were installed in 1997 and integrated into the WMP (Plate 1). Six warning signs were posted at Buildings 15, 19, and 21. The *Addendum to Future Development Report* (Radian International, 1998b) initially documented LUCs for the site. LUCs were further modified in the 2001 and 2004 ESDs. In addition, the 2004 ESD contains an appendix to be included in the RPMP that documents the LUCs.

4.6.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established monitoring requirements for wells LM095AU, LM166AU, and LM167AU. As part of this Third Five-Year Review, groundwater analytical results from 2010 through 2014 were reviewed to evaluate the likelihood of residual contamination impacting groundwater at SWMU 7.

1998 OU 1 ROD groundwater monitoring requirements were met in well LM095AU and LM167AU in 2009; therefore, these wells are no longer sampled. 1998 OU 1 ROD groundwater monitoring requirements were not met for bis(2-ethylhexyl)phthalalate in well LM166AU; however, this well was decommissioned as part of a construction project in 2006. Other COCs met 1998 OU-1 ROD groundwater monitoring requirements in well LM166AU. Well locations are shown on Figure 4.6-1.

4.6.4 Land Use Controls

LUCs were established in the 2004 ESD for 1,2-DCE, TCE, bis(2-ethylhexyl)phthalate, dichlorophenoxy acetic acid (2,4-D), dieldrin, linuron, simazine, chlordane, DDE, DDD, benzo(a)pyrene, benzo(a)anthracene, beryllium, PCBs, 2,3,7,8-TCDD with the following purpose:

- Prohibit residential, day care, play area, or school use;
- Prevent unprotected exposure for construction workers to contaminated soil; and
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure;

- Follow defined procedures in the event of a change in land use;
- Install warning signs; and
- Ensure controls are restored following construction activities.

The LUCs for SWMU 7 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at SWMU 7. The inspection findings are presented in Table 4.2-1 and the LUC boundary is depicted on Figure 4.6-1.

4.7 OU 1: SWMU 8

SWMU 8 is a former burn pit located in the eastern portion of the Depot. The pit was approximately 16 feet deep, 250 feet long, and 30 feet wide (Figure 1.2-1). Phthalates, PAHs, pesticides, petroleum hydrocarbons, dioxin/furans, and metals were released to the soil from disposal activities associated with SWMU 8.

4.7.1 Remedy Selection

The RAOs established in the 1998 OU 1 ROD include the following:

- Prevent future construction workers from being exposed to the following COCs in the soil that would cause an excess cancer risk greater than $1x10^{-6}$ or a hazard index greater than 1.0:
    - Pesticides (total DDX and dieldrin)
- Prevent migration of the following COCs in the soil that could cause groundwater contamination:
    - SVOCs (diethylphthalate, bis[2-ethylhexyllphthalate, 2,4-dinitrotoluene, and naphthalene);
    - Pesticides and herbicides (chlordane, 2,4-D, DDT, DDD, dieldrin, lindane, linuron, MCPA, and simazine); and
    - Petroleum hydrocarbons (diesel, motor oil, and gasoline).

The selected remedy is excavation of approximately 8,000 cubic yards (10,400 tons) of contaminated soil and debris from the burn pit followed by installation of one groundwater monitoring and two groundwater extraction wells. The remedy included excavation to the approximate depth of the groundwater table. The 1998 OU 1 ROD estimated that 3,400 tons of contaminated soil would require disposal at a Class I disposal facility and 2,400 tons of debris (concrete, wood, etc.) would be disposed of at a Class III facility. Clean soil imported from off site was used to backfill the excavated areas. The 1998 OU 1 ROD also required the installation of one new monitoring well (LM168AU) and continued monitoring of existing wells (LM019A, LM097AU, and LM119A). The 2013 MTF removed groundwater extraction from the remedy.

4.7.2 Remedy Implementation

Mobilization for remedial activities at SWMU 8 occurred on 23 September 2002 with excavation commencing on 8 October 2002. Based on the design data collection effort performed at SWMU 8, the

area of the excavation was extended approximately 20 feet to the southeast because chlordane and dieldrin were detected outside of the 1998 OU 1 ROD specified excavation boundary. The excavation and initial over-excavation were completed between 8 October 2002 and 14 November 2002, respectively. The depth along the center of the excavation was approximately 20 feet bgs, which was below the seasonal high level for groundwater at this site.

Initial confirmation sample results from the sidewalls and bases (benches and bottom) of the excavation indicated that additional excavation was necessary to remove soil with contaminants exceeding the cleanup standards. Fourteen step-out excavations were performed, and confirmation soil samples were collected following the completion of each step-out. Additional excavation was not performed at sample locations with contamination exceeding cleanup standards at depths below the groundwater table, in accordance with the 1998 OU 1 ROD.

On 21 November 2002, excavation and confirmation sampling activities were completed. On 18 December 2002, backfilling of the excavation and waste disposal activities were. Over 17,000 cubic yards of material were excavated, transported, and disposed off site (URS, 2004a).

In November 1997, installation of the 1998 OU 1 ROD-specified new monitoring well (LM168AU) was completed. A second monitoring well (LM178AU) was installed in February 2003. LM097AU, which was decommissioned because of its location within the excavation area, was replaced with LM097AUA in February 2003.

4.7.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established site-specific requirements for selected wells and contaminants to determine the effectiveness of the selected remedy on water quality. 1998 OU 1 ROD monitoring requirements were met at wells LM097AUA in 2007, LM119A in 2011, LM168AU in 2010, and LM178AU in 2008. LM097AUA was decommissioned in March 2013 and LM168AU and LM178AU were decommissioned in February 2013.

4.8 OU 1: SWMU 20

SWMU 20 is located in the central portion of the Depot (Figure 1.2-1). SWMU 20 included a floor drain at Building 26, an aboveground solvent tank in Building 10, a 4-foot by 5-foot sump outside of the NWC of Building 10, and a 2-foot by 3-foot sump outside of the northeastern corner of Building 10. A spray paint booth and cleaning operations were reportedly connected to Manhole W-1 of the IWPL (SWMU 33). SWMU 20 also included a contaminated soil area just east of Building 10. VOCs and SVOCs were detected in sludge collected from the two sumps and the floor drain. Contamination also was found in soil samples collected beneath these features. Underground storage tank (UST) Site 13 is close to SWMU 20 and reportedly contained a 2,000-gallon No. 2 fuel oil tank, which was removed in 1987.

4.8.1 Remedy Selection

The 1998 OU 1 ROD established the following RAO for SWMU 20 where multiple COCs pose threats to groundwater or risks to human or ecological receptors:

- Prevent the migration of the following COCs in the soil that could cause groundwater contamination that exceeds appropriate regulatory standards and health-based concentrations:
    - VOCs (TCE, ethylbenzene, and xylenes);

- SVOCs (diethylphthalate, 2,4-dinitrophenol, pentachlorophenol [PCP], and 2,4,6-trichlorophenol);
- Pesticides and herbicides (dieldrin, methiocarb, 2-methyl-4-chlorophenoxyacetic acid [MCPA], and linuron); and
- Petroleum hydrocarbons (diesel).

The 1998 OU 1 ROD selected SVE as the remedy for SWMU 20 and included, excavation, off-site disposal, and compliance monitoring to address vadose zone impacts. The 1998 OU 1 ROD identified the following to demonstrate achievement of vadose zone remediation:

1. The concentrations of PCE and TCE present in soil gas are equal to or less than the soil gas cleanup standard.
2. It is demonstrated that the remaining PCE and TCE can no longer cause leachate concentrations to exceed the ACLs.
3. TCE and PCE have been removed to the extent technically and economically feasible. This evaluation will include, at a minimum, the following factors:
    a. The total cost and duration of continued operation of the SVE system until ACLs are met.
    b. The total cost and duration of continued groundwater treatment to meet ACLs without continued SVE operation.
    c. The incremental cost (cost benefit) of continued operation of the SVE system on the basis of a cost per pound of contaminant removal if the underlying groundwater has not attained ACLs.

The 2004 ESD modified the remedy with the deletion of SVE and addition of LUCs. The remedy was modified as total petroleum hydrocarbon (TPH) contamination was encountered beneath Building 10, which would have reduced the effectiveness of the SVE remedy preventing achievement of the RAOs.

In 2010, Building 10 was demolished thereby allowing for the reevaluation of remedial alternatives. The *DDJC-Tracy Solid Waste Management Unit 20 Feasibility Study* (URS, 2009c) identified pneumatic fracturing and SVE as the preferred remedial alternative and the 2011 ESD formally selected SVE and pneumatic fracturing as the remedy.

In addition to reinstating the SVE remedy at SWMU 20, the 2011 ESD made the following modifications to the vadose zone cleanup criteria for SVE sites:

1. The most recent concentrations of TCE and PCE present in soil gas are equal to or less than the cleanup standard. If the cleanup standard is met then no additional evaluations will be necessary.

    or

2. When cumulative mass removed by the SVE system has reached asymptotic levels after performing the SVE system operation optimization, with rebound concentrations remaining above the cleanup standards; and

3. It is demonstrated that the remaining TCE and PCE can no longer cause leachate concentrations to exceed the ACL.

4.8.2 Remedy Implementation

In 1997 and 1999, excavations and grouting at SWMUs 20 and 33 were performed (Environmental Chemical Corporation [ECC], 1999; Shaw, 2004). Two phases of excavation occurred at SWMU 20. During the first excavation, approximately 27 cubic yards of soil were removed (ECC, 1999). During the second phase of excavation, an additional 305 cubic yards of soil were excavated, resulting in a total excavation of approximately 332 cubic yards, over 30 times the 10-cubic-yard excavation estimate in the 1998 OU 1 ROD. The 1998 OU 1 ROD intended that an SVE system would be installed after excavation to address remaining TCE soil contamination at SWMU 20. However, the greater extent of the 1997/1999 excavations and residual TPH and VOC impacts (some of which remained beneath Building 10) led to a decision to replace the SVE remedy with LUCs. The 2004 ESD formally deleted the SVE remedy and instituted LUCs as the vadose zone remedy at SWMU 20.

In December 2007, the USACE conducted an investigation beneath Building 10 and along portions of the former IWPL. Eight soil borings were completed inside Building 10, and samples were collected at depths of 4 to 5 feet below the surface of the warehouse floor. Two soil samples were collected adjacent to the former IWPL on the west side of the building. Five soil samples collected near the former solvent tank and floor drains contained TCE concentrations ranging from 28 to 260 milligrams per kilogram (mg/kg). Pesticides and motor oil were also detected in one soil sample collected near the floor grate (USACE, 2008).

In 2008, three field investigations were conducted at SWMU 20 to determine COC concentrations in the soil, soil gas, and groundwater beneath the northeastern portion of Building 10 and surrounding areas to the north and east. The results from this investigation indicate the presence of TCE in soil and soil gas above cleanup standards presented in the ROD.

The concentrations of TCE that remained in soil and soil gas at SWMU 20 and the demolition of Building 10 prompted a second evaluation of risks associated with VOCs in the soil, which led to an evaluation of remedial alternatives for the site. Seven remedial alternatives were evaluated and recommendations were presented in the *DDJC-Tracy Solid Waste Management Unit 20 Feasibility Study* (URS, 2009c). The 2009 FS recommended SVE enhanced with pneumatic fracturing as the preferred remedial action for TCE in SWMU 20 subsurface soil. The 2011 ESD modified the 1998 OU 1 ROD and the 2004 ESD by incorporating SVE enhanced with pneumatic fracturing to address VOCs in the vadose zone.

In October 2011, installation of the SVE system was completed and began operation. The remedy consists of nine SVE wells and five multi-completion vapor monitoring wells. The soil vapor is treated by GAC prior to discharge to the atmosphere.

In August 2012, 1998 OU 1 ROD specified cleanup goals for protection of groundwater were met, however, SVE operations continued through November 2013 with the intention of meeting the industrial soil gas screening levels for vapor intrusion protectiveness (55.8 ppbv for TCE and 693 ppbv for PCE). From October 2011 until November 2013 the SVE system operated at SWMU 20 and removed approximately 2.8 pounds of VOCs.

In February 2014, the most recent sampling event, no PCE concentrations exceeded the industrial soil gas screening level for vapor intrusion protectiveness. Three vapor extractions (VEs) and two vapor monitoring points (VMPs) have TCE concentrations that exceeded the industrial soil gas screening level for vapor intrusion protectiveness.

4.8.3 Groundwater Monitoring

SWMU 20 TCE groundwater plume was initially defined by direct push investigations followed by the installation and monitoring of LM193AU. Concentrations at the former LM193AU ranged from 63 to 104 µg/L. Review of LM193AU construction details suggested that this well's filter pack and screen intervals passed through areas of TCE contamination in the vadose zone ranging up to 13,000 ppbv. The potential exists that the dense TCE vapors entered the filter pack and well screen of LM193AU and partitioned into groundwater, thereby contaminating the groundwater samples collected at this former monitoring location. The replacement well, LM196AU is screened at the water table and is seasonally subject to TCE soil gas contamination from the vadose zone; however, LM196AU has a shorter length of well screen exposed in the vadose zone for only part of the year as compared to the former monitoring well LM193AU. The TCE concentration variability in groundwater at these locations can be explained by the well construction. During the 2014 reporting period, LM196AU had a TCE concentration of 0.44 µg/L and LM197B was non-detect for TCE. The reduction of TCE concentrations in groundwater is attributed to the reduction of TCE in soil gas concentrations associated with SVE system operation.

Wells LM085B, LM115AU, and LM175A are 1998 OU 1 ROD monitoring wells installed at SWMU 20 to evaluate the effectiveness of the SVE remedy. The remedy for groundwater protection was complete in 2012. As part of this Third Five-Year Review, groundwater analytical results from 2010 through 2014 were reviewed to evaluate the likelihood of residual contamination impacting groundwater at SWMU 20. Well locations are shown on Figure 4.8-1.

LM085B

The 1998 OU 1 ROD monitoring requirements have not been met. VOCs and TPH in the diesel range (TPHD) have never exceeded their respective groundwater concentrations requiring evaluation, and SVOCs, organochlorine (OC) and chlorinated pesticides, and herbicides have never been detected. The 1998 OU 1 ROD requires sampling for VOCs for three years post remedial action. This well will continue to be monitored until 1998 OU 1 ROD requirements have been met.

LM115AU

The 1998 OU 1 ROD monitoring requirements have not been met. The 1998 OU 1 ROD ACLs were met for TCE in 1Q01 and PCE in 3Q11. Other VOCs have never been detected. The 1998 OU 1 ROD requires sampling for VOCs for three years post remedial action. This well will continue to be monitored until requirements have been met.

LM175A

The 1998 OU 1 ROD monitoring requirements have not been met for VOCs and OC pesticides. The 1998 OU 1 ROD ACL was met for TCE in 3Q03. PCE was never detected above the ACL, but exceeded the concentration requiring evaluation in 2Q08. No other VOCs were ever detected above their respective groundwater concentrations requiring evaluation. The requirements were met for dieldrin in 3Q02. The ROD requires sampling for VOCs and OC pesticides for three years post remedial action. This well will continue to be monitored until ROD requirements have been met.

4.8.4 Soil Vapor Monitoring

General Purpose Warehouse (GPW) 59

In September 2013, prior to construction of GPW 59, soil vapor samples were collected from soil borings advanced adjacent to SWMU 20 and beneath the proposed GPW 59 footprint. The samples were analyzed for TCE and PCE and used to determine whether a vapor intrusion risk may be present for future occupants of GPW 59. The results of this vapor intrusion screening level assessment indicate that PCE and TCE in soil gas are less than the industrial soil gas RSLs; therefore, PCE and TCE do not present an unacceptable risk to future industrial occupants of GPW 59 from vapor intrusion (HDR, 2013e).

4.8.5 Land Use Controls

LUCs were established for TCE, TPHD, PAHs, PCBs, and aluminum at SWMU 20 in the 2004 ESD with the following purposes:

- Prohibit residential, day care, play area, or school use; and
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone.

The 2011 ESD modified the remedy to include that future buildings are to be constructed with vapor barrier to mitigate intrusion of COCs from vadose zone soil to indoor air. The 2004 ESD, as modified by the 2011 ESD, imposed the following LUCs:

- Clearly posted signage detailing LUC and notification procedures for construction activities or land use changes;
- Maintain administrative controls (i.e. new provisions stated in the IMP and changes to the notification procedures);
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in existing asphalt pavement/building foundation cover or notification procedure;
- Follow defined procedures in the event of a change in land use. Site specific procedures will be determined by the Environmental Office, DLA Installation Support at San Joaquin. The procedures include, but are not limited to: PPE of the industrial/construction worker, disposition or contaminated soils encountered during subsurface construction activities, and restoration of the LUC and/or surface condition following construction activities; and
- Future buildings to be constructed with engineered controls specifically designed to prevent the migration of soil gas to indoor air.

The LUCs for SWMU 20 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this five-year review period, no deficiencies were noted at SWMU 20. The inspection findings are presented in Table 4.2-1 and the LUC boundary is depicted on Figure 4.8-1.

4.8.6 Operation and Maintenance

The SVE remedy was operated in accordance with the *SWMU 20 Soil Vapor Extraction System Operations and Maintenance Manual* (HDR, 2012e). Routine maintenance activities include weekly visits to record the following data:

- Record system flow, temperature, VOC concentration via photoionization detector at the system influent, effluent, and each SVE well,
- General control panel instrument readings,
- Approximate condensate volume in holding tank,
- Position of air dilution and recirculation valves, and
- Alarms recorded and system operational status.

Scheduled and unscheduled SVE system shutdowns are reported in quarterly and annual groundwater monitoring reports, which are provided to regulatory agencies. Scheduled SVE system shutdowns were generally performed to conduct routine maintenance and after attaining 1998 OU 1 ROD cleanup goals to evaluate soil vapor rebound concentrations. Unscheduled shutdowns were generally infrequent and were not responsible for extended periods of SVE system nonoperation.

Between October 2011 and February 2014, approximately 2.8 pounds of TCE mass has been removed by the SVE system. In August 2012, the 1998 OU 1 ROD cleanup goal for protection of groundwater (350 ppbv for TCE and 780 ppbv for PCE) was met, However, SVE operations continued with the intention of meeting the industrial soil gas screening levels for vapor intrusion protectiveness (55.8 ppbv for TCE and 693 ppbv for PCE). In February 2014, the most recent sampling event, no PCE concentrations exceeded the industrial soil gas screening level for vapor intrusion protectiveness. The system is currently off to allow further rebounding of soil gas concentrations prior to collecting future soil gas samples.

4.9 OU 1: SWMU 24

SWMU 24 is the site of a former 500-gallon UST (UST 31) that was used to store petroleum wastes from materials testing in Building 247 from 1961 to 1988. SWMU 24 is located in the central portion of the Depot (Figure 1.2-1). In 1988, the UST was removed and visibly contaminated soil from the excavation was disposed of off site. Xylenes, 2-butanone (MEK), 4-methyl-2-pentanone, petroleum hydrocarbons, and other organic compounds were detected in soils in the vicinity of the tank excavation.

4.9.1 Remedy Selection

The selected remedy in the 1998 OU 1 ROD for SWMU 24 is bioventing and compliance monitoring of wells LM116A and LM118AU to evaluate the effectiveness of the remedy on water quality. The RAOs selected in the 1998 OU 1 ROD included the following:

- Prevent future Depot workers from being exposed to toluene in the soil that would cause a hazard index greater than 1.0.
- Prevent the migration of the following COCs in the soil that could cause groundwater contamination that exceeds appropriate regulatory standards and health based concentrations.
    - VOCs (acetone, MEK, ethylbenzene, 2-hexanone, 4-methyl-2-pentanone, toluene, and xylenes),
    - SVOCs (2,4-dimethylphenol, fluoranthene, 2-methylnaphthalene, 4-methylphenol, naphthalene, phenenthrene, phenol, and pyrene); PCBs (Aroclor 1260)

- Pesticides (carbofuran, lindane, phorate, and ronnel); and
- Petroleum hydrocarbons (diesel and gasoline).

The 2001 ESD modified the LUC to clarify the need for a site characterization and environmental assessment in the event of a land use change from industrial to residential. The 2004 ESD added LUCs to address the potential risk under the residential use scenario in the event of a land use change.

4.9.2 Remedy Implementation

The bioventing system at SWMU 24, located on the southern side of Building 247, was installed and started in December 2000.

In October 2003, monitoring data indicated that bioventing had reduced TPH contamination at SWMU 24, so the system was taken off line. Closure/confirmation sampling was performed in December 2003, and sample results at only one of the four soil boring locations were below the 1998 OU 1 ROD cleanup standards. The highest TPH concentrations were on the southern side of Building 247 (URS, 2004b).

During the presentation of the closure sampling results at the February 2004 RPM meeting, the DTSC requested that indoor air monitoring be conducted in Building 247. The air sampling was conducted in June 2004 after approval of a sampling work plan. The sampling results indicated that indoor air quality was generally consistent with the activities conducted within the building, and that contaminants present were well below permissible exposure limits (PELs) for worker exposure (URS, 2012).

The CVRWQCB requested that SVE be attempted to address the residual TPH contamination on the southern side of Building 247. An SVE pilot test was conducted in January 2005. Based on the results from the pilot study, it was concluded that the use of SVE to remediate the remaining TPH in the gasoline range (TPHG) and VOC mass in the vicinity of Building 247 was not expected to be effective, and that other remedial technologies were not expected to be implementable due to low SVE extraction rates and the majority of the contamination being present under the concrete slab floor of Building 247 (URS, 2005b).

4.9.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established monitoring requirements for wells LM116A and LM118AU to determine the effectiveness of the selected remedy on water quality. As part of this Third Five-Year Review, groundwater analytical results from 2010 through 2014 were reviewed to evaluate the likelihood of residual contamination impacting groundwater at SWMU 24.

Well LM116A never yielded COCs, specified in the 1998 OU 1 ROD, at concentrations requiring evaluation; therefore, this well met the 1998 OU 1 ROD monitoring requirements and was decommissioned in February 2013. Well LM118AU met the 1998 OU 1 ROD monitoring requirements in 2004 and this well was decommissioned in February 2013. Well locations are shown on Figure 4.9-1.

4.9.4 Land Use Controls

LUCs were established in the 2004 ESD for toluene, acetone, PAHs, TPHG, TPHD, PCBs, aluminum, and manganese with the following purpose:

- Prohibit residential, day care, play area, or school use.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for SWMU 24 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at SWMU 24. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.9-1.

4.10 OU 1: SWMU 27

SWMU 27 is located in the northwestern portion of the Depot (Figure 1.2-1). Herbicides, SVOCs, PCBs, petroleum hydrocarbons, and metals were released to soils because of activities associated with SWMU 27. The distribution of these constituents was confined primarily to the area within Building 206, mainly around the former service pit, the former waste oil sump, and the former floor drain in Building 206. In April 1995, Building 206, which is part of SWMU 27 was demolished. The locomotive pit, service pit, and sump were filled with concrete. Currently, the site is covered by asphalt and Building 201.

4.10.1 Remedy Selection

The RAOs established by the 1998 OU 1 ROD are:

- Prevent future Depot workers from being exposed to the following COCs in the soil that would cause an excess cancer risk greater than 1×10^{-6};
    - PAHs (benzo[a]pyrene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, and indeno[1,2,3-cd]pyrene)
    - PCBs (Arochlor 1260)
- Prevent the migration of the following COCs in the soil that could cause groundwater contamination that exceeds appropriate regulatory standards and health-based concentrations:
    - VOCs (TCE)
    - Herbicides (2,4-D, MCPA, and 2,4,5-T)
    - Total petroleum hydrocarbons in the motor oil range (TPHMO)

The selected remedy in the 1998 OU 1 ROD requires excavation of the former waste oil sump; excavating soil contaminated with PAHs, PCBs, petroleum hydrocarbons, and herbicides (2,4-D, MCPA, and 2,4,5-T) from beneath the railroad tracks; and excavating soil contaminated with MCPA (a herbicide) at the area of a suspected herbicide spill. The 1998 OU 1 ROD estimated approximately 130 cubic yards (170 tons) of soil and concrete would be excavated and sent to an off Depot disposal facility. The 1998 OU 1

ROD also requires groundwater sampling for analysis of VOCs, SVOCs, and herbicides as part of the WMP to evaluate the effectiveness of the selected remedy.

4.10.2 Remedy Implementation

Between 21 June 1999 and 1 September 1999, remediation activities were performed. Approximately 601 tons of TPHD contaminated soil were excavated from SWMU 27 and disposed of at Allied Waste Company's Forward Landfill in Manteca, California (Shaw, 2003). Soil was excavated within the limits of the excavation footprint at the floor drain and locomotive pit locations to a depth of 5 feet bgs. The waste oil sump was excavated to a depth of approximately 19 feet bgs. Based on analytical results from confirmation samples, additional excavation was performed at the northern sidewall of the railroad track excavation and the western sidewall of the waste oil sump excavation. An exposed oil standpipe sump was discovered during the excavation. This sump was removed along with its associated piping. In addition to the soil transported to Forward Landfill, approximately 27 tons of petroleum contaminated debris was transported to Kettleman Hills Landfill for disposal, and 40 gallons of waste oil from the oil standpipe sump were transported to Evergreen Oil in Newark, California, for recycling.

Soil containing TPH above the 1998 OU 1 ROD-specified cleanup standard remained at one location. TPHMO was reported at 18,000 µg/kg, and the cleanup standard is 10,000 µg/kg. It was determined that this contamination was part of the groundwater petroleum plume associated with UST Site 7d, rather than SWMU 27.

4.10.3 Groundwater Monitoring Program

The 1998 OU 1 ROD established monitoring requirements for well LM117A to determine the effectiveness of the selected remedy on water quality. Well LM117A met the 1998 OU 1 ROD monitoring requirements for TCE, 2,4-D, MCPA, and 2,4,5-T in 2003. LM117A met the 1998 OU 1 ROD monitoring requirements for TPHMO in 2014; therefore; this well will no longer be sampled.

4.11 OU 1: SWMU 33

In 1972, an existing pipeline and a storm drain line were interconnected to form the industrial wastewater pipeline, which has been designated as SWMU 33 (Figure 1.2-1). The industrial wastewater pipeline is constructed of 4-inch to 7-inch diameter pipe of varying composition (transite, vitrified clay, polyvinyl chloride) and is buried to a depth of approximately 2 to 4 feet below grade. Eight manholes were located along the pipeline. The pipeline consists of two major segments referred to as the south IWPL and the east IWPL. The total length of the south IWPL and its branches is approximately 1,200 lineal feet; the total length of the east IWPL and its branches is also approximately 1,200 lineal feet. The IWPL is no longer in use. A portion of the industrial wastewater pipeline is located under Building 10 (SWMU 20) and serviced a TCE tank located inside Building 10. The TCE tank was identified as the source for the TCE in soil, soil vapor, and groundwater at SWMU 20. The tank was removed prior to April 1992 and is no longer an active source. The portion of the IWPL servicing the tank has been grouted and is no longer considered an active source (URS, 2012).

4.11.1 Remedy Selection

The RAOs established by the 1998 OU 1 ROD are:

- Prevent the migration of the following COCs in the soil that could cause groundwater contamination to exceed appropriate regulatory standards and health-based concentrations:

- Aldrin
- Dieldrin
- Diethylphthalate
- Di-n-butylphthalate

The remedy selected in the 1998 OU 1 ROD includes excavation of manhole(s) at Building 10, grouting of the piping connections to the industrial wastewater pipeline, and LUCs. Most of the industrial wastewater pipeline piping was left in place following grouting. Most of the industrial wastewater pipeline piping was left in place following grouting. LUC requirements were modified in the 2001 and 2004 ESDs.

4.11.2 Remedy Implementation

On 13 October 1997, remedial efforts (performed as a removal action) began on the industrial wastewater pipeline began and were completed on 19 December 1997. Remedial activities are documented in the *DDJC-Tracy Remedial Action Report for Solid Waste Management Units 2, 3, and 33* (URS, 2002a).

Implementation included the excavation of contaminated soil in the vicinity of RI soil borings SB464 and SB462. Following excavation of the contaminated soil, the pipe ends were plugged with an expandable plug and grouted.

Manhole W-3 was cleaned and demolished. Industrial wastewater pipeline sections of a vitrified clay pipe were cut and removed; personnel from Triad Environmental cut and removed sections of an asbestos pipe. Confirmation samples were collected from each side wall and the floor of the excavated area. The analytical results from the samples taken from Manhole W-3 were found to have concentrations of COCs below the cleanup standards.

Seven manholes along the industrial wastewater pipeline were cleaned and decommissioned. After cleaning, it was found that the floor of Manhole W-5 had deteriorated, exposing the soil below. This manhole was excavated completely, and an additional 4 feet of soil was excavated based on confirmation sampling results. Pipes entering these manholes were plugged using expandable plugs. For Manhole W-5, the buried lines leading to this excavated manhole were plugged and grouted. Finally, concrete was poured into each manhole that was not removed to complete the decommissioning. On 25 November 1997, work at manholes, except Manhole W-5, was completed. On 11 December 1997, manhole W-5 was backfilled, and the work was completed.

The remedial design required cutting, plugging, and grouting nine lateral junctions in the industrial wastewater pipeline. Triad Environmental cut and removed the four laterals made of asbestos pipe. Three vitrified clay laterals were then cut and removed. Remaining buried pipes were plugged, grouted, and filled. After excavating Manholes E-1 and E-2, Laterals 255-A, 255-B, and 255-C were to be plugged, grouted, and filled. However, Laterals 255-A and 255-B could not be located. Finally, asphalt was placed on top of backfilled areas. On 19 December 1997, the work on the laterals was completed. Five floor drains linked to the industrial wastewater pipeline were grouted. Remaining wastewater was first removed by pumping into a portable tank. Once the wastewater had been removed from the floor drains, the drains were grouted. On 24 November 1997, the work on the floor drains was completed.

Wastes were disposed of at one of the following designated disposal facilities, based on waste type

- CWM, Kettleman Hills facility at 35251 Old Skyline Road in Kettleman City, California. Hazardous waste, debris, and asbestos materials are accepted for landfill disposal by CWM.

- Forward Landfill, Inc., 9999 South Austin Road in Manteca, California. Forward Landfill, Inc., accepts nonhazardous waste soil and debris for landfill disposal.

Approximately 105 tons of contaminated soil and asbestos debris were disposed of at the Kettleman Hills facility. Approximately 45 tons of asphalt debris was disposed of at Forward Landfill, Inc.

4.11.3 Groundwater Monitoring Program

The 1998 OU 1 ROD required groundwater monitoring at wells LM002A and LM129A and analysis for VOCs, SVOCs, pesticides, and herbicides as part of the WMP. Wells LM002A and LM129A met the 1998 OU 1 ROD monitoring requirements in 2004; therefore, these wells were no longer sampled; however, depth to groundwater measurements are still recorded in these wells during semiannual monitoring events. Well locations are shown on Figure 4.11-1

4.11.4 Land Use Controls

LUCs were established in the 2001 ESD, and modified in the 2004 ESD, for xylenes, diethylphthalate, di-n-butylphthalate, naphthalene, aldrin, carbaryl, dieldrin, methiocarb, and TPHD with the following purpose:

- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from vadose zone.

The 2004 ESD identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;

- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;

- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure;

- Follow defined procedures in the event of a change in land use;

- Install warning signs; and

- Ensure controls are restored following construction activities.

The LUCs for SWMU 33 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, during the August 2014 inspection, it was found that SWMU 33 was missing a LUC sign. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.11-1.

4.12 OU 1: Building 30 Drum Storage Area

Building 30 Drum Storage Area is in the southern portion of the Depot, near the Consolidated Subsistence Facility (Figure 1.2-1). The original area of the site was much larger, but it is now partially covered by the Consolidated Subsistence Facility, constructed in 1992. During construction of the facility, buried drums were discovered in the vicinity of Building 30 Drum Storage Area. The site now encompasses a relatively small area between a forklift ramp and the central office on the northern side of the Consolidated Subsistence Facility.

4.12.1 Remedy Selection

The RAO established by the 1998 OU 1 ROD is:

- Prevent the migration of benzyl alcohol, bis(2-ethylhexyl)phthalate, diethylphthalate, and di-butylphthalate in soil that could cause groundwater contamination that exceeds appropriate regulatory standards and health-based concentrations.

The remedy selected in the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs is the establishment of LUCs and groundwater monitoring. DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in the appendix to the RPMP.

4.12.2 Remedy Implementation

The 1998 OU 1 ROD established sampling requirements for well LM169A to determine the effectiveness of the selected remedy on water quality. Well LM169A never yielded COCs, specified in the 1998 OU 1 ROD, at concentrations requiring evaluation; therefore this well met the 1998 OU 1 ROD monitoring requirements and is no longer sampled; however, depth to groundwater measurements are still recorded in this well during semiannual monitoring events.

4.12.3 Land Use Controls

LUCs were established in the 2001 ESD and modified by the 2004 ESD for benzyl alcohol, bis(2-ethylhexyl)phthalate, diethylphthalate, di-n-butylphthalate for the following purpose:

- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone.

The 2001 and 2004 ESDs identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs; and

- Ensure controls are restored following construction activities.

The LUCs for the Building 30 Drum Storage Area are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at the Building 30 Drum Storage Area. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.12-1.

4.13 OU 1: Site 72

During 1998 and 1999, a storm drain and catch basin were installed in the Site 72 area. The area is predominantly covered with pavement, and is located westward of the sewage lagoons (SWMU 2/3) and eastward of the stormwater detention basin (SWMU 4), as shown on Figure 1.2-1. Results from the chemical analysis of soil excavated during the installation activities prompted the identification of this area as a new (with respect to the ROD), potentially contaminated area. Historically, residue from pesticide application trucks was discharged into the industrial waste lagoons (SWMU 3). The source of contaminants at Site 72 is uncertain, but it is possible that some of the wash water used at SWMU 3 spilled onto the soil surrounding the lagoons.

4.13.1 Remedy Selection

The RAO established in the 1998 OU 1 ROD Amendment and as modified by the 2004 ESD is:

- Prohibit residential, day care, play area, or school use.

The 1998 OU 1 ROD Amendment identified institutional controls in the form of LUCs as the selected remedy to prevent unacceptable risks to human health and the environment associated with contamination remaining at the site.

4.13.2 Remedy Implementation

The following LUCs were established in the 2004 ESD for DDX and dieldrin with the following purpose:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for Site 72 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at Site 72. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.13-1.

4.14 OU 1: Northern Depot Soils Area

The Northern Depot Soils Area is north of the storm drain and sewage lagoons (Figure 1.2-1). The site was reportedly used as a storage area for the National Stockpile of Strategic Metals. For a period from shortly after World War II until the 1980s, ferrous chromium ore was stored at this site. Manganese was also stored at the site from shortly after World War II until the 1970s. From 1980 to 1986, lead ballast was stored at the Northern Depot Soils Area.

4.14.1 Remedy Selection

The RAOs established by the 1998 OU 1 ROD are:

- Prohibit residential, day care, play area, or school use.
- Prevent future Depot workers from being exposed to arsenic and manganese in the surface and near-surface soils that would cause a hazard index greater than 1.0.

The remedy selected in the 1998 OU 1 ROD consists of installing an asphalt cover over the soils with concentrations of arsenic and manganese that pose potential health risks. The total area requiring the cover was estimated in the 1998 OU 1 ROD to be 138,000 square feet. The cover was intended to provide a barrier to prevent grader operators or construction workers from coming into contact with surface soils potentially containing elevated levels of arsenic and manganese. The 1998 OU 1 ROD requires the cover to be inspected annually to ensure the asphalt remains intact.

The 2001 ESD also modified the remedy to an aggregate cover, rather than asphalt, as was specified in the 1998 OU 1 ROD and added LUCs, including the addition of warning signs.

4.14.2 Remedy Implementation

Between 8 April 2002 and 31 July 2002, construction activities were conducted to install the aggregate cover in the southeastern portion of the Northern Depot Soils Area (Shaw, 2004). The area of the aggregate cover measures 65,700 square feet.

Gravel previously installed over 16,400 square feet to the north of the existing aggregate cover is consistent with the remedy identified in the 2001 ESD. Pre-existing asphalt covers an additional 5,200 square feet to the north of the AB cover. In addition, the GWTP1 facility covers an area of 2,000 square feet of the Northern Depot Soils Area, preventing exposure to contaminated shallow surface and near-surface soils. The remaining 11,900 square feet is covered by soil supporting a dense growth of grass. Analyses of three design data collection effort samples collected within the grass area and one sample collected immediately north of the grass area indicated arsenic and manganese concentrations were less than the cleanup standards of 48 mg/kg and 812 mg/kg for arsenic and manganese, respectively (URS, 2001a). These findings were documented in the final project closeout plan (remedial action report) for the Northern Depot Soils Area (Shaw, 2004).

In January 2013, gravel was placed over an area of approximately 8,700 square feet, adequately covering areas identified during annual LUC inspections as having deficiencies.

4.14.3 Land Use Controls

LUCs established in the 2001 ESD and modified by the 2004 ESD for arsenic and manganese with the following purpose:

- Prohibit residential, day care, play area, or school use; and
- Prevent unprotected exposure of construction workers to contaminated soil.

The 2001 and 2004 ESDs identified the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs; and
- Ensure controls are restored following construction activities.

The LUCs for the Northern Depot Soils Area are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During the 2014 annual inspection, it was noted that inadequate cover was observed on the eastern portion of the Northern Depot Soils Area. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.14-1.

4.15 OU 1: Eastern Depot Soils Area

The Eastern Depot Soils Area consists of non-vegetated areas on the eastern side of the Depot historically used for grader-training exercises (Figure 1.2-1). These areas were sampled during the RI, and the BRA concluded that the health risk in the Eastern Depot Soils Area was acceptable under the current industrial land use scenario but not under the potential future residential land use scenario (Montgomery Watson, 1996).

4.15.1 Remedy Selection

The RAO established by the 2001 ESD is:

- Prohibit residential, day care, play area, or school use.

The 1998 OU 1 ROD does not address LUCs for the Eastern Depot Soils Area; however, LUCs were established as the remedy for this site in the 2001 ESD to address potential health risks in the event of a land use change. The LUCs were modified in the 2004 ESD. DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in the appendix to the RPMP.

4.15.2 Remedy Implementation

The following LUCs were established in the 2001 ESD as modified by the 2004 ESD for aluminum, arsenic, chlordane, dieldrin, DDX, and PCBs with the following purpose:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for the Eastern Depot Soils Area are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at Eastern Depot Soils Area. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.15-1.

4.16 OU 1: Southern Depot Soils Area

The Southern Depot Soils Area consists of non-vegetated areas at the southern end of the Depot historically used for grader training exercises (Figure 1.2-1). The Depot's truck gate and transport control facility, constructed on a portion of this site, is planned for completion in 2010. These areas were sampled during the RI, and the BRA concluded that the health risk in the Southern Depot Soils Area was acceptable under the current industrial land use scenario but not under the potential future residential land use scenario (Montgomery Watson, 1996).

4.16.1 Remedy Selection

The RAO established by the 2001 ESD is:

- Prohibit residential, day care, play area, or school use.

The 1998 OU 1 ROD does not address LUCs for the Eastern Depot Soils Area; however, LUCs were established as the remedy for this site in the 2001 ESD to address potential health risks in the event of a land use change. The LUCs were modified in the 2004 ESD. DLA is responsible for implementing, monitoring, maintaining, and enforcing LUCs in accordance with the procedures and requirements documented in the appendix to the RPMP.

4.16.2 Remedy Implementation

The following LUCs were established in the 2001 ESD as modified by the 2004 ESD dieldrin with the following purpose:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure; and
- Follow defined procedures in the event of a change in land use.

The LUCs for the Southern Depot Soils Area are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at Southern Depot Soils Area. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.16-1.

4.17 OU 1: Area 1 Building 237

Area 1 is located in the north-central portion of Depot (Figure 1.2-1). Site features include Building 237, located in the central portion of Area 1, the underground IWPL (known as SWMU 33), located west of Building 237, an arcuate-shaped abandoned rail spur located to the north and east, and a relatively large open paved area located south of Building 237. Building 237 consists of a metal frame structure on a concrete slab floor and foundation with a footprint of approximately 45 feet wide and 150 feet long. The remaining surface of Area 1 is either covered with asphalt around Building 237 or covered with gravel around the abandoned railroad spur located north of Building 237.

In 1972, the IWPL was constructed by interconnecting existing pipelines and storm drain lines. The IWPL connected Building 238 to the northeast of Area 1, former Warehouse 10, Buildings 221 and 228 located southwest of Area 1, and Building 236. The IWPL discharged into the industrial waste ponds located just north of Area 1. In 1991, as part of the SWMU 33 investigation, soil samples were collected at various locations along the IWPL. The results of the IWPL investigation indicated that pesticides were detected at several locations.

4.17.1 Remedy Selection

The 1998 OU 1 ROD established the RAO of preventing the migration of PCE from soil to groundwater, selected SVE as the remedy, and established soil gas cleanup standards that represent calculated concentrations of TCE in soil gas that, when in equilibrium with groundwater, will not result in groundwater concentrations above their respective ACLs; the concentrations are assumed protective of groundwater quality.

4.17.2 Remedy Implementation

In the fall of 1998, soil vapor samples were collected from 35 CPT locations at three depths between 5 and 15 feet bgs. Laboratory analysis indicated that 15 locations yielded TCE or PCE at concentrations greater than 1998 OU 1 ROD cleanup standards. TCE concentrations ranged from below detection limits to 15,000 parts per billion by volume (ppbv) and PCE concentrations ranged from below detection limits to 10,000 ppbv (URS, 2003b). The estimated initial mass of TCE and PCE at Area 1 Building 237 was 1.8 and 3.4 pounds, respectively (URS, 2003b).

In January 1999, an SVE pilot tests was conducted at Area 1 Building 237 to estimate soil vapor permeability values and radius of influence. The SVE pilot test was conducted by Rust Environmental & Infrastructure (Rust) with the results presented in the *DDJC-Tracy Bioventing/Soil Vapor Extraction Sites, Remedial Design, Appendix E* (Radian International, 2000a).

A total of eight vapor extraction wells and 14 vapor monitoring probes were installed at Area 1 Building 237. In November 2000, the SVE system was started and operated continuously until 2002. During this period, 3.3 pounds of TCE and 29.5 pounds of PCE were removed from the vadose zone via SVE (URS, 2003b).

In September 2002, site optimization sampling was performed. The results, which were presented in the *DDJC-Tracy Soil Vapor Extraction Optimization Work Plan* (URS, 2003b), indicated that the remediation effort was ready to proceed to "focused operations," to progress the site toward complete site restoration and ultimately meeting the remedial objectives and goals. In August 2003, system operation was temporarily suspended to evaluate potential rebound effects from the COCs. In November and December 2003, closure/confirmation sampling was conducted in accordance with the *DDJC-Tracy Soil Vapor Closure/Confirmation Sampling Work Plan* (URS, 2003c) to assess whether remediation was complete.

Based on evaluations of residual concentrations exceeding the 1998 OU 1 ROD soil gas cleanup standards and on considerations for additional mass removal, SVE was restarted in late January 2004. Focused operations continued during the spring of 2004, with various extraction and monitoring wells connected to the vacuum extraction pipelines. Based on declining blower influent concentrations, the SVE system was shutdown in June 2004 and allowed to rebound for eight weeks. Second round closure/confirmation, sampling was conducted in August 2004 in accordance with the *DDJC-Tracy Second Round Soil Gas Closure/Confirmation Sampling Work Plan* (URS, 2004b) to assess whether remediation was complete. The sampling results were documented in a Technical Memorandum (URS, 2004c).

The results from the August 2004 second round closure sampling indicated no soil gas concentrations exceeded 1998 OU 1 ROD cleanup standards in the direct push sampling locations or vapor monitoring probe locations in the southern portion of this site. In the northern portion of this site, soil gas concentrations at two relatively small areas with direct push sampling had PCE above 1998 OU 1 ROD cleanup standards. The maximum PCE concentration detected was 3,000 ppbv. The other Area 1 Building 237 PCE concentrations were equal to or less than 1,300 ppbv. Both locations had detections within an area that is less than 40 feet in diameter. The remaining locations appeared to be very localized and small, with soil gas concentrations primarily in the shallow vadose zone (URS, 2005a).

The results from the August 2004 closure/confirmation sampling indicated that though the sites are being remediated, it is still possible to detect areas that have not been fully remediated with the existing SVE system. Detectable soil gas concentrations at two to five times the 1998 OU 1 ROD action level remain at the site (URS, 2005a).

Preliminary modeling of the SVE sites was conducted, with special attention to areas that displayed high concentrations at the 6-foot and 12-foot intervals. Modeling results indicated that TCE concentrations in the leachate at the groundwater capillary fringe do not exceed aquifer cleanup standards at 30 years, but are still increasing; therefore, some additional SVE was warranted (URS, 2005a).

In 2005, SVE pulsing operations were performed at shallow AIWs at Area 1. Pulsing operations continued until influent SVE concentrations indicated that COC concentrations were consistently less than cleanup standards. The SVE system was then shutdown for a year. Pulsing operations were started again in December 2006. During this time, the AIWs were open to the atmosphere for passive venting.

In 2008, a CPT investigation, soil gas monitoring, and extraction well sampling event was conducted to identify specific areas and depths of residual TCE and PCE contamination. The results of the investigation and sampling event indicated that groundwater had not been impacted by TCE or PCE greater than the 5 µg/L ACL, but that soil gas concentrations exceeded the 1998 OU 1 ROD cleanup standard at several locations. Because Area 1 Building 237 had several vadose zone locations with PCE concentrations in excess of the cleanup standards, VLEACH modeling was performed. The VLEACH vadose zone modeling suggested that remaining soil gas concentrations would allow leachate concentrations greater than ACLs, which could have a negative impact on groundwater quality (URS,

2009a). Based on the modeling results, it was determined that SVE enhanced with pneumatic fracturing of the subsurface soil would assist in additional removal of residual TCE and PCE mass.

SVE program enhancements were made in June 2009 which included full-scale pneumatic fracturing and installation of additional SVE wells. The enhanced SVE system operated intermittently between June and September 2009. In September 2009, the SVE system was shutdown due to PCE and TCE concentrations below the 1998 OU 1 ROD cleanup standards.

In November and December 2009, soil gas samples were collected from existing vapor extraction wells, vapor monitor wells, and air injection wells located at the site (URS, 2010b). In addition, one soil gas and one groundwater sample were collected at groundwater monitoring well LM192AU. The sample results were used for additional VLEACH modeling in January 2010.

VLEACH vadose zone modeling was repeated to assess the potential for residual PCE and TCE concentrations in soil to impact groundwater and was documented in *Results from Sampling Effort to Support NFA Decision at Area 1 Building 237 SVE Site* (URS, 2010b). The modeling results indicated that TCE leachate concentrations would not exceed the groundwater ACL (5 µg/L). For the northern portion of Area 1, PCE in the vadose zone was also not expected to produce leachate concentrations greater than the ACL. However, for the southern portion, modeling predicted PCE leachate concentrations with a maximum concentration of 5.1 µg/L, slightly greater than the ACL; the model concentrations decreased with time (URS, 2010b). Based on the results of the modeling, the SVE system was shutdown.

In 2011, DLA collected soil gas samples and indoor air samples to evaluate human health risk to current occupants of Building 231 and 237. Chlorinated solvents were detected in the indoor air samples collected from Building 231, but at concentrations less than U.S. EPA industrial screening levels for indoor air. To determine whether VOCs in soil gas present an unacceptable cancer risk to occupants of Building 237 DLA collected indoor air samples. The indoor air sampling indicated that chlorinated solvents were not detected above laboratory reporting limits (RLs) in the Building 237 indoor air samples (EA, 2011).

During the 2009 SVE enhancement program north of Building 237, a strong chemical odor was noted in the soil cuttings from one of the new vapor extraction wells. IDW sampling indicated that several pesticides were present above the U.S. EPA regional screening levels (RSLs). In May and July 2010 and February 2011, groundwater samples were collected for analysis of pesticides from five groundwater monitoring wells located north of Building 237. The results indicated pesticide detections in one well, LM192AU, located immediately north of Building 237.

Area 1 Building 237 EE/CA (HDR, 2012d) was prepared to evaluate methods to conduct a Non-Time-Critical Removal Action to remediate soils impacted with pesticides at Area 1 Building 237. The EE/CA proposed the excavation of approximately 418 cubic yards of pesticide-impacted soil. In July and August 2012, a total of 480 cubic yards of soil was removed in two separate phases of excavation immediately north of Building 237. The excavation resulted in a calculated risk value that was less than the cleanup goal (HDR, 2012d).

In May and June 2013, soil vapor samples were collected from 11 soil borings and 11 vapor monitoring wells in Area 1 Building 237 to assess concentrations of TCE and PCE since shutdown of the SVE system PCE was reported at three locations at concentrations greater than the 1998 OU 1 ROD cleanup standard, indicating that PCE may present an unacceptable risk to groundwater (HDR, 2013c). However, groundwater samples collected in close proximity to these exceedances did not contain TCE or PCE at concentrations exceeding the ACL (HDR, 2013c). DLA recommended keeping existing LUCs in place to mitigate vapor intrusion pathway to future industrial buildings constructed in this area.

4.17.3 Groundwater Monitoring

WMP Reports for the years 2010 through 2014 were reviewed to evaluate the likelihood of residual contamination impacting groundwater quality at Area 1. Wells LM192AU and EW012AU were sampled in 2012 and 2013, respectively, and analyzed for pesticides to evaluate whether the soil removal action was effective at mitigating impacts to groundwater. The results of the groundwater sampling did not yield pesticides above laboratory detection limits; therefore, the pesticide remedy functioned as intended. Wells LM061AU and LM137A met the 1998 OU 1 ROD monitoring requirements in 2003 and 2008, respectively. The monitoring well locations are presented on Figure 4.17-1.

LM061AU

Well LM061AU has 1998 OU 1 ROD monitoring requirements for 1,1-DCE, TCE and PCE. The requirements were met for 1,1-DCE in 4Q92, PCE in 3Q00, and TCE in 3Q03 (Table B-2 in Appendix B). This well was decommissioned in May 2014.

LM137A

Well LM137A has 1998 OU 1 ROD monitoring requirements for 1,1-DCE, TCE and PCE. The requirements were met for PCE in 3Q08, TCE in 1Q05, and 1,1-DCE has never exceeded the ACL (Table B-2 in Appendix B). This well is no longer recommended for sampling; however, it is being retained in the monitoring program for water level information.

4.17.4 Soil Vapor Monitoring

In May and June 2013, 11 soil vapor samples were collected from soil borings and 11 soil gas samples were collected from monitoring points at Area 1. The propose of this investigation was to evaluate concentrations of TCE and PCE in the vadose zone after shutdown of the SVE system and to determine whether VOC concentrations present a risk to human health via vapor intrusion to commercial/industrial occupants of existing and/or future buildings. The results of this investigation indicated that PCE was present at concentrations greater than 1998 OU 1 ROD cleanup standards.

To estimate whether PCE or TCE presents a vapor intrusion risk, a soil gas screening level was calculated from the indoor air RSL using attenuation factors (0.1 for shallow or 0.01 for deep samples) as published in *OSWER Draft Guidance for Evaluation of the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (U.S. EPA, 2002). Based on this assessment, TCE and PCE are present in shallow soil gas at concentrations that present a vapor intrusion risk to commercial/industrial occupants of future buildings. The results from this sampling event are documented in the *Final Areas 1, 2, and 3 Soil Gas Optimization Report* (HDR, 2013c).

4.17.5 Indoor Air Monitoring

In March 2011, indoor air samples were collected from Building 237, located at Area 1. The results of indoor air sampling indicated that chlorinated solvents were not detected at concentrations greater than laboratory RLs (EA, 2011). Adjacent Building 220 (an above ground water storage tank) and Building 236 (an open air structure used to store equipment) were not evaluated because they are unoccupied structures (HDR, 2011a).

In May 2011, indoor air samples were collected from Building 231. TCE and PCE was detected in the indoor air samples; however, based on the comparison to the U.S. EPA RSL values, these low concentrations do not present an excess cancer risk greater than one in one million (HDR, 2011a).

4.17.6 Land Use Controls

LUCs were established for PCE and TCE at Area 1 Building 237 in the 2011 ESD with the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone;
- Mitigate intrusion of PCE and TCE from vadose zone to indoor air; and
- Protect construction worker from exposure to COCs in soil.

The 2011 ESD identified the following LUCs:

- Clearly posted signage detailing LUC and notification procedures for construction activities or land use changes;
- Maintain administrative controls (i.e. new provisions stated in the IMP and changes to the notification procedures);
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in existing asphalt pavement/building foundation cover or notification procedure;
- Follow defined procedures in the event of a change in land use. Site specific procedures will be determined by the Environmental Office, DLA Installation Support at San Joaquin. The procedures include, but are not limited to: personal protective equipment (PPE) of the industrial/construction worker, disposition or contaminated soils encountered during subsurface construction activities, and restoration of the LUC and/or surface condition following construction activities; and
- Future buildings will be constructed with engineered controls specifically designed to prevent the migration of soil gas to indoor air.

The 2013 MTF added pesticides as a COC and modified the LUC boundary at Area 1 Building 237.

The LUCs at Area 1 Building 237 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this five-year review period, no deficiencies were noted at Area 1 Building 237. The inspection findings are presented in Table 4.2-1 and the LUC boundary is presented on Figure 4.17-1.

4.18 OU 1: Area 3

Area 3 is located along the northern edge of the Depot adjacent to Area 2, between the railroad tracks and Depot/Annex property line (Figure 1.2-1). Area 3 was historically used as a drum storage area, in which spills due to the leakage of stored drums and/or other accidents in the handling of stored drums may have occurred (WCC, 1992a).

4.18.1 Remedy Selection

The 1998 OU 1 ROD established the RAO of preventing the migration of PCE and TCE from soil to groundwater, selected SVE as the remedy, and established soil gas cleanup standards that represent calculated concentrations of PCE and TCE in soil gas that, when in equilibrium with groundwater, will not result in groundwater concentrations above their respective ACLs; the concentrations are assumed protective of groundwater quality.

4.18.2 Remedy Implementation

In the fall of 1998, soil vapor samples were collected from 49 CPT locations at three depths typically between 5 and 15 feet bgs. Laboratory analysis indicated that 30 locations yielded TCE or PCE at concentrations greater than 1998 OU 1 ROD cleanup standards. TCE concentrations ranged from below detection limits to 35,000 ppbv and PCE concentrations ranged from below detection limits to 49,000 ppbv (URS, 2003b). The estimated initial mass of TCE and PCE at Area 3 was 24.7 and 39.4 pounds, respectively (URS, 2003b).

In January 1999, an SVE pilot test was conducted at SWMU 1/Area 2 to estimate soil vapor permeability values and radius of influence. The results of the test conducted at SWMU 1/ Area 2 were used to design the SVE system at Area 3, since the two locations have similar lithologies and are located next to each other (URS, 2003b). The SVE pilot test was conducted by Rust with the results presented in the *DDJC-Tracy Bioventing/Soil Vapor Extraction Sites, Remedial Design, Appendix E* (Radian International, 2000a).

A total of 18 vapor extraction wells and 34 vapor monitoring probes were installed at Area 3. SVE system was started in November 2000 and was operated continuously until 2002. During this period, 23.5 lbs of TCE and 22.1 lbs of PCE were removed from the vadose zone via SVE (URS, 2003b).

Site optimization sampling was performed in September 2002. The results, which were presented in the *DDJC-Tracy Soil Vapor Extraction Optimization Work Plan* (URS, 2003b), indicated that the remediation effort was ready to proceed to “focused operations,” to progress the site toward complete site restoration and ultimately meeting the remedial objectives and goals. System operation was temporarily suspended in August 2003 to evaluate potential rebound effects from the COCs. Closure/confirmation sampling was conducted in November and December 2003 in accordance with the *DDJC-Tracy Soil Vapor Closure/Confirmation Sampling Work Plan* (URS, 2003c) to assess whether remediation was complete.

Based on residual concentrations exceeding the 1998 OU 1 ROD cleanup goals SVE was restarted in late January 2004. Focused operations continued during the spring of 2004, with various extraction and monitoring wells connected to the vacuum extraction pipelines. Based on declining blower influent concentrations, the SVE system was shutdown on 3 June 2004 and allowed to rebound for eight weeks. Second round closure/confirmation sampling was conducted in August 2004 in accordance with the *DDJC-Tracy Second Round Soil Gas Closure/Confirmation Sampling Work Plan* (URS, 2004b) to assess whether remediation was complete. The sampling results were documented in a Technical Memorandum (URS, 2004c).

The results from the August 2004 closure/confirmation sampling indicated two moderate-size locations that have residual TCE and PCE concentrations remaining above the cleanup standards and one small location with residual TCE concentrations remaining above the cleanup standards. In the northwestern area of the site, a direct push location had a soil gas TCE concentration of 2,100 ppbv at the 6-foot-depth interval and 640 ppbv at the 12-foot interval. A direct push sampling result of 330 ppbv further northwest

indicated that this area is limited to about 70 feet in diameter. The largest TCE area is estimated to be approximately 350 feet long. The highest TCE concentration, 2,300 ppbv, was from a direct push sample in a 6-foot-depth interval. PCE concentrations are highest in the north central part of the site, in the 6-foot interval. The central PCE plume is approximately 120 feet in diameter. The southern PCE plume is approximately 80 feet in diameter.

The results from the August 2004 closure/confirmation sampling indicate that though the sites were being remediated, it was still possible to detect areas that have not been fully remediated with the existing SVE system. Detectable soil gas concentrations at two to five times the 1998 OU 1 ROD action level remain at the site (URS, 2005a).

Preliminary modeling of the SVE sites were conducted, with special attention to areas that displayed high concentrations at the 6-foot and 12-foot intervals. Modeling results indicated that TCE concentrations in the leachate at the groundwater capillary fringe do not exceed aquifer cleanup standards at 30 years, but are still increasing; therefore, some additional SVE was warranted (URS, 2005a).

In 2005, SVE pulsing operations were performed at shallow AIWs. Pulsing operations occurred until influent SVE concentrations indicated that COC concentrations were consistently less than cleanup standards. The SVE system was then shutdown for a year. Pulsing operations were started again in December 2006. During that time, the AIWs were open to the atmosphere for passive venting.

In 2008, soil gas samples were collected from nine CPT borings. Laboratory analysis indicated that soil gas exceeding 1998 OU 1 ROD cleanup standards remained at three small areas. In addition, TCE and PCE was detected in groundwater samples at maximum concentrations up to 25 µg/L and 5.7 µg/L, respectively (HDR, 2013d).

Results from the March 2008 CPT investigation at Area 3 provided data to complete the STOP evaluation in January 2009. The STOP evaluation concluded that SVE should be terminated at Area 3 because residual mass in the vadose zone was not predicted to result in leachate concentrations of PCE or TCE that exceed their respective ACLs. In addition, the estimated vadose zone VOC mass will not increase the groundwater remediation cost or duration of treatment. Area 3 was recommended for NFA of the SVE remedy. There are no protectiveness issues related to the implementation and completion of the SVE remedial action at Area 3.

In January 2013, groundwater samples were collected from seven soil borings advanced in the immediate vicinity of the 2008 CPT borings to delineate the extent of the ACL exceedances. PCE was detected at a maximum concentration of 11 µg/L that prompted the installation of well LM203A, so that groundwater quality could be monitored over time. The results of this investigation are documented in the *Area 3 Groundwater Remedy Optimization Report* (HDR, 2013d). Well LM203A was added to the groundwater monitoring program.

In May 2013, soil vapor samples were collected from soil borings and vapor monitoring wells at Area 3 to assess concentrations of TCE and PCE since shutdown of the SVE system. Laboratory analysis of these samples indicated the presence of PCE and TCE at concentrations greater than the 1998 OU 1 ROD cleanup standard, implying that PCE may present an unacceptable risk to groundwater (HDR, 2013c).

4.18.3 Groundwater Monitoring

Wells LM032AU, LM058AU, and LM203A continue to be monitored as 1998 OU 1 ROD monitoring requirements have not been met. These wells are monitored to evaluate the effectiveness of the remedy at Area 3. As part of this Third Five-Year Review, groundwater analytical results from 2010 through 2014

were reviewed to evaluate the likelihood of residual contamination impacting groundwater at Area 3. Well locations are shown on Figure 4.18-1.

LM032AU

The 1998 OU 1 ROD monitoring requirements have not been met for PCE. TCE and PCE concentrations have decreased in well LM032AU since startup of the SVE system. Recent TCE and PCE concentration in well LM032AU, after shutdown of the SVE system, generally indicate stable concentration trends. The requirements were met for 1,1-DCE in 1Q95 and TCE in 3Q07. PCE exceeded the ACL in 3Q13, however, was below the ACL in 3Q14. This well will continue to be sampled until the 1998 OU 1 ROD requirements are met.

LM058AU

Well LM058AU is located hydraulically downgradient from well LM032AU and located within the Area 3 TCE and PCE Plume. Historically, with the exception of PCE detected at 5.02 µg/L in 1Q99, well LM058AU has not yielded TCE or PCE above the ACL, until recently. In 3Q12, PCE was detected at 12.9 µg/L and TCE was detected at 6.51 µg/L. The PCE and TCE concentrations have since decreased slightly and were detected during 3Q14 at 10 µg/L and 5.8 µg/L, respectively. In October 2012, operation of EW034AU, located approximately 150 north of LM058AU, ceased due to 3Q12 VOC concentrations less than the ACL. VOC concentrations in EW034AU did not rebound greater than the ACL after shutdown and remain within the historical range observed over the last seven years. The likely source for the TCE and PCE concentrations observed in LM058AU is from the central portion of Area 3, however, LM032AU, located approximately 150 feet directly upgradient, has not shown increases in VOC concentrations.

LM203A

In January 2013, well LM203A was installed in the portion of Area 3 where PCE and TCE were detected at the greatest concentrations during the 2008 and 2011 investigations. Well LM203A consistently yields PCE at a concentration greater than the ACL. In 3Q14, PCE concentration was detected at 18 µg/L. LM203A is located approximately 40 feet south of a TCE and PCE soil gas plume with concentrations greater than the 1998 OU 1 ROD specified cleanup level that would be protective of groundwater. Due to the fact that there are no known sources of PCE in groundwater in the vicinity of LM203A, it is likely that TCE and PCE in the vadose zone is partitioning to groundwater in this area resulting in the PCE exceedance of the ACL. This well will continue to be monitored.

4.18.4 Soil Vapor Monitoring

In May and June 2013, 10 soil vapor samples were collected from soil borings and 26 soil gas samples were collected from monitoring points at SWMU 1/Area 2. The propose of this investigation was to evaluate concentrations of TCE and PCE in the vadose zone after shutdown of the SVE system and to determine whether VOC concentrations present a risk to human health via vapor intrusion to commercial/industrial occupants of existing and/or future buildings. The results of this investigation indicated that PCE and TCE was present at concentrations greater than 1998 OU 1 ROD cleanup standards.

To estimate whether PCE or TCE presents a vapor intrusion risk, a soil gas screening level was calculated from the indoor air RSL using attenuation factors (0.1 for shallow or 0.01 for deep samples) as published in *OSWER Draft Guidance for Evaluation of the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (U.S. EPA, 2002). Based on this

assessment, TCE and PCE are present in shallow soil gas at concentrations that present a vapor intrusion risk to commercial/industrial occupants of future buildings. The results from this sampling event are documented in the *Final Areas 1, 2, and 3 Soil Gas Optimization Report* (HDR, 2013c).

4.18.5 Land Use Controls

LUCs were established for PCE and TCE at Area 3 in the 2011 ESD with the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone; and
- Mitigate intrusion of PCE and TCE from vadose zone to indoor air.

The 2011 ESD identified the following LUCs:

- Clearly posted signage detailing LUC and notification procedures for construction activities or land use changes;
- Maintain administrative controls (i.e. new provisions stated in the IMP and changes to the notification procedures);
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in existing asphalt pavement/building foundation cover or notification procedure;
- Follow defined procedures in the event of a change in land use. Site specific procedures will be determined by the Environmental Office, DLA Installation Support at San Joaquin. The procedures include, but are not limited to: PPE of the industrial/construction worker, disposition or contaminated soils encountered during subsurface construction activities, and restoration of the LUC and/or surface condition following construction activities; and
- Future buildings will be constructed with engineered controls specifically designed to prevent the migration of soil gas to indoor air.

The LUCs for Area 3 are included in Appendix G of the RPMP. Annual inspections are conducted to evaluate the effectiveness of the LUCs and to identify deficiencies; the findings are included in annual monitoring reports. During this Third Five-Year Review period, no deficiencies were noted at Area 3. The inspection findings are presented in Table 4.2-1 and the LUC boundary is depicted on Figure 4.18-1.

4.19 NWC OU: Northwestern Corner Operable Unit

4.19.1 Remedy Selection

The NWC OU ROD established a remedy to address the dieldrin-contaminated in the NWC of the Tracy Site. Other plumes containing only VOCs or a mixture of VOCs and dieldrin located elsewhere beneath and downgradient from the Tracy Site are addressed in the OU 1 ROD, and as amended. The NWC OU ROD stated the following RAOs:

- Remove dieldrin from groundwater beneath the NWC to the extent technically and economically feasible.

- Protect human health and the ecological and receptors from exposure to dieldrin in groundwater.

The NWC OU remedy was stipulated in an 14 April 2010 agreement signed by U.S. EPA, RWQCB, DTSC, and DLA. The selected remedy included removing dieldrin from groundwater in the NWC OU using extraction to the extent technically and economically feasible for a duration of up to three years. DLA would also implement LUCs to limit residual exposure to dieldrin concentrations that could prevent unrestricted use of the site. The goal of the remedy is to reduce dieldrin concentrations in NWC groundwater OU to less than 0.05 µg/L. The NWC OU remedy included the following elements:

- Design and installation of a groundwater extraction and treatment system, which consists of four groundwater extraction wells, a liquid-phase GAC treatment unit, and discharge of treated water to the Tracy Site IGs.
- Operate and maintain the extraction system for a period of up to three years.
- Institution and inspection of on-site LUCs during implementation of the remedy and following completion of the remedy.
- Perform monthly monitoring of the four groundwater extraction wells and quarterly monitoring at eight groundwater monitoring wells.
- Report the results from monitoring events in quarterly and annual monitoring reports.
- Prepare an Interim Remedial Action Completion Report following remedial action construction and initial implementation.
- Prepare a Preliminary Project Completion Report at the conclusion of the three year pumping period.

The agreement contained remedy specific design elements including extraction well placement and screening intervals. The agreement is included as Appendix B of the *Record of Decision Remedy for Northwestern Corner Groundwater Operable Unit* (URS, 2011).

4.19.2 Remedy Implementation

Design of the NWC OU remedy was documented in the *Northwestern Corner Groundwater Operable Unit Remedial Design / Remedial Action Work Plan* (HDR, 2011b), which presented a CSM and basis of design. In January 2011, a direct push design study was conducted to identify extraction well locations and screen intervals. Investigation results and recommendations from the direct push design study were documented in the *Northwestern Corner Direct Push Design Study* (HDR, 2011c).

In January 2012, construction of the NWC OU remedy was completed and the remedy was implemented. The groundwater extraction portion of the remedy consists of four extraction wells; two of which are located on the Depot (EW056A and EW057A) and two of which are located on the Annex (LM174AU and EW059A). LM174AU, an existing monitoring well was converted to an extraction well after it was determined that the proposed extraction well location (EW058A) would not yield flows above 1 gpm (HDR, 2012a).

Extracted water is pumped through LGAC units, located near the respective extraction wells on the Annex and Depot before being conveyed through underground piping to GWTP 2. Each LGAC unit consists of two 1,000 pound vessels in a “series” type configuration. Once the treated water reaches

GWTP 2, it is combined with OU 1 groundwater and pumped through an air stripper to remove VOCs present in OU 1 groundwater. The treated water is then pumped through buried conveyance piping to the northern IG galleries for disposal. As of September 30, 2014, approximately 9.3 grams of dieldrin were removed from the NWC OU (HDR, 2014c). The NWC OU extraction wells and treatment system locations are shown in Figure 4.1-2. Construction activities including well construction details, pump test results, startup procedures, and as-built drawings were documented in the *Northwestern Corner Operable Unit Remedial Action Report* (HDR, 2012a).

The NWC OU ROD established LUC requirements at the NWC with the purpose of preventing exposure to contaminated groundwater on the Depot and Annex. DLA is responsible for implementing the LUCs documented in Appendix G of the RPMP and summarized below:

- Prohibit installatin of water supply wells on the NWC of the Tracy Site through the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest.*
- Protect infrastructure associated with the NWC Groundwater OU monitoring, extraction, treatment, and disposal systems.
- Post appropriate signage at the NWC Groundwater OU Site indicating restrictions on groundwater use and production well installations.
- Implement notification procedure for construction activities or land use changes through the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest*.
- Maintain administrative controls (i.e., *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* and notification procedures).
- Perform annual reviews to ensure compliance with instituted controls and to correct any deficiencies in the notification procedure.
- Follow defined procedures in the event of a change in land use.

In August 2010, DLA met with the SJCEHD to discuss implementation of well notification procedures to prevent the installation of water supply wells in areas potentially impacted with COCs. These procedures identify well construction details and require the notification of DLA and CVRWQCB in the event that a well construction permit is applied within the notification boundary, which includes the on and off Depot portions of the plume underlying the NWC OU. The notification boundary is defined as the area between 11th Street, Chrisman Road, Linne Road, and S. Bird Road.

Table 4.1-1. Groundwater Treatment Plant 2 Extraction Well Operational Status, Tracy Site[a]

Operating Wells[b]		
EW009B[e]	EW027B	EW057A[c]
EW024B[d]	EW028B[e]	LM174AU[c]
EW025B[e]	EW048AU	EW059A[c]
EW026B[e]	EW056A[c]	
Wells Shut Down (Date for Shutdown [a])		
EW002AU (February 2009)	EW020A (October 2012)	EW034AU (October 2012)
EW003 (May 2005)	EW022A (May 2005)	EW042AU (October 2012)
EW005AUA (May 2004)	EW029B (May 2005)	EW044AU (October 2012)
EW006AU (June 2004)	EW030C (May 2004)	EW045AU (March 2008)
EW011AU (October 2012)	EW031C (October 2012)	EW046AU (October 2012)
EW018A (January 2013)	EW032AU (May 2004)	EW047AU (April 2013)
EW019A (October 2012)		

[a] OU 1 extraction wells are evaluated annually based on the extraction well decision logic.
[b] Wells are considered "operating" if online anytime during the 2014 reporting period (October 2013 to September 2014).
[c] Northwestern corner extraction well, began operation on 4 January 2012.
[d] Pumping resumed based on 3Q14 COC concentrations greater than the ACLs.
[e] Pumping suspended based on 3Q14 COC concentrations less than the ACLs.

ACL = aquifer cleanup level
COC = contaminant of concern
OU = operable unit
Tracy Site = Defense Distribution Depot San Joaquin
3Q14 = third quarter 2014 (quarter/year)

Table 4.1-2. Groundwater Extraction and Treatment System Performance for the 2010 - 2014 Monitoring Years

Treatment System Parameter	Total 2010[a]	Total 2011[a]	Total 2012[a]	Total 2013[a]	Total 2014 (Through September)[a]	Cumulative to Date (2010 – September 2014)
Total Mass Removed (lbs)	7.53 [b] (40% decrease from 2009 total mass removed)	6.07 [b] (19% decrease from 2010 total mass removed)	5.09 [b] (16% decrease from 2011 total mass removed)	2.11[b] (59% decrease from 2012 total mass removed)	2.23[b] (5.7% increase from 2013 total mass removed)	230.14[c]
Volume-to-Mass Ratio (gal/lb extracted)	20,943,352 (51% increase from 2009)	22,868,562 (9.2% increase from 2010)	24,474,150 (2.6% increase from 2011)	23,161,510 (5% decrease from 2012)	19,657,477 (15% decrease from 2013)	--
Cost per Pound of Mass Removed[d,e] ($/lb)	$119,673 (52% increase from 2009)	$135,369 (13.1% increase from 2010)	$136,454 (0.8% increase from 2011)	NA	NA	$68,892[f]
O&M Costs[e] ($)	$901,141 (9% decrease from 2009)	$821,688 (8.8% decrease from 2010)	$694,552 (15.4 % decrease from 2011)	NA	NA	$15,555,091
Average/Maximum Influent TCE Concentration at GWTP2 (µg/L)	3.32/3.98 (Both reduced from 2009 concentrations which were 4.01/5.7)	3.14/3.70 (Both reduced from 2010 concentrations which were 3.32/3.98)	2.90/3.63 (Both reduced from 2011 concentrations which were 3.14/3.70)	3.15/4.23 (Both increased from 2012 concentrations which were 2.90/3.63)	3.17/4.40 (Both increased from 2013 concentrations which were3.15/4.23)	NA
Average/Maximum Influent PCE Concentration at GWTP2 (µg/L)	1.53/1.81 (Both reduced from 2009 concentrations which were 1.93/2.7)	1.40/1.56 (Both reduced from 2010 concentrations which were 1.53/1.81)	1.46/1.86 (Both increased from 2011 concentrations which were 1.40/1.56)	1.43/2.10 (The average decreased while the maximum increased from 2012 concentrations which were 1.46/1.86)	1.64/2.30 (Both increased from 2013 concentrations which were 1.43/2.10)	NA
Average/Maximum Influent Dieldrin Concentration at the Pesticide Wells (µg/L)	0.0404/0.0724 at EW048AU (Both the values decreased compared to 2009 where the concentrations were 0.099/0.11 at EW048AU)	0.061/0.068 at EW048AU (The average value increased while the maximum value decreased compared to 2010 where the concentrations were 0.0404/0.0724 at EW048AU)	0.044/0.183 at EW056A (Both the values increased compared to 2011 where the concentrations were 0.061/0.068 at EW048AU)[g]	0.047/0.190 at EW056A (Both the values increased compared to 2012 where the concentrations were 0.044/0.183 at EW056A)[g]	0.061/0.160 at EW056A (The average value increased and the maximum value decreased compared to 2013 where the concentrations were 0.047/0.190 at EW056A)[g]	NA

Table 4.1-2. Groundwater Extraction and Treatment System Performance for the 2010 - 2014 Monitoring Years (Continued)

Treatment System Parameter	Total 2010[a]	Total 2011[a]	Total 2012[a]	Total 2013[a]	Total 2014 (Through September)[a]	Cumulative to Date (2010 – September 2014)
Total Volume Treated (gallons)	157,703,444 (9.6% decrease from 2009)	138,812,174 (12% decrease from 2010)	119,483,425 (14% decrease from 2011)	48,870,788 (59% decrease from 2012)	43,836,174 (10% decrease from 2013)	2,992,677,869[d]
Average Monthly Volume Treated (gal)	13,141,954	11,567,681	9,956,952	4,072,566	3,653,015	NC
Average Flow Rate (gpm)[h]	300	264.1	227.3	93	83	NC

[a] GWTP1 was shutdown permanently on 16 January 2006, and extraction wells were connected to GWTP2.
[b] Includes mass extracted by inline LGAC systems.
[c] Total mass removed includes the original IRM GWTP and GWTP1.
[d] Average cost per pound = cost/mass removed.
[e] Cost includes GWTP O&M contractor costs, supporting performance monitoring and reporting costs, and Well Monitoring Program costs for both OU 1 and NWC OU remedy.
[f] This is the cumulative cost/cumulative mass extracted.
[g] Volume of groundwater treated is based on available flow data from 1998 through 2014.
[h] Calculated using total volume treated divided by 365 days/year, 24 hours/day, and 60 minutes/hour.

gal = gallons
gal/lb = gallons per pound
gpm = gallons per minute
GWTP = groundwater treatment plant
IRM = interim remediation measure
lbs = pounds
LGAC = liquid-phase granular activated carbon
NA = not applicable
NC = not calculated
NWC = northwestern corner
O&M = operation and maintenance
OU = operable unit
$/lb = cost per pound
µg/L = micrograms per liter

Table 4.2-1. Findings During Annual Inspection of Land Use Control Sites

Site	Key Finding	Actions
OU 1	• No land use changes.	• No action necessary.
NWC OU	• No land use changes.	• No action necessary.
Area 1 Building 237	• No land use changes.	• No action necessary.
SWMU 1/Area 2	• No land use changes.	• No action necessary.
Area 3	• New soil borings conducted and a monitoring well installed as part of the Installation Restoration Program.	• No action necessary.
SWMU 2/3	• No land use changes.	• No action necessary.
SWMU 4	• No land use changes.	• No action necessary.
SWMU 6	• No land use changes.	• No action necessary.
SWMU 7	• No land use changes.	• No action necessary.
SWMU 8	• No land use changes (part of the Eastern Depot Soils Area).	• No action necessary.
SWMU 20	• No land use changes.	• No action necessary.
SWMU 24	• LUC signs were removed for painting during the annual inspection. Signs were reinstalled on Building 247 in September 2014.	• No action necessary.
SWMU 33	• Need to replace sign that was on former Building 10.	• No action necessary, two signs were attached to the utility pole south of Ennis Street in June 2015.
Northern Depot Soils Area	• Inadequate aggregate cover in two sections, totaling approximately 200 square feet.	• Supplement aggregate cover in these sections.
Site 72	• New fenced-in storage area near LUC. Environmental office was notified and nothing was constructed on Site 72.	• No action necessary.
Building 30 Drum Storage Area	• No land use changes.	• No action necessary.
Eastern Depot Soils Area	• No land use changes.	• No action necessary.
Southern Depot Soils Area	• No land use changes.	• No action necessary.

LUC = land use control
NWC = Northwestern Corner
OU = operable unit
SWMU = solid waste management unit
Site = Defense Distribution Depot San Joaquin

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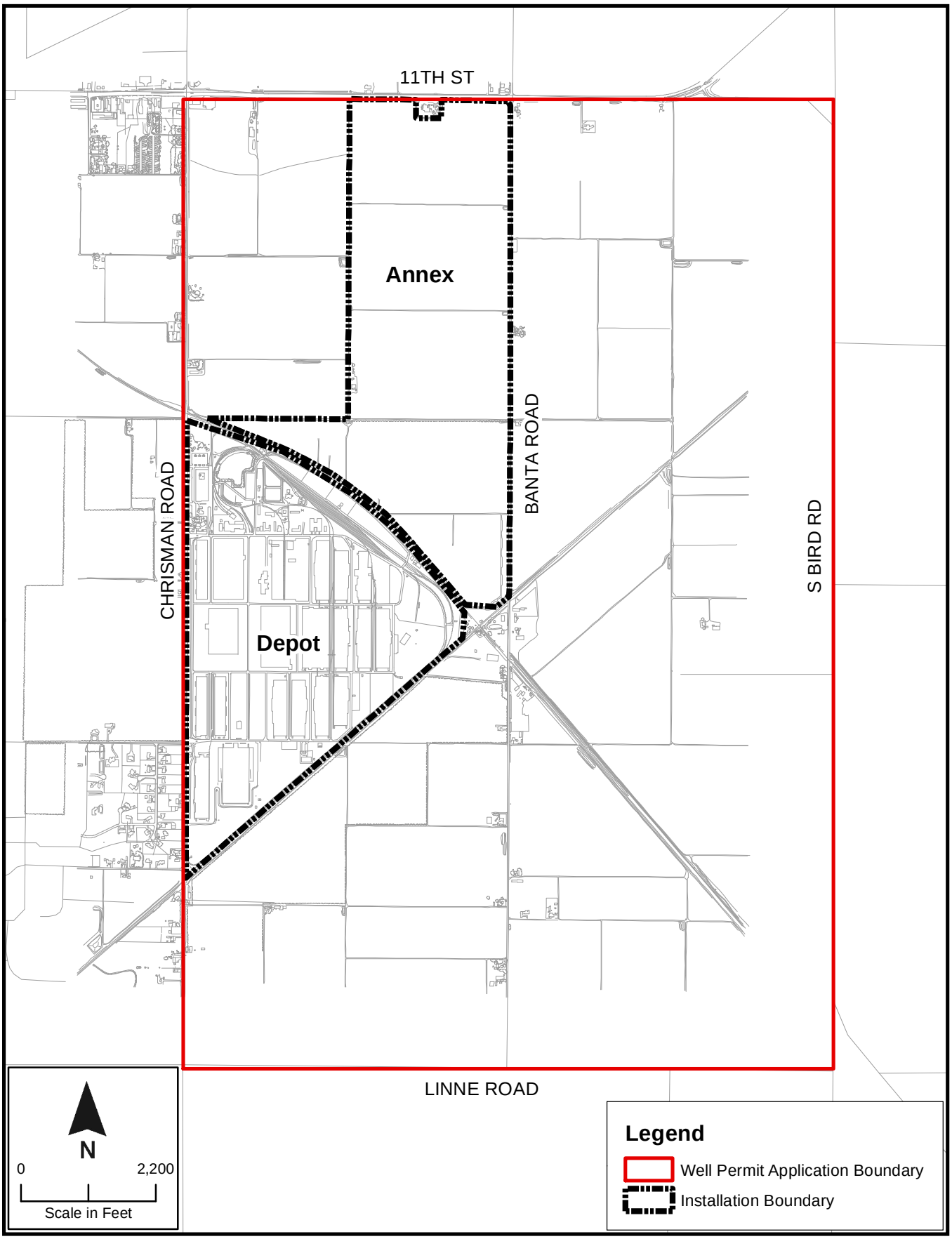


Figure 4.1-1 Well Permit Application Notification Boundary

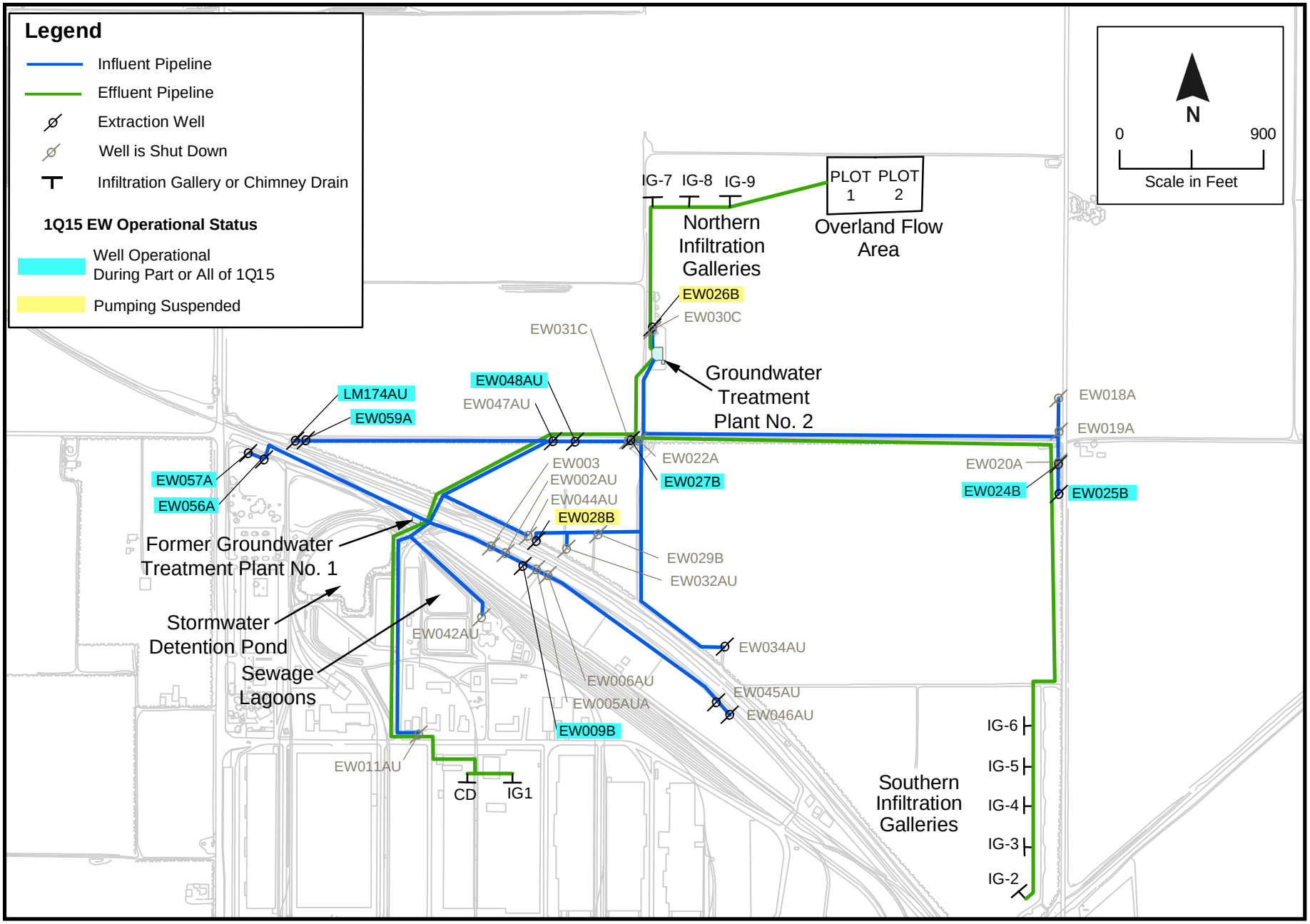


Figure 4.1-2 Groundwater Treatment Plant 2 Features

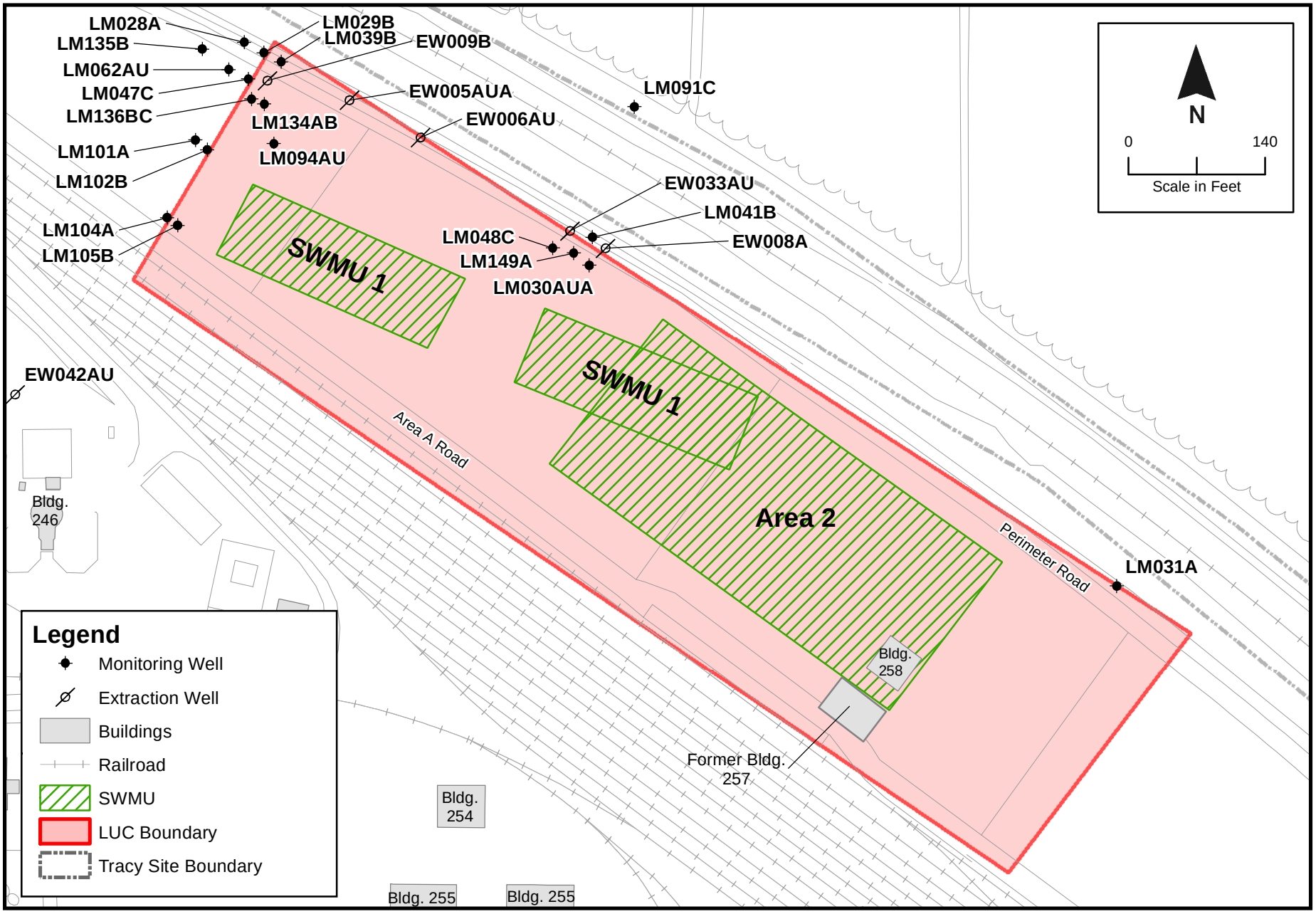


Figure 4.2-1 SWMU 1/Area 2 Monitoring Well Locations and LUC Boundary

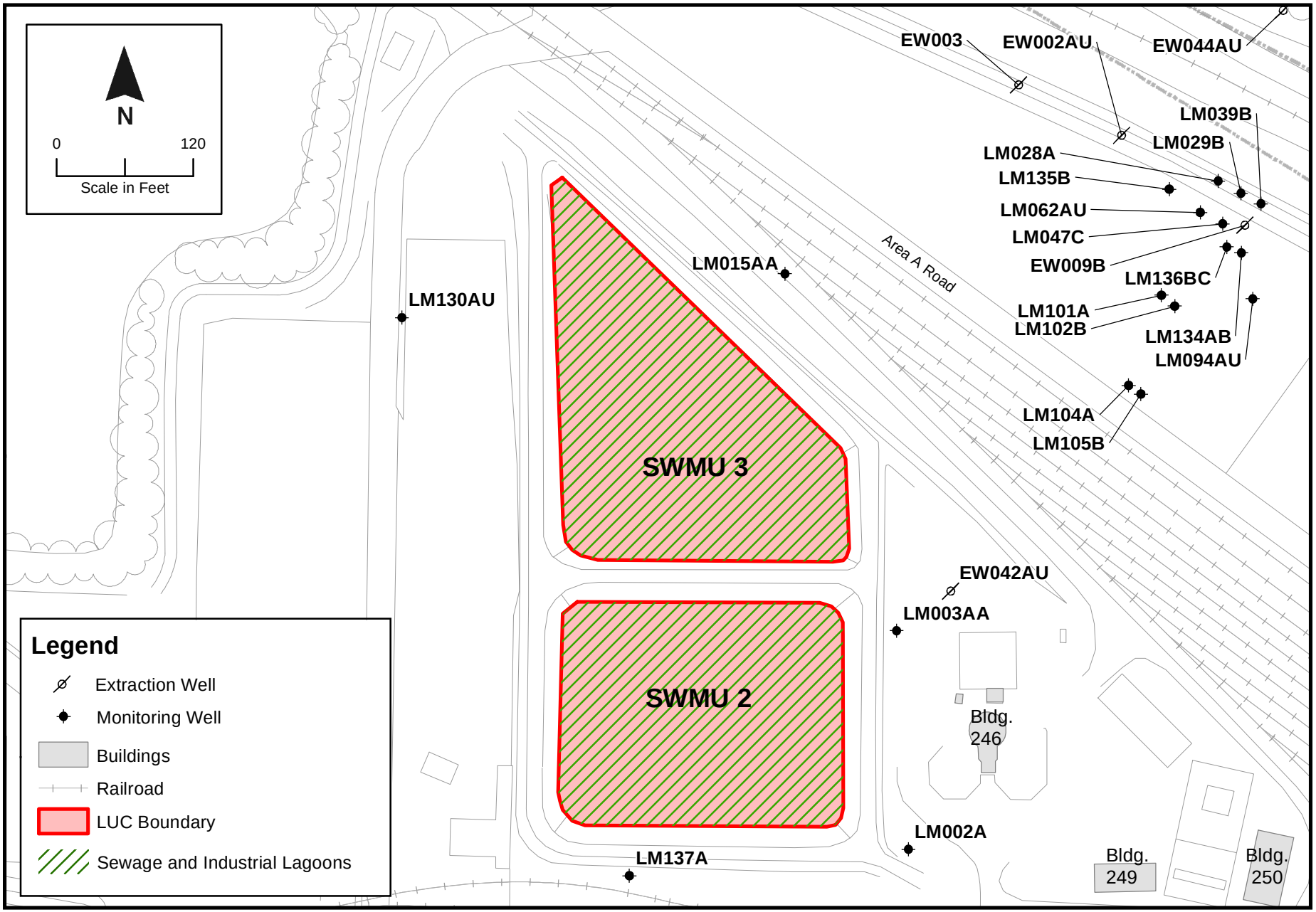


Figure 4.3-1 SWMU 2/SWMU 3 Monitoring Well Locations and LUC Boundary

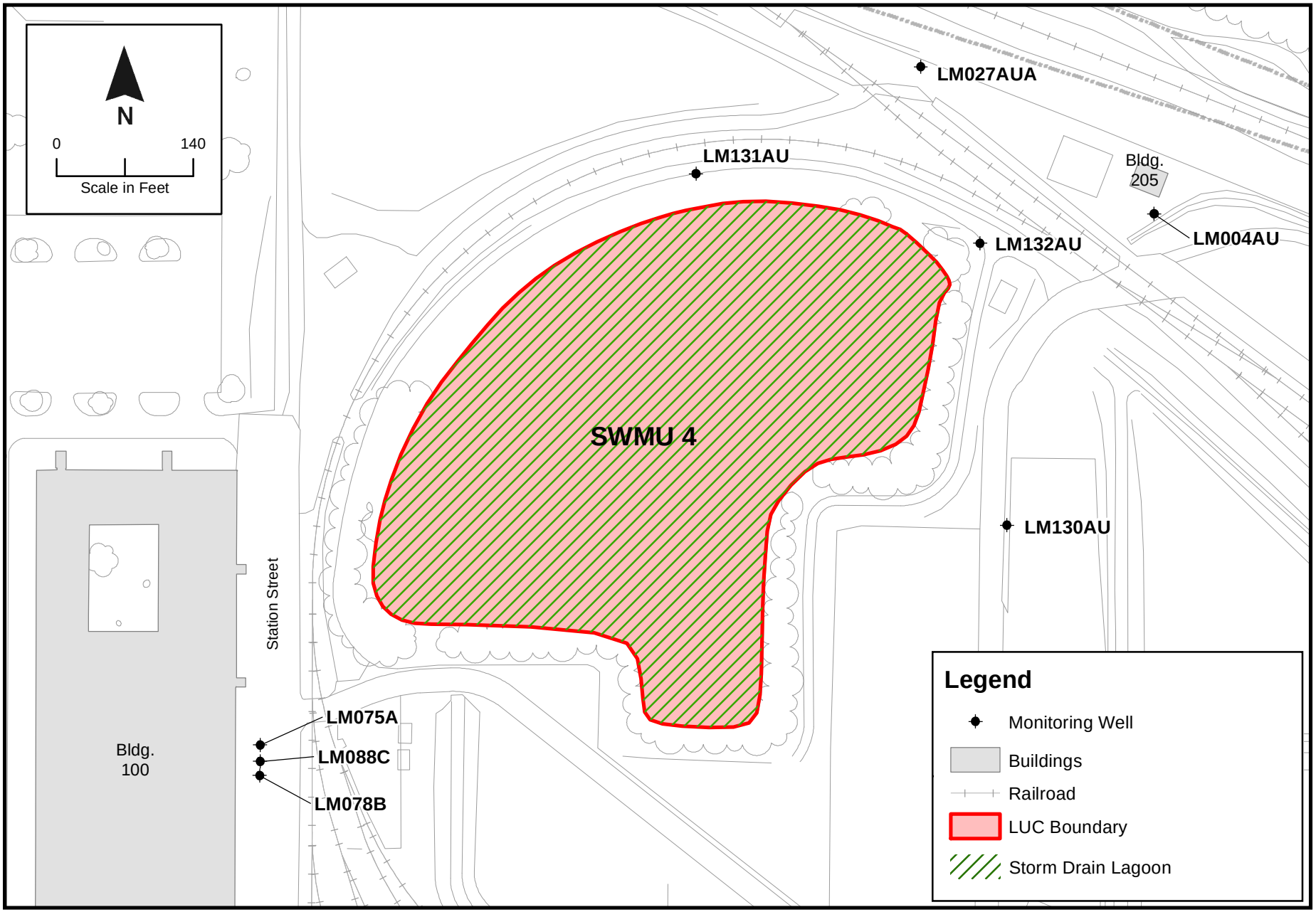


Figure 4.4-1 SWMU 4 Monitoring Well Locations and LUC Boundary

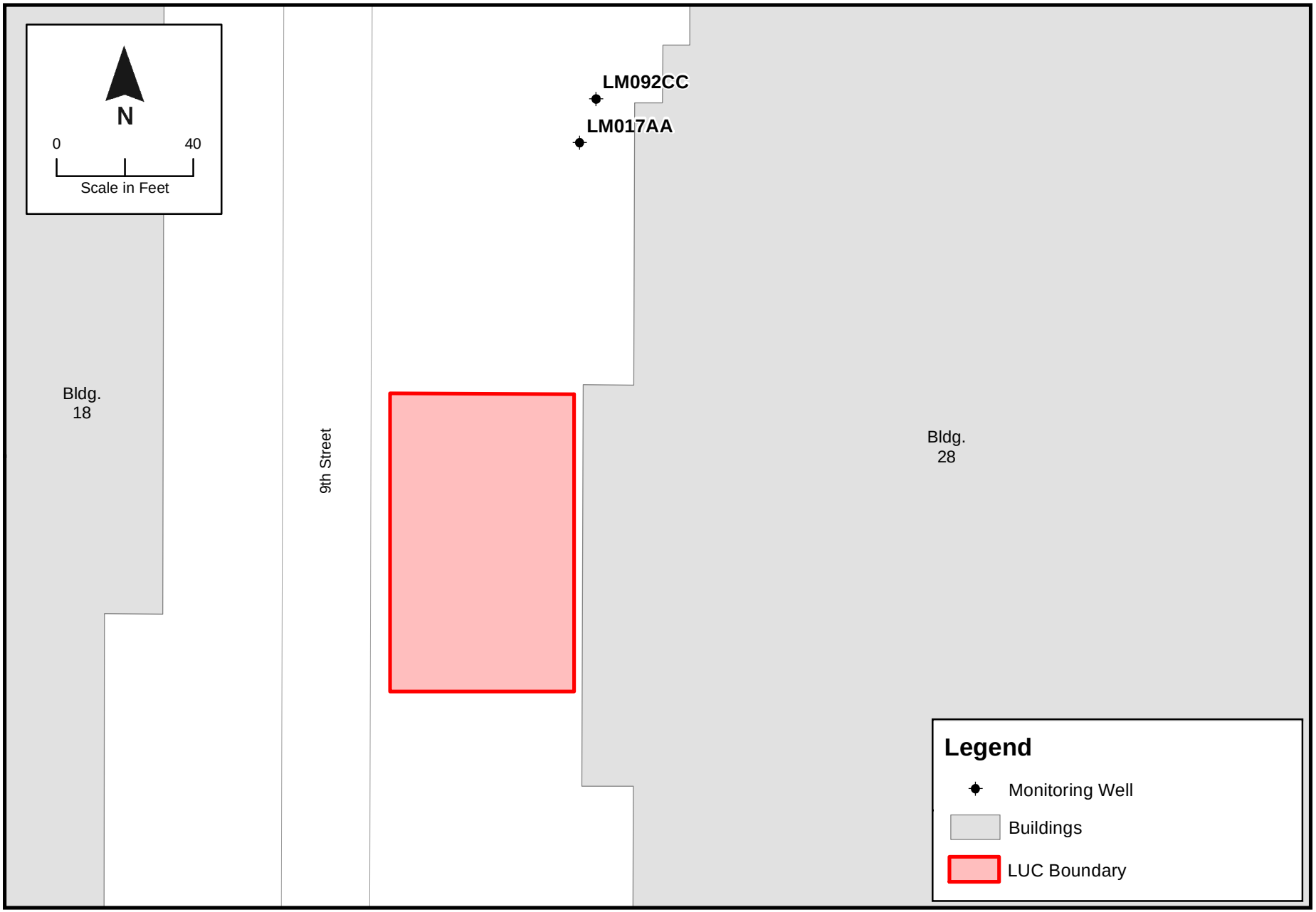
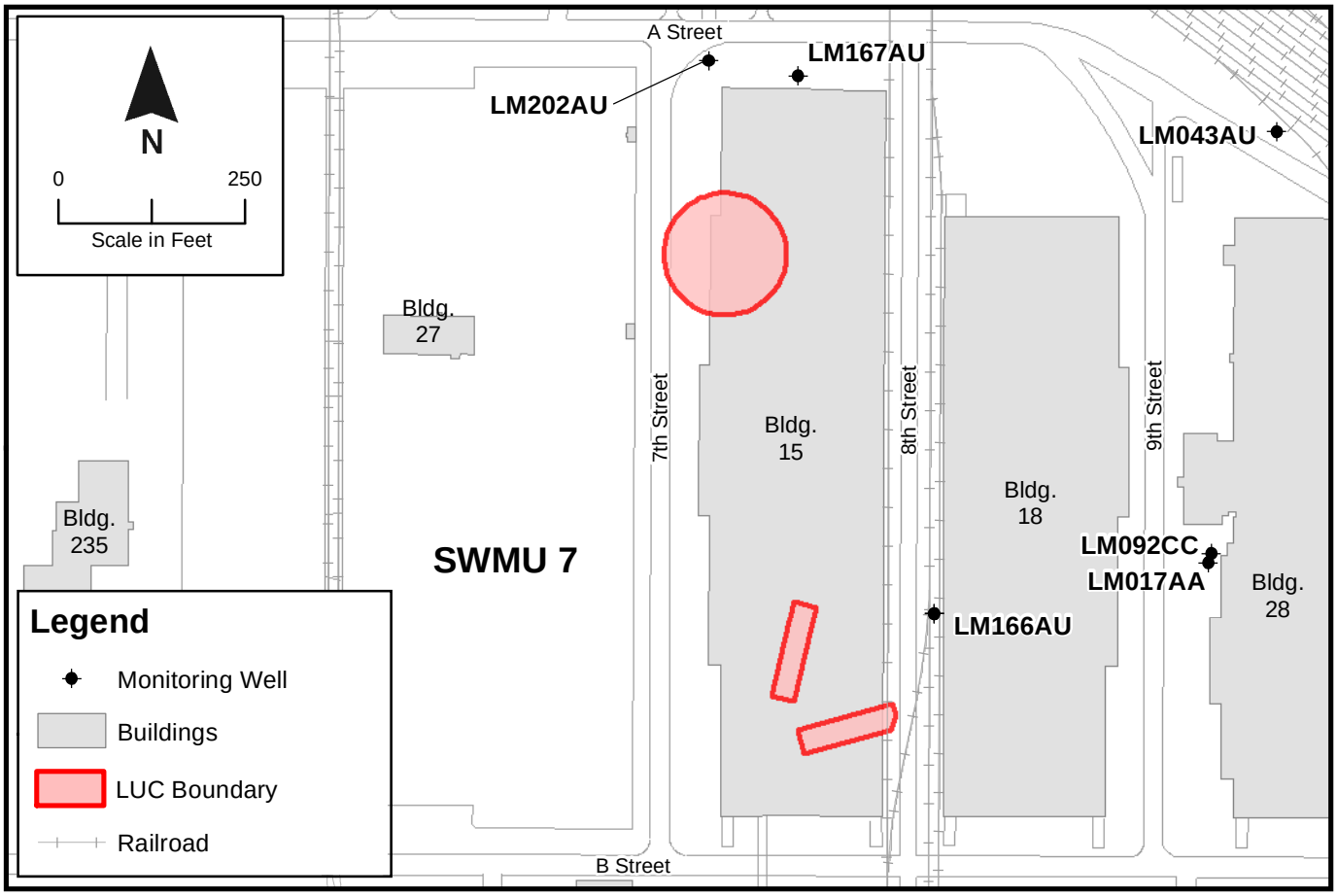


Figure 4.5-1 SWMU 6 Monitoring Well Locations and LUC Boundary



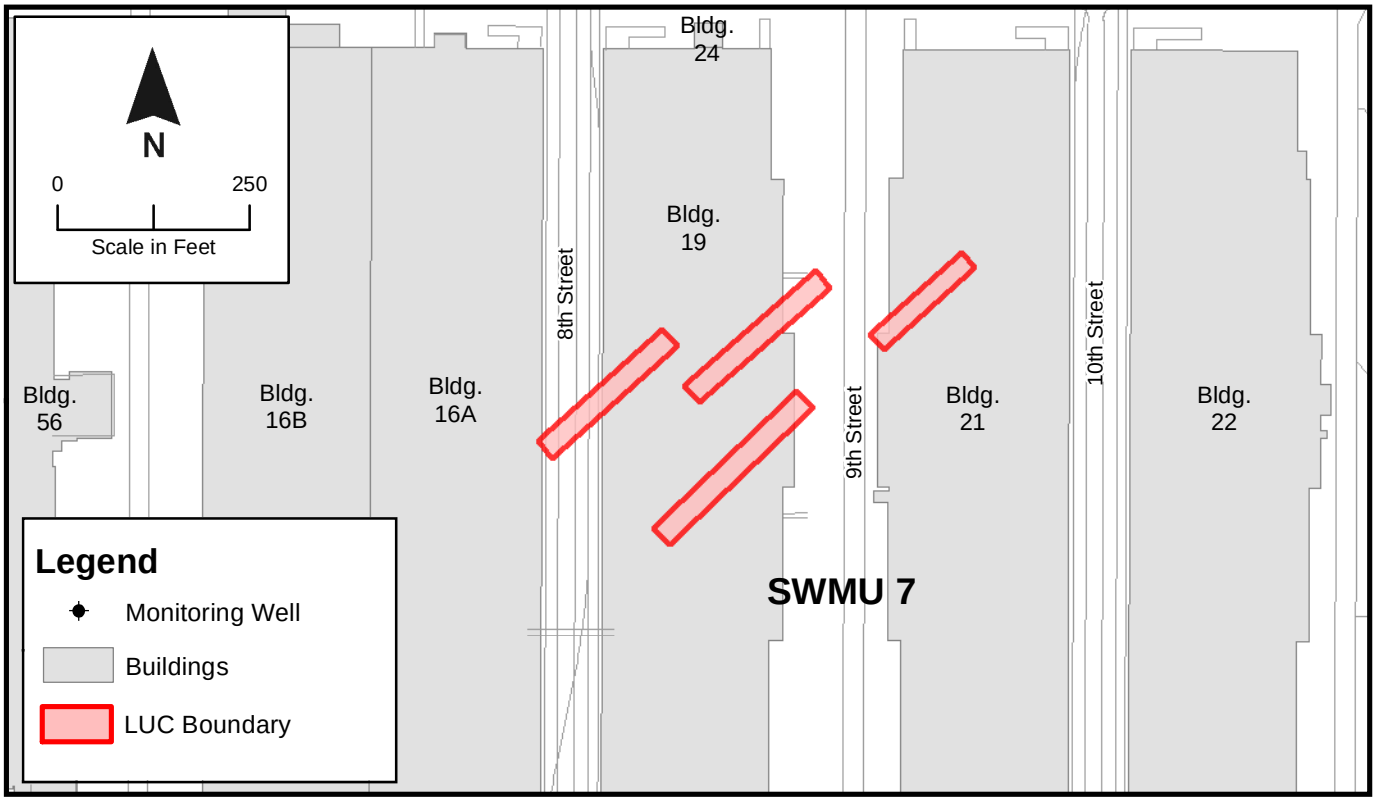


Figure 4.6-1 SWMU 7 Monitoring Well Locations and LUC Boundary

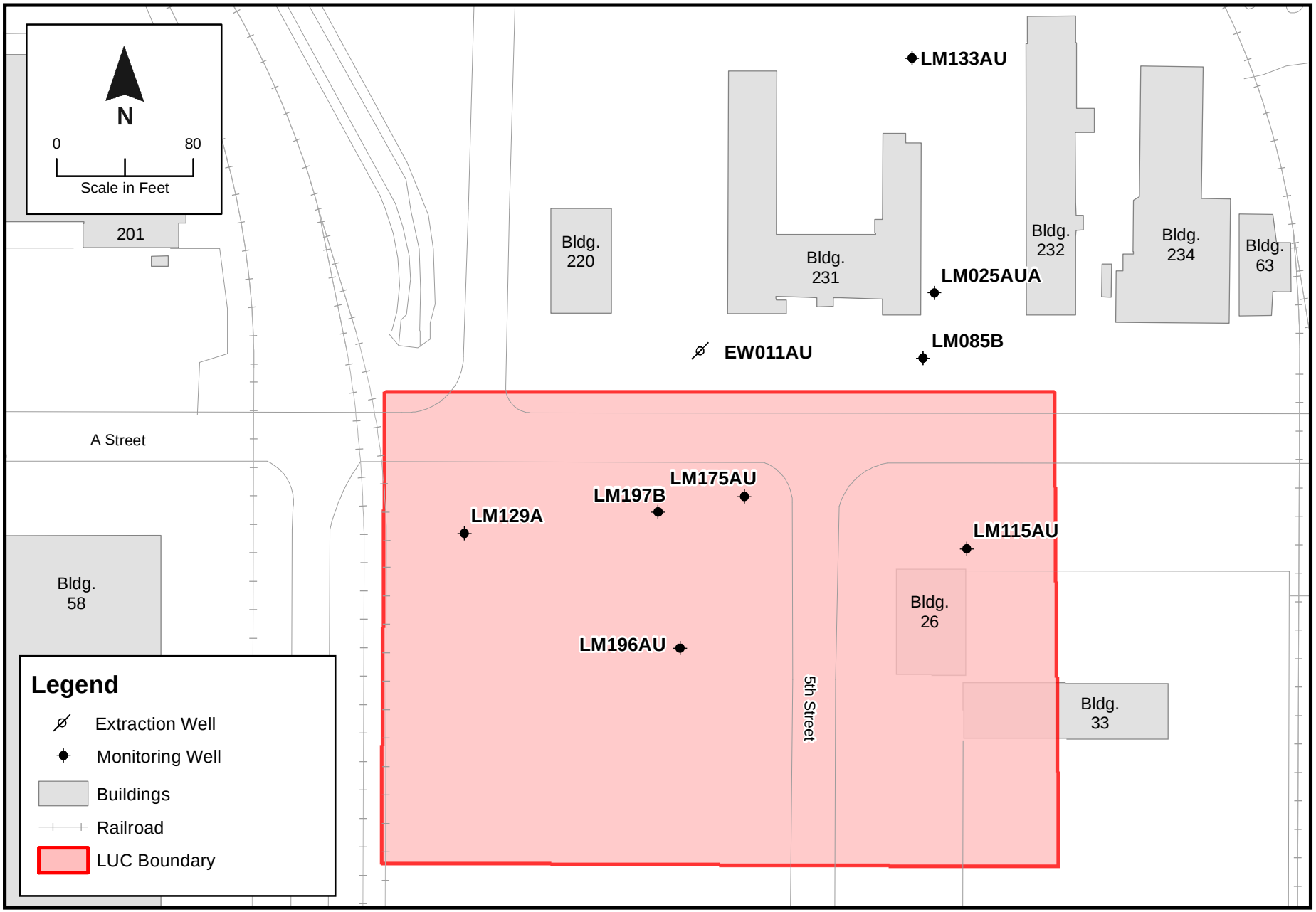


Figure 4.8-1 SWMU 20 Monitoring Well Locations and LUC Boundary

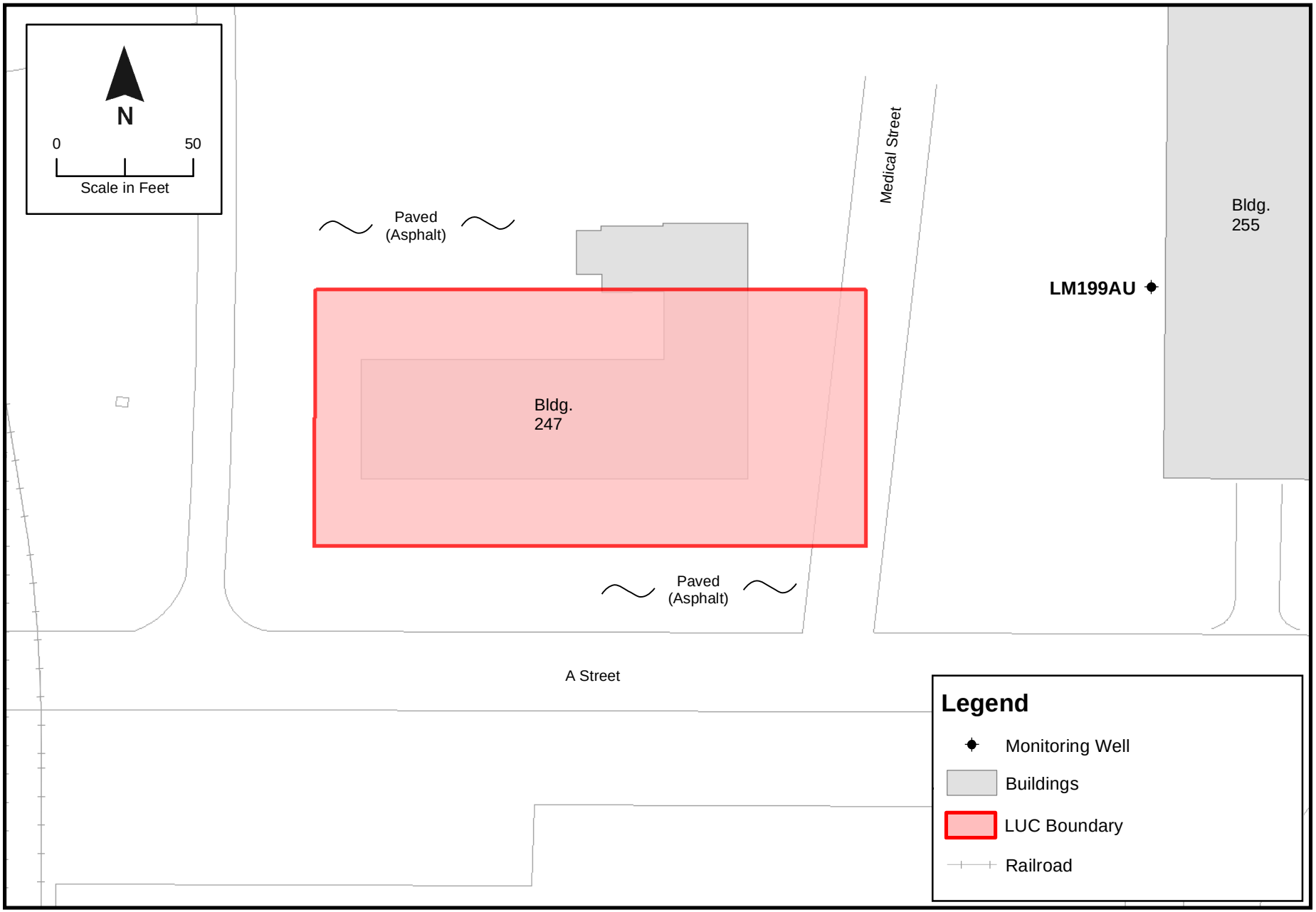


Figure 4.9-1 SWMU 24 Monitoring Well Locations and LUC Boundary

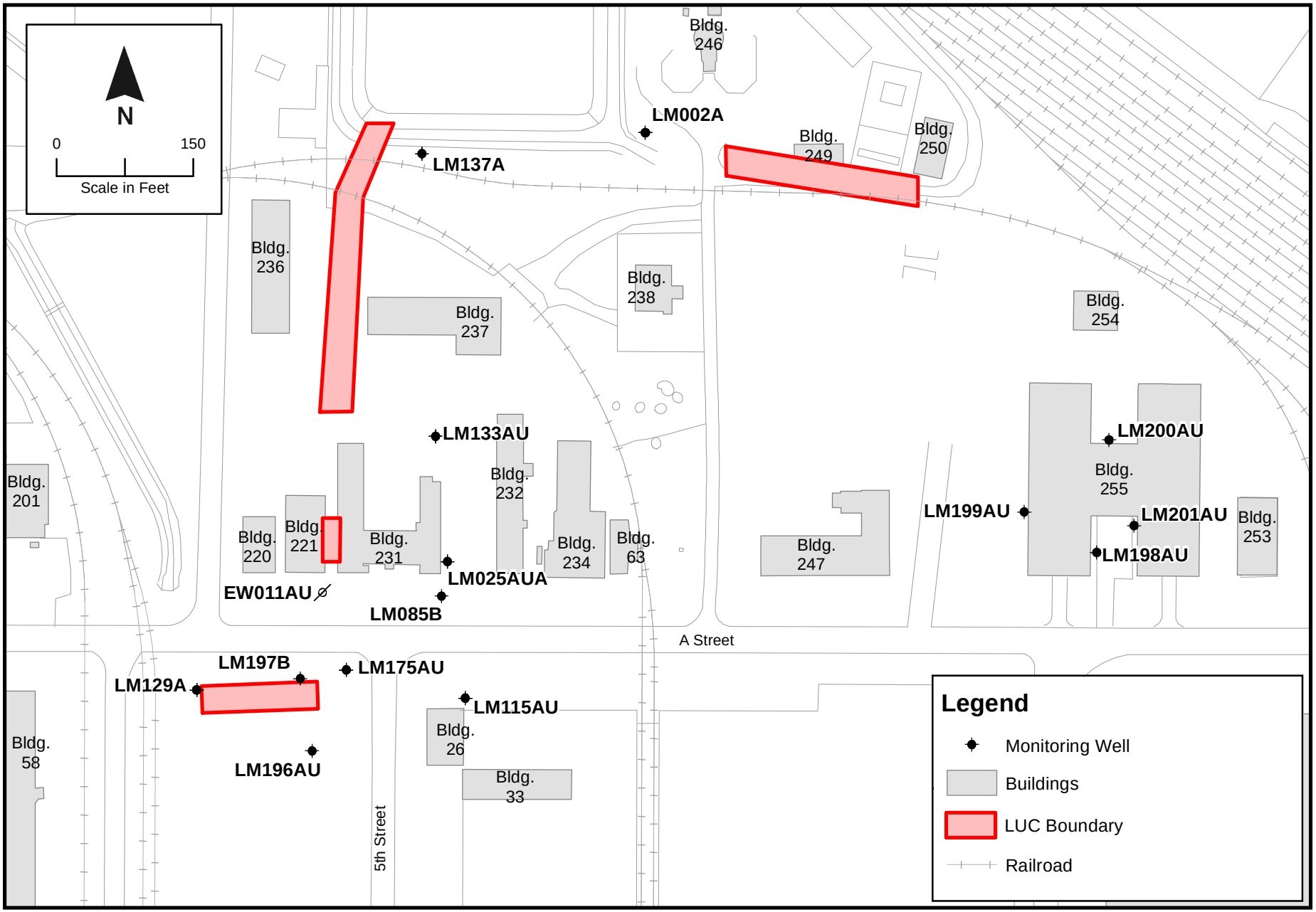


Figure 4.11-1 SWMU 33 Monitoring Well Locations and LUC Boundary

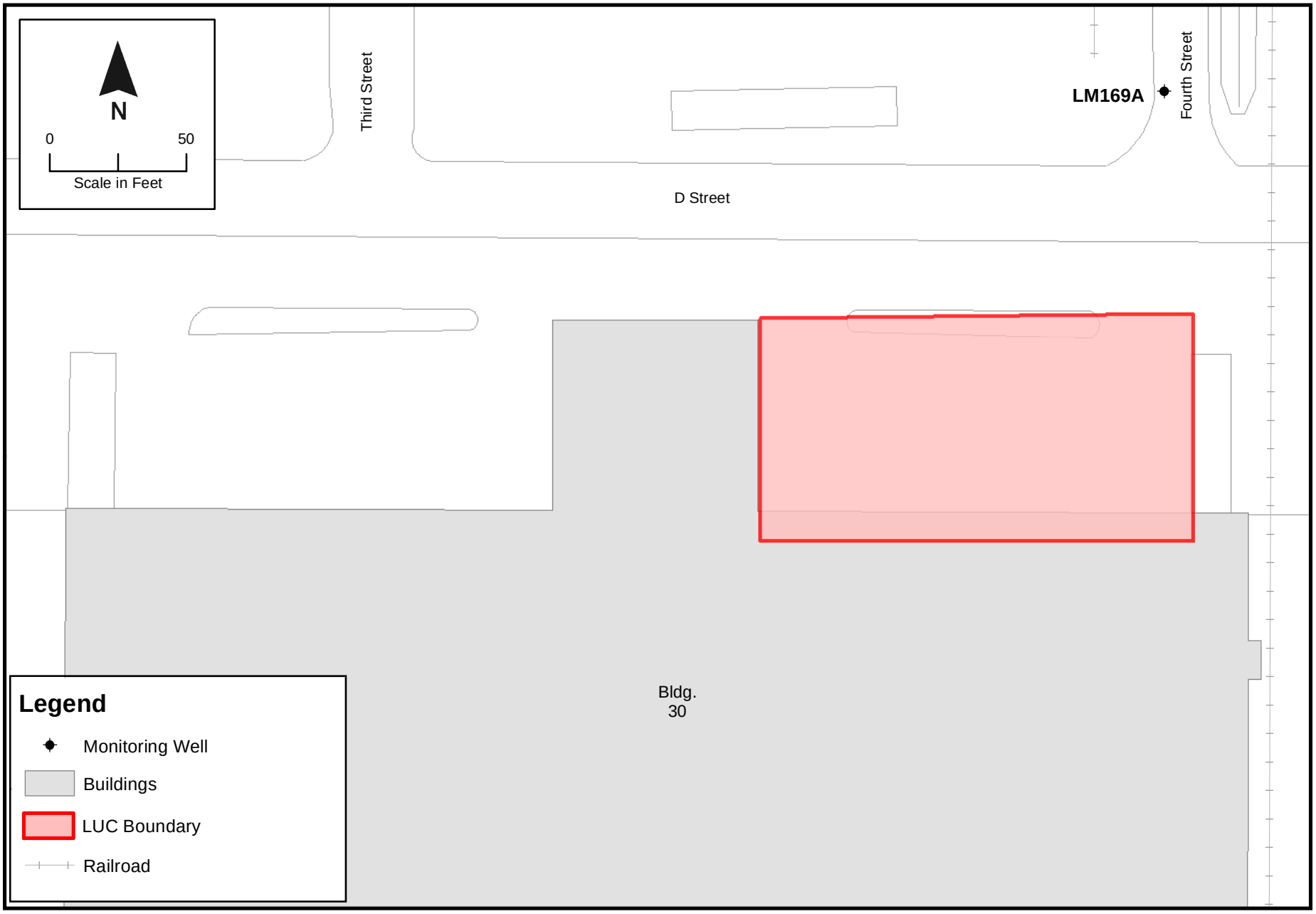


Figure 4.12-1 Building 30 Drum Storage Area Monitoring Well Locations and LUC Boundary

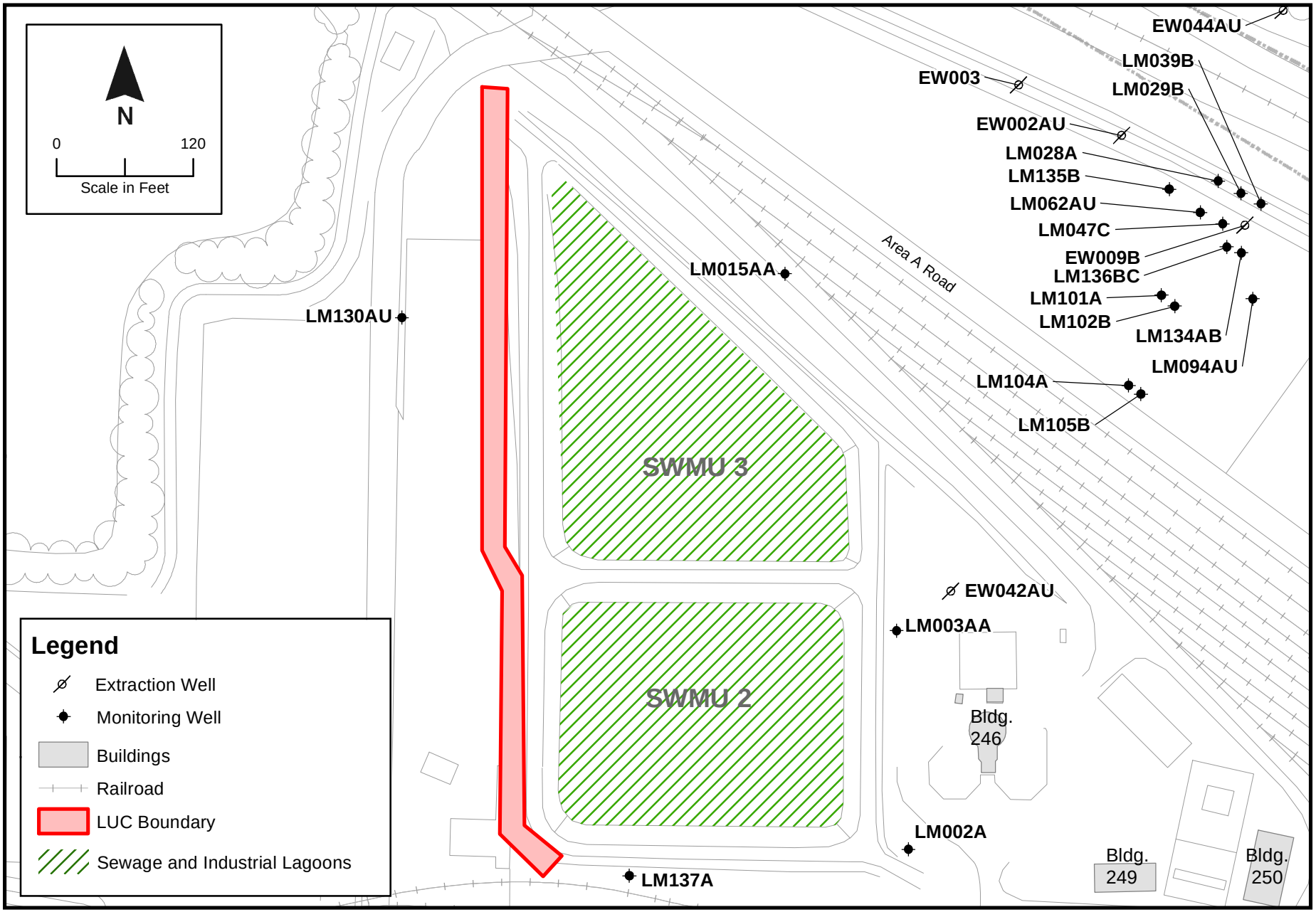


Figure 4.13-1 Site 72 Monitoring Well Locations and LUC Boundary

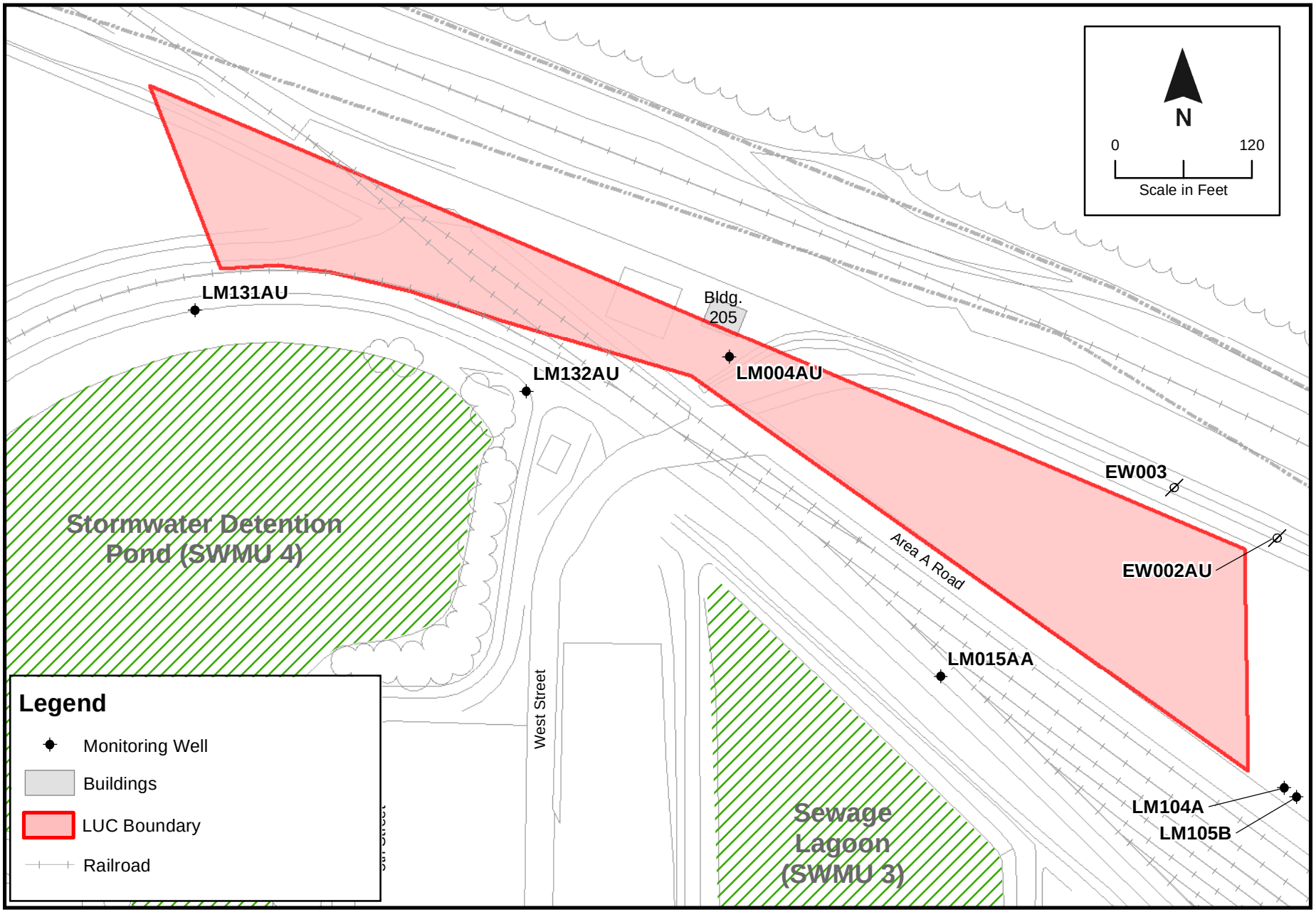


Figure 4.14-1 Northern Depot Soils Area Monitoring Well Locations and LUC Boundary

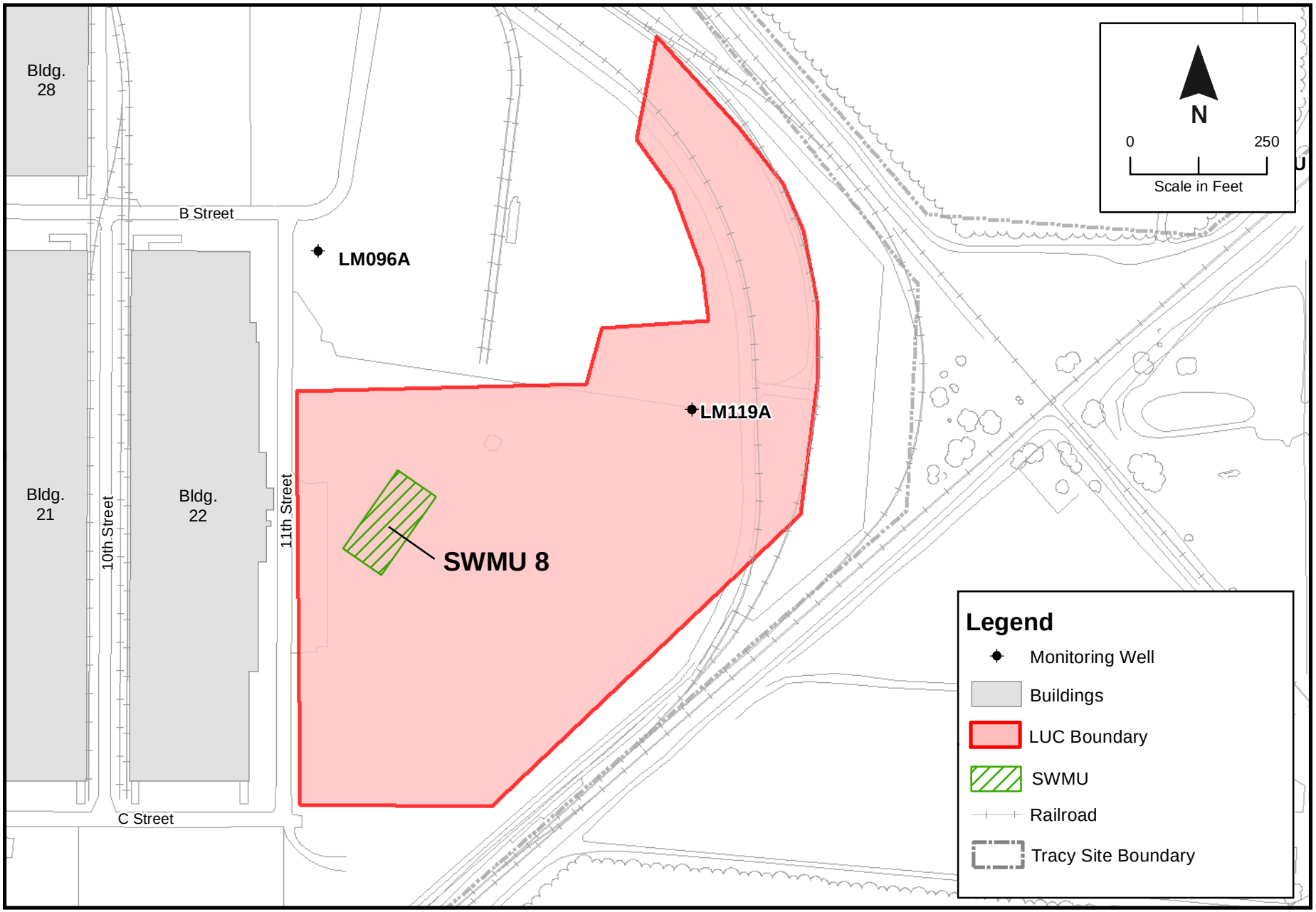


Figure 4.15-1 Eastern Depot Soils Area Monitoring Well Locations and LUC Boundary

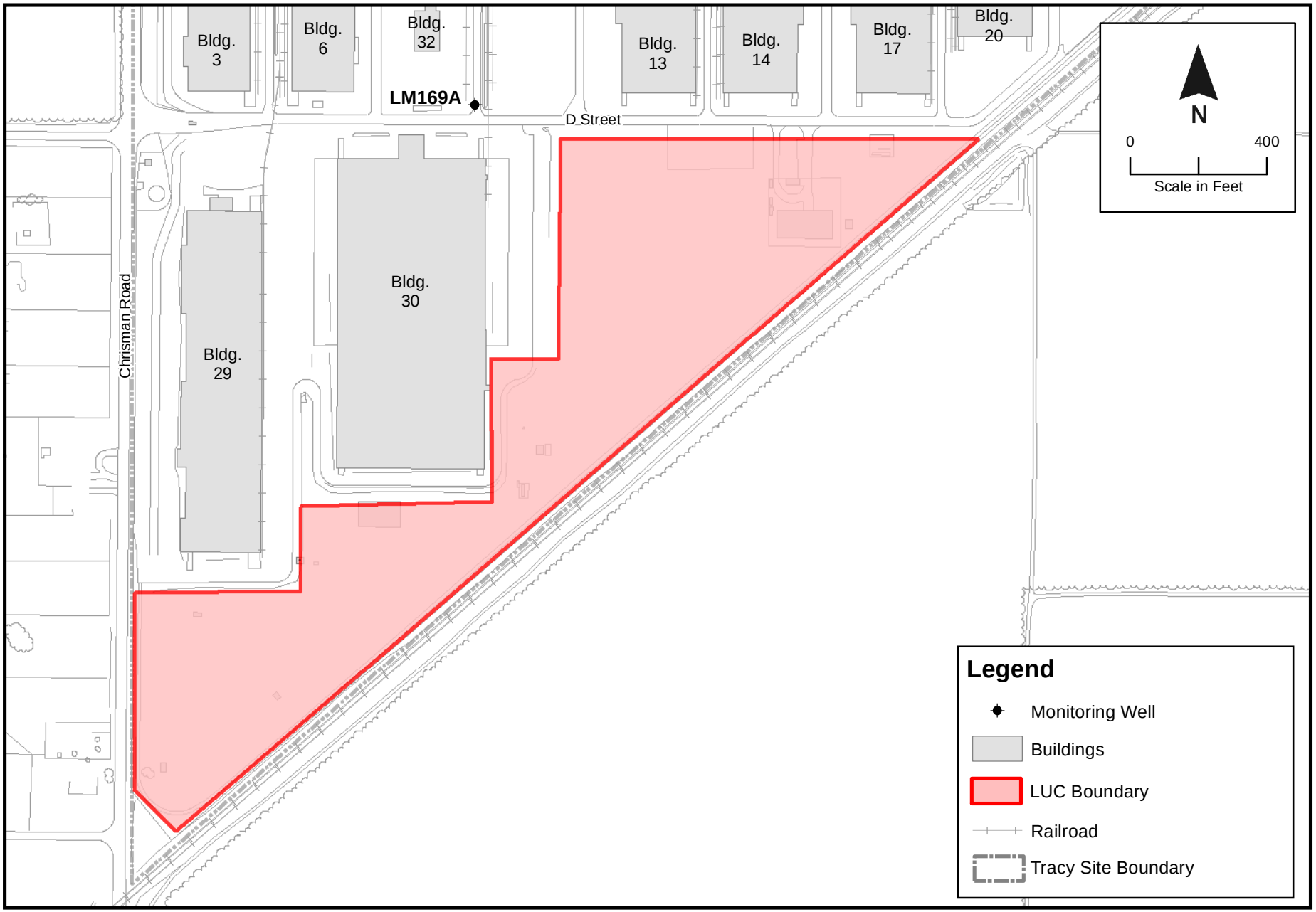


Figure 4.16-1 Southern Depot Soils Area Monitoring Well Locations and LUC Boundary

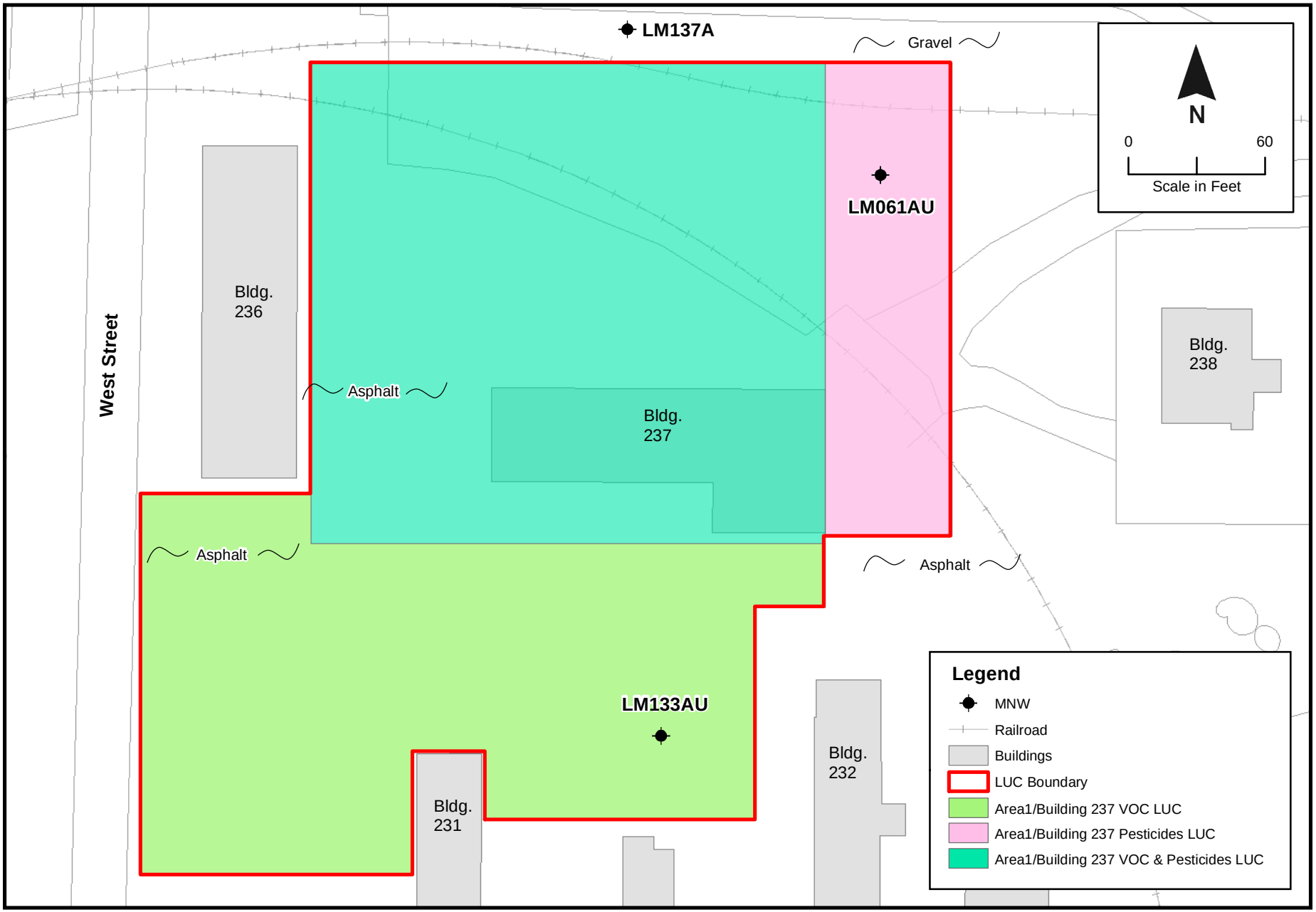


Figure 4.17-1 Area 1 Building 237 Monitoring Well Locations and LUC Boundary

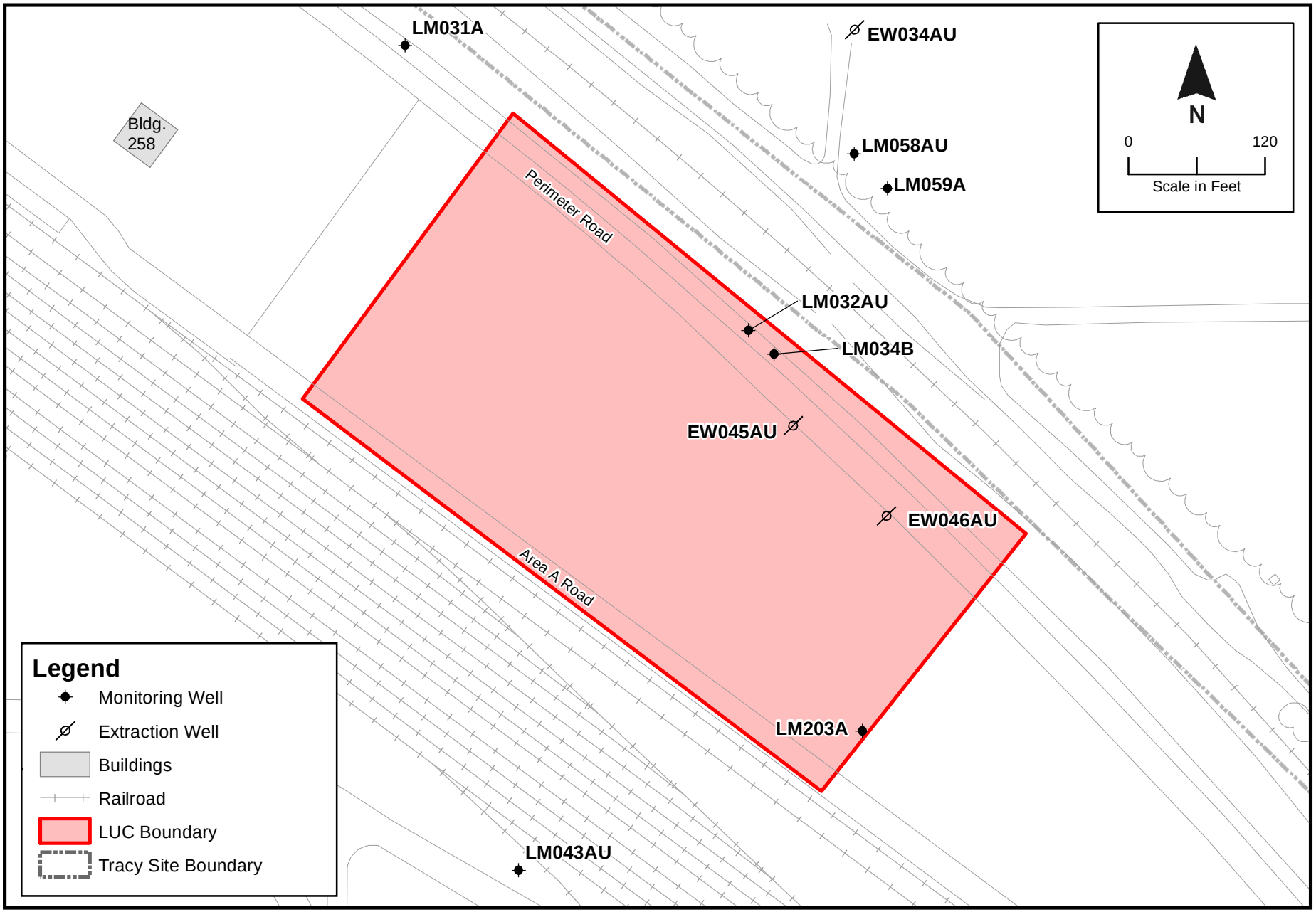


Figure 4.18-1 Area 3 Monitoring Well Locations and LUC Boundary

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This section describes the progress since the Second Five-Year Review, including a description of the protectiveness statements, issues, the status of recommendations and follow-up actions presented in the *Defense Distribution Depot San Joaquin – Tracy Site Second Five-Year Review Report* (URS, 2012).

5.1 Protectiveness Statements from Previous Review

The Second Five-Year Review made the following protectiveness statements:

5.1.1 OU 1 and NWC OU

The remedy for OU 1 is protective of human health and the environment in the short term. Contaminant plumes are present in groundwater. However, exposure pathways that could result in unacceptable risks are being controlled by institutional controls on groundwater beneath federal government property. Groundwater containing TCE has reached a drinking water well that is treated with LGAC and monitored quarterly. To assure long-term protectiveness, monitoring wells that can demonstrate containment by natural attenuation will be installed and included in the groundwater monitoring program. The remedy for the NWC Groundwater OU will address dieldrin-contaminated groundwater that could pose health risks if it was being used.

5.1.2 SVE Sites

Currently, Tracy Site decision documents identify SVE remedies for three sites: Area 1/ Building 237, SWMU 1/Area 2, and Area 3. The remedy at Area 1 Building 237 is protective of human health and the environment in the short term, but long-term protectiveness must be confirmed by evaluation of the vapor intrusion pathway. In addition, investigation of a potential pesticide source area at the site may result in the need to modify the remedy or establish LUCs in that area to protect human health and the environment.

The remedy at SWMU 1/Area 2 is protective of human health and the environment because LUCs are in place and are effective. The remedy at Area 3 is protective of human health and the environment and does not include LUCs.

5.1.3 Soil Sites

Remedies at the following 11 sites are protective of human health and the environment because LUCs are in place and are effective:

- SWMUs 2 and 3
- SWMU 4
- SWMU 6
- SWMU 7
- SWMU 24
- SWMU 33

- Northern Deport Soils Area
- Building 30 Drum Storage Area
- Site 72
- Eastern Depot Soils Area
- Southern Depot Soils Area

The remedies at SWMU 8, SWMU 27, and the Day Care Center are protective of human health and the environment, and LUCs are not required at these sites. The remedy at SWMU 20 is expected to be protective of human health and the environment upon implementation of the SVE remedial action, construction of the asphalt parking lot in 2010, and continued implementation and monitoring of LUCs.

5.2 Issues, Recommendations, and Status

The following issues and recommendations were excerpted from the Second Five-Year Review Report. The status of actions taken during this Third Five-Year Review period to address the issue and recommendation are also documented below.

5.2.1 Major Issues

The following major issues were identified in the draft, draft final, and final versions of the Second Five-Year Review. In most instances, the recommendations presented in the draft and draft final versions of the Second Five-Year Review were addressed prior to submittal of the final version; however, since the actions taken in response to the recommendation were completed during this Third Five-Year Review period, their status is presented below.

5.2.1.1 Banta Road TCE Plume

Issue

In 2010, TCE concentrations in the plume ranged from 5 to 14 µg/L. Most of the Banta Road TCE Plume is now east of Banta Road. The remedy for that portion of the plume is dispersion with metabolism and volatilization processes in accordance with the 1995 ESD. Recent CPT investigation results indicate the plume extends more than 1,500 feet east of Banta Road. There are no monitoring wells to provide data to determine whether the plume is attenuating or migrating toward residential supply wells; therefore, long-term protectiveness of the remedy for the plume east of Banta Road is uncertain.

Status

DLA is currently in discussion with property owners in this area to allow for the installation of monitoring wells and construction of soil borings on private property. It is unknown if/when these property owners will permit DLA to install and sample these wells/borings.

5.2.1.2 NWC OU

Issue and Recommendation

No remedy is currently in place for the NWC Dieldrin Plume (highest concentration 0.25 µg/L); however, a preferred remedy, developed during the dispute resolution process, was agreed upon by DLA, U.S. EPA, and the State of California. The NWC Groundwater OU should be established in a ROD to address the NWC Dieldrin Plume. The remedy consisting of extraction, treatment for dieldrin, and percolation of the treated effluent for three years is expected to be implemented within the next year.

Prepare a proposed plan identifying the preferred remedy (groundwater extraction from four wells, LGAC treatment, and on-site discharge for three years) and establish the NWC Groundwater OU.

After reviewing public comments, prepare a NWC Groundwater OU ROD and implement the selected remedy.

Status

The preferred remedy was documented in a proposed plan that was made available for public comment in October 2010 and presented at a public meeting in November 2010. The NWC Groundwater OU was established in the *Record of Decision, Remedy for Northwestern Corner Groundwater Operable Unit* (URS, 2011), which was finalized in October 2011. On 4 January 2012, the remedy was implemented, and the groundwater extraction wells were started.

5.2.1.3 GWTP 2 O&M Manual

Issue and Recommendation

Three inline LGAC units were installed at dieldrin extraction wells because GWTP1, where dieldrin-contaminated groundwater had been treated, was taken out of service. After groundwater passes through the LGAC units, it is conveyed to and treated at GWTP 2 and then discharged. In addition, an LGAC unit is installed at a residential well on private property east of Banta Road. The O&M manual does not include information on the O&M of the inline LGAC units or the conveyance lines to GWTP 2, nor does it include information on the inline LGAC unit on the off Depot private well.

Update the O&M manual to include information needed for O&M of the inline LGAC units.

Status

On 25 April 2012, the *Addendum to the Groundwater Treatment Plant 2 Operations and Maintenance Manual, Liquid-Phase Granular Activated Carbon Systems Operations and Maintenance, Defense Distribution Depot San Joaquin–Tracy Site* (HDR, 2012b) was submitted.

5.2.1.4 STOP Evaluation

Issue and Recommendation

NFA has been recommended at three SVE sites. The STOP evaluations completed for Area 1 Building 237, SWMU 1/Area 2, and Area 3 and VLEACH modeling results indicate that the functional components of requirements for vadose zone cleanup cited in Section 9.6.5 of the 1998 OU 1 ROD have

been met. Regulatory acceptance of the STOP evaluation through a decision document is necessary to permanently terminate SVE at these sites.

If the signatory parties of the 1998 OU 1 ROD are in agreement, codify the STOP evaluation process for SVE sites at the Tracy Site in an ESD.

Status

The STOP evaluation process for SVE sites was codified for the Site in the *2011 Explanation of Significant Differences to the 1998 Record of Decision* (HDR, 2011a).

5.2.1.5 Vapor Intrusion Pathway

Issue and Recommendation

Inhalation of VOCs in indoor air was not evaluated at Area 1 Building 237 in the BRA. The PCE contamination in soil may extend under the northern side of Building 237. The potential exists for PCE vapors in the soil to migrate vertically into Building 237, which is occupied by employees every work day.

Because PCE contamination in soil may extend under Building 237, notify workers in Building 237 of the potential for vapor intrusion, and evaluate the vapor intrusion pathway.

Status

In March 2011, warning signs were posted on or adjacent to the north and south side entrances to Building 237. In addition, three indoor air samples were collected at Building 237. Chlorinated VOCs were not detected (EA, 2011).

5.2.1.6 Pesticides

Issue and Recommendation

Concentrations of pesticides in excess of the hazardous criteria for disposal were detected in IDW generated from the installation of an SVE well (VE0051) during the remedy enhancement activities completed in June 2009 at Area 1 Building 237. DDT was detected at a concentration of 21,000 µg/kg; DDE was detected at a concentration of 5,700 µg/kg; and gamma-BHC at a concentration of 4,700 µg/kg. Pesticide contamination was confirmed during an October 2009 limited hand auger effort. The current remedy for Area 1 Building 237 is not appropriate for the treatment of pesticides detected in soils.

Delineate the extent of pesticide contamination in soil and groundwater at the Area 1 Building 237 site to determine the appropriate remedy to assure protection of human health and the environment.

Status

In February and April 2011, soil and groundwater sampling was conducted at Area 1 Building 237 to assess the lateral and vertical extent of pesticides in soil and groundwater beneath the site. Pesticides were detected at concentrations greater than residential and industrial RSLs in shallow soil (up to 5 feet bgs) at several locations around and to the north of Building 237. There were no concentrations of pesticides detected greater than industrial or residential RSLs in samples collected from 10 feet bgs or deeper. Using the data collected during the 2011 investigations, a streamlined risk evaluation was

performed, and based on the results, a limited soil removal action sufficient to reduce site risk to industrial use standards was recommended in the *Area 1 Building 237 Engineering Evaluation/Cost Analysis Defense Distribution Depot San Joaquin – Tracy Site* (HDR, 2012d).

In July and August 2012, 480 tons of soil was removed from the area immediately to the north of Building 237. The confirmation sample results indicated that the site specific cleanup goal for 4,4'-DDT was exceeded. As a result, risk modeling was performed and the results again indicated that the site wide ELCR goal was met, however the ELCR was further reduced to 2.0×10^{-5} with a HI of 0.0735. Based on the reduction in risk to the industrial worker and because the objectives of the removal action were met, no additional excavation was warranted (HDR, 2012f).

5.2.2 Minor Issues

The following minor issues were identified in the draft, draft final, and final versions of the Second Five-Year Review. In most instances, the recommendations presented in the draft and draft final versions of the Second Five-Year Review were addressed prior to submittal of the final version; however, since the actions taken in response to the recommendation were completed during this Third Five-Year Review period, their status is presented below.

5.2.2.1 SWMU 20 Plume

Issue and Recommendation

In 2009, the SWMU 20 plume had the highest TCE concentrations (104 µg/L) in groundwater beneath the Tracy Site. Prior to 2009, there was little evidence that TCE concentrations exceeding 100 µg/L were present in groundwater beneath the area. TCE concentrations at two monitoring wells downgradient of SWMU 20 have been less than the ACL since they were installed in 1993 and 2002, respectively. Furthermore, TCE concentrations at EW011AU, an extraction well only 120 feet north of the SWMU 20 plume, have been less than the ACL since 2001. The plume appears to be stable or migrating at a very slow rate, even under the influence of an extraction well. The potential for this plume to migrate cannot be determined with the existing monitoring wells.

Install a monitoring well in the Upper Hydrologic Zone within the footprint of the SWMU 20 plume in the approximate former location of LM193AU and install a downgradient monitoring well in the Middle Hydrologic Zone between the new Upper Hydrologic Zone well and EW011AU, the nearest operating extraction well.

Status

Concentrations at the former LM193AU ranged from 63 to 104 µg/L. Review of LM193AU construction details suggested that this well's filter pack and screen intervals passed through areas of TCE contamination in the vadose zone ranging up to 13,000 ppbv. The potential exists that the dense TCE vapors entered the filter pack and well screen of LM193AU and partitioned with groundwater, thereby contaminating the groundwater samples collected at this former monitoring location. The replacement well, LM196AU is screened at the water table and is seasonally subject to TCE soil gas contamination from the vadose zone. However, LM196AU has a shorter length of well screen exposed for only part of the year as compared to the former monitoring well LM193AU (HDR, 2012g).

The TCE concentration variability in groundwater at these locations can be explained by the well construction. Monitoring of LM196AU (LM193AU replacement well) and LM197B at SWMU 20 occurred during this Third Five-Year Review reporting period. LM196AU had TCE concentrations ranging from 0.44 µg/L to 15.6 µg/L, with an average detected concentration of 3.42 µg/L. Well LM197B has not had a detection for TCE. The consistently low TCE concentrations detected in samples collected from well LM196AU further supports the hypothesis of soil gas contributing to the previous sample results from LM193AU (104 µg/L) (HDR, 2012g).

5.2.2.2 Area 1, DDT Detection

Issue and Recommendation

During SVE remedy enhancement activities at the Area 1 Building 237 site in 2009, DDT, DDE, and lindane were detected in investigation-derived waste at concentrations exceeding levels protective of human health and the environment. Subsequently, groundwater samples were collected at the site (LM192AU), and the highest concentrations were DDT at 0.234 µg/L, DDE at 0.0681 µg/L, and DDD at 0.0711 µg/L. The DDT concentration equals the U.S. EPA RSL for tap water. The extent of these pesticide concentrations in groundwater is not known.

Collect groundwater samples at the time soil samples are collected at the Area 1 Building 237 site to delineate pesticides in soil. Sample monitoring wells upgradient and downgradient from LM192AU for DDT, DDD, and DDE to estimate the extent of a potential pesticide plume; determine whether the plume is migrating, and, if necessary, study the feasibility of remediation.

Status

On 8 February 2011, groundwater samples were collected at LM192AU and LM133AU, which is hydraulically upgradient from LM192AU. A HydroPunch groundwater sample was also collected at a soil boring downgradient from LM192AU. Pesticides were not detected at either well or in the HydroPunch sample (HDR, 2012d). Based on these results, the conclusion stated in the *Area 1 Building 237 Engineering Evaluation/Cost Analysis Defense Distribution Depot San Joaquin – Tracy Site* is that there is no impact to groundwater from the pesticides detected in the soil around Building 237 (HDR, 2012d).

5.2.2.3 Area 3 TCE Plume

Issue and Recommendation

Although the plume is within the capture zone of EW046AU, concentrations of TCE and PCE in groundwater at the extraction well are less than ACLs, which could make it a candidate for shutdown. However, the plume (concentrations: 5 to 25 µg/L TCE and 5 to 5.7 µg/L PCE) would not be in a capture zone if EW046AU was shutdown in a rebound evaluation. If EW046AU is considered for shutdown, monitoring of the Area 3 TCE plume must continue to assure it does not migrate downgradient.

Prior to shutting down EW046AU, reevaluate the TCE groundwater contamination detected in the 2008 HydroPunch investigation beneath Area 3.

Status

Installation of a monitoring well between the Area 3 TCE plume and EW046AU was recommended in the *Well Monitoring Program 2010 Annual Report* (HDR, 2011d).

In January 2013, HDR advanced seven soil borings in the area of the 2008 CPT investigation and collected groundwater samples from these borings. The boring which yielded the greatest PCE concentration was converted to well LM203A (HDR, 2013d). During the most recent monitoring period in December 2013 and August 2014, well LM203A yielded PCE at 15 µg/L and 18 µg/L, respectively.

5.2.2.4 SWMU 8

Issue

The 1998 OU 1 ROD requires installation of two pesticide extraction wells at SWMU 8 because dieldrin, chlordane, DDD, DDE, and DDT had been detected in groundwater downgradient from the site during the RI. However, after the 1998 OU 1 ROD was signed, chlordane, DDE, and DDT were detected only once at concentrations exceeding the site-specific concentrations requiring evaluation, and dieldrin never exceeded the site-specific concentration requiring evaluation. Therefore, a consensus decision among RPMs was reached that the two extraction wells were no longer necessary.

Status

The 2013 MTF provided the following rationale for removing groundwater extraction from the remedy at SWMU 8:

> *During 4Q94, as part of the remedial investigation at SWMU 8, chlordane, 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD), 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE) and 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT) were detected in groundwater samples collected from LM097AU at concentrations of 0.037 µg/L, 0.021 µg/L, 0.008 µg/L, and 0.022 µg/L, respectively (Montgomery Watson, 1996). Maximum concentrations of alpha chlordane (2,660 µg/kg), gamma chlordane (3,370 µg/kg), 4,4'-DDD (51,400 µg/kg), 4,4'-DDE (15,200 µg/kg), and 4,4'-DDT (2,640 µg/kg) were also detected in soil.*
>
> *Based upon these soil results, the 1998 ROD required the installation of one monitoring well for compliance monitoring, two extraction wells, and soil removal with off-site disposal at SWMU 8 (Radian International, 1998). In November 2002, a removal action of approximately 17,000 cubic yards of soil was completed and in February 2003, monitoring well LM178AU was installed (URS, 2004). ROD-required monitoring well locations are shown on Figure 1 and excavation extents are shown on Figure 2. Chlordane was last detected at a concentration greater than the ACL (0.1 µg/L) during 1Q07 in the sample collected from well LM168AU.*
>
> *4,4'-DDD has not been detected at concentrations greater than the reporting limit since 4Q94. 4,4'-DDE and 4,4'-DDT have not been detected at concentrations greater than the reporting limit since 3Q00. Also well LM114A, which is not a ROD-required monitoring well. However, it was sampled for pesticides quarterly during 1996. Concentrations in this well did not exceed the ACLs for pesticides. Lastly, the Second Five-Year Review (URS, 2012) recommends removing groundwater extraction as part of the remedy for SWMU 8.*

5.2.2.5 OU 1 DCE

Issue

An ACL of 6.0 µg/L was established for 1,1-DCE in the OU 1 ROD and that ACL was maintained in the 1998 OU 1 ROD. Concentrations of 1,1-DCE have not exceeded the ACL in samples collected at the

Tracy Site since 1997, and 1,1-DCE has not been detected in groundwater samples from the site since 3Q04. These results indicate that 1,1-DCE is no longer a COC for groundwater at the Site.

Status

The 2013 MTF provided the following rationale for removing 1,1-DCE as a groundwater COC:

> *In the 1993 ROD, an ACL of 6 micrograms per liter (µg/L) was established for 1,1,-DCE (Woodward Clyde, 1993) and was maintained in the 1998 ROD (Radian International, 1998a). The maximum historical concentration of 1,1,-DCE was 37 µg/L in LM093AU during 1Q95. Concentrations of 1,1-DCE have not exceeded the ACL of 6 µg/L in any groundwater sample collected from the Tracy Site in 17 years (2Q95:9.2 µg/L in LM093AU). 1,1-DCE was last detected three years ago at an estimated concentration of 0.884 µg/L in LM193AU (2Q09). Since 2Q09, 469 groundwater samples have been collected and analyzed with no detections greater than the method detection limit (MDL) for 1,1-DCE.*
>
> *Under anaerobic conditions in groundwater, 1,1-DCE may be produced by biodegradation of trichloroethene (TCE) (Wiedemeir et al, 1998). The absence of 1,1,-DCE detections and aerobic conditions in groundwater indicate that 1,1-DCE is unlikely to be generated by biodegradation at the Tracy Site (HDR | e2M, 2010a). These results further support removal of 1,1-DCE as a COC for groundwater at the Tracy Site. In addition, the Second Five-Year Review Report (URS Group, Inc. [URS], 2012) recommends removing 1,1-DCE from the list of groundwater COCs at the Tracy Site.*

5.2.2.6 Natural Attenuation

Issue

The declining VOC concentrations in several portions of the OU 1 plume may be due not only to extraction of VOCs by the pump-and-treat remedy but also to natural attenuation processes, including adsorption, dispersion, and volatilization. The potential exists that the TCE and PCE plumes will continue to be reduced in size without extraction. Groundwater modeling results indicate that groundwater concentrations in most plumes (excluding the SWMU 20 plume) would decrease to less than ACLs within 12 years with no extraction. Evidence for natural attenuation through biodegradation or reductive dechlorination processes was evaluated; geochemical data supporting those processes were not found.

Status

DLA will continue to evaluate natural attenuation of the VOC plume in annual monitoring reports.

5.2.2.7 ROD Monitoring Requirements

Issue and Recommendation

The monitoring required is incomplete for TCE at LM056C, LM067B, LM151B, LM156A, and LM157A and for dieldrin at LM028A and LM094AU because detections of those contaminants exceeded the groundwater concentrations requiring evaluation specified in the 1998 OU 1 ROD. Monitoring of these wells will continue until requirements are met.

Continue monitoring groundwater at LM056C, LM067B, LM151B, LM156A, and LM157A for TCE and LM028A and LM094AU for dieldrin until ROD monitoring requirements are met.

Status

Through the Third Five-Year Review Period LM056C, LM067B, LM151B, LM156A, and LM157A (TCE) and LM028A (dieldrin) have not yet met 1998 OU 1 ROD monitoring requirements and continue to be monitored. LM094AU met the ROD monitoring requirement for dieldrin in 2010, and sampling was discontinued at this well starting in 2011 (HDR, 2011a).

5.2.2.8 Land Use Controls

Issue and Recommendation

During the Second Five-Year Review site inspection, it was determined that LUC warning signs were not present at SWMU 1/Area 2.

Status

LUC warning signs have been installed at SWMU 1/Area 2 which are inspected at least annually. The location of the signs and a description of the LUCs are presented in the *Land Use Control Inspection* (HDR, 2013f).

5.2.2.9 ROD Monitoring Requirements

Issue and Recommendation

The required monitoring is incomplete for PCE at LM030AUA and LM137A; TCE at LM041B; and PCE and TCE at LM032AU LM094AU because detections of those contaminants exceeded the groundwater concentrations requiring evaluation specified in the 1998 OU 1 ROD. Monitoring of these wells will continue until requirements are met.

Continue monitoring groundwater at LM030AUA and LM137A for PCE; LM041B for TCE; and LM032AU for PCE and TCE until ROD monitoring requirements are met.

Status

Through the 2014 monitoring period, LM030AUA (PCE) and LM041B (TCE) have not yet met 1998 OU 1 ROD monitoring requirements and will continue to be monitored (HDR, 2012g). LM137A met the 1998 OU 1 ROD monitoring requirement for PCE in 2011 but will continue to be monitored as a guard well (HDR, 2012g). For LM032AU, the 1998 OU 1 ROD monitoring requirement for PCE has been met but not for TCE, therefore, the well will continue to be monitored (HDR, 2012g).

LM030AUA is screened from 10 to 20 ft bgs, with an average of 7 ft of screen exposed through the vadose zone. The exposed screen would allow soil gas to migrate into the well and filter pack and have direct contact with the groundwater. Well LM149A located approximately 15 feet to the northwest of well LM030AUA, is screened from 25 to 35 feet bgs, provides a better representation of PCE impacts in groundwater, and has not yielded TCE or PCE above the ACL since 4Q94 (HDR, 2014b).

5.2.2.10 SWMU 20

Issue and Recommendation

Soil at SWMU 20 was not covered at the time of the site inspection. Temporary fencing has been erected around the site, preventing unauthorized access to the exposed soil. TCE was detected at concentrations above the soil vapor cleanup standard in the vadose zone beneath the former location of Building 10. SVE was deleted from the SWMU 20 remedy in the 2004 ESD.

An asphalt parking lot that will cover SWMU 20 is planned for construction in 2010. Add SVE as the remedy for SWMU 20 in an ESD, and implement SVE at SWMU 20. At the completion of the SVE remedial action, evaluate whether LUCs are needed.

Status

An asphalt parking lot was constructed in the area of SWMU 20 in late 2010. SVE was added to the SWMU 20 remedy in the *2011 Explanation of Significant Differences to the 1998 Record of Decision, Defense Distribution Depot San Joaquin – Tracy Site* (HDR, 2011a). The SVE system was installed between June and October 2011, and operations began on 24 October 2011 (HDR, 2012g).

5.2.2.11 Land Use Controls

Issue and Recommendation

LUC warning signs are installed or need repair/replacement at sites SWMUs 2/SWMU 3, SWMU 4, SWMU 6, SWMU 20, SWMU 24, SWMU 33, Site 72, Eastern, and Southern Depot Soils Areas. The western portion of the Northern Depot Soils Area is no longer covered with grass to prevent erosion and dust generation, as required by the 2004 ESD

Install LUC warning signs where needed and replace sign for SWMU 33 at Building 10.

Re-cover bare portion of the Northern Depot Soils Area (with grass, gravel, asphalt, etc.) to minimize dust generation and potential exposure to airborne dust.

Status

LUC warning signs have been installed at SWMUs 2 and 3, SWMU 4, SWMU 6, SWMU 20, SWMU 24, SWMU 33, Site 72, Eastern, and Southern Depot Soils Areas. The location and pictures of the LUCs is presented in *Land Use Control Inspection* (HDR, 2013f).

In January 2013, a deficiency with the aggregate cover at the Northern Depot Soils Area was corrected. Gravel was spread across the bare portion of Northern Depot Soils Area (HDR, 2014d).

5.2.2.12 Required Monitoring

Issue, Recommendation, and Status

Monitoring is required in the 1998 OU 1 ROD at the following sites. The status of attainment of the monitoring requirements is presented below:

- **SWMUs 2 and 3 - dieldrin at LM003AA.** Through the 2014 monitoring period, LM003AA has not yet met the ROD monitoring requirement for dieldrin and will continue to be monitored (Appendix B).

- **SWMU 4 - 2,4-D at LM027AUA.** LM027AUA met the ROD monitoring requirement for 2,4-D in 2011, and sampling was discontinued at this well in 2012 (Appendix B).

- **SWMU 6 - PCE at LM017AA.** LM017AA met the ROD monitoring requirement for PCE in 2010, and sampling was discontinued at this well in 2011 (Appendix B).

- **SWMU 8 - TPHD at LM119A or chlordane, 2,4-D, and MCPA at LM168AU.** LM119A and LM169AU met the 1998 OU 1 ROD monitoring requirements in 2011, and sampling was discontinued in 2012 (Appendix B).

- **SWMU 20 - TCE, PCE, diethylphthalate, 2,4-dinitrophenol, PCP, 2,4,6-trichlorophenol, methiocarb, and linuron at LM175AU and PCE at LM115AU.** Through the 2014 monitoring period, LM175AU has not yet met 1998 OU 1 ROD monitoring requirements and will continue to be monitored for three years after remedial action has been completed at SWMU 20 (HDR, 2014b). LM115AU met the 1998 OU 1 ROD monitoring requirement for PCE in 2010 but will continue to be monitored as a guard well for SWMU 20 (Appendix B).

- **SWMU 27 - TPHMO at LM117A.** Well LM117A met the 1998 OU 1 ROD monitoring requirements in 3Q14 this well will no longer be sampled (HDR, 2014b).

5.2.2.13 Detection Limits

Issue and Recommendation

SWMU 4 - The detection limits for the method used by the laboratory to analyze storm water samples for DDT and dieldrin are greater than the storm water discharge standards required by the 1998 OU 1 ROD.

Use U.S. EPA Method 8081A to achieve lower detection limits for discharge samples.

Status

Detection limits for DDT and dieldrin were lowered starting in 2012 without changing the analytical method (U.S. EPA Method 608) being used.

5.2.2.14 Residual Contamination

Issue and Recommendation

SWMU 24 - Residual contaminant concentrations nearby and below Building 247 have not been reduced to the 1998 OU 1 ROD cleanup standards.

Consider remediation with SVE, bioventing, or soil excavation and removal if Building 247 is demolished, though there are no plans for the demolition of the building at this time.

Status

Wells LM116A and LM118AU met the 1998 OU 1 ROD monitoring requirements in 2003 these wells were subsequently decommissioned (Appendix B); therefore, contaminants are not impacting groundwater. LUCs are in place at SWMU 20 to mitigate impacts to human health.

5.3 Additional Actions since Second Five-Year Review

5.3.1 Area 3 Groundwater Remedy Optimization

In 2008, PCE and TCE were detected in groundwater samples collected from soil borings at concentrations greater than the ACLs. In January 2013, seven soil borings were advanced at Area 3 and groundwater samples were collected to laterally delineate these TCE and PCE ACL exceedances. The January 2013 investigation delineated the lateral extent of TCE and PCE in groundwater and as a result, a groundwater monitoring well (LM203A) was installed to provide a future monitoring location. The results of this investigation are documented in the *Area 3 Groundwater Remedy Optimization Report* (HDR, 2013d).

5.3.2 GWTP Modifications

Due to the observed decrease in GWTP flow as extraction wells are shutdown, continued use of air stripping as the primary treatment method is inefficient. The 2014 MTF modified the remedy in the 1998 OU 1 ROD from groundwater extraction and treatment via airstripping to groundwater extraction and treatment via air stripping and/or GAC. On 23 January 2015, DLA submitted the *Work Plan for Treatment System Conversion at Groundwater Treatment Plant 2* which presents methods to modify GWTP 2 to allow for the treatment via GAC. In March 2015, upgrades to the GWTP were made and documentation of these improvements were presented in the 2015 Annual Report.

5.3.3 Removal of 1,1-DCE as a Groundwater COC

Concentrations of 1,1-DCE have not exceeded the ACL of 6 µg/L in groundwater sample collected from the Tracy Site in 17 years. The absence of 1,1,-DCE detections and aerobic conditions in groundwater indicate that 1,1-DCE is unlikely to be generated by biodegradation at the Tracy Site (HDR | e2M, 2010a); therefore, the 2013 MTF removed 1,1-DCE as a groundwater COC from the OU 1 ROD (HDR, 2013a).

5.3.4 Well Decommissioning

In 2013, 4 groundwater extraction and 22 groundwater monitoring wells were decommissioned (HDR, 2013g). In 2014, six groundwater extraction and 28 groundwater monitoring wells were decommissioned (HDR, 2014b).

5.3.5 NWC Remedy Installation and Startup

In 2011, DLA began installation of the NWC OU remedy. The objective of the remedy is to remove dieldrin from groundwater beneath the NWC OU to the extent technically and economically feasible. Four extraction wells were installed, connected to two LGAC treatment systems, and integrated into GWTP 2. Treated water is discharged to IGs. The NWC OU remedy design in documented in the *Northwestern Corner Remedial Design / Remedial Action Work Plan* (HDR, 2011b). The NWC OU remedy operations were initiated in January 2012.

5.3.6 Area 1 Building 237

The results of the hand auger sampling, presented in the *Final Area 1/Building 237 Remedial Investigation Work Plan* (HDR, 2011e), confirmed the presence of pesticides, specifically DDT, DDD, DDE and dieldrin in soils at concentrations greater than the U.S. EPA residential Preliminary Remediation Goals immediately north of Building 237.

In the spring of 2011, DLA evaluated the potential human health concerns associated with vapor intrusion to indoor air. In March 2011, two indoor air samples from Buildings 237 and one sample from the exterior of Building 237 were collected.

The results of this air sampling indicate that chlorinated solvents were not detected above laboratory RLs. However the laboratory analysis did detect VOCs associated with gasoline. Because Building 237 is used for facility maintenance, the detected VOCs were likely from the gasoline powered machinery stored inside of the building. Adjacent Building 220 (an above ground water storage tank) and Building 236 (an open air structure used to store equipment) were not evaluated because they are unoccupied structures. The results of this sampling event were reported by DLA (EA, 2011).

On 10 January 2012, HDR submitted the *Final Area / Building 237 Engineering Evaluation/Cost Analysis* which presented an evaluation and recommendation of removal action alternatives to address pesticide-impacted soils at Area 1 Building 237. The alternatives evaluated included a limited soil removal, a soil removal to less than risk-based industrial levels, and a soil removal to less than risk-based residential levels. Based on this analysis, soil removal to less than risk-based industrial levels was selected as the preferred remedial alternative.

On 12 May 2012, HDR submitted the *Final Area 1/Building 237 Action Memorandum/Removal Action Work Plan* which presented the proposed removal action activities including site preparation, mobilization of personnel, equipment, and supplies, excavation, backfill, and post-excavation site restoration activities. During July and August 2012, the removal action at Area 1 Building 237 was performed. These activities included a pre-excavation survey, well decommissioning, soil excavation, confirmation soil sampling, over excavation followed by additional confirmation sampling, backfilling, compaction, site restoration, and demobilization. The following wells were decommissioned as part of the excavation activities: VE0005, VE0048, VE0051, VE0052, VM0008, and LM192AU. These activities are documented in the 4 October 2012 *Final Area 1/Building 237 Removal Action Report.*

5.3.7 Building 231 Indoor Air Quality Assessment

On 26 May 2011, HDR performed an assessment of the indoor air quality in Building 231. The purpose of this assessment was to evaluate whether chemicals present in the subsurface pose a health risk to occupants of Building 231 from vapor intrusion. The indoor air quality assessment included collection of three indoor air samples, one ambient outdoor air sample, and collection of soil vapor samples. The results of this sampling event were reported in the 2011 ESD (HDR, 2011a).

Laboratory analysis of indoor air samples indicated the presence of TCE, PCE, 1,1,1- trichloroethane, and 1,2-DCA at concentrations less than the U.S. EPA Region 9 indoor air RSLs for industrial/commercial land use areas.

5.3.8 Areas 1, 2, and 3 Soil Gas Optimization

In May and June 2013, 88 soil gas samples were collected from existing monitoring wells and soil borings advanced at Area 1, Area 2, and Area 3. The results from this investigation concluded that a

vapor intrusion risk is present at Area 1, Area 2, and Area 3; however the risk is mitigated with LUCs which require the implementation of mitigation measures for future buildings constructed in these areas. It was also concluded that TCE and PCE are present in soil gas at sufficient concentrations to present an unacceptable risk to groundwater at Area 3. The results from this investigation are documented in the *Areas 1, 2, and 3 Soil Gas Optimization Report* (HDR, 2013c).

5.3.9 SWMU 20 Soil Vapor Extraction

In the summer of 2011, DLA began installation of the SWMU 20 SVE system. This remedy is intended to address VOC impacts to the vadose zone at the location of former SWMU 20. The remedy consists of 9 soil vapor extraction wells and 5 multi-completion vapor monitoring points. The extracted soil vapor is treated by GAC prior to discharge to atmosphere. The SWMU 20 SVE system design is documented in the report titled: *SWMU 20 Soil Vapor Extraction Remedial Design / Remedial Action Work Plan Defense Distribution Depot San Joaquin, Tracy Site* (HDR, 2010). The SWMU 20 SVE system became operational in October 2011.

5.3.10 Northern Depot Soils Area Ground Cover LUC Compliance

The Northern Depot Soils Area LUC consists of ground cover to reduce the potential of wind blown migration of metals contaminated soil. It was determined in the *Tracy Site Second Five-Year Review Report* (URS, 2012) that the ground cover was insufficient to comply with the LUC requirements in the triangular area located in the western portion of the northern Depot Soils Area. On 4 January 2013, 3-inches of ¾-inch crushed gravel was placed over an area of approximately 8,700 square feet, adequately covering the area identified as having insufficient ground cover.

6.0 FIVE-YEAR REVIEW PROCESS

This section describes activities performed during the Third 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.

6.1 Administrative Components

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

- Maurice Benson, DLA Installation Support at San Joaquin, Environmental Services Branch
- John Lucey, U.S. EPA (Region 9)
- Christopher Sherman, DTSC
- Marcus Pierce, RWQCB (Central Valley Region)

Members of the review team were notified of the initiation of the Third Five-Year Review for the Tracy Site during the April 2014 RPM quarterly meeting. The schedule for this Third Five-Year Review is presented in Table 6.1-1.

6.2 Community Involvement and Notification

DLA Installation Support at San Joaquin, Environmental Services Branch, has maintained an active community involvement program since the 1980s. Key components of this program include:

- Providing general information updates to the community through the distribution of the Tracy Site's *Environmental Update* fact sheets to a community mailing list that includes interested parties (approximately 200 addresses) and mailing addresses within the postal zones surrounding the Depot (more than 3,000 addresses).
- Notifying the community of program milestones and providing opportunities for public review and comment through public notices placed in local newspapers, as required by U.S. EPA guidance.
- Holding public meetings to present milestone documents and solicit public review and comment, as required by the *Community Relations Plan* (URS, 2008a).
- Providing informal program updates to community members through the Site Community Update Forum. Generally, the Community Update Forum has held infrequent meetings.

In accordance with U.S. EPA guidance (2001), DLA notified the community that the Site's Third Five-Year Review began in August 2014. A public notice was published in the *Stockton Record* on August 29, 2014, *Manteca Bulletin* on August 29, 2014, and *Vida en el Valle* (a regional Spanish language newspaper) on September 3, 2014. The notice provides an overview of the Third Five-Year Review process, provides a list of contacts for community members who have questions or concerns.

As part of the Third Five-Year Review process, DLA solicited regional stakeholders for feedback regarding ongoing environmental restoration activities at the Tracy 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. A summary of the interviews is provided in Section 6.6; interview records are included in Appendix C.

A public notice will be published in the *Stockton Record*, *Manteca Bulletin*, and *Vida en el Valle* to notify the community of the completion of the review process and finalization of 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 for the Tracy Site will be available for viewing by the public in the Administrative Record at the Information Repository located at the Tracy Site and online at: http://cumulis.epa.gov/fiveyear.

6.3 Document Review

The Third Five-Year Review process included a review of documents relevant to the Tracy Site IRP, including the RODs, ROD amendment, ESDs, and memoranda to file listed in Section 1 to identify a comprehensive set of current RAOs, cleanup levels, applicable or relevant and appropriate requirements (ARARs). The previous five-year review was reviewed to identify issues and recommendations from the previous five-year review reports. Documents relevant to the implementation and performance of the groundwater, soil gas, and soil remedies were reviewed, including monthly monitoring reports and quarterly and annual monitoring reports, as well as various closure and remedial action reports. Documents relevant to the performance of the various treatment systems were reviewed to evaluate whether the systems are operating in accordance with their O&M manuals. Finally, investigation and risk assessment documents were reviewed as needed. Documents that were consulted during the preparation of this report are cited throughout this document and included in the reference list in Section 12.0 of this report. The reports, issued subsequent to preparation of the Second Five-Year Review, reviewed as part of this Third Five-Year Review are listed on Table 6.3-1.

6.4 Data Review

In general, data reviewed for the technical assessment in this Third Five-Year Review included data presented and evaluated in the monthly monitoring reports for OU 1, quarterly and annual WMP Reports for OU 1, SWMU 20, and annual inspections of soil sites with LUCs, which are cited throughout this document, where appropriate. For groundwater remedy performance assessments, hydraulic and analytical data reviewed include groundwater level changes, gradients, flow directions, capture zones, groundwater quality data, including trends, mass removal data, and effluent compliance data. For SVE remedy performance assessments, data reviewed include analytical concentration data from both field measurements and laboratory analysis of vapor samples, extraction and emission rate data, mass removal data, compliance data, and operational data (e.g., uptime, electrical usage, and destruction rate efficiency). For the soil (non-SVE) remedy performance assessments, data reviewed include groundwater and storm water data, compliance data, and site inspection reports.

6.5 Site Inspection and Land Use Control Management

On 26 August 2014, DLA Installation Support at San Joaquin inspected OU 1, NWC OU and the soil remedial action sites. This LUC inspection serves as a substitute for the Five-Year Review Site Inspection. Representatives from the RWQCB and HDR also participated in the inspections. The next LUC inspection is planned for August 2015.

Tracy Site inspections are conducted to provide information regarding site status and to visually confirm and document the conditions of the remedy, the site, and the surrounding area. At the Site, this included the groundwater extraction and treatment system for OU 1, soil sites with LUCs, soil sites without LUCs, the Day Care Center, and the SVE sites. Findings from the 2014 LUC inspections are presented on Table 4.2-1.

6.6 Interviews

As part of this Third Five-Year Review, a series of interviews were conducted to evaluate opinions and concerns regarding environmental restoration activities at the Tracy 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 Tracy Site. Interview questionnaires were submitted via United States Postal Service and electronic mail. Of the 13 individuals asked to participate in the interview process, four responded. The interviewee responses were used in development of this Third Five-Year Review and the returned questionnaires are included in Appendix C.

Table 6.1-1. Third Five-Year Review Schedule

		Draft			Draft Final		
Document Title	**Document Status**	**Submission Date**	**Review Period**	**Comments Due Date**	**Submission Date**	**Comments Due Date**	**Signature Date**
Third Five-Year Review	Primary	2/3/15	90 days	5/4/15	7/3/15	8/3/15	9/29/15

Table 6.3-1. Documents Reviewed – Basis for the Response Action

Installation-Wide

DDRW-Tracy Comprehensive Remedial Investigation/Feasibility Study (Montgomery Watson, 1996)

DDJC-Tracy Site-Wide Comprehensive Record of Decision (Radian International, 1998a)

DDJC-Tracy Explanation of Significant Differences to the Selected Remedies in the ROD for SWMUs 2, 3, 7, and 33, Building 30 Drum Storage Area, and the Northern Deport Soils Area (URS, 2001a)

DDJC-Tracy Baseline Ecological Risk Assessment, Solid Waste Management Unit 4 (URS, 2001b)

DDJC-Tracy Amendment to the Sitewide Comprehensive Record of Decision (URS, 2003a)

DDJC-Tracy 2004 Explanation of Significant Differences to the Sitewide Comprehensive Record of Decision (URS, 2004a)

DDJC-Tracy Five-Year Review Report (URS, 2005a).

DDJC-Tracy Response Completion Plan (URS, 2008b).

Defense Distribution Depot San Joaquin – Tracy Site Second Five-Year Review Report (URS, 2012)

Final – 2011 Explanation of Significant Differences to the 1998 Record of Decision (HDR, 2011a)

Final – Memorandum to the Site File Documenting Five Minor Modifications to the DDJC-Tracy Site-Wide Comprehensive Record of Decision (HDR, 2013a)

Final – Memorandum to the Site File Documenting the Additional of LGAC for treatment of VOCs to the DDJC-Tracy Site-Wide Comprehensive Record of Decision (HDR, 2014a)

OU 1

Operable Unit No. 1, Record of Decision, DDRW-Tracy, California (WCC, 1993)

DDRW-Tracy, Operable Unit 1 Explanation of Significant Difference (Montgomery Watson, 1995)

DDJC-Tracy Northwestern Corner Dieldrin Plume Feasibility Study Report (URS, 2010a)

NWC OU

Record of Decision Remedy for Northwestern Corner Groundwater Operable Unit (URS, 2011)

Notes:

DDJC = Defense Distribution Depot San Joaquin California
DDRW = Defense Distribution Region West
ROD = Record of Decision
SWMU = solid waste management unit

Table 6.3-2. Documents Reviewed – Implementation of the Response

Installation-Wide
DDJC Summary Master Plan (HDR, 2013h)
DDJC Real Property Master Plan Digest (HDR, 2013i)
Preliminary Closeout Report (U.S. EPA, 2012b)
OU 1
OU 1 Groundwater Interim Remedial Action Report (URS, 2001c)
SVE Closure/Confirmation Sampling Results Technical Memorandum (URS, 2004c)
Results of Building 247 Indoor Air Quality Evaluation, (URS, 2004d)
Biovent Area SVE Pilot Test Memorandum, B247, DDJC-Tracy (URS 2005b)
DDJC-Tracy Warehouse 10 Investigation Repot, Part 1−Summary Results (URS, 2009d)
Pneumatic Fracturing Enhancement to SVE at Area 1-Phase 1, DDJC-Tracy Technical Memorandum (URS, 2009a)
Pneumatic Fracturing Enhancement to SVE at Area 1-Phase 1, DDJC-Tracy, Summary of Phase I Field Activities (URS, 2009e)
SWMU 20 Soil Vapor Extraction System Remedial Action Report (HDR, 2012i)
Remedial Action Report for Solid Waste Management Units 2, 3, and 33 (URS, 2002a)
Project Closeout Plan (Remedial Action Report), SWMU 27 Small Excavation Site, DDJC-Tracy Site, Tracy, California (Shaw Environmental, Inc., 2003)
NWC OU
FINAL – Northwestern Corner Groundwater Operable Unit Remedial Action Report (HDR, 2012h)

Notes:

DDJC	=	Defense Distribution Depot San Joaquin California
OU	=	operable unit
SVE	=	soil vapor extraction
SWMU	=	solid waste management unit

Table 6.3-3. Documents Reviewed – Remedy Performance

Groundwater Treatment Plant Monthly Performance Monitoring Reports (URS, 2005c, 2006b, 2007, 2008c, and 2009f) (HDR | e2M, 2009 and 2010b)
Groundwater Remedy Enhancement Summary Report (URS, 2009b)
Off-Depot Private Water Supply Well Contingency Plan (URS, 2009g)
Area 3 Groundwater Remedy Optimization Report (Final) (HDR, 2013d)
Well Monitoring Program Annual Monitoring Reports (HDR, 2011d, 2012g, and 2013g)
Draft Well Monitoring Program Monitoring Report (HDR, 2014b)
Sampling Effort to Support NFA Decisions at Area/Building 237 SVE Site, DDJC-Tracy (URS, 2009h)
DDJC-Tracy Remedy Enhancement Decisions at SVE Sites Area 1/Building 237, SWMU 1/Area 2, and Area 3 (URS, 2009i)
Results from Sampling Effort to Support NFA Decisions at Area/Building 237 SVE Site, DDJC-Tracy (URS, 2010b)
Indoor Air Quality Sampling Event (EA, 2011)
Areas 1, 2 and 3 Soil Gas Remedy Optimization (Final) (HDR, 2013c)
Well Monitoring Program Annual Monitoring Reports contain SVE remediation and operations information.
SWMU 20 Soil Vapor Extraction System Remedial Action Report (HDR, 2012i)
Area 1/Building 237 Engineering Evaluation/Cost Analysis (Final) (HDR, 2012d)
Area 1/Building 237 Removal Action Report (HDR, 2012a)
Well Monitoring Program Annual Monitoring Reports contain annual site inspection information for land use control sites.

Notes:
DDJC = Defense Distribution Depot San Joaquin California
NFA = no further action
SVE = soil vapor extraction
SWMU = solid waste management unit

Table 6.3-4. Documents Reviewed – Operation and Maintenance

Operation and Maintenance Manual, Groundwater Treatment Plant 1 (Tetra Tech, 2005)
Operations and Maintenance Manual, Groundwater Treatment Plant 2 (URS, 2006)
SWMU 20 SVE System Operations and Maintenance Manual (HDR, 2012e)
NWC Groundwater OU Remedial System Operations and Maintenance Manual (HDR, 2012c)
Well Monitoring Reports contain operations information for groundwater and soil vapor extraction and treatment systems.

Notes:
OU = operable unit
NWC = Northwestern Corner
SWMU = solid waste management unit

Table 6.3-5. Documents Reviewed – Legal Documents

Federal Facility Agreement for DDRW-Tracy (DLA, 1991).
Order No. 99-053. Waste Discharge Requirements for DDJC-Tracy. California (RWQCB-CV, 1998)

Notes:
DDJC = Defense Distribution Depot San Joaquin California
DDRW = Defense Distribution Region West
DLA = Defense Logistics Agency
RWQCB-CV = Regional Water Quality Control Board−Central Valley Region

Table 6.3-6. Documents Reviewed – Community Involvement

Community Relations Plan, DDJC-Tracy (URS, 2008a).

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7.0 TECHNICAL ASSESSMENT

The technical assessment for remedial actions at the Tracy Site was performed to determine whether the remedial actions are, or upon completion will be, protective of human health and the environment. To reach a protectiveness determination, EPA guidance recommends that the following three questions be addressed for each action (U.S. EPA, 2001):

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

Questions A and C are addressed on a site-by-site basis in Sections 7.2 through 7.20. Question B is discussed in Section 7.1. The technical assessment for each site focuses on the performance of the remedial actions during the period of this Third Five-Year Review (June 2010 through September 2014).

For reference, the cleanup levels for each site are presented in Table 3.5-1 and 3.5-2.

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

Question B is discussed here because the same discussion applies to the RAO for most of the remedial actions (i.e. protection of groundwater quality, human health, etc.). This avoids repeating the same text in the assessment for each site. Changes to location specific ARARs, toxicity data, and relevant screening levels, which are not applicable to the Site as a whole, are discussed in their site specific sections below.

7.1.1 Are the exposure assumptions used at the time of the remedy still valid?

The exposure assumptions used during the risk assessments developed as part of the 1996 RI/FS were based on current and anticipated future land use at each site. The exposure assumptions used for areas under review largely remain valid, with the following exceptions:

U.S. EPA updated its overall default exposure factors in the Exposure Factors Handbook – 2011 Edition (U.S. EPA, 2011b) and in the February 2014 OSWER Directive 9200.1-120 (U.S. EPA, 2014a), which provided program-specific recommendations on the use of exposure parameters to characterize exposures to human populations for human health risk assessments. Several of the recommended parameters differ from the exposure factors used in the 1996 RI/FS (Montgomery Watson, 1996). The changes include increasing the adult body weight from 70 kg to 80 kg and reducing the residential adult exposure duration from 30 years to 26 years. Taken alone, without considering potential changes in COC concentrations or other revisions to how risk is calculated, both changes result in a decrease in calculated risk for the COCs; therefore, neither the protectiveness of the original risk assessments or original risk-based cleanup levels is impacted.

U.S. EPA *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (“Supplemental Guidance”) (U.S. EPA, 2005), assesses the mode of action (MOA) of a chemical to determine potential impact via mutagenesis when exposure occurs at younger ages (U.S. EPA, 2005). The Supplemental Guidance provides information on using age-dependent adjustment factors and age-specific

exposure factors in developing default risk estimates if there is evidence of a mutagenic MOA (MMOA). If chemical-specific data are available, those data shall be used in determining risk from childhood (or earlier, e.g., prenatal) exposures. The California DTSC is instituting guidance on how to assess MMOA risk; however, at the time of this Third Five-Year Review, the guidance has yet to be finalized. Two Tracy Depot COCs (i.e., trichloroethene, benzo(a)pyrene) are considered to have a MMOA; however, areas that identify these two chemicals as COCs have LUCs which prevent residential use, except for SWMU 27. Implications of MMOA considerations for TCE and benzo(a)pyrene in SWMU 27 are discussed further in the area-specific section. MMOA child resident exposure scenarios would apply in the future if the land use changes or residential use needs to be considered (TBC) further in regards to LUCs.

The 1996 RI/FS did not evaluate exposure to vapor intrusion (VI); therefore, the remedies identified in the Site-Wide Comprehensive Record of Decision do not account for potential VI risk. More recently, VI was evaluated in several areas, i.e., Areas 1, 2, 3, SWMU 20, Building 231, Building 237, and GPW 59. The 2011 ESD implemented remedies (e.g., soil-vapor extraction and indoor air sampling) for areas where VI was determined to be an issue.

In 2009, U.S. EPA released the *Risk Assessment Guidance for Superfund* (RAGS), Part F that revised the method for calculating inhalation risks (U.S. EPA, 2009). These calculations are optimally site- and receptor-specific. RAGS states that the risk assessment should assess the duration of exposure (i.e., acute, sub-chronic, or chronic); the exposure pattern, a comparison of the site-specific exposure time and frequency to a typical sub-chronic or chronic timeframe; and the exposure scenario-specific exposure concentration, using the exposure concentration equation from RAGS that best matches the site-specific exposure scenario. As the inhalation risks are meant to be site-specific, they will vary depending on site conditions and potential receptors, which may impact the calculated risk and protectiveness of the remedy; however, existing LUCs effectively prevent unacceptable exposure.

LUCs instituted in 17 areas were reviewed as part of this Third Five-Year Review. The 1996 RI/FS did not address a residential use exposure scenario in several of these areas (SWMUs 2 and 3, 4, 6, 7, 20 and Site 72), which, if completed, would include different exposure assumptions than would be necessary to consider the area for unrestricted use. The 1996 RI/FS did use residential exposure scenarios when calculating risk at SWMUs 24, SWMU 33, Eastern, and Northern Depot Areas. Based on the unacceptable human health risk calculated at these areas, LUCs were implemented. Current and probable future exposure at these areas is commercial/industrial; therefore, application of the residential exposure scenario at SWMUs 24, SWMU 33, Eastern, and Northern Depot Areas overestimates the health risk.

7.1.2 Are the toxicity data used at the time of the remedy still valid?

The toxicity values for several COCs have changed since preparation of the 1996 RI/FS. These toxicity values are used with exposure assumptions to estimate risk of health effects resulting from exposure to a given concentration of a contaminant (or group of contaminants). Therefore, changes to the toxicity values may impact the risk assessment conclusions and protectiveness of remedies. Table 7.1-1 identifies the COCs where toxicity values have become more stringent for each area and Tables 7.1-2 to 7.1-4 identify the initial risk estimates by media. If the toxicity value has not become more stringent, dieldrin for example, the COC is not identified on Table 7.1-1. A discussion of these changes and their impact on the Site are discussed below.

The TCE toxicity values have been revised since the *Second Five-Year Review* (URS, 2012). Changes to the TCE toxicity values result in an increase in the excess cancer risk via inhalation or ingestion (U.S. EPA, 2011b). These toxicity value changes have been incorporated into the January 2015 carcinogenic RSLs and have resulted in a more stringent TCE screening level to account for MMOA exposure.

In 2012, the U.S. EPA Final Health Assessment for PCE identified PCE as a likely human carcinogen and included new IRIS cancer toxicity values for oral and inhalation routes of exposure (U.S. EPA, 2012a). Compared to previous toxicity values, the new cancer values and resulting cancer risks decrease; which result in a less stringent (higher) screening level.

In 2012, the non-cancer value for PCE ingestion route of exposure decreased (U.S. EPA, 2012a), which results in a more stringent (lower) screening level. The toxicity value for non-cancer inhalation remains the same as in the 1996 RI/FS.

In September 2011, the U.S. EPA published its *Toxicological Review of Trichloroethylene in Support of the Integrated Risk information System (IRIS).* Recent findings on TCE conclude that women in the first trimester of pregnancy are one of the most sensitive populations to TCE short-term inhalation exposure due to the potential for heart malformation for the developing fetus (U.S. EPA, 2013a). Based on these findings the DTSC recommends an indoor air SL for TCE of 0.48 micrograms per cubic meter ($\mu g/m^3$) for residential exposure and 3.0 $\mu g/m^3$ for industrial exposure (DTSC, 2015). Use of the U.S. EPA's 0.03 indoor air to soil gas attenuation factor (U.S. EPA, 2015) corresponds to a TCE soil gas screening level of 3.0 ppbv and 19 ppbv for residential and industrial exposure, respectively. These values are more stringent than the 350 ppbv cleanup standard established in the 1998 OU-1 ROD to prevent impacts to groundwater. While the California-modified RSL is not an ARAR, it was established to be protective of sensitive groups and presented herein for comparison.

EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South bay NPL Sites requires that the California modified indoor air screening level for PCE of 0.48 $\mu g/m^3$ for residential exposures and 2.1 $\mu g/m^3$ for industrial exposures be used as appropriate to evaluate vapor intrusion impacts to indoor air (U.S. EPA, 2013a). Use of the U.S. EPA's 0.03 indoor air to soil gas attenuation factor (U.S. EPA, 2015) corresponds to a PCE soil gas screening level of 2.4 ppbv and 70 ppbv for residential and industrial exposure, respectively. These values are more stringent than the 780 ppbv cleanup standard established in the 1998 OU-1 ROD to prevent impacts to groundwater. While the California-modified RSL is not an ARAR, it was established to be protective of sensitive groups and presented herein for comparison.

The MCL-based cleanup values for groundwater COCs have not changed, as the TCE and PCE toxicity values have not been incorporated in the Federally promulgated drinking water MCLs; however, the updated TCE and PCE toxicity values have been incorporated in the January 2015 U.S. EPA RSLs, which include a tap water RSL. While the tap water RSL is not an ARAR, it was established by the U.S. EPA to be protective of the $1x10^{-6}$ excess cancer risk and is presented herein for comparison.

A Federal MCL has not been established for dieldrin; however, the California SWRCB has established a drinking water Notification Level. In 2000, the Notification Level, formerly called the Action Level, changed from 0.05 µg/L to 0.0022 µg/L. The SWRCB defines the Notification Level as being a health-based value with an incremental cancer risk of $1x10^{-6}$.

Table 7.1-1 summarizes the toxicity changes by chemical, by area and indicates that the majority of the toxicity values are either unchanged or less stringent at the time of this Third Five-Year Review, with some exceptions. There are 12 COCs whose toxicity values have become more stringent. Of these, most cancer toxicity values via the ingestion route have become more stringent while the changes to non-cancer toxicity values vary.

The changes in toxicity values suggest that the excess cancer risk and non-cancer hazard estimates calculated in the 1996 RI/FS underestimate the potential risk to industrial and residential receptors for COCs with more stringent toxicity values. To account for changes in toxicity values and to incorporate

analytical data collected during this Third Five-Year Review Period, cancer risks and noncancer hazard quotients for the Third Five-Year Review sites were recalculated for certain sites using the following methods:

- ProUCL Version 5.0.00 (U.S. EPA, 2013b) was used to recalculate the exposure point concentration (EPC) as the upper 95% confidence limit on the arithmetic mean for samples collected and analyzed during this Third-Five Year Review period. These COC-specific exposure point concentrations (EPCs) are listed on Tables 7-1.2 to 7-1.4. ProUCL input and output data is presented in Appendix D.

- For sites where analytical data has not been collected within the past five years, original EPCs calculated in the 1996 RI/FS and in the 2001 No Further Response Action Planned for Defense Site Environmental Reporting and Tracking System 72 (DSERTS 72) are listed on Tables 7-1.2 to 7-1.4.

- Cancer risk was calculated by dividing the EPCs by the January 2015 residential or commercial/industrial RSL or May 2015 CA DTSC commercial/industrial indoor air RSL (converted to soil gas RSL) and then multiplying this ratio by 10-6 to estimate a chemical specific risk for a reasonable maximum exposure. For each site, the COC risks were summed to provide a cumulative site risk. The COC and cumulative site risks are presented on Tables 7-1.2 to 7.1-4.

- Noncancer risk was calculated by dividing the EPCs by the January 2015 residential or commercial/industrial RSL to estimate a hazard quotient. The hazard quotients for each COC were summed for each site to identify a hazard index.

7.1.3 Are the cleanup levels used at the time of the remedy still valid?

For some COCs, cleanup levels identified in the 1998 OU 1 ROD were established based on laboratory RLs at that time that are greater than the current U.S. EPA contract-required quantitation limits (CRQLs). Table 7.1-5 identifies areas where RL-based cleanup levels are compared to the CRQLs as well as the commercial/industrial soil U.S. EPA RSLs (with target risk [TR] of $1x10^{-6}$ and target hazard quotient [THQ] of 1). Although many RL-based cleanup levels are greater than the CRQL, none of the cleanup levels are greater than the commercial/industrial RSLs. These comparisons are discussed as appropriate in the site specific subsections below.

Soil gas cleanup levels were established in the 1998 OU 1 ROD for the protection of groundwater. These soil gas cleanup levels were not established for the protection of human health via vapor intrusion to indoor air. The 2011 ESD used commercial/industrial indoor air RSLs and an attenuation factor of 0.01 to estimate a soil gas screening level protective of human health via vapor intrusion to indoor air consistent with the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater to Soil* (U.S. EPA, 2002); however, the RSLs used in the 2011 ESD to calculate a soil gas screening level are greater than the California-modified RSLs.

Cleanup levels that were derived using risk-based methods were compared to the January 2015 RSLs and the California modified-RSL for TCE and PCE (U.S. EPA). Table 7.1-6 presents this comparison and indicates that the original cleanup levels for seven of the ten areas exceed commercial/industrial RSLs. For instances where the cleanup level is greater than the commercial/industrial RSL, the maximum concentrations were compared to the respective commercial/industrial RSLs; all of these COC maximum concentrations were above the RSL. These comparisons are discussed as appropriate in the site specific subsections below.

The location-specific ARARs for the evaluation of ecological receptors' exposure to the COCs include the California Fish and Game Code and the Endangered Species Act. However, approximately 75 percent of the Depot is covered with buildings, roadways, and paved parking areas; no deleterious substances are being discharged and no endangered species have been observed (URS, 2012).

7.1.4 Are the remedial action objectives used at the time of the remedy still valid?

None of the RAOs addressed at the time of remedy selection have changed and the RAOs are still valid.

7.2 OU 1: Operable Unit 1

7.2.1 Selected Remedy

The 1993 OU 1 ROD identifies TCE, PCE, and 1,1-DCE as the groundwater COCs for which an action is required, and establishes ACLs based on the federal MCL for each COC. The *Memorandum to the Site File Documenting Five Minor Modifications to the DDJC-Tracy Site-Wide Comprehensive Record of Decision* (HDR, 2013a) removed 1,1-DCE as groundwater COC for the Site. The remedy selected in the 1993 OU 1 ROD was extraction and treatment of COC-contaminated groundwater, and injection or infiltration into the Upper Hydrologic Zone.

Dieldrin was added as a groundwater COC in the 1998 OU 1 ROD. Because there is no MCL promulgated for dieldrin, the detection-limit-based California action level was adopted as the ACL. The dieldrin plume associated with OU 1 is the SSL plume. The selected remedy for the SSL Dieldrin Plume is groundwater extraction and wellhead treatment via LGAC followed by injection/infiltration with groundwater treated for VOCs via air stripping. In addition, the 1998 OU 1 ROD identified dispersion as the selected remedy for COCs in groundwater east of Banta Road.

The current RAOs for the OU 1 COCs are to:

- Protect human health and the environment;
- Remediate hot spots (i.e., areas with highest levels of dieldrin contamination in groundwater);
- Minimize transport off the Depot; and
- Minimize migration and remediate to the ACL.

Table 3.5-1 presents the 1998 OU 1 ROD ACLs for OU 1 groundwater COCs.

The Memorandum to the Site File Documenting the Addition of LGAC for Treatment of VOCs to the DDJC-Tracy Site-Wide Comprehensive Record of Decision (HDR, 2014a) modified the groundwater treatment remedy for VOCs, as presented in the 1998 OU 1 ROD, from air stripping to air stripping and/or LGAC.

7.2.2 Technical Assessment Questions

7.2.2.1 Question A - Is the remedy functioning as intended by the decision documents?

The remedy is functioning as intended by the 1998 OU 1 ROD, ROD Amendment, ESDs, and MTFs.

7.2.2.2 Progress Toward Meeting RAOs

The following sections document the progress archived toward meeting RAOs during this Third Five-Year Review period.

OU 1 Plume Containment, Dispersion, and Attenuation

Plume containment through hydraulic capture is exhibited by the stability in concentrations at the downgradient edge of the plumes and contaminant dispersion is demonstrated by the shrinkage of plumes and an overall reduction of COC concentrations. During this Third Five-Year Review period, the groundwater monitoring and extraction program has generally decreased in size and scope indicating that the remedy is effectively meeting the RAOs. Specifically, plume migration is not evident at SWMU 20, North Central TCE, the southern portion of the Area 3 PCE, or the southern portion of the SSL Dieldrin Plume (HDR, 2014b). Figures 7.2-1 and 7.2-2 show the interpreted capture zones for the operating extraction wells in the Upper and Middle Hydrologic Zones. A discussion of status toward achieving OU 1 plume containment, dispersion, and attenuation is discussed in the sections below.

Upper Hydrologic Zone Plume Containment

As illustrated on Figure 7.2-1, extraction well EW048AU is providing containment of the northern most portion of the SSL Dieldrin Plume. The southern portion of the SSL Dieldrin Plume, defined by well LM028A, is outside of the influence of well EW048AU; however, the dieldrin concentration in the nearest down gradient well, EW044AU is less than the ACL; therefore, dieldrin dispersion is effectively achieving the RAO in the southern portion of the SSL Dieldrin Plume.

As illustrated on Figure 7.2-1, TCE and PCE are present in groundwater at Area 3 at concentrations greater than the ACL. Groundwater extraction is not occurring in this area and based on the 3Q14 monitoring results, downgradient wells EW034AU and EW046AU did not yield TCE or PCE at concentrations greater than the ACL; therefore, there is evidence that migration of TCE and PCE at concentrations greater than the ACL is not occurring at Area 3.

During the 3Q14 monitoring event, TCE concentrations in LM196AU, located in the center of the SWMU 20 soil gas plume, decreased to less than the ACL. Downgradient extraction well EW011AU, which ceased operation in 2012, has not yielded TCE at concentrations greater than the ACL; therefore, the SVE remedy at SWMU 20 was effective at mitigating the migration of VOCs from the vadose zone to groundwater. A detailed discussion on the effectiveness of the SVE remedy at SWMU 20 is presented in its respective section below.

Middle Hydrologic Zone Plume Containment

As illustrated on Figure 7.2-2, the North Central TCE plume is contained by extraction well EW027B and the downgradient edge of the North Central TCE plume is monitored by LM067B and EW026B. Operation of groundwater extraction well EW026B is effectively containing the North Central PCE plume and preventing the migration of TCE greater than the ACL; therefore, the remedy is effective at meeting the RAOs in this area.

The remedy to remediate the Banta Road TCE Plume relies on hydraulic control along Banta Road and dispersion east of Banta Road. Extraction wells EW024B and EW025B provide hydraulic control along Banta Road and downgradient monitoring wells LM153B and LM155B do not yield TCE at concentrations greater than the ACL; therefore, the remedy is effective at providing hydraulic control in

this area. A detailed discussion on the effectiveness of the dispersion remedy for the Banta Road TCE Plume is discussed in the paragraphs below.

Dispersion East of Banta Road

As presented in the 2009 Annual Report (HDR|e^{2}M, 2010c), natural attenuation parameters were measured in groundwater samples collected from 10 wells during the 1Q09 and 3Q09 monitoring events (HDR, 2010). Based on the evaluation of the natural attenuation parameters, there is no indication of anaerobic biodegradation occurring in the Banta Road TCE Plume; however, the dispersion remedy is successful at meeting RAOs for the reasons discussed below.

Upper Hydrologic Zone

Three wells are located along the Upper Hydrologic Zone plume centerline (LM150A, LM156A, and LM157A). Since 2001, LM150A has demonstrated a significant decrease in TCE concentrations, with concentrations decreasing to 2.2 µg/L in 2014. Since 1999, LM156A has shown a slow but overall decrease in TCE concentrations; however, TCE concentrations remain greater than the ACL. Since 1999, TCE concentrations at LM157A increased from 6.14 µg/L in April of 1999 to 7.61 µg/L in 2007; but since 2007 exhibit a decreasing trend and in 3Q14 yielded TCE at 5.4 µg/L. Based on declining TCE concentrations in most wells, which have decreased to less than the ACL in many cases, the dispersion remedy is being met in the Upper Hydrologic Zone.

Wells LM156A and LM157A are the only wells in the Upper Hydrologic Zone of the Banta Road TCE Plume that yield TCE greater than the ACL. In 1Q09, well LM157A yielded TCE at 6.52 µg/L and the groundwater sample collected from boring CP0916, approximately 1,600 ft downgradient of LM157A yielded TCE at 3.8 µg/L. Since 1Q09, the TCE concentration in well LM157A continued to decrease; therefore, the dispersion remedy is effective and the extent of TCE greater than the ACL downgradient from well LM157A is likely limited. Linear regression analysis of LM156A indicates the ACL will be attained by 2022 (HDR, 2014b).

Middle Hydrologic Zone

Middle Hydrologic Zone plume centerline wells are LM151B, located in the center of the Banta Road TCE Plume east of Banta Road, and LM158B, located in the plume centerline hydraulically downgradient from well LM151B, both exhibit increasing TCE concentration trends; however, TCE concentrations at LM158B are an order of magnitude less than the ACL (0.55 µg/L in 3Q14). The TCE concentration in LM151B is consistently greater than the ACL; however, the TCE concentration over the last decade is generally stable and ranges from 7 µg/L to 8.93 µg/L, just slightly greater than the ACL. Well LM187B also yields TCE greater than the ACL; however, TCE concentrations exhibit a decreasing trend and linear regression analysis indicates the ACL will be attained by 2033 (HDR, 2014b). The stable or decreasing TCE concentration trends in the Middle Hydrologic Zone Banta Road TCE Plume indicate that the dispersion remedy is effective and TCE is projected to reach the ACL in a reasonable amount of time.

Well LM158B, located hydraulically downgradient from the Middle Hydrologic Zone Banta Road TCE Plume, has not yielded TCE above the ACL; however, since 1Q08 TCE in well LM158A does exhibit an increasing trend. Regardless of the increasing TCE concentration in well LM158B, decreasing concentrations in other Middle Hydrologic Zone wells indicate that the dispersion remedy is effective.

Attenuation of Contaminants in Groundwater

Another measure of remedial action performance is the attenuation of contaminants over time. The attenuation process may occur under natural conditions (biodegradation, dispersion, dilution, adsorption, and volatilization) or through the extraction of contaminants. The following paragraphs discuss the attenuation mechanisms which may be occurring at the Tracy Site and used to achieve the RAOs.

TCE and PCE Attenuation. Both TCE and PCE are organic compounds susceptible to natural attenuation mechanisms in groundwater. Dispersion, adsorption, volatilization, and abiotic degradation are mechanisms potentially affecting TCE or PCE plumes. TCE and PCE may degrade by step-wise dehalogenation through the action of anaerobic bacteria (Vogel and McCarty, 1985). However, over the last 15 years of monitoring at the Tracy Site, very little evidence of bacterial degradation of TCE and PCE has been found. Concentrations of degradation products cis-1, 2-DCE and vinyl chloride were rarely identified in groundwater at concentrations greater than laboratory reporting levels. Dispersion and sorption are identified in the RI report as likely attenuation mechanisms for TCE and PCE (Montgomery Watson, 1996b). Furthermore, a natural attenuation study conducted in 2009 and presented in the *Well Monitoring Program-2009 Annual Monitoring Report* (HDR|e^2M, 2010c) found that because concentrations of COCs are either decreasing or stable in areas where groundwater extraction is not occurring, dilution, dispersion, and sorption appear to be the dominant natural attenuation processes.

As illustrated on Figure 7.2-3, the SWMU 20 TCE Plume has been remediated and the North Central TCE Plume has decreased in areal extent. The Area 3 TCE Plume size has increased in areal extent based on TCE concentrations detected in monitoring well LM058AU.

As illustrated on Figure 7.2-4, the Western PCE and North Central PCE Plumes have been remediated. The Area 3 PCE Plume size has increased in areal extent based on PCE concentrations detected in monitoring wells LM058AU and LM203A.

Dieldrin Attenuation. The findings reported in the *Dieldrin Natural Attenuation Investigation Results* (URS, 2007) suggest that dieldrin is attenuated by natural mechanisms in groundwater beneath the Tracy Site and that the off site extent of plumes is contracting, predominantly as a result of the nondestructive mechanisms of sorption in deposits containing mostly clay or silt and dilution in zones of higher permeability. Data from monitoring wells in areas near the SSL Dieldrin Plumes exhibit decreasing trends both within and outside of the influence of active groundwater remediation (URS, 2005a). The SSL Dieldrin Plume contracted more than 1,000 feet between 1996 and 2002 prior to active RA, and data from a past CPT investigation verify that the SSL Dieldrin Plume footprint is continuing to contract (URS, 2005a). The potential effects of co-solvency in the SSL Dieldrin Plume or the hydraulic effects of agricultural well AG-2 may explain the greater-than-expected mobility of dieldrin and its longer plume footprint compared to the NWC OU; co-solvency effects or the high extraction well pump rates at the SSL Dieldrin Plume may also have contributed indirectly to a higher level of effectiveness in dieldrin removal than could otherwise have been expected. Data from past investigations do not suggest that destructive processes, such as biological degradation, are contributing to the attenuation of dieldrin in the saturated zone (URS, 2007).

The properties of dieldrin indicate that it strongly sorbs to organic matter based on its large organic carbon-partitioning coefficient and to clay minerals in soil. In addition, its solubility in water is very low. Because of these characteristics, dieldrin should not move very far in soils or groundwater unless the chemical's partitioning coefficient or solubility is changed, as may have been the case for the SSL Dieldrin Plume because of its commingling with the VOC plumes. Monitoring well data from the Tracy Site indicated that by 1998 the SSL Dieldrin Plume had migrated about 2,000 feet from sources on the northern part of the Depot because of the pumping of AG-2 and potential VOC co-solvency effects;

however, the SSL Dieldrin Plume now extends less than half of that distance (Figure 7.2-5). Natural attenuation, through the adsorption mechanism, has likely been acting on much of the plume, and extraction wells have prevented further migration and aided the reduction in plume size through mass removal.

7.2.2.3 System Operation and Maintenance

During this Third Five-Year Review period, GWTP 2 removed approximately 23 pounds of COCs from groundwater with approximately 94% uptime. Effluent monitoring confirmed that GWTP 2 discharges complied with RWQCB Order No. 98-053. The GWTP 2 is functioning as intended by the decision documents.

7.2.2.4 Implementation of LUCs and Other Measures

Visual inspection of the LUC is conducted annually to verify that the LUC are being implemented as defined in decision documents. Annual visual inspection of OU 1 confirmed that the LUC protectiveness measures are satisfactory. Documentation of the annual LUC inspections are presented in the annual monitoring reports and the most recent LUC inspection field forms are documented in Appendix E.

7.2.2.5 Indicators of Potential Remedy Problems

As documented in the sections above, the remedies are functioning as intended by their decision document; however, this Third Five-Year Review identified the following problems:

- The limited monitoring well network in some areas of the Tracy Site reduces the ability to effectively monitor progress toward meeting RAOs. There are areas where individual plumes are defined by an individual monitoring and/or extraction well. Examples include: Area 3 TCE Plume (LM058AU), SSL Dieldrin Plume in the Middle Hydrologic Zone (LM135B), and North Central TCE Plume (EW027B) (HDR, 2014b),

- Existing groundwater quality data is sufficient to demonstrate that the dispersion remedy is working for the Banta Road TCE Plume; however, recent groundwater quality data is necessary to delineate the Banta Road TCE Plume's downgradient extent,

- GWTP 2 plant was originally designed to treat 800 gpm of VOC contaminated water. The shutdown of groundwater extraction wells as RAOs are achieved has resulted in a decrease in the GWTP 2 flow rate to approximately 90 gpm. Further decreases are anticipated with the shutdown of the NWC in January 2015. Continued operation of GWTP 2 at approximately 10% of its designed flow rate, results in greater energy consumption and greater maintenance requirements than an optimally sized GWTP2.

7.2.2.6 Opportunities for Optimization

The following optimization opportunities were identified for OU 1.

- GWTP 2 discharges treated groundwater to the northern IG in compliance with RWQCB Order No. 98-053. The primary means of treatment at the GWTP 2 is air stripping to remove VOCs and LGAC at most dieldrin-impacted wells. Extraction well EW027B does not have LGAC treatment and is discharging dieldrin-impacted water to the treatment plant. The GWTP 2 air stripper was not designed to treat dieldrin and therefore the dieldrin is discharged into groundwater at the

northern IG. In March 2015 modifications were made to the GWTP which included replacement of the air stripper with activated carbon. This treatment method is more appropriate for the lower process flow rates and consistent with decision document remedies. Since these modifications were completed outside this Third Five-Year Review period a detailed description of the changes is not included in this report. The 2015 Annual Report will provided a description of the GWTP modifications.

- During this Third Five-Year Review period, estimated dieldrin concentrations detected in the GWTP 2 effluent ranged from 0.0079 µg/L to 0.0197 µg/L with a median concentration of 0.012 µg/L. While this concentration is less than the 0.05 µg/L RWQCB Order No. 98-053 dieldrin effluent limitation, these detections are greater than the 0.005 µg/L dieldrin background threshold value and the numerical beneficial use limit of 0.002 µg/L which were identified in the 1998 OU 1 ROD. The 2014 MTF modified the remedy to include LGAC treatment at the GWTP 2, which is capable of prevent the discharge of dieldrin at concentrations greater than background. As discussed above, the March 2015 modifications are capable of reducing the dieldrin concentration in the GWTP effluent to less than the 0.002 µg/L beneficial use limit.

- In 2014, the GWTP 2 air stripper operated from approximately 6 to 18% of its designed hydraulic loading capacity. GWTP 2 is operating at a fraction of its designed flow rate because criteria established by the 1998 OU 1 ROD have been achieved and groundwater extraction wells have been shutdown. As COC concentrations in groundwater continue to decrease, and with the planned completion of the NWC OU remedy in January 2015, the hydraulic loading of the GWTP 2 will continue to decrease. Continued operation of the GWTP 2 at the low process flow rate results in a lower treatment efficiently from higher power consumption and greater maintenance requirements. The 2014 MTF modified the remedy to allow for LGAC treatment. On 23 January 2015, DLA submitted the *Work Plan for Treatment System Conversion at Groundwater Treatment Plant 2* which presents methods to modify GWTP 2 to allow for the treatment via GAC. In March 2015, upgrades to the GWTP were made and documentation of these improvements were presented in the 2015 Annual Report.

7.2.2.7 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, despite changes included in the U.S. EPA *Exposure Factors Handbook: 2011 Edition*, as described in Section 7.1.

The cancer and non-cancer toxicity ingestion value for PCE and pathways for TCE have become more stringent. For those COCs and exposure pathways having more stringent toxicity values, particularly the TCE MMOA considerations for future child residents, the cancer risks, and/or non-cancer hazard quotient (HQ) in the original risk assessment may underestimate the potential risk to industrial and residential receptors. Table 7.1-1 provides details regarding which toxicity values changed for each COC.

To incorporate changes in the concentrations of COCs detected in groundwater in more reecent sampling and in toxicity values since the 1996 RI/FS, a revised EPC for TCE, PCE and dieldrin was calculated for OU 1. Groundwater analytical data collected during this Third Five-Year Review period were used as ProUCL inputs to calculate the 95% UCL on the arithmetic mean. These EPCs were then divided by the January 2015 residential tap water RSL and multiplied by 10-6 to provide a COC cancer risk per COC. These are then summed to provide a cumulative risk of $4x10^{-5}$, see Table 7.1-2.

As illustrated on Table 7.1-2, the Federal MCL-based cleanup level for TCE and PCE were compared to the January 2015 residential tap water RSL. While the tap water RSL is not a promulgated standard, it is

risk-based, does account for MMOA, and therefore, is a TBC. Both Federal MCLs remain valid, as they are promulgated standards and therefore, ARARs have not changed.

There is no federal or State of California enforceable, chemical-specific ARAR for dieldrin, such as a primary MCL for drinking water. The 1998 OU 1 ROD established an ACL for dieldrin of 0.05 µg/L based on a 1998 California Action Level. In 2000, the California Action Level, now deemed the California Notification Level, changed from 0.05 µg/L to 0.0022 µg/L. For comparison, the January 2015 residential tap water RSL is 0.0017 µg/L. While both the 2000 California Action Level and January 2015 tap water RSL are risk based screening levels, protective of the $1x10^{-6}$ residential exposure, they are not promulgated standards. Other available information that does not constitute an ARAR (e.g., advisories, criteria, and guidance) should be considered along with ARARs if it helps to ensure protectiveness or is otherwise appropriate for use in a specific alternative. Such information is commonly referred to as a TBC. TBCs are not legally enforceable standards.

RAOs for OU 1 require remediation of dieldrin and VOC hot spots to both minimize migration and remediate groundwater contamination. The *Well Monitoring Program 2014 Annual Monitoring Report* states that there is evidence the remedy is retarding the migration of dieldrin and VOCs (HDR, 2014c). The 2013 Memorandum to File removed 1,2-DCE from further evaluation because groundwater concentrations have not exceeded the action cleanup level of 6 µg/L since 1995. Groundwater monitoring continues at the Banta Road TCE Plume, where modeling indicates the water quality objectives will be attained in 2033 (HDR, 2014b). The RAOs remain valid.

7.2.2.8 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

No new information has come to light that could call into question the protectiveness of the remedy.

7.3 OU 1: SWMU 1/Area 2

7.3.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for SWMU 1/Area 2:

- SVE to prevent the migration of PCE and TCE from impacting groundwater; and
- Groundwater monitoring to verify the effectiveness of the remedy.

LUCs were established for PCE and TCE at SWMU 1/Area 2 in the 2011 ESD for the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone;
- Mitigate intrusion of PCE and TCE from vadose zone to indoor air; and
- Protect construction worker from exposure to COCs in soil.

More detail on the selected remedial action is provided in Section 4.0.

7.3.2 Technical Assessment Questions

7.3.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy is functioning as intended by the 1998 OU 1 ROD and as modified by the 2004 ESD and 2011 ESD.

Remedial Action Performance

With the exception of well LM030AUA, groundwater monitoring wells at SWMU 1/Area 2 have meet the 1998 OU 1 ROD monitoring requirements; therefore the remedy was successful at achieving the RAOs. For the reasons expressed in Section 4.4.3, well LM030AUA does not provide an accurate representation of groundwater quality at SWMU 1/Area 2 and therefore samples collected from this well should not be relied upon when determining whether the remedy met the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

Indicators of Potential Remedy Problems

LM030AUA is screened from 10 to 20 feet bgs, with an average of 7 feet of screen exposed through the vadose zone. The exposed screen allows soil gas to migrate into the well and filter pack and have direct contact with the groundwater. During the 3Q14 monitoring event, well LM030AUA yielded PCE at 16 µg/L and TCE at 2 µg/L. This represents the highest recent PCE concentration detected in groundwater at Area 2. Although soil gas and groundwater samples collected in 2008 did not yield TCE or PCE greater than 1998 OU 1 ROD cleanup objectives or ACL, the recent historical high PCE concentration detected in the groundwater sample collected from LM030AUA suggests that the PCE concentration in soil gas has rebounded, significantly since shutdown of the SVE system, and may be partitioning into groundwater through the well. Monitoring well LM149A (0.36J µg/L for PCE during 3Q14), located 15 feet to the northwest of LM030AUA and screened from 25 to 35 feet bgs, provides a better representation of PCE impacts in groundwater in the vicinity.

The migration of VOCs through this well and into groundwater is not consistent with the RAOs established in the 1998 OU 1 ROD. Well LM030AUA should be decommissioned.

7.3.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer and non-cancer toxicity values for beryllium and TCE have become more stringent than values used in the 1996 RI/FS (Table 7.1-1). Due to these changes, the previous cancer risk and non-cancer hazard estimates potentially underestimate the risk to industrial receptors. To reevaluate the risk, the soil EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2. The revised cumulative cancer risk of $5x10^{-6}$ and noncancer hazard index (HI) of 0.03 are presented on Table 7.1-3. The soil gas EPCs were updated to reflect new data collected in the last five years and the revised cumulative cancer risk of $6\ x10^{-5}$ is presented on Table 7.1-4. .

The 1998 OU 1 ROD soil gas cleanup levels for TCE (350 ppbv) and PCE (780 ppbv) were established to minimize impacts to groundwater. The 2011 ESD then identified indoor air RSLs and new commercial/industrial soil gas screening levels for TCE (113.5 ppbv) and PCE (31 ppbv) were calculated in accordance with the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater to Soil* (U.S. EPA, 2002) for the protection of human health via vapor intrusion. Since the 2011 ESD, the California-modified indoor air RSLs for TCE and PCE have been revised based on the *EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay NPL Sites* (U.S. EPA 2013, DTSC, 2015). Use of the California-modified RSLs and the U.S. EPA's 0.03 indoor air to soil gas attenuation factor results in commercial/industrial soil gas screening level of 19 ppbv and 10 ppbv for TCE and PCE, respectively. These values are less than those used to establish LUCs at SWMU1/Area 2 in the 2011 ESD.

Cleanup levels were not developed for some soil COCs, as the 1996 RI/FS concluded that there were no potential adverse effects for an industrial receptor (URS, 2012) as demonstrated by an excess cancer risk greater than $1x10^{-6}$ and noncancer risk of less than 1.0. These COCs are identified in Table 7.1-3.

The RAO to prevent the migration of PCE and TCE in soil to groundwater remains valid. The chosen remedy is addressing the RAO by instituting LUCs that require that buildings constructed in this area to include vapor intrusion mitigation measures and notification prior to future construction activities. The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination of beryllium and PAHs, which is being accomplished through instituting a LUC in this area.

7.3.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

Review of the LUC boundaries and most recent soil gas analytical results indicates that the LUC boundary does not cover all areas of SWMU 1/Area 2 where TCE and/or PCE concentrations are greater than soil gas screening levels calculated with the California-modified RSLs. While LUC boundaries may not adequately prevent the future construction of unmitigated commercial or residential buildings, the remedy remains protective for the following reasons:

- The January 2015 RSL users guide states "It should be emphasized that screening levels are not cleanup standards. We [U.S. EPA] also do not recommend that the RSLs be used as cleanup levels for Superfund Sites until the recommendations in EPA's Supplemental Guidance to RAGS, Volume I, Part A ("Community Involvement in Superfund Risk Assessments" http://www.epa.gov/oswer/riskassessment/ragsa/pdf/ci_ra.pdf) have been addressed."

- The LUC at SWMU 1/Area 2 covers the majority of the site where TCE and PCE are detected at concentrations greater than the soil gas screening level calculated with the California-modified RSL. The portion of SWMU 1/Area 2 that is not covered by the LUC is located to the south of the LUC boundary, beneath the railroad tracks, and in an area that does not include buidlings. The presence of the railroad tracks reduces the likelihood that this area would be selected for future building construction.

- The California-modified RSL was calculated by the U.S. EPA to be protective of the excess cancer risk range of $1x10^{-6}$ and therefore the lower bounds of the U.S. EPA's accepted risk management range of $1x10^{-4}$ to $1x10^{-6}$. The LUC is protective of the U.S. EPA's upper risk range of $1x10^{-4}$.

7.4 OU 1: SWMUs 2 and 3

The following sections identify the selected remedy at SWMUs 2 and 3 and provide an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.4.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for SWMUs 2 and 3:

- Excavation and disposal of contaminated soil, and
- Groundwater monitoring to verify the effectiveness of the remedy.

LUCs were established for dieldrin, beryllium and aluminum at SWMU 2 and 3 in the 2001 and 2004 ESDs for the following purposes:

- Prohibit residential, day care, play area, or school use; and
- Prevent unprotected exposure of construction workers to contaminated soil.

More detail on the selected remedial action is provided in Section 4.0.

7.4.2 Technical Assessment Questions

7.4.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMUs 2 and 3 is functioning as intended by the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs.

Remedial Action Performance

The remedy was successful at excavating and disposing of contaminated soil; however, groundwater monitoring well LM003AA has not met 1998 OU 1 ROD monitoring requirement and continues to be monitored. Review of recent historical analytical results indicates that the dieldrin concentration in well LM003AA exhibits a decreasing trend, which is likely to meet the RAO in a reasonable amount of time; therefore, this well will continue to be monitored until 1998 OU 1 ROD monitoring requirements have been met.

Land Use Controls. During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.4.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer inhalation and non-cancer ingestion toxicity values for beryllium have become more stringent when compared to the values used in the 1996 RI/FS. The cancer and non-cancer risk estimates in the 1996 RI/FS potentially underestimate the potential risk to industrial receptors. To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $1x10^{-5}$ and noncancer HI of 0.08 are presented on Table 7.1-3.

The original RL-based cleanup levels for 2,4-dimetholphenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate are greater than the U.S. EPA CRQLs, but less than the January 2015 commercial/industrial soil RSLs; therefore, the cleanup levels remain valid. The remaining RL-based cleanup levels are either equal to the CRQL or less than their January 2015 commercial/industrial soil RSL; therefore, these cleanup levels remain valid. An RSL or CRQL has not been established for monuron; however, the maximum concentration is less than its RL-based cleanup level and therefore remains valid.

With the exception of dieldrin, risk-based cleanup levels for other COCs are less than the current commercial/industrial soil RSLs and therefore remain valid. The cleanup level for DDX (total) was removed in the 2001 ESD, as the post-excavation soil concentrations of DDD, DDE, and DDT were below background concentrations that were derived in the 1996 RI/FS (URS, 2001a).

Cleanup levels were not developed for several of the COCs identified in Table 7.1-3. These maximum soil concentrations were less than their January 2015 commercial/industrial soil RSLs; therefore, they do not present an unacceptable risk to human health.

The RAOs to prevent the exposure of industrial receptors to contaminated soil and to prevent the migration of COCs in soil to groundwater remain valid. The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

7.4.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

No new information has become known that could call into question the protectiveness of the remedy.

7.5 OU 1: SWMU 4

The following sections identify the selected remedy at SWMU 4 and provide an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.5.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for SWMU 4:

- Installation of an overflow weir to prevent potentially contaminated sediment from being discharged from the pond;
- Installation of a sediment trap. (Note: the overflow weir was designed to enable the pond to function as a sediment trap);
- Storm water monitoring to ensure the overflow weir and sediment trap are effective; and
- Groundwater monitoring to verify the effectiveness of the remedy.

LUCs were established in the 2001 and 2004 ESD to prohibit residential, day care, play area, or school use.

More detail on the selected remedial action is provided in Section 4.0.

7.5.2 Technical Assessment Questions

7.5.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 4 is functioning as intended by the 1998 OU 1 ROD as modified by the 1998 OU 1 ROD Amendment and 2001 and 2004 ESDs.

Remedial Action Performance

1998 OU 1 ROD monitoring requirements were met for therefore the remedy was effective at preventing impacts to groundwater. DLA Installation Support performs sampling if discharged storm water as part of its storm water pollution prevention program, to comply with requirements of California's General permit for Industrial Activities. Annual storm water discharge reports indicates that storm water was not observed discharging from SWMU 4 during the 2010 through 2014 reporting period. Therefore, the remedy was effective at preventing potentially contaminated sediment from being discharged from the pond.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer inhalation toxicity value for arsenic has become more stringent, which suggests the cancer risk estimates potentially underestimate the potential risk to industrial receptors. The 1996 RI/FS risk estimatesindicate that potential cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). In comparison, the potential non-cancer adverse effects were of concern for an industrial receptor, in which arsenic and manganese contributed the most to the unacceptable hazard estimates via the ingestion and dermal exposure routes. To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $8x10^{-6}$ and noncancer HI of 0.28 are presented on Table 7.1-3.

The RAOs to prevent ecological receptors from being exposed to COCs in the sediment and surface water as well as to prevent the release of COCs from sediment that would cause surface water concentrations to exceed federal freshwater chronic AWQC remain valid.

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

No new information has become known that could call into question the protectiveness of the remedy.

7.6 OU 1: SWMU 6

The following sections identify the selected remedy at SWMU 6 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.6.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for SWMU 6:

- Excavation and disposal of contaminated soil, and
- Groundwater monitoring to verify the effectiveness of the remedy.

The 2004 ESD established LUCs for the following purposes:

- Prohibit residential day care, play area, or school use; and
- Prevent unprotected exposure of construction workers to contaminated soil.

More detail on the selected remedial action is provided in Section 4.0.

7.6.2 Technical Assessment Questions

7.6.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 6 is functioning as intended by the 1998 OU 1 ROD as modified by the 2004 ESD.

Remedial Action Performance

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer inhalation and non-cancer ingestion toxicity values for beryllium have become more stringent; therefore, the cancer and non-cancer risk estimates potentially underestimate the potential risk to industrial receptors. The original risk estimatesindicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $10x10^{-7}$ and noncancer HI of 0.0003 are presented on Table
7.1-3.

The original RL-based cleanup levels for endrin and heptachlor are less than the current U.S. EPA CRQLs and less than the current commercial/industrial soil RSLs; therefore, the cleanup levels remain valid. There are no current U.S. EPA CRQLs for dicamba and 2,3,7,8-TCDD. Cleanup levels for dicamba

and 2,3,7,8-TCDD were compared to the commercial/industrial soil RSLs, while dicamba's cleanup level is less than the commercial/industrial RSL, 2,3,7,8-TCDD's cleanup level is greater than the RSL.

Laboratory analysis and risk assessment methods for 2,3,7,8-TCDD and related constituents have advanced greatly since the time of the 1996 RI/FS. For example, current lab analyses can reach nanogram/kilogram (ng/kg) concentrations for soil matrices (U.S. EPA, 2009), whereas the RL in 1996 was 5 µg/kg. In addition, 2014 U.S. EPA guidance related to the bioavailability of dioxins discusses the fact that soil-related exposure is normally to a mixture of "dioxin-like" chemicals that have varying toxicity and relative bioavailability (U.S. EPA, 2014b). Variations in toxicity potency are addressed through use of Toxicity Equivalence Factors that reflects the toxicity potency relative to 2,3,7,8-TCDD (U.S. EPA, 2014b). For the Tracy Site, the original RL-based cleanup level does not have a corresponding CRQL and the RL exceeds the commercial/industrial RSL, which would result in the original cleanup level no longer being valid.

The original risk-based cleanup levels for dieldrin, lindane, and 2, 4, 5-T are less than the current commercial/industrial soil RSLs; therefore, the cleanup levels remain valid. The cleanup level for 2,3,7,8-TCDD is greater than the commercial/industrial RSL; Therefore, 2,3,7,8-TCDD may present an unacceptable risk to human health; however, future assessment should include a detailed, congener-specific analysis and incorporate the many advances in performing risk analysis before including dioxins in determination of protectiveness for SWMU 6.

Cleanup levels were not developed for benzo(a)anthracene, benzo(a)pyrene, beryllium, and PCBs; however, maximum soil concentrations for these COCs were less than the January 2015 commercial/industrial soil RSLs.

The RAOs to prevent the exposure of industrial receptors to contaminated soil and to prevent the migration of pesticides in soil to groundwater remain valid. The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

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

No new information has become known that could call into question the protectiveness of the remedy; however, comparison of maximum detected COC concentrations to the January 2015 residential RSLs indicate that COCs are not present in soil at concentrations sufficient to present an unacceptable human health risk; therefore, DLA could prepare an appropriate decision document to remove LUCs requirements from SWMU 6. SWMU 6 meets criteria allowable for unrestricted use and unrestricted exposure; therefore, future five year reviews of SWMU 6 are not necessary.

7.7 OU 1: SWMU 7

The following sections identify the selected remedy at SWMU 7 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.7.1 Selected Remedy

The remedy selected in the 1998 OU 1 ROD included LUCs to prevent impacts to human health and compliance monitoring of existing and proposed monitoring wells to demonstrate protection of groundwater. The 2001 ESD clarified the LUCs imposed by the 1998 OU 1 ROD to require that the

existing structures and pavement at SWMU 7 be maintained. The 2004 ESD amended the requirements for LUCs at SWMU 7 as follows:

- Establish notification procedure for construction activities or land use changes in the IMP
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement
- Perform annual site inspection and review to ensure compliance with controls and to correct deficiencies in the existing cover or notification procedure
- Follow defined procedures in the event of a change in land use
- Install warning signs
- Ensure controls are restored following construction activities

More detail on the selected remedial action is provided in Section 4.0.

7.7.2 Technical Assessment Questions

7.7.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 7 is functioning as intended by the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs.

Remedial Action Performance

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer and non-cancer toxicity values for 1,2-DCE, beryllium, and TCE have become more stringent. Table 7.1-1 indicates which toxicity values changed for each chemical. Due to the change in toxicity values, the cancer and non-cancer risk estimates in the 1996 RI/FS potentially underestimate the potential risk to industrial receptors. The original risk estimatesindicate that potential cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS, yet the potential non-cancer adverse effects were of concern, via inhalation of manganese (URS, 2012). To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $2x10^{-6}$ and noncancer HI of 0.02 are presented on Table 7.1-3.

The original RL-based cleanup levels for 1,2-DCE and bis(2-ethylhexyl)phthalate are greater than the current U.S. EPA CRQLs, yet they are less than the current commercial/industrial soil RSLs. Therefore, the RL-based cleanup levels remain valid. For the other RL-based cleanup levels, the CRQL is either greater, equal to, or there is not one for comparison. These cleanup levels were compared to the commercial/industrial soil RSLs and they are less than the RSLs; therefore, they remain valid.

Cleanup levels were not developed for the 10 COCs indicated on Table 7.1-3; however, maximum soil concentrations for these COCs were less than the January 2015 commercial/industrial soil RSLs.

The RAOs to prevent the exposure of industrial receptors to contaminated soil and to maintain existing cover to minimize infiltration of runoff remain valid. The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

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

No new information has come to light that could call into question the protectiveness of the remedy at SWMU 7.

7.8 OU 1: SWMU 8

The following sections identify the selected remedy at SWMU 8 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.8.1 Selected Remedy

The 1998 OU 1 ROD and 2004 ESD identified the following RAOs for SWMU 8:

- Excavation/disposal of contaminated soil followed by groundwater extraction, and
- Groundwater monitoring to verify the effectiveness of the remedy.

More detail on the selected remedial action is provided in Section 4.0.

7.8.2 Technical Assessment Questions

7.8.2.1 Question A - Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

In response to confirmation sampling results, the excavation at SWMU 8 was expanded to more than double the design volume. Although soil concentrations exceeded the 1998 OU 1 ROD cleanup standards, it was determined that all contaminant concentrations had been reduced to levels below risk-based cleanup levels identified in the 1998 OU 1 ROD and were unlikely to pose a risk to the environment (based on DI WET results) (URS, 2004a). The 2004 ESD further states that residual concentrations of DDT and dieldrin do not pose a significant threat under the residential scenario and that potential impacts to groundwater will be evaluated through the WMP.

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls. LUCs have not been established for SWMU 8.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The non-cancer ingestion and inhalation toxicity values for naphthalene have become more stringent than values use in the 1996 RI/FS. The non-cancer risk estimates potentially underestimate the potential risk to industrial receptors. The cancer and non-cancer risk estimates used in the 1996 RI/FSindicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor (URS, 2012). To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $1x10^{-6}$ and noncancer HI of $1x10^{-6}$ are presented on Table 7.1-3.

The original RL-based cleanup levels for 2,4-dinitrotoluene, bis(2-ethylhexyl)phthalate, diethylphthalate, and naphthalene are greater than the current U.S. EPA CRQLs; but less than January 2015 commercial/industrial soil RSLs; therefore, the cleanup levels remain valid. Lindane's RL-based cleanup level is equal to the U.S. EPA CRQL and remains valid. Of the remaining COCs that use original RL-based cleanup levels, there are no current U.S. EPA CRQLs for comparison; however, the cleanup levels are less than the January 2015 commercial/industrial RSLs and therefore remain valid.

The original risk-based cleanup levels for chlordane, dieldrin, DDD and DDT are less than the current commercial/industrial soil RSLs; therefore, the cleanup levels remain valid.

The RAOs to prevent the exposure of industrial receptors to pesticides and to prevent the migration of COCs from soil to groundwater remain valid.

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

The mass of contaminants removed is estimated to be 5,293 pounds, and less than 1 pound is estimated to remain at SWMU 8 (URS, 2004a). Comparrison of post excavation soil sample results to the January 2015 residential RSLs indicates that detected analytes are less than their RSL; however, post excavation results are not provided for DDE; therefore, it is unknown whether soil excavation was able to to reduce DDE from a maximum detected concentration of 15,200 µg/Kg to less than the residential RSL. For this reason DDE may be present in soil at concentrations that prevent unrestricted use and unrestricted exposure.

While DDE may be present at concentrations that do not allow for unrestricted use or unrestricted exposure SWMU 8 is located within the Eastern Depot Soils Area LUC boundary; therefore, the remedy is protective.

7.9 OU 1: SWMU 20

7.9.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for SWMU 20:

- Excavation of COC impacted soil from the vadose zone;

- SVE to prevent the migration of residual VOCs from impacting groundwater; and
- Groundwater monitoring to verify the effectiveness of the remedy.

The 2004 ESD removed the SVE component of the remedy and added a LUC due to contaminants left in place beneath Building 10 as well as potential contamination to the east of Building 10.

Following the demolition of Building 10, the 2011 ESD reinstated the SVE component of the remedy and established a LUC at SWMU 20 for the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone;
- Require that all future buildings be constructed with a vapor barrier to mitigate intrusion of COCs from the vadose zone to indoor air.

More detail on the selected remedial action is provided in Section 4.0.

7.9.2 Technical Assessment Questions

7.9.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 20 is functioning as intended by the 1998 OU 1 ROD as modified by the 2011 ESD.

Remedial Action Performance

The SVE system operated at SWMU 20 for approximately 10,765 hours from October 2011 until November 2013 and removed approximately 2.8 pounds of VOCs. In August 2012, 1998 OU 1 ROD specified cleanup goals for protection of groundwater were met, however, SVE operations continued with the intention of meeting the industrial soil gas screening levels for vapor intrusion protectiveness. In February 2014, the most recent sampling event, PCE did not exceed the industrial soil gas screening level for vapor intrusion protectiveness; however, three VEs and two VMPs have TCE concentrations that exceeded the industrial soil gas screening level for vapor intrusion protectiveness.

The 1998 OU 1 ROD requires a minimum of three years of post remedial groundwater monitoring to determine whether the remedy was successful; therefore, 1998 OU 1 ROD monitoring requirements have not been met and groundwater monitoring wells will continue to be sampled.

Land Use Controls. During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.9.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

Since the 1996 RI/FS, the cancer and non-cancer toxicity values for 2,4, 6-trichlorophenol, xylenes, and TCE have become more stringent (Table 7.1-1). The cancer and non-cancer risk estimates in the 1996

RI/FS potentially underestimate the potential risk to industrial receptors. The original risk estimates indicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). To reevaluate the risk, the soil EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $2x10^{-6}$ and noncancer HI of 0.01 are presented on Table 7.1-3. The soil gas EPC for TCE was updated to incorporate data collected in the last five years and the cancer risk was revised to $4x10^{-6}$ is presented on Table 7.1-4.

RL-based cleanup levels that are greater than the current U.S. EPA CRQL were determined to be less than the commercial/industrial soil RSLs and therefore, these cleanup levels remain valid. For the other RL-based cleanup levels, the CRQL is either higher, equal to, or there is not one for comparison. These cleanup levels were compared to the commercial/industrial soil RSLs and they are less than the RSLs; therefore, they remain valid. There is not a CRQL or RSL for methiocarb; since there has been no change in exposure assumptions, the cleanup level remains valid.

The California-modified RSLs for TCE and PCE, which can be used in conjunction with the 0.03 indoor air to soil gas attenuation factor to calculate soil gas screening levels, are more stringent than the soil gas screening levels codified in the 2011 ESD.

The RAO to prevent migration of COCs in soil to groundwater remains valid. The RAO to prohibit residential, day care and school use also remains valid to protect sensitive receptors (and less sensitive receptors, e.g., an industrial worker) from residual contamination. This is being accomplished through instituting a LUC in this area.

7.9.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

While the California-modified RSL for TCE and PCE is more stringent than the RSL used in the 2011 ESD to establish the vapor intrusion LUC, review of soil gas sample results and comparison to their respective California modified RSLs, indicates that the existing LUC prevents residential exposure to TCE and PCE in soil gas that can present impacts to human health. No new information has become known that could call into question the protectiveness of the remedy.

7.10 OU 1: SWMU 24

The following sections identify the selected remedy at SWMU 24 and provide an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.10.1 Selected Remedy

The selected remedy in the 1998 OU 1 ROD for SWMU 24 is bioventing and compliance monitoring of wells LM116A and LM118AU to evaluate the effectiveness of the remedy on water quality.

The 2004 ESD established the following LUCs:

- Establish notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e. IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct and deficiencies in the notification procedure; and

- Follow defined procedures in the event of a change in land use.

More detail on the selected remedial action is provided in Section 4.0.

7.10.2 Technical Assessment Questions

7.10.2.1 Question A - Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer and non-cancer toxicity values for eight COCs have become more stringent when compared to values used in the 1996 RI/FS (Table 7.1-1). The cancer and non-cancer risk estimates used in the 1996 RI/FS potentially underestimate the risk to industrial receptors. The original risk estimates indicate that potential cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012), but there was an unacceptable non-cancer hazard estimate, via the inhalation route from manganese. To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 which revised the cumulative cancer risk to $3x10^{-6}$ and noncancer HI of 0.2 are presented on Table 7.1-3.

The 2009 RAGS Part F guidance revised the method for calculating inhalation risks to optimally incorporate site- and receptor-specific exposure factors and corresponding toxicity values. The 1996 RI/FS relied on default exposure factors and inhalation toxicity derivation methods in use at that time, use of site and receptor specific exposure factors and newer methods to derive toxicity values, consistent with the RAGS guidance, may affect the calculated risk and protectiveness of the remedy.

The original RL-based soil cleanup levels for several COCs are greater than the U.S. EPA CRQL, but less than the current commercial/industrial RSLs; therefore, the cleanup levels remain valid. The remaining RL-based cleanup levels are either equal to the CRQL or a CRQL is not available for the COC. For those COCs where a CRQL is not provided, the cleanup levels were compared to the commercial/industrial soil RSLs. The cleanup levels were less than the commercial/industrial RSLs, therefore, the RL-based cleanup levels remain valid.

The RAOs to prevent migration of COCs in soil to groundwater and prevent exposure of industrial receptors to toluene in soil remain valid. The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination; this is being accomplished through instituting a LUC in this area.

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

VOCs are present in soil at SWMU 24 and extend beneath Building 247, which is currently occupied. In June 2004, indoor air samples were collected from Building 247 and it was reported that concentrations of VOCs were well less than occupational health exposure criteria (URS, 2004d). As stated in the *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC, 2011) the Occupational Safety and Health Administration PELs are not appropriate criteria for evaluating the risk associated with vapor intrusion to indoor air in California.

To evaluate whether VOCs detected in indoor air during the June 2004 sampling event present a risk to industrial occupants, the DLA compared the indoor air results to the May 2015 DTSC modified Commercial/Industrial indoor air RSL for PCE and TCE. This comparison indicated that PCE and TCE were not detected in indoor air samples at concentrations greater than the May 2015 DTSC modified Commercial/industrial RSL; therefore, VOCs do not present a risk to Building 247 occupants.

7.11 OU 1: SWMU 27

The following sections identify the selected remedy at SWMU 27 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.11.1 Selected Remedy

The selected remedy in the 1998 OU 1 ROD for SWMU 27 is bioventing and compliance monitoring of wells LM117A to evaluate the effectiveness of the remedy on water quality. LUCs were not established for SWMU 27.

More detail on the selected remedial action is provided in Section 4.0.

7.11.2 Technical Assessment Questions

7.11.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 27 is functioning as intended by the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs.

Remedial Action Performance

Well LM117A met the 1998 OU 1 ROD monitoring requirements for TCE, 2,4-D, MCPA, and 2,4,5-T in 2003 and for TPHMO in 3Q14 this well will no longer be sampled (HDR, 2014b).

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

The exposure assumptions remain valid, as discussed in Section 7.1.1. Changes to the exposure assumptions (increased body weight and decreased adult exposure duration) in the 2011 U.S. EPA Exposure Factors Handbook would result in a decrease in the calculated risk for industrial/commercial receptors. However, TCE and benzo(a)pyrene are noted as having a MMOA; early life (e.g., child) exposure assumptions have been changed as per the Supplemental Guidance. The MMOA assessment guidelines would be applicable to child resident exposure and could impact exposure assumptions in this

area if the land use changes or residential use is to be evaluated, e.g., in order to assess the need for a LUC.

The cancer and non-cancer inhalation and ingestion toxicity values for TCE have become more stringent when compared to the values used in the 1996 RI/FS (Table 7.1-1). The cancer and non-cancer risk estimates used in the 1996 RI/FS underestimate the potential risk to industrial receptors. The original risk estimates indicate that potential non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). In comparison, there was an unacceptable cancer for an industrial receptor, in which benzo(a)pyrene among the other PAHs contributed the most. To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $2x10^{-5}$ and noncancer HI of 0.0005 are presented on Table 7.1-3.

The original RL-based cleanup level for TCE is the same as the current U.S. EPA CRQL and remains valid. Since there are no CRQLs for the remaining COCs whose cleanup levels were based on RLs, these cleanup levels were compared to the current commercial/industrial soil RSL. This comparison indicates that the cleanup levels are less than the RSL and therefore, remain valid. The risk-based cleanup level for PCBs is lower than the commercial/industrial RSL; and therefore, remains valid.

The original risk-based cleanup levels and the maximum soil concentration for benzo(a)pyrene is greater than the commercial/industrial soil RSL. Therefore, the cleanup level for benzo(a)pyrene is no longer valid. However, the maximum concentration is based on analytical data from soils that were removed in 1999. Post-excavation sampling is stated to have attained cleanup levels for COCs, except TPH; however, analytical results were not found in review of available site documents, therefore validity of this statement could not be confirmed. If post-excavation sampling results can be confirmed, TPH may no longer present a health risk. Residual TPH contamination is attributed to UST Site 7d (URS, 2012).

The RAOs to prevent the migration of the COCs from soil to groundwater and to prevent the exposure of industrial workers to PAHs and PCBs remain valid. Groundwater samples collected from well LM117A have met the 1998 OU 1 ROD cleanup goals; therefore, the protection of groundwater RAO has been met.

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

Review of the *Project Closeout Plan* (USACE, 2003) indicates that benzo(a)pyrene was not detected in post-excavation soil samples above the laboratory RL of approximately 550 µg/Kg; however, the January 2015 residential RSL for benzo(a)pyrene is 16 µg/Kg. Due to the elevated laboratory RL, is unknown whether benzo(a)pyrene is present in soil at concentrations sufficient to present a risk to residential receptors in the event of a change in land use. A LUC has not been established at SWMU 27 to prevent a change in land use.

7.12 OU 1: SWMU 33

The following sections identify the selected remedy at SWMU 33 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.12.1 Selected Remedy

The remedy selected in the 1998 OU 1 ROD includes excavation of manhole(s) at Building 10, grouting of the piping connections to the industrial wastewater pipeline, and LUCs. Most of the industrial

wastewater pipeline was left in place following grouting. LUC requirements were modified in the 2001 and 2004 ESDs.

More detail on the selected remedial action is provided in Section 4.0.

7.12.2 Technical Assessment Questions

7.12.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for SWMU 33 is functioning as intended by the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs.

Remedial Action Performance

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The non-cancer ingestion and inhalation values for naphthalene and xylene have become more stringent than values used in the 1996 RI/FS; therefore, the non-cancer risk estimates potentially underestimate the risk to industrial receptors. The risk estimates in the 1996 RI/FS indicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2 and the revised cumulative cancer risk of $4x10^{-9}$ and noncancer HI of $3x10^{-6}$ are presented on Table 7.1-3.

The 1996 RI/FS did not evaluate risk from exposure to VOCs in indoor air from VI. Potential VI impacts at SWMU 33 have been evaluated as part of the soil gas optimization performed at Area 1 and SWMU 20.

The original RL-based cleanup levels for the COCs are greater than the current U.S. EPA CRQLs, but less than the current commercial/industrial soil RSLs. Therefore, the RL-based cleanup levels remain valid. The remaining RL-based cleanup levels are either equal to or less than the CRQL or a CRQL is not provided for the COC. These cleanup levels were compared to the commercial/industrial soil RSLs. The cleanup levels are less than the January 2015 commercial/industrial RSLs and therefore, the cleanup levels remain valid. There is not a CRQL or RSL for methiocarb and the maximum concentration is greater than the cleanup level; there is inadequate information to determine whether this RL-based cleanup level remains valid.

The RAO to prevent the migration of COCs from soil to groundwater remains valid. The effect of potential migration of COCs to groundwater may be evaluated using U.S. EPA's 1996 Soil Screening Guidance, as described above, as it may affect the protectiveness of the remedy.

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

No new information has become known that could call into question the protectiveness of the remedy.

7.13 OU 1: Building 30 Drum Storage Area

The following sections identify the selected remedy at the Building 30 Drum Storage Area and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.13.1 Selected Remedy

The remedy selected in the 1998 OU 1 ROD as modified by the 2001 and 2004 ESDs is the establishment of LUCs and groundwater monitoring.

7.13.2 Technical Assessment Questions

7.13.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for the Building 30 Drum Storage Area is functioning as intended by the 1998 OU 1 ROD.

Groundwater Monitoring Program

Groundwater monitoring wells met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was effective at meeting the RAOs.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The toxicity values used in the 1996 RI/FS have not become more stringent for of the COCs identified for this area and thus, remain valid. The original risk estimates indicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS. The EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2. The revised cumulative cancer risk of $9x10^{-9}$ and noncancer HI of $5x10^{-5}$ are presented on Table 7.1-3.

The original RL-based cleanup levels for three of the four COCs are greater than the current U.S. EPA CRQLs, yet they are less than the current commercial/industrial soil RSLs. Therefore, the RL-based cleanup levels remain valid. Since there is not a CRQL for benzyl alcohol, the maximum detected soil concentration was compared to the current commercial/industrial soil RSL. The maximum detected soil concentration is less than the RSL, and therefore, does not affect protectiveness.

The RAO to prevent the migration of COCs from soil to groundwater with LUCs, and confirmed by groundwater sampling was established in the 1998 OU 1 ROD. The RAO has been met and the LUCs are no longer necessary for the following reasons:

- The presence of phthalates at Building 30 is interpreted to be a result of laboratory contamination. However, phthalates were included in the modeling effort as a contingency to determine what impacts would result if the concentrations represented actual contamination (1996 RI/FS),
- Theoretical concentrations of benzyl alcohol and diethylphthalate were less than beneficial use limits but exceeded background levels. Because the compounds which pose a potential threat to groundwater are suspected laboratory artifacts, further evaluation of the fate and transport of these COPCs using numerical modeling was not recommended (1996 RI/FS),
- The 1996 RI/FS states that phthalates were detected in the deepest soil sample. If phthalate contamination was a result of drum storage the greatest phthalate concentrations would be expected to be shallower, closer to the suspected source, and decrease with depth,
- Groundwater samples collected from monitoring well LM169A, installed at Building 30 to evaluate effectiveness of the remedy, has never yielded COCs at greater than 1998 OU 1 ROD groundwater concentrations requiring evaluation,
- The maximum detected concentration of benzyl alcohol is less than U.S. EPA January 2015 soil screening levels established for the protection of the beneficial use of groundwater, and
- Maximum detected concentrations of COCs are less than the U.S. EPA January 2015 residential RSLs.

If DLA intends to pursue lifting LUCs and future five year review requirements for the Building 30 Drum Storage Area, a decision document will need to be prepared which effectively demonstrates that COCs do not present an unacceptable risk to human health or the environment and that LUCs are not necessary to mitigate the infiltration of runoff that could encourage contaminant migration from the vadose zone.

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

No new information has become known that could call into question the protectiveness of the remedy.

7.14 OU 1: Site 72

The following sections identify the selected remedy at Site 72 and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.14.1 Selected Remedy

The remedy selected for these areas is the establishment of LUCs.

7.14.2 Technical Assessment Questions

7.14.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy is functioning as intended by the 1998 OU 1 ROD and subsequent decision documents.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The toxicity values have not become more stringent for of the COCs identified for this area and thus, remains valid. The original risk estimates indicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 2001 risk assessment (URS, 2001a). The EPCs from the 2001 NFRAP were divided by the RSLs per the methods discussed in Section 7.1.2 ;the revised cumulative cancer risk of $1x10^{-6}$ is presented on Table 7.1-3.

Cleanup levels were not developed for the COCs in this area, because there is not a significant current or future risk as discussed in the Second Five-Year Review (URS, 2012). The COC maximum soil concentrations have been compared to the current commercial/industrial soil RSLs to evaluate the validity of these earlier conclusions. COC maximum detected soil concentrations are less than their respective January 2015 commercial/industrial RSL; therefore the cleanup levels remain valid.

The RAO to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

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

No new information has become known that could call into question the protectiveness of the remedy.

7.15 OU 1: Northern Depot Soils Area

The following sections identify the selected remedy at the Northern Depot Soils Area and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.15.1 Selected Remedy

The remedy selected in the 1998 OU 1 ROD consists of installing an asphalt cover over soil with concentrations of arsenic and manganese that pose potential health risks.

The 2001 ESD modified the remedy by changing the cover requirements to allow for an aggregate cover as opposed to the asphalt cover specified in the 1998 OU 1 ROD. The 2001 ESD allows the aggregate cover to be replaced with an asphalt cover as specified in the 1998 OU 1 ROD.

7.15.2 Technical Assessment Questions

7.15.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for Northern Depot Soils Area was not functioning as intended by the 1998 OU 1 ROD and 2001 ESD.

Land Use Controls

Annual inspection of the LUC is performed by DLA. Since the last Five-Year Review, gravel was placed in areas of deficiency to provided adequate cover; however, vehicle traffic or other disturbances reduced the cover thickness in traffic areas. During the 2014 annual inspection, it was noted that inadequate cover was observed on the eastern portion of Northern Depot Soils Area. While the absence of adequate cover is an indicator that the remedy is not functioning as intended by decision documents, this observation does not result in impacts to human health that could affect protectiveness for the following reasons:

- A majority of the eastern portion of the Northern Depot Soils Area is paved with asphalt, effectively eliminating the exposure pathway.
- Soil samples collected from locations on the eastern portion of the Northern Depot Soils Area which exceeded the 812 mg/Kg cleanup standard are covered with asphalt.
- The U.S. EPA's January 2015 commercial/industrial RSL for manganese is 2,600 mg/Kg. This was calculated with a target cancer risk of $1x10^{-6}$ and hazard index of 0.1. The U.S. EPA's acceptable risk management range is $1x10^{-4}$ to $1x10^{-6}$ which corresponds to a manganese concentration of 260,000 mg/kg and 2,600 mg/Kg, respectively. The greatest manganese concentration detected in shallow soil at the Northern Depot Soils Area was 26,000 mg/Kg an order of magnitude less than the upper bounds of the U.S. EPA's risk management range.
- Industrial RSLs are calculated assuming that the exposure occurs 250 days per year over a 25 year time period. In general, exposure at the Northern Depot Soils Area is much less frequent as the area is used for storage and transient exposure by DLA police inspecting the Depot perimeter; therefore, application of RSLs may be overly conservative.

While comparison of these analytes to relevant industrial screening levels does not indicate the presence of a health risk, the LUC requires the maintenance of adequate cover. In order to comply with the LUC requirements the cover should be restored in this area.

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

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer inhalation value for arsenic has become more stringent when compared to values used in the 1996 RI/FS, which suggests the cancer risk estimates potentially underestimates the risk to commercial/industrial receptors. The original risk estimates indicate that potential cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS, but the non-cancer adverse effects were of concern (URS, 2012). Arsenic contributed the most to unacceptable non-cancer hazard estimates via both the ingestion and dermal exposure routes. To reevaluate the risk, the EPCs from the

1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2; the revised cumulative cancer risk of $2x10^{-5}$ and noncancer HI of 1 are presented on Table 7.1-3.

The original risk-based cleanup levels for arsenic and manganese are less than the current commercial/industrial soil RSLs; therefore, the cleanup levels remain valid.

The RAOs to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area. The RAO to prevent the exposure of industrial receptors to arsenic and manganese contamination remains valid as well.

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

No new information has become known that could call into question the protectiveness of the remedy.

7.16 OU 1: Eastern Depot Soils Area

The following sections identify the selected remedy at the Eastern Depot Soils Area and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.16.1 Selected Remedy

The remedy selected for this area is the establishment of LUCs.

7.16.2 Technical Assessment Questions

7.16.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedies are functioning as intended by the 1998 OU 1 ROD and subsequent decision documents.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.16.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The cancer inhalation value for arsenic has become more stringent, than the value used in the 1996 RI/FS. This suggests the cancer risk estimates potentially underestimate the risk to industrial receptors.The original risk estimates, presented on Table 7.1-3, indicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS. However, the risk estimates were not acceptable for the residential receptor; arsenic and dieldrin contributed the most to the cancer risk via ingestion and dermal routes of exposure while dieldrin, DDD, DDE, and DDT contributed the most to the non-cancer estimate via the ingestion route. To reevaluate the risk, the EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2. The revised cumulative cancer risk of 9x10-6 and noncancer HI of 0.01 are presented on Table 7.1-3.

The 2004 ESD established COCs for the site; however, no cleanup levels were developed (URS, 2012), as indicated on Table 7.1-3. The COC maximum detected soil concentrations have been compared to the current commercial/industrial soil RSLs. COC maximum concentrations have been determined to be below their respective RSL, except for arsenic.

The RAOs to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

7.16.2.3 Question C – Has other information come to light that could call into question the protectiveness of the remedy?

No new information has become known that could call into question the protectiveness of the remedy.

7.17 OU 1: Southern Depot Soils Area

The following sections identify the selected remedy at the Southern Depot Soils Area and provides an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.17.1 Selected Remedy

The remedy selected for this area is the establishment of LUCs.

7.17.2 Technical Assessment Questions

7.17.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedies are functioning as intended by the 1998 OU 1 ROD and subsequent decision documents.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.17.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

The toxicity values used in the 1996 RI/FS have not become more stringent for the COCs identified for this area and thus, remain valid. The original risk estimatesindicate that potential cancer and non-cancer adverse effects were not of concern for an industrial receptor at the time of the 1996 RI/FS. The EPCs from the 1996 RI/FS were divided by the RSLs per the methods discussed in Section 7.1.2; the revised cumulative cancer risk of $2x10^{-6}$ is presented on Table 7.1-3.

Although dieldrin was added as a COC in the 2004 ESD, no cleanup level was developed (URS, 2012). Dieldrin's maximum soil concentration is less than the current commercial/industrial soil RSL.

The RAOs to prohibit residential, day care and school use remains valid to protect sensitive receptors from residual contamination, which is being accomplished through instituting a LUC in this area.

7.17.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

No new information has become known that could call into question the protectiveness of the remedy.

7.18 OU 1: Area 1 Building 237

The following sections identify the selected remedy at Area 1 Building 237 and provide an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.18.1 Selected Remedy

The 1998 OU 1 ROD identified the following remedies for Area 1 Building 237:

- SVE to prevent the migration of PCE from impacting groundwater; and
- Groundwater monitoring to verify the effectiveness of the remedy.

LUCs were established for PCE and TCE at Area 1 Building 237 in the 2011 ESD for the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone;
- Mitigate intrusion of PCE and TCE from vadose zone to indoor air; and
- Protect construction worker from exposure to COCs in soil.

The 2012 EE/CA identified a limited soil removal action alternative to remediate pesticide contaminated soil along the north side of Building 237. Residual pesticide contamination prompted the inclusion of LUCs in the 2013 MTF to prevent exposure to pesticides in soil.

More detail on the selected remedial action is provided in Section 4.0.

7.18.2 Technical Assessment Questions

7.18.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for Area 1 Building 237 is functioning as intended by the 1998 OU 1 ROD as modified by the 2011 ESD and 2013 MTF.

Remedial Action Performance

In 2012, pesticide impacted soil was removed from Area 1 Building 237 and achieved an excess cancer risk of 2x10-5 and hazard index of 0.0735. Based on the reduction in risk to the industrial worker and because the objectives of the removal action were met, no additional excavation was warranted (HDR, 2012f).

During the Third Five-Year Review period, groundwater monitoring wells have met 1998 OU 1 ROD monitoring requirements; therefore, the remedy was successful at meeting the RAOs.

Land Use Controls. During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.18.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

During this Third Five-Year Review period, the cancer and non-cancer toxicity values for PCE and TCE have become more stringent. Table 7.1-1 indicates which toxicity values changed for each chemical. The cancer risk and non-cancer hazard estimates potentially underestimate the risk to industrial receptors. To reevaluate the risk, the soil EPCs were updated with data from the last five years, as per the methods discussed in Section 7.1.2. The revised cumulative cancer risk of $7x10^{-6}$ is presented on Table 7.1-3. Soil gas EPCs were also updated using analytical data from the last five years; the cumulative cancer risk of $6x10^{-6}$ is presented on Table. 7.1-4.

The RAGS, Part F, Supplemental Guidance for Inhalation Risk Assessment (U.S. EPA, 2009) revised the method for calculating inhalation risks to optimally incorporate site- and receptor-specific exposure factors and corresponding toxicity values. While the 1996 RI/FS relied on default exposure factors and incorporated guidance in place at that time, use of site and receptor specific exposure factors and toxicity values derived using the updated methods, consistent with RAGS, Part F, may affect the calculated risk and protectiveness of the remedy.

The California-modified RSLs for TCE and PCE, which can be used in conjunction with the U.S. EPA's 0.03 indoor air to soil gas attenuation factor to calculate soil gas screening levels, are more stringent than the soil gas screening levels codified in the 2011 ESD.

A cleanup level for soil was developed for DDT using the commercial/industrial soil RSL because it contributed the most to both the cancer and non-cancer risk estimates (HDR, 2012f). No soil cleanup levels were developed for COC pesticides because a NTCRA was performed to excavate the soil to meet site-specific risk-based values for an industrial worker's exposure to pesticides and a LUC was established to prohibit exposure of residential receptors to residual pesticide contamination (HDR, 2012f).

Soil gas samples collected after shutdown of the SVE system indicated that TCE and PCE are present in soil gas at concentrations greater than 1998 OU 1 ROD cleanup goals; therefore, the RAO to prevent migration of PCE and TCE from soil to groundwater remains valid for this area.

The RAO to prohibit residential, day care and school use also remains valid to protect sensitive receptors (and less sensitive receptors, e.g., an industrial worker) from residual contamination. This is being accomplished through instituting a LUC in this area.

7.18.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

Review of the LUC boundaries and most recent soil gas analytical results indicates that the LUC boundary does not cover all areas of Area 1 Building 237 where TCE and/or PCE concentrations are greater than soil gas screening levels calculated with the California-modified RSLs. While LUC

boundaries may not adequately prevent the future construction of unmitigated commercial or residential buildings, the remedy remains protective for the following reasons:

- The January 2015 RSL users guide states ”It should be emphasized that screening levels are not cleanup standards. We [U.S. EPA] also do not recommend that the RSLs be used as cleanup levels for Superfund Sites until the recommendations in EPA's Supplemental Guidance to RAGS, Volume I, Part A ("Community Involvement in Superfund Risk Assessments" http://www.epa.gov/oswer/riskassessment/ragsa/pdf/ci_ra.pdf) have been addressed.”

- The LUC at Area 1 Building 237 covers the majority of the site where TCE and PCE are detected at concentrations greater than the soil gas screening level calculated with the California-modified RSL.

- The California-modified RSL was calculated by the U.S. EPA to be protective of the excess cancer risk range of $1x10^{-6}$ and therefore the lower bounds of the U.S. EPA’s accepted risk management range of $1x10^{-4}$ to $1x10^{-6}$. The LUC is protective of the U.S. EPA’s upper risk range of $1x10^{-4}$.

While application of RSLs as cleanup standards may not be appropriate for the reasons listed above, the March 2011 Building 237 indoor air sample laboratory RL of 0.50 ppbv for PCE is greater than the California-modified commercial/industrial RSL of 0.30 ppbv; therefore, PCE may be present in indoor air at a concentration ranging from 0.30 ppbv to 0.50 ppbv and therefore present an unacceptable long term risk to Building 237 occupants. Review of the March 2011 Building 237 indoor air sample results indicate that TCE was not detected at concentrations greater than the 0.57 ppbv California-modified indoor air commercial/industrial RSL; therefore, TCE does not present an unacceptable human health risk.

The U.S. EPA’s letter *EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South bay NPL Sites* (U.S. EPA, 2013a) states:

> *For cancer causing chemicals, the Superfund Health Protective Risk Range encompasses the range of concentrations EPA considers to be protective, from 1 to 100 in a million increased lifetime cancer risk. The level that falls into the most protective end of the risk range – 1 in a million increased lifetime risk – is what is used as the screening level for any particular chemical. After identifying the health protective levels, EPA then compares measured values to the lowest, most health-protective, end of the range. Although levels of exposure anywhere within the range may be acceptable, EPA’s goal for indoor air exposures to Superfund site-related chemicals is to keep exposures as low as reasonably possible within the Superfund Health Protective Risk Range.*

Although the March 2011 PCE laboratory RL of 0.50 ppbv exceeded the 0.30 ppbv California-modified commercial/industrial RSL the absence of PCE in indoor air greater than 0.50 ppbv demonstrates that the remedy is protective of the upper bounds of the U.S. EPA’s protective risk range; therefore, the remedy is protective in the short term.

7.19 OU 1: Area 3

The following sections identify the selected remedy at Area 3 and provide an evaluation as to whether the remedy is functioning as intended by the decision documents.

7.19.1 Selected Remedy

The 1998 OU 1 ROD identified the following RAOs for Area 3:

- SVE to prevent the migration of PCE from impacting groundwater; and
- Groundwater monitoring to verify the effectiveness of the remedy.

LUCs were established for PCE and TCE at Area 3 in the 2011 ESD for the following purposes:

- Prohibit residential, day care, play area, or school use;
- Maintain existing surface to minimize infiltration of runoff that could encourage contaminant migration from the vadose zone;
- Mitigate intrusion of PCE and TCE from vadose zone to indoor air; and
- Protect construction worker from exposure to COCs in soil.

More detail on the selected remedial action is provided in Section 4.0.

7.19.2 Technical Assessment Questions

7.19.2.1 Question A - Is the remedy functioning as intended by the decision documents?

During the Third Five-Year Review period, the remedy for Area 3 is not functioning as intended by the 1998 OU 1 ROD.

Remedial Action Performance

While SVE, previously conducted at Area 3, was effective at reducing TCE and PCE concentrations in soil gas, the May 2013 soil gas samples indicated that TCE and PCE have rebounded to concentrations greater than 1998 OU 1 ROD cleanup goals. Groundwater samples collected from Area 3 confirmed that TCE and PCE are present in groundwater at concentrations greater than the ACL; therefore, it is likely that TCE and PCE in the vadose zone are affecting groundwater and the remedy is not functioning as intended by the decision documents.

Land Use Controls

During the Third Five-Year Review period, the LUC remedy is functioning as intended. No issues have been identified during the annual inspections.

7.19.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions remain valid, as discussed in Section 7.1.1.

Several of the cancer and non-cancer toxicity values for PCE and TCE have become more stringent. Table 7.1-1 indicates which toxicity values changed for each chemical. The cancer and non-cancer risk estimates in the 1996 RI/FS potentially underestimate the potential risk to industrial receptors. The original risk estimates indicate that potential cancer and non-cancer adverse effects were not of concern

for an industrial receptor at the time of the 1996 RI/FS (URS, 2012). To reevaluate the risk, the EPCs were updated with analytical data from the last five years, as per the methods discussed in Section 7.1.2. The revised cumulative cancer risk of $1x10^{-4}$ is presented on Table 7.1-4.

As discussed above, the RAGS guidance revised the method for calculating inhalation risks to optimally incorporate site- and receptor-specific exposure factors and corresponding toxicity values; as they are meant to be site-specific, they will vary depending on site conditions and potential receptors, which may affect the calculated risk and protectiveness of the remedy.

The California-modified RSLs for TCE and PCE, which can be used in conjunction with the U.S. EPA's 0.03 indoor air to soil gas attenuation factor to calculate soil gas screening levels, are more stringent than the soil gas screening levels codified in the 2011 ESD.

The RAO to prevent migration of COCs from soil to groundwater remains valid. The RAO to prohibit residential, day care and school use also remains valid to protect sensitive receptors (and less sensitive receptors, e.g., an industrial worker) from residual contamination. This is being accomplished through instituting a LUC in this area.

7.19.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

Review of the LUC boundaries and most recent soil gas analytical results indicates that the LUC boundary does not cover all areas of Area 3 where TCE and/or PCE concentrations are greater than soil gas screening levels calculated with the California-modified RSLs. While LUC boundaries may not adequately prevent the future construction of unmitigated commercial or residential buildings, the remedy remains protective for the following reasons:

- The January 2015 RSL users guide states "It should be emphasized that screening levels are not cleanup standards. We [U.S. EPA] also do not recommend that the RSLs be used as cleanup levels for Superfund Sites until the recommendations in EPA's Supplemental Guidance to RAGS, Volume I, Part A ("Community Involvement in Superfund Risk Assessments" http://www.epa.gov/oswer/riskassessment/ragsa/pdf/ci_ra.pdf) have been addressed."

- The LUC Area 3 covers the majority of the site where TCE and PCE are detected at concentrations greater than the soil gas screening level calculated with the California-modified RSL. The portion of Area 3 that is not covered by the LUC is located to the west of the LUC boundary, beneath the railroad tracks. The presence of the railroad tracks reduces the likelihood that this area would be selected for future building construction.

- SVE is scheduled to be constructed at Area 3 and operational by the end of 2015. It is possible that operation of the SVE system will reduce TCE and PCE concentrations in the vadose zone to a point where TCE and PCE are detected less than the California-modified RSL.

The California-modified RSL was calculated by the U.S. EPA to be protective of the excess cancer risk range of $1x10^{-6}$ and therefore the lower bounds of the U.S. EPA's accepted risk management range of $1x10^{-4}$ to $1x10^{-6}$. The LUC is protective of the U.S. EPA's upper risk range of $1x10^{-4}$.

7.20 NWC OU: Northwestern Corner Operable Unit

7.20.1 Selected Remedy

The selected remedy for the NWC OU will remove dieldrin from groundwater to the extent technically and economically feasible for a maximum of three years, consistent with the 14 April 2010 dispute resolution agreement and as documented in the NWC OU ROD. The selected remedy involves:

Mass Removal Components:

- Four groundwater extraction wells pumping for a maximum of three years;
- Treatment of extracted groundwater with LGAC to remove dieldrin to meet WDRs; and
- Discharge of treated groundwater through IGs on the Tracy Site.

Containment Components:

- Natural attenuation (for example, sorption).

Exposure Control Components:

- Implement LUCs, as appropriate, that prohibit installation of water supply wells on the NWC of the Tracy Site through the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest*; and
- Annual inspections to confirm compliance with LUCs, as appropriate.

7.20.2 Technical Assessment Questions

7.20.2.1 Question A - Is the remedy functioning as intended by the decision documents?

Remedial Action Performance:

On January 4, 2012, the NWC OU remedy was started. Following startup, extraction well flow rates were adjusted to optimize groundwater level drawdown and mass extraction in each well. Extracted groundwater is treated through two LGAC units and then discharged to the northern IG. Operations are monitored weekly and adjustments to flow rates have been completed as needed to optimize mass extraction. Groundwater samples are collected monthly from NWC extraction wells and quarterly from NWC monitoring wells. Extraction well operation summaries, dieldrin extraction and sampling results have been documented in monthly, quarterly and annual monitoring reports.

Operations and sampling have been completed in accordance with the remedy documented in the NWC OU ROD. As of September 30, 2014, approximately 9.15 grams of dieldrin were removed from the NWC OU (HDR, 2014b). Dieldrin concentrations in the four NWC extraction wells are generally stable with a slight decreasing trend since startup. The dieldrin extraction rate has also been stable with the rate of removal decreasing in 2014.

The nature and extent of contamination in NWC OU was assessed using groundwater analytical results from 12 groundwater wells. Based on these results, the lateral extent of the dieldrin plume in the Upper Hydrologic Zone has been reduced. Concentrations of dieldrin in eight of the 12-groundwater wells

sampled showed either decreasing or stable trends. The remaining four wells sampled had no trend to determine a trend. During the 2014 reporting period, eight of the 12 wells sampled yielded dieldrin concentrations greater than the 0.05 µg/L goal. (HDR, 2014c)

Land Use Controls:

LUCs were established to prevent exposure of contaminated groundwater above the ACLs. During this Third Five-Year Review period, the LUC remedy is functioning as intended; however, signs identifying the extent of the LUC, a NWC OU ROD requirement, were not observed during the 2014 LUC inspection. Figure 1.2-1 shows the extent of the NWC LUC. Inspections have been conducted annually to confirm land use has not changed. Notification procedures, established with the SJCEHD, ensure future water supply wells are not screened within the affected aquifer.

System Operation and Maintenance:

During this five-year review period, the NWC extraction system has removed approximately 9.3 grams of dieldrin from groundwater. Extraction well pumping and dieldrin removal rates have remained constant since remedy startup. Effluent monitoring from the LGAC treatment system has confirmed that discharges complied with RWQCB Order No. 98-053.

Monitoring Activities:

Groundwater monitoring and reporting activities have been implemented at the NWC OU groundwater extraction wells and monitoring wells, as required by the NWC OU ROD. The results from these monitoring events are presented in quarterly and annual monitoring reports.

7.20.2.2 Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions used in the human health risk assessment included in the *Northwestern Corner Dieldrin Plume Feasibility Study* (URS, 2009j) remain valid for non-residential exposure scenarios. Changes in the exposure assumptions (increased body weight and decreased adult exposure duration) in the U.S. EPA Exposure Factors Handbook (U.S. EPA, 2011b), taken alone would result in a decrease in the calculated risk for industrial/commercial receptors; therefore, neither change affects the protectiveness of the risk assessment.

Dieldrin's original cleanup level was set to the California Water Action (now termed Notification) Level in 1996, which was 0.05 µg/L. In 2000, the California Notification Level changed to 0.0022 µg/L. For comparison, the January 2015 dieldrin tap water RSL is 0.0017 µg/L. The California Notification Level and tap water RSL, while not promulgated standards, are presented herein for comparison.

The *Northwestern Corner Dieldrin Plume Feasibility Study* calculated an excess cancer risk of $6x10^{-5}$ and non-cancer risk of 0.3 (URS, 2009j). To incorporate changes in groundwater quality and toxicity values since the 2009 Feasibility Study, an EPC for dieldrin was recalculated for OU 1. Groundwater analytical data collected from the last five years was used as input data to ProUCL to calculate the 95% UCL on the arithmetic mean. These EPCs were then divided by the January 2015 residential tap water RSL and multiplied by 10-6 to provide a COC cancer risk of $6x10^{-5}$ (Table 7.1-2); therefore, the cancer risk has not changed since the previous Five-Year Review.

The RAO for the NWC OU is the protection of human and ecological receptors from exposure to dieldrin through LUCs and to remove dieldrin from groundwater to the extent technically and economically

feasible. No ecological risks were noted (URS, 2009j). The 2011 NWC ROD remedy of extracting and treating the groundwater plume was implemented in January 2012 and will be completed in January 2015. Therefore, the remedy is underway and the RAO remains valid.

7.20.2.3 Question C—Has other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that calls into question the protectiveness of the remedy. No ecological risks were noted in original risk assessment or have been identified since that time. The site is not located in a floodplain, or subject to land use changes.

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Table 7.1-1. Review of Toxicity Reference Values – Tracy Site

				TRVs from Tracy Site 1996 RI/FS				TRVs from May 2014 U.S. EPA RSLs				Comparison			
				Noncancer		Cancer		Noncancer		Cancer		Noncancer		Cancer	
COC	CASRN	Area	Matrix	Converted RfC_i (mg/m^3)	RfD_o (mg/kg-d)	SF_i Conversion to IUR (µg/m^3)	SFO (mg/kg-d)$^{-1}$	RfC_i (mg/m^3)	RfD_o (mg/kg-d)	IUR (µg/m^3)$^{-1}$	SFO (mg/kg-d)$^{-1}$	RfC_i (mg/m^3)	RfD_o (mg/kg-d)	IUR (µg/m^3)$^{-1}$	SFO (mg/kg-d)$^{-1}$
1,2-Dichloroethene	540-59-0	DSERTS 7 (SWMU 7)	Soil	3.50E-02	1.00E-02	NV	NV	NV	2.00E-03	NV	NV	--	More Stringent	--	--
2,4,6-trichlorophenol	88-06-2	DSERTS 20 (SWMU 20)	Soil	1.05E-01	3.00E-02	2.00E-05	7.00E-02	NV	1.00E-03	3.10E-06	1.10E-02	--	More Stringent	Less Stringent	Less Stringent
2-hexanone	591-78-6	DSERTS 24 (SWMU 24)	Soil	8.0///5E-02	8.00E-02	NV	NV	3.00E-02	5.00E-03	NV	NV	More Stringent	More Stringent	--	--
2-methylnaphthalene	91-57-6	DSERTS 24 (SWMU 24)	Soil	1.40E-01	4.00E-02	NV	NV	NV	4.00E-03	NV	NV	--	More Stringent	--	--
Arsenic	7440-38-2	DSERTS 4 (SWMU 4), DSERTS 67 (Northern Depot Soils Area), Eastern Depot Soils Area	Soil	NV	3.00E-04	3.43E-03	1.50E+00	1.50E-05	3.00E-04	4.30E-03	1.50E+00	--	No Change	More Stringent	No Change
Beryllium	7440-41-7	DSERTS 2and3 (SWMUs 2 and 3), DSERTS 6 (SWMU 6), DSERTS 7 (SWMU 7), DSERTS 1 (SWMU 1/Area 2)	Soil, Soil Gas	NV	5.00E-03	2.00E-03	7.00E+00	2.00E-05	2.00E-03	2.40E-03	NV	--	More Stringent	More Stringent	--
Naphthalene	91-20-3	SWMUs 8, 24 and 33	Soil	1.40E-01	4.00E-02	NV	NV	3.00E-03	2.00E-02	3.40E-05	NV	More Stringent	More Stringent	--	--
PCE	127-18-4	DSERTS 24 (SWMU 24), DSERTS 1 (SWMU 1/Area 2), DSERTS 31 and 71 (OU1), DSERTS 66 (Area 1/Building 237), and DSERTS 68 (Area 3)	Soil Gas, Groundwater	3.50E-02	1.00E-02	6.00E-06	5.10E-02	4.00E-02	6.00E-03	2.60E-07	2.10E-03	No Change	More Stringent	Less Stringent	Less Stringent
Phenol	108-95-2	DSERTS 24 (SWMU 24)		2.10E+00	6.00E-01	NV	NV	2.00E-01	3.00E-01	NV	NV	More Stringent	More Stringent	--	--
TCE	79-01-6	DSERTS 7 (SWMU 7), DSERTS 20 (SWMU 20), DSERTS 24 (SWMU 24), DSERTS 27 (SWMU 27), DSERTS 1 (SWMU 1/Area 2), DSERTS 31 and 71 (OU1), DSERTS 66 (Area 1/Building 237), DSERTS 68 (Area 3)	Soil, Soil Gas, Groundwater	2.10E-02	6.00E-03	2.86E-06	1.50E-02	2.00E-03	5.00E-04	4.10E-06	4.60E-02	More Stringent	More Stringent	More Stringent	More Stringent
Toluene	108-88-3	DSERTS 24 (SWMU 24)	Soil	3.85E-01	2.00E-01	NV	NV	5.00E+00	8.00E-02	NV	NV	Less Stringent	More Stringent	--	--
Xylenes	1330-20-7	DSERTS 20 (SWMU 20), DSERTS 24 (SWMU 24), and DSERTS 65 (SWMU 33)	Soil	7.00E+00	2.00E+00	NV	NV	1.00E-01	2.00E-01	NV	NV	More Stringent	More Stringent	--	--

Table 7.1-1. Review of Toxicity Reference Values – Tracy Site (Continued)

Notes:
The 1996 RI/FS utilized toxicity reference values (TRVs) from 1996 U.S. EPA Integrated Risk Information System (IRIS) and 1995 California EPA Health Effects Assessment Summary Tables (HEAST).
The 1996 inhalation slope factors (SFi in units of (mg/kg-d)-1) were converted to the same units as in the January 2015 U.S. EPA RSLs (ug/m3) by using a default U.S. EPA body weight of 70 kg and inhalation rate of 20 m3/d (USEPA 1997).
The 1996 inhalation reference concentrations (RfCi - in units of (mg/kg-d)-1) were converted to the same units as in the January 2015 U.S. EPA RSLs ((mg/m3)-1) by using a default body weight of 70 kg and inhalation rate of 20 m3/d (USEPA 1997).

Abbreviations:

CASRN	=	Chemical Abstracts Service registry number assigned to each chemical
COC	=	Chemical of concern
IUR	=	Inhalation Unit Risk
NV	=	No Value
RfC_i	=	Inhalation reference concentration
RfD_o	=	Oral reference dose
RI/FS	=	Remedial Investigation / Feasibility Study
RSLs	=	U.S. EPA Regional Screening Levels
SF_i	=	Inhalation slope factor
SFO	=	Oral slope factor
TRV	=	Toxicity reference value

Table 7.1-2. Groundwater Cleanup Standards, RSLs, EPCs, and the Estimated Residential Cancer Risk from Groundwater Ingestion

COC	CASRN	Tracy Site Groundwater Cleanup Standard (µg/L)	January 2015 U.S. EPA RSLs Residential Tapwater TR = 1E-06, THQ = 1.0 (µg/L)	May 2015 DTSC Recommended Tap Water Screening level (µg/L)	U.S. EPA RSLs Basis	EPC (µg/L)	Estimated Cancer Risk
OU 1							
Dieldrin	60-57-1	0.05	0.0017	NE	c	0.0489	2.88E-05
PCE	127-18-4	5	11	0.19	c**	2.785	2.53E-07
TCE	79-01-6	5	0.49	NE	c**	2.808	5.73E-06
						Cumulative Risk	3.5E-05
NWC OU							
Dieldrin	60-57-1	0.05 (goal)	0.0017	NE	c	0.0973	5.72E-05

Notes:

May 2015 DTSC Recommended Tap Water Screening Level from HERO HHRA Note Number: 3, DTSC-Modified Screening Levels (May 2015)

EPCs are calculated using ProUCL version 5.0.00. The data inputs and ProUCL outputs are provided in Appendix D.

Cumulative Risk = The summation of individual COC risk.

Risks are calculated as follows:

For cancer endpoints, risk = EPC / RSL * 1x10-6

Abbreviations:

CASRN = Chemical Abstracts Service registry number assigned to each chemical
COC = chemical of concern
EPC = Exposure Point Concentration
RSL = U.S. EPA regional screening level
TR = target risk
THQ = target hazard quotient
UCL = upper confidence limit
µg/L = micrograms per liter
NE = Not Established

RSL Basis:

c = Cancer basis
n = Noncancer basis
**= Where n RSL < 10X c RSL

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
SWMU 1/Area 2							
Beryllium	7440-41-7	--	2,300,000	n	68,000	NA	2.96E-02
PAHs	130498-29-2	--	290	c	1,500	5.17E-06	NA
PCBs	1336-36-3	--	1,000	c	NV	NV	NA
				Cumulative Risk and Hazard Index		5.2E-06	3.0E-02
SWMUs 2 and 3							
2,4-Dichlorophenoxyacetic acid	94-75-7	47	9,700,000	n	6.1	NA	6.29E-07
2,4-dimethylphenol	105-67-9	330	16,000,000	n	548	NA	3.43E-05
4-methylphenol	106-44-5	330	82,000,000	n	400	NA	4.88E-06
Aldrin	309-00-2	3	140	c	11	7.86E-08	NA
Aluminum	7429-90-5	3	1,100,000,000	nm	17,000,000	NA	1.55E-02
Beryllium	7440-41-7	--	2,300,000	n	NV	NV	NV
Bis(2-ethylhexyl)phthalate	117-81-7	330	160,000	c	190	1.19E-09	NA
Chlordane	12789-03-6	10	8,000	c*	33,000	4.13E-06	NA
DDD	72-54-8	1,600	9,600	c	4,000	4.17E-07	NA
DDE	72-55-9	1,800	6,800	c	NV	NV	NA
DDT	50-29-3	1,700	8,600	c*	3,300	3.84E-07	NA
Dieldrin	60-57-1	370	140	c	920	6.57E-06	NA
Di-n-butylphthalate	84-74-2	330	82,000,000	n	240	NA	2.93E-06
Diuron	330-54-1	260	1,600,000	n	150	NA	9.38E-05
Endrin	72-20-8	3	250,000	n	NV	NV	NV
Heptachlor	76-44-8	1.5	510	c	NV	NV	NA
Lead	7439-92-1	28,300	800,000	L	38,000	NA	4.75E-02
Lindane	58-89-9	1.7	2,500	c	40	1.60E-08	NA
Linuron	330-55-2	--	1,600,000	n	NV	NV	NV
Mercury	7439-97-6	--	40,000	ns	460	NA	1.15E-02
Monuron	150-68-5	260	NV	NV	220	NV	NV
Oxamyl	23135-22-0	--	21,000,000	n	NV	NV	NV
Selenium	7782-49-2	616	5,800,000	n	9,000	NA	1.55E-03
Simazine	122-34-9	--	19,000	c	NV	NV	NA
Stirofos	961-11-5	--	96,000	c	NV	NV	NA
				Cumulative Risk and Hazard Index		1.2E-05	7.6E-02

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
SWMU 4							
2,4-Dichlorophenoxyacetic acid	94-75-7	3	9,700,000	n	2.7	NA	2.78E-07
Aluminum	7429-90-5	--	1,100,000,000	nm	19,000,000	NA	1.73E-02
Arsenic	7440-38-2	--	3,000	cR	11,000	3.67E-06	NA
Bis(2-ethylhexyl)phthalate	117-81-7	122	160,000	c	6,600	4.13E-08	NA
Carbaryl	63-25-2	550	82,000,000	n	200	NA	2.44E-06
Carbofuran	1563-66-2	1,000	4,100,000	n	420	NA	1.02E-04
Chlordane	12789-03-6	20	8,000	c*	NV	NV	NA
DDD	72-54-8	241	9,600	c	2,300	2.40E-07	NA
DDE	72-55-9	241	6,800	c	NV	NV	NA
DDT	50-29-3	241	8,600	c*	NV	NV	NA
Dieldrin	60-57-1	3	140	c	110	7.86E-07	NA
Lead	7439-92-1	5,130	800,000	L	190,000	NA	2.38E-01
Manganese	7439-96-5	--	26,000,000	n	510,000	NA	1.96E-02
PAHs	130498-29-2	70	290	c	910	3.14E-06	NA
PCBs	1336-36-3	--	1,000	c	420	4.20E-07	NA
Selenium	7782-49-2	616	5,800,000	n	25,000	NA	4.31E-03
				Cumulative Risk and Hazard Index		8.3E-06	2.8E-01
SWMU 6							
2,3,7,8-TCDD	1746-01-6	5	0.022	c*	0.0031	1.41E-07	NA
2,4,5-Trichlorophenoxyacetic acid	93-76-5	13	8,200,000	n	NV	NV	NV
Benzo(a)anthracene	56-55-3	--	2,900	c	410	1.41E-07	NA
Benzo(a)pyrene	50-32-8	--	290	c	120	4.14E-07	NA
Beryllium	7440-41-7	--	2,300,000	n	750	NA	3.26E-04
Dicamba	1918-00-9	10	25,000,000	n	NV	NV	NV
Dieldrin	60-57-1	3	140	c	34	2.43E-07	NA
Endrin	72-20-8	3	250,000	n	0.68	NA	2.72E-06
Heptachlor	76-44-8	1.5	510	c	0.61	1.20E-09	NA
Lindane	58-89-9	5	2,500	c	0.94	3.76E-10	NA
PCBs	1336-36-3	--	1,000	c	17	1.70E-08	NA
				Cumulative Risk and Hazard Index		9.6E-07	3.3E-04

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
SWMU 7							
1,2-Dichloroethene	540-59-0	10	2,300,000	n	3.2	NA	1.39E-06
2,3,7,8-TCDD	1746-01-6	--	0.022	c*	0.0031	1.41E-07	NA
2,4-Dichlorophenoxyacetic acid	94-75-7	25	9,700,000	n	1.9	NA	1.96E-07
Benzo(a)anthracene	56-55-3	--	2,900	c	410	1.41E-07	NA
Benzo(a)pyrene	50-32-8	--	290	c	120	4.14E-07	NA
Beryllium	7440-41-7	--	2,300,000	n	750	NA	3.26E-04
Bis(2-ethylhexyl)phthalate	117-81-7	330	160,000	c	250	1.56E-09	NA
Chlordane	12789-03-6	--	8,000	c*	6,000	7.50E-07	NA
DDD	72-54-8	--	9,600	c	1,300	1.35E-07	NA
DDE	72-55-9	--	6,800	c	820	1.21E-07	NA
Dieldrin	60-57-1	3	140	c	34	2.43E-07	NA
Linuron	330-55-2	200	1,600,000	n	1	NA	8.75E-07
Manganese	7439-96-5	--	26,000,000	n	560,000	NA	2.15E-02
PAHs	130498-29-2	--	290	c	NV	NV	NA
PCBs	1336-36-3	--	1,000	c	17	1.70E-08	NA
Simazine	122-34-9	10	19,000	c	50	2.63E-09	NA
TPH-diesel	TPH_diesel	100,000	420,000	n	NV	NV	NV
TCE	79-01-6	5	6,000	c**	23	3.83E-09	NA
				Cumulative Risk and Hazard Index		2.0E-06	2.2E-02
SWMU 8							
2,4-Dichlorophenoxyacetic acid	94-75-7	25	9,700,000	n	1.9	NA	1.96E-07
2,4-dinitrotoluene	121-14-2	330	7,400	c	120	1.62E-08	NA
Bis(2-ethylhexyl)phthalate	117-81-7	330	160,000	c	250	1.56E-09	NA
Chlordane	12789-03-6	10	8,000	c*	6,000	7.50E-07	NA
DDD	72-54-8	81	9,600	c	1,300	1.35E-07	NA
DDE	72-55-9	--	6,800	c	820	1.21E-07	NA
DDT	50-29-3	47	8,600	c*	800	9.30E-08	NA
Dieldrin	60-57-1	4	140	c	34	2.43E-07	NA
Diethylphthalate	84-66-2	330	660,000,000	nm	NV	NV	NV
Lindane	58-89-9	1.7	2,500	c	1	3.76E-10	NA

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
Linuron	330-55-2	200	1,600,000	n	1.4	NA	8.75E-07
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	410,000	n	NV	NV	NV
Naphthalene	91-20-3	330	17,000	c*	58	3.41E-09	NA
Simazine	122-34-9	10	19,000	c	50	2.63E-09	NA
TPH-diesel	TPH_diesel	10,000	420,000	n	NV	NV	NV
TPH-gasoline	TPH_gas	1,000	420,000	n	NV	NV	NV
TPH-motor oil	TPH_motoroil	10,000	420,000	n	NV	NV	NV
				Cumulative Risk and Hazard Index		1.4E-06	1.1E-06
SWMU 20							
2,4-dinitrophenol	51-28-5	1,300	1,600,000	n	NV	NV	NV
2,4,6-trichlorophenol	88-06-2	330	210,000	c**	NV	NV	NA
Aluminum	7429-90-5	--	1,100,000,000	nm	11,000,000	NA	1.00E-02
Dieldrin	60-57-1	2	140	c	56	4.00E-07	NA
Diethylphthalate	84-66-2	330	660,000,000	nm	NV	NV	NV
Ethylbenzene	100-41-4	5	25,000	c	190	7.60E-09	NA
Linuron	330-55-2	200	1,600,000	n	420	NA	2.63E-04
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	410,000	n	190	NA	4.63E-04
Methiocarb	2032-65-7	500	NV	NV	9,000	NV	NV
PAHs	130498-29-2	--	290	c	NV	NV	NA
PCBs	1336-36-3	--	1,000	c	1,800	1.80E-06	NA
Pentachlorophenol	87-86-5	830	4,000	c	NV	NV	NA
TPH-diesel	TPH_diesel	10,000	420,000	n	NV	NV	NV
TCE	79-01-6	5	6,000	c**	16	2.67E-09	NA
Xylenes	1330-20-7	5	2,500,000	ns	170	NA	6.80E-05
				Cumulative Risk and Hazard Index		2.2E-06	1.1E-02

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
SWMU 24							
2-butanone	78-93-3	10	190,000,000	nms	500	NA	2.63E-06
2-hexanone	591-78-6	10	1,300,000	n	37,000	NA	2.85E-02
2-methylnaphthalene	91-57-6	330	3,000,000	n	3,500	NA	1.17E-03
2,4-dimethylphenol	105-67-9	330	16,000,000	n	220	NA	1.38E-05
4-methyl-2-pentanone (MIBK)	108-10-1	10	56,000,000	ns	600	NA	1.07E-05
4-methylphenol	106-44-5	330	82,000,000	n	410	NA	5.00E-06
Acetone	67-64-1	10	670,000,000	nms	650,000	NA	9.70E-04
Aluminum	7429-90-5	--	1,100,000,000	nm	18,000,000	NA	1.64E-02
Carbofuran	1563-66-2	500	4,100,000	n	320	NA	7.80E-05
Ethylbenzene	100-41-4	10	25,000	c	21,000	8.40E-07	NA
Fluoranthene	206-44-0	330	30,000,000	n	2,800	NA	9.33E-05
Lindane	58-89-9	1.7	2,500	c	4	1.40E-09	NA
Manganese	7439-96-5	--	26,000,000	n	800,000	NA	3.08E-02
Naphthalene	91-20-3	330	17,000	c*	2,300	1.35E-07	NA
PAHs	130498-29-2	--	290	c	430	1.48E-06	NA
PCBs (Aroclor 1260)	11096-82-5	30	1,000	c	55	5.50E-08	NA
Phenanthrene	85-01-8	330	NV	NV	2,900	NV	NV
Phenol	108-95-2	330	250,000,000	nm	NV	NV	NV
Phorate	298-02-2	20	160,000	n	70	NA	4.38E-04
Pyrene	129-00-0	330	23,000,000	n	NV	NV	NV
Ronnel	299-84-3	35	41,000,000	n	62	NA	1.51E-06
Toluene	108-88-3	5	47,000,000	ns	160,000	NA	3.40E-03
TPH-diesel	TPH_diesel	10,000	420,000	n	NV	NV	NV
TPH-gasoline	TPH_gas	1,000	420,000	n	NV	NV	NV
Xylenes	1330-20-7	5	2,500,000	ns	200,000	NA	8.00E-02
				Cumulative Risk and Hazard Index		2.5E-06	1.6E-01

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
SWMU 27							
2,4-Dichlorophenoxyacetic acid	94-75-7	25	9,700,000	n	3	NA	3.30E-07
2,4,5-Trichlorophenoxyacetic acid	93-76-5	5	8,200,000	n	5	NA	5.98E-07
Benzo(a)pyrene	50-32-8	1,000	290	c	6,100	2.10E-05	NA
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	410,000	n	190	NA	4.63E-04
PAHs	130498-29-2	15,000	290	c	NV	NV	NA
PCBs (Aroclor 1260)	11096-82-5	1,000	1,000	c	1,800	1.80E-06	NA
TPH-motor oil	TPH_motoroil	10,000	420,000	n	NV	NV	NV
TCE	79-01-6	5	6,000	c**	16	2.67E-09	NA
				Cumulative Risk and Hazard Index		2.3E-05	4.6E-04
SWMU 33							
Aldrin	309-00-2	1.7	140	c	0.51	3.64E-09	NA
Carbaryl	63-25-2	400	82,000,000	n	NV	NV	NV
Dieldrin	60-57-1	2	140	c	NV	NV	NA
Diethylphthalate	84-66-2	330	660,000,000	nm	59	NA	8.94E-08
Di-n-butylphthalate	84-74-2	330	82,000,000	n	130	NA	1.59E-06
Methiocarb	2032-65-7	500	NV	NV	NV	NV	NV
Naphthalene	91-20-3	330	17,000	c*	NV	NV	NA
TPH-diesel	TPH_diesel	100,000	420,000	n	NV	NV	NV
Xylenes	1330-20-7	5	2,500,000	ns	3.8	NA	1.52E-06
				Cumulative Risk and Hazard Index		3.6E-09	3.2E-06
Area 1 Building 237							
DDD	72-54-8	--	9,600	c	8424	8.78E-07	NA
DDE	72-55-9	--	6,800	c	207.5	3.05E-08	NA
DDT	50-29-3	7,000	8,600	c*	3586	4.17E-07	NA
Dieldrin	60-57-1	--	140	c	726.8	5.19E-06	NA
				Cumulative Risk and Hazard Index		6.5E-06	NA

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
Northern Depot Soils Area							
Arsenic	7440-38-2	48	3,000	cR	62,000	2.07E-05	NA
Manganese	7439-96-5	812,500	26,000,000	n	26,000,000	NA	1.00E+00
				Cumulative Risk and Hazard Index		2.1E-05	1.0E+00
Building 30 Drum Storage Area)							
Benzyl Alcohol	100-51-6	330	82,000,000	n	NV	NV	NV
Bis(2-ethylhexyl)phthalate	117-81-7	330	160,000	c	1,400	8.75E-09	NA
Diethylphthalate	84-66-2	330	660,000,000	nm	180	NA	2.73E-07
Di-n-butylphthalate	84-74-2	330	82,000,000	n	3,800	NA	4.63E-05
				Cumulative Risk and Hazard Index		8.8E-09	4.7E-05
Site 72							
Chlordane	12789-03-6	--	8,000	c*	NV	NV	NA
DDD	72-54-8	--	9,600	c	82	8.54E-09	NA
DDE	72-55-9	--	6,800	c	800	1.18E-07	NA
DDT	50-29-3	--	8,600	c*	720	8.37E-08	NA
Dieldrin	60-57-1	--	140	c	150	1.07E-06	NA
Endrin	72-20-8	--	250,000	n	NV	NV	NV
Selenium	7782-49-2	--	5,800,000	n	NV	NV	NV
TPH-motor oil	TPH_motoroil	--	420,000	n	NV	NV	NV
				Cumulative Risk and Hazard Index		1.3E-06	NA
Eastern Depot Soils Area							
Aluminum	7429-90-5	--	1,100,000,000	nm	13,000,000	NA	1.18E-02
Arsenic	7440-38-2	--	3,000	cR	6,200	2.07E-06	NA
Chlordane	12789-03-6	--	8,000	c*	690	8.63E-08	NA
DDD	72-54-8	--	9,600	c	1,200	1.25E-07	NA
DDE	72-55-9	--	6,800	c	4,200	6.18E-07	NA
DDT	50-29-3	--	8,600	c*	4,500	5.23E-07	NA
Dieldrin	60-57-1	--	140	c	740	5.29E-06	NA
PCBs	1336-36-3	--	1,000	c	100	1.00E-07	NA
				Cumulative Risk and Hazard Index		8.8E-06	1.2E-02

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

COC	CASRN	Tracy Site Soil Cleanup Standard (µg/kg)	January 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	EPC (µg/kg)	Estimated Cancer Risk	Estimated Noncancer Risk (Hazard Quotient)
Southern Depot Soils Area							
Dieldrin	60-57-1	--	140	c	270	1.93E-06	NA

Standards Notes:

"--" indicates there are several chemicals that were originally identified as a chemical of concern (COC), but cleanup standards were not developed.
All cleanup up standards for SWMU 4 were removed in the 2004 Record of Decision (ROD) Amendment, but they are presented in this table.

PAHs (total) utilizes the minimum RSL of the individual compounds labeled as a PAH that are detected as a COC (i.e., benzo(a)pyrene).

PCBs (total) utilizes the high risk PCB RSLs.

Total petroleum hydrocarbons (TPH) utilizes the minimum of the aromatic and aliphatic RSLs (i.e., aromatic low).
1,2-dichloroethene utilizes the minimum RSL of its isomers (i.e., cis-1,2-dichloroethene).

EPC Notes:

For all of these exposure areas, except for Area 1 Building 237, exposure point concentrations (EPCs) are taken from previous risk assessments (noted below) because no soil removal actions have been performed within the last five years, soil concentrations are assumed to be unchanged.

Soil exacavation was performed in 2012 for Area 1 Building 237 and new EPCs are calculated with ProUCL version 5.0.00 using post-excavation data. For instances where more than one 95% upper confidence limit of the arithmetic mean (UCL) is provided, the distribution and statistical information of the dataset is reviewed and the minimum value of the appropriate UCLs is chosen per ProUCL User's Guide (i.e., For gamma-distributed data sets, the minimum of the suggested gamma-distributed UCLs is chosen per page 4 of the Introduction section). The data inputs and ProUCL outputs are provided in Appendix D.

These remaining EPCs are presented in the 1996 Comprehensive Remedial Investigation/Feasibility Study, Appendix R unless otherwise noted: Tables C.16 and C.17 for SWMU 1/Area 2; Tables C.5 and C.8 for SWMUs 2 and 3; Table C.11 for SWMU 4; Table C.38 for SWMU 6, 7 and 8; Table C.32 for SWMU 24; Tables C.23 and C.24 for SWMU 20 and 27; Table C.53 for SWMU 33; Table C.44 for Bldg 30 Drum Storage Area; Table C.65 for Northern Depot; Table C.68 for Eastern Depot; and Table C.71 for Southern Depot.

The EPCs for Site 72 are presented in the 2001 No Further Response Action Planned for Defense Site Environmental Reporting and Tracking System 72, Tables 3.5 and 3.10.

The maximum EPC is displayed for SWMU 1/Area 2, SWMU 20, SWMU 27 and the Northern Deport Soils Area that evaluated more than one type of industrial worker: depot worker, construction worker and grade operator.

Table 7.1-3. Soil Cleanup Standards, RSLs, EPCs, and the Calculated Cancer/Noncancer Risk from Industrial Exposure (Continued)

SWMUs 20 and 27 were analyzed as part of the same exposure unit in the 1996 Remedial Investigation/Feasibility Study (RI/FS), which means that the EPCs are the same for both areas.

SWMUs 6, 7, and 8 were analyzed in the same exposure unit in the 1996 RI/FS, which means that the EPCs are the same for both areas.

Risk and Hazard Quotient Notes:

Ratios are calculated as follows:

For cancer endpoints, risk = EPC / RSL * 1x10-6

For noncancer endpoints, hazard quotient = EPC / noncancer RSL

The ratios are then summed to determine a cumulative risk estimate and hazard index across all COCs in the exposure area.

NA = Ratio not applicable (e.g., NA in the Hazard Quotient column because the RSL has a cancer basis).

Abbreviations:

CASRN	=	Chemical Abstracts Service registry number assigned to each chemical
COC	=	Chemical of concern
EPC	=	Exposure point concentration
NV	=	No value
RSL	=	U.S. EPA regional screening level
TR	=	Target risk
THQ	=	Target hazard quotient
µg/kg	=	micrograms per kilogram

RSL Basis:

c	=	Cancer basis
L	=	see RSL user guide on lead, a blood-lead model was utilized.
m	=	Concentration may exceed ceiling limit
n	=	Noncancer basis
R	=	Relative bioavailability factor of 0.6 applied
s	=	Concentration may exceed Csat
*	=	Where: n RSL < 100X c RSL
**	=	Where n RSL < 10X c RSL

Table 7.1-4. Soil Gas Cleanup Standards EPCs, and the Calculated Cancer Risk from Industrial Exposure

COC	CASRN	Tracy Site Soil Gas Cleanup Standard (ppbv)	May 2015 CA DTSC-modified Industrial Soil Gas SL (ppbv)	CA DTSC SL Basis	EPC (ppbv)	Estimated Cancer Risk
SWMU 20						
TCE	79-01-6	350	19	c	72.58	3.90E-06
SWMU 24						
PCE	127-18-4	780	10	c	NV	NV
TCE	79-01-6	350	19	c	NV	NV
SWMU 1/Area 2						
PCE	127-18-4	780	10	c	450.2	4.36E-05
TCE	79-01-6	350	19	c	215	1.15E-05
					Cumulative Risk	5.5E-05
Area 1 Building 237						
PCE	127-18-4	780	10	c	567.70	5.50E-05
TCE	79-01-6	350	19	c	125	6.71E-06
					Cumulative Risk	6.2E-05
Area 3						
PCE	127-18-4	780	10	c	1130	1.09E-04
TCE	79-01-6	350	19	c	263.7	1.42E-05
					Cumulative Risk	1.2E-04

Notes:

May 2015 CA DTSC-modified Industrial Air SLs (2.1 ug/m3 for PCE and 3.0 for TCE) are divided by an attenuation factor 0.03 for soil gas sampling medium from the June 2015 EPA Vapor Intrusion guidance and converted from units of ug/m3 to ppbv using EPA's air concentration calculator at a standard temperate of 25 degC and pressure of 1 atm, which can be found at the following link: http://www.epa.gov/athens/learn2model/part-two/onsite/ia_unit_conversion.html

Exposure point concentrations (EPCs) are calculated using ProUCL version 5.0.00. For instances where more than one 95% upper confidence limit of the arithmetic mean (UCL) is provided, the distribution and statistical information of the dataset is reviewed and the minimum value of the appropriate UCLs is chosen per ProUCL User's Guide (i.e., For gamma-distributed data sets, the minimum of the suggested gamma-distributed UCLs is chosen per page 4 of the Introduction section in ProUCL User's Guide). The data inputs and ProUCL outputs are provided in the Appendix D.

Risks are calculated as follows:

For cancer endpoints, risk = EPC / SL * 1x10-6

The risks are then summed to determine a cumulative risk estimate across all COCs in the exposure area.

Abbreviations:

CASRN = Chemical Abstracts Service registry number assigned to each chemical
CA DTSC = California Department of Toxic Substances Control
COC = chemical of concern
EPC = Exposure point concentration
NV = No value
ppbv = parts per billion by volume
SL = Screening Level
UCL = Upper confidence level

SL Basis:

c = Cancer basis

Table 7.1-5. Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits

COC	CASRN	Tracy Depot Cleanup Level	Units	Type/Source	U.S. EPA Soil CRQL (µg/kg)	Is lab RL > U.S. EPA Soil CRQL?	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	Is the Cleanup Level > Industrial RSL?
SWMUs 2 and 3									
2,4-dimethylphenol	105-67-9	330	µg/kg	Reporting Limit	170	TRUE	16,000,000	n	FALSE
4-methylphenol	106-44-5	330	µg/kg	Reporting Limit	170	TRUE	82,000,000	n	FALSE
Bis(2-ethylhexyl)phthalate	117-81-7	330	µg/kg	Reporting Limit	170	TRUE	160,000	c	FALSE
Di-n-butylphthalate	84-74-2	330	µg/kg	Reporting Limit	170	TRUE	82,000,000	n	FALSE
Diuron	330-54-1	260	µg/kg	Reporting Limit	NV	--	1,600,000	n	FALSE
Endrin	72-20-8	3	µg/kg	Reporting Limit	3.3	FALSE	250,000	n	FALSE
Heptachlor	76-44-8	1.5	µg/kg	Reporting Limit	1.7	FALSE	510	c	FALSE
Lindane	58-89-9	1.7	µg/kg	Reporting Limit	1.7	EQUAL	2,500	c	FALSE
Monuron	150-68-5	260	µg/kg	Reporting Limit	NV	--	NV	--	--
SWMU 6									
2,3,7,8-TCDD	1746-01-6	5	µg/kg	Reporting Limit	Varies	Varies	0.022	c*	Varies
Dicamba	1918-00-9	10	µg/kg	Reporting Limit	NV	--	25,000,000	n	FALSE
Endrin	72-20-8	3	µg/kg	Reporting Limit	3.3	FALSE	250,000	n	FALSE
Heptachlor	76-44-8	1.5	µg/kg	Reporting Limit	1.7	FALSE	510	c	FALSE
SWMU 7									
1,2-Dichloroethene	540-59-0	10	µg/kg	Reporting Limit	5	TRUE	2,300,000		FALSE
2,4-Dichlorophenoxyacetic acid	94-75-7	25	µg/kg	Reporting Limit	NV	--	9,700,000	n	FALSE
Bis(2-ethylhexyl)phthalate	117-81-7	330	µg/kg	Reporting Limit	170	TRUE	160,000	c	FALSE
Dieldrin	60-57-1	3	µg/kg	Reporting Limit	3.3	FALSE	140	c	FALSE
Linuron	330-55-2	200	µg/kg	Reporting Limit	NV	--	1,600,000	n	FALSE
Simazine	122-34-9	10	µg/kg	Reporting Limit	NV	--	19,000	c	FALSE
TPH-diesel	TPH_diesel	100,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
TCE	79-01-6	5	µg/kg	Reporting Limit	5	EQUAL	6,000	c**	FALSE

Table 7.1-5. Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits (Continued)

COC	CASRN	Tracy Depot Cleanup Level	Units	Type/Source	U.S. EPA Soil CRQL (µg/kg)	Is lab RL > U.S. EPA Soil CRQL?	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	Is the Cleanup Level > Industrial RSL?
SWMU 8									
2,4-Dichlorophenoxyacetic acid	94-75-7	25	µg/kg	Reporting Limit	NV	--	9,700,000	n	FALSE
2,4-dinitrotoluene	121-14-2	330	µg/kg	Reporting Limit	170	TRUE	7,400	c	FALSE
Bis(2-ethylhexyl)phthalate	117-81-7	330	µg/kg	Reporting Limit	170	TRUE	160,000	c	FALSE
Diethylphthalate	84-66-2	330	µg/kg	Reporting Limit	170	TRUE	660,000,000	nm	FALSE
Lindane	58-89-9	1.7	µg/kg	Reporting Limit	1.7	EQUAL	2,500	c	FALSE
Linuron	330-55-2	200	µg/kg	Reporting Limit	NV	--	1,600,000	n	FALSE
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	µg/kg	Reporting Limit	NV	--	410,000	n	FALSE
Naphthalene	91-20-3	330	µg/kg	Reporting Limit	3.3	TRUE	17,000	c*	FALSE
Simazine	122-34-9	10	µg/kg	Reporting Limit	NV	--	19,000	c	FALSE
TPH-diesel	TPHD	10,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
TPH-gasoline	TPHG	1,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
TPH-motor oil	TPHMO	10,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
SWMU 20									
2,4-dinitrophenol	51-28-5	1,300	µg/kg	Reporting Limit	330	TRUE	1,600,000	n	FALSE
2,4,6-trichlorophenol	88-06-2	330	µg/kg	Reporting Limit	170	TRUE	210,000	c**	FALSE
Dieldrin	60-57-1	2	µg/kg	Reporting Limit	3.3	FALSE	140	c	FALSE
Diethylphthalate	84-66-2	330	µg/kg	Reporting Limit	170	TRUE	660,000,000	nm	FALSE
Ethylbenzene	100-41-4	5	µg/kg	Reporting Limit	5	EQUAL	25,000	c	FALSE
Linuron	330-55-2	200	µg/kg	Reporting Limit	NV	--	1,600,000	n	FALSE
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	µg/kg	Reporting Limit	NV	--	410,000	n	FALSE
Methiocarb	2032-65-7	500	µg/kg	Reporting Limit	NV	--	NV	--	--
Pentachlorophenol	87-86-5	830	µg/kg	Reporting Limit	6.7	TRUE	4,000	c	FALSE

Table 7.1-5. Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits (Continued)

COC	CASRN	Tracy Depot Cleanup Level	Units	Type/Source	U.S. EPA Soil CRQL (µg/kg)	Is lab RL > U.S. EPA Soil CRQL?	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	Is the Cleanup Level > Industrial RSL?
TPH-diesel	TPH_diesel	10,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
Xylenes	1330-20-7	5	µg/kg	Reporting Limit	5	EQUAL	2,500,000	ns	FALSE
SWMU 24									
2-butanone	78-93-3	10	µg/kg	Reporting Limit	10	EQUAL	190,000,000	nms	FALSE
2-hexanone	591-78-6	10	µg/kg	Reporting Limit	10	EQUAL	1,300,000	n	FALSE
2-methylnaphthalene	91-57-6	330	µg/kg	Reporting Limit	3.3	TRUE	3,000,000	n	FALSE
2,4-dimethylphenol	105-67-9	330	µg/kg	Reporting Limit	170	TRUE	16,000,000	n	FALSE
4-methyl-2-pentanone (MIBK)	108-10-1	10	µg/kg	Reporting Limit	10	EQUAL	56,000,000	ns	FALSE
4-methylphenol	106-44-5	330	µg/kg	Reporting Limit	170	TRUE	82,000,000	n	FALSE
Acetone	67-64-1	10	µg/kg	Reporting Limit	10	EQUAL	670,000,000	nms	FALSE
Carbofuran	1563-66-2	500	µg/kg	Reporting Limit	NV	--	4,100,000	n	FALSE
Ethylbenzene	100-41-4	10	µg/kg	Reporting Limit	5	TRUE	25,000	c	FALSE
Fluoranthene	206-44-0	330	µg/kg	Reporting Limit	3.3	TRUE	30,000,000	n	FALSE
Lindane	58-89-9	1.7	µg/kg	Reporting Limit	1.7	EQUAL	2,500	c	FALSE
Naphthalene	91-20-3	330	µg/kg	Reporting Limit	3.3	TRUE	17,000	c*	FALSE
PCBs (Aroclor 1260)	11096-82-5	30	µg/kg	Reporting Limit	NV	--	1,000	c	FALSE
Phenanthrene	85-01-8	330	µg/kg	Reporting Limit	3.3	TRUE	NV	--	--
Phenol	108-95-2	330	µg/kg	Reporting Limit	170	TRUE	250,000,000	nm	FALSE
Phorate	298-02-2	20	µg/kg	Reporting Limit	NV	--	160,000	n	FALSE
Pyrene	129-00-0	330	µg/kg	Reporting Limit	3.3	TRUE	23,000,000	n	FALSE
Ronnel	299-84-3	35	µg/kg	Reporting Limit	NV	--	41,000,000	n	FALSE
Toluene	108-88-3	5	µg/kg	Reporting Limit	5	EQUAL	47,000,000	ns	FALSE
TPH-diesel	TPH_diesel	10,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
TPH-gasoline	TPH_gas	1,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
Xylenes	1330-20-7	5	µg/kg	Reporting Limit	5	EQUAL	2,500,000	ns	FALSE

Table 7.1-5. Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits (Continued)

COC	CASRN	Tracy Depot Cleanup Level	Units	Type/Source	U.S. EPA Soil CRQL (µg/kg)	Is lab RL > U.S. EPA Soil CRQL?	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	U.S. EPA RSLs Basis	Is the Cleanup Level > Industrial RSL?
SWMU 27									
2,4-Dichlorophenoxyacetic acid	94-75-7	25	µg/kg	Reporting Limit	NV	--	9,700,000	n	FALSE
2,4,5-Trichlorophenoxyacetic acid	93-76-5	5	µg/kg	Reporting Limit	NV	--	8,200,000	n	FALSE
MCPA 2-Methyl-4-chlorophenoxyacetic acid	94-74-6	5,000	µg/kg	Reporting Limit	NV	--	410,000	n	FALSE
TPH-motor oil	TPHMO	10,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
TCE	79-01-6	5	µg/kg	Reporting Limit	5	EQUAL	6,000	c**	FALSE
SWMU 33									
Aldrin	309-00-2	1.7	µg/kg	Reporting Limit	1.7	EQUAL	140	c	FALSE
Carbaryl	63-25-2	400	µg/kg	Reporting Limit	NV	--	82,000,000	n	FALSE
Dieldrin	60-57-1	2	µg/kg	Reporting Limit	3.3	FALSE	140	c	FALSE
Diethylphthalate	84-66-2	330	µg/kg	Reporting Limit	170	TRUE	660,000,000	nm	FALSE
Di-n-butylphthalate	84-74-2	330	µg/kg	Reporting Limit	170	TRUE	82,000,000	n	FALSE
Methiocarb	2032-65-7	500	µg/kg	Reporting Limit	NV	--	NV	--	--
Naphthalene	91-20-3	330	µg/kg	Reporting Limit	3.3	TRUE	17,000	c*	FALSE
TPH-diesel	TPH_diesel	100,000	µg/kg	Limit - CA Tri-Regional guidance	NV	--	420,000	n	FALSE
Xylenes	1330-20-7	5	µg/kg	Reporting Limit	5	EQUAL	2,500,000	ns	FALSE
Building 30 Drum Storage Area									
Benzyl Alcohol	100-51-6	330	µg/kg	Reporting Limit	NV	--	82,000,000	n	FALSE
Bis(2-ethylhexyl)phthalate	117-81-7	330	µg/kg	Reporting Limit	170	TRUE	160,000	c	FALSE
Diethylphthalate	84-66-2	330	µg/kg	Reporting Limit	170	TRUE	660,000,000	nm	FALSE
Di-n-butylphthalate	84-74-2	330	µg/kg	Reporting Limit	170	TRUE	82,000,000	n	FALSE

Table 7.1-5. Comparison of Reporting Limit-Based Cleanup Levels to U.S. EPA Contract-Required Quantitation Limits (Continued)

Notes:

Current lab analyses for dioxin compounds can reach ng/kg levels for soil matrices and the CRQLs vary from 1.0 to 10 ng/kg. The CRQL for 2,3,7,8-TCDD is 1.0 ng/kg.

TPH utilizes the minimum of the aromatic and aliphatic RSLs for the purposes of this five-year review.

Abbreviations:

CASRN = Chemical Abstracts Service registry number assigned to each chemical
COC = chemical of concern
CRQL = Contract required quantitation limit
RL = Laboratory reporting limit
RSL = U.S. EPA regional screening level
NV = No value
TR = Target risk
THQ = Target hazard quotient
µg/kg = micrograms per kilogram

Basis:

c = Cancer basis
m = Concentration may exceed ceiling limit
n = Noncancer basis
s = Concentration may exceed Csat
* = Where: n SL < 100X c SL
** = Where n SL < 10X c SL

Table 7.1-6. Comparison of Risk-Based/Site-Specific Cleanup Standards to January 2015 U.S. EPA Regional Screening Levels - Tracy Site

Site	COC	CASRN	Tracy Site Cleanup Standard	Units	Type/Source	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	Jan 2015 U.S. EPA RSLs Industrial Soil Gas TR = 1E-06, THQ = 1.0 (ppbv)	U.S. EPA RSLs Basis	Is the Cleanup Standard > Industrial RSL?
SWMUs 2 and 3	**Soil**								
	2,4-Dichlorophenoxyacetic acid	94-75-7	47	µg/kg	Equilibrium Partitioning Limit	9,700,000	NA	n	FALSE
	Aldrin	309-00-2	3	µg/kg	Equilibrium Partitioning Limit	140	NA	c	FALSE
	Chlordane	12789-03-6	10	µg/kg	Equilibrium Partitioning Limit	8,000	NA	c*	FALSE
	DDD	72-54-8	1,600	µg/kg	Equilibrium Partitioning Limit	9,600	NA	c	FALSE
	DDE	72-55-9	1,800	µg/kg	Equilibrium Partitioning Limit	6,800	NA	c	FALSE
	DDT	50-29-3	1,700	µg/kg	Equilibrium Partitioning Limit	8,600	NA	c*	FALSE
	Dieldrin	60-57-1	370	µg/kg	Risk-Based Concentration	140	NA	c	TRUE
	Lead	7439-92-1	28,300	µg/kg	Risk-Based Concentration	800,000	NA	L	FALSE
	Selenium	7782-49-2	616	µg/kg	Risk-Based Concentration	5,800,000	NA	n	FALSE
SWMU 6	**Soil**								
	2,4,5-Trichlorophenoxyacetic acid	93-76-5	13		Site-specific derived criterion	8,200,000	NA	n	FALSE
	Dieldrin	60-57-1	3	µg/kg	Level derived from model	140	NA	c	FALSE
	Lindane	58-89-9	5	µg/kg	Site-specific derived criterion	2,500	NA	c	FALSE
SWMU 8	**Soil**								
	Chlordane	12789-03-6	10	µg/kg	Equilibrium Partitioning Limit	8,000	NA	c*	FALSE
	DDD	72-54-8	81	µg/kg	Equilibrium Partitioning Limit	9,600	NA	c	FALSE
	DDT	50-29-3	47	µg/kg	Site-specific derived criterion	8,600	NA	c*	FALSE
	Dieldrin	60-57-1	4	µg/kg	Site-specific derived criterion	140	NA	c	FALSE

Table 7.1-6. Comparison of Risk-Based/Site-Specific Cleanup Standards to January 2015 U.S. EPA Regional Screening Levels - Tracy Site (Continued)

Site	COC	CASRN	Tracy Site Cleanup Level	Units	Type/Source	Jan 2015 U.S. EPA RSLs Industrial Soil TR = 1E-06, THQ = 1.0 (µg/kg)	Jan 2015 U.S. EPA RSLs Industrial Soil Gas TR = 1E-06, THQ = 1.0 (ppbv)	U.S. EPA RSLs Basis	Is the Cleanup Level > Industrial RSL?
SWMU 20	**Soil and Soil Gas**								
	TCE (soil)	79-01-6	5	µg/kg	Derived using target soil gas standard	6,000	NA	c**	FALSE
	TCE (soil gas)	79-01-6	350	ppbv	Site-specific derived criterion	NA	56	c**	TRUE
SWMU 24	**Soil Gas**								
	TCE	79-01-6	350	ppbv	Site-specific derived criterion	NA	56	c**	TRUE
	PCE	127-18-4	780	ppbv	Site-specific derived criterion	NA	693	c**	TRUE
SWMU 27	**Soil**								
	Benzo(a)pyrene	50-32-8	1,000	µg/kg	Risk-Based Concentration	290	NA	c	TRUE
	Total PAHs	130498-29-2	15,000	µg/kg	Risk-Based Concentration	8.5	NA	c	TRUE
	PCBs (Aroclor 1260)	11096-82-5	1,000	µg/kg	Risk-Based Concentration	1,000	NA	c	EQUAL
Northern Depot Soils Area	**Soil**								
	Arsenic	7440-38-2	48	µg/kg	Risk-Based Concentration	3,000	NA	cR	FALSE
	Manganese	7439-96-5	812,500	µg/kg	Risk-Based Concentration	26,000,000	NA	n	FALSE
SWMU 1/Area 2	**Soil Gas**								
	PCE	127-18-4	780	ppbv	Site-specific derived criterion	NA	693	c**	TRUE
	TCE	79-01-6	350	ppbv	Site-specific derived criterion	NA	56	c**	TRUE
Area 1 Building 237	**Soil Gas**								
	PCE	127-18-4	780	ppbv	Site-specific derived criterion	NA	693	c**	TRUE
	TCE	79-01-6	350	ppbv	Site-specific derived criterion	NA	56	c**	TRUE
Area 3	**Soil Gas**								
	PCE	127-18-4	780	ppbv	Site-specific derived criterion	NA	693	c**	TRUE
	TCE	79-01-6	350	ppbv	Site-specific derived criterion	NA	56	c**	TRUE

Table 7.1-6. Comparison of Risk-Based/Site-Specific Cleanup Standards to January 2015 U.S. EPA Regional Screening Levels - Tracy Site (Continued)

Note:

Commercial/Industrial soil gas RSLs are calculating by dividing the commercial/industrial indoor air RSLs by the default U.S. EPA attenuation factor of 0.01 for soil gas samples collected at a depth greater than 5 ft bgs (USEPA 2002).

PAHs (total) utilizes the minimum RSL of the individual compounds for the purposes of this Five-Year Review.

Abbreviations:

CASRN	=	Chemical Abstracts Service registry number assigned to each chemical
COC	=	Chemical of concern
NA	=	Not applicable
NV	=	No value
ppbv	=	parts per billion by volume
RSL	=	U.S. EPA regional screening level
TR	=	Target risk
THQ	=	Target hazard quotient
µg/kg	=	micrograms per kilogram

Basis:

c = Cancer basis

L = see RSL user guide on lead, a blood-lead model was utilized.

n = Noncancer basis

R = Relative bioavailability factor of 0.6 applied

* = Where: n SL < 100X c SL

** = Where n SL < 10X c SL

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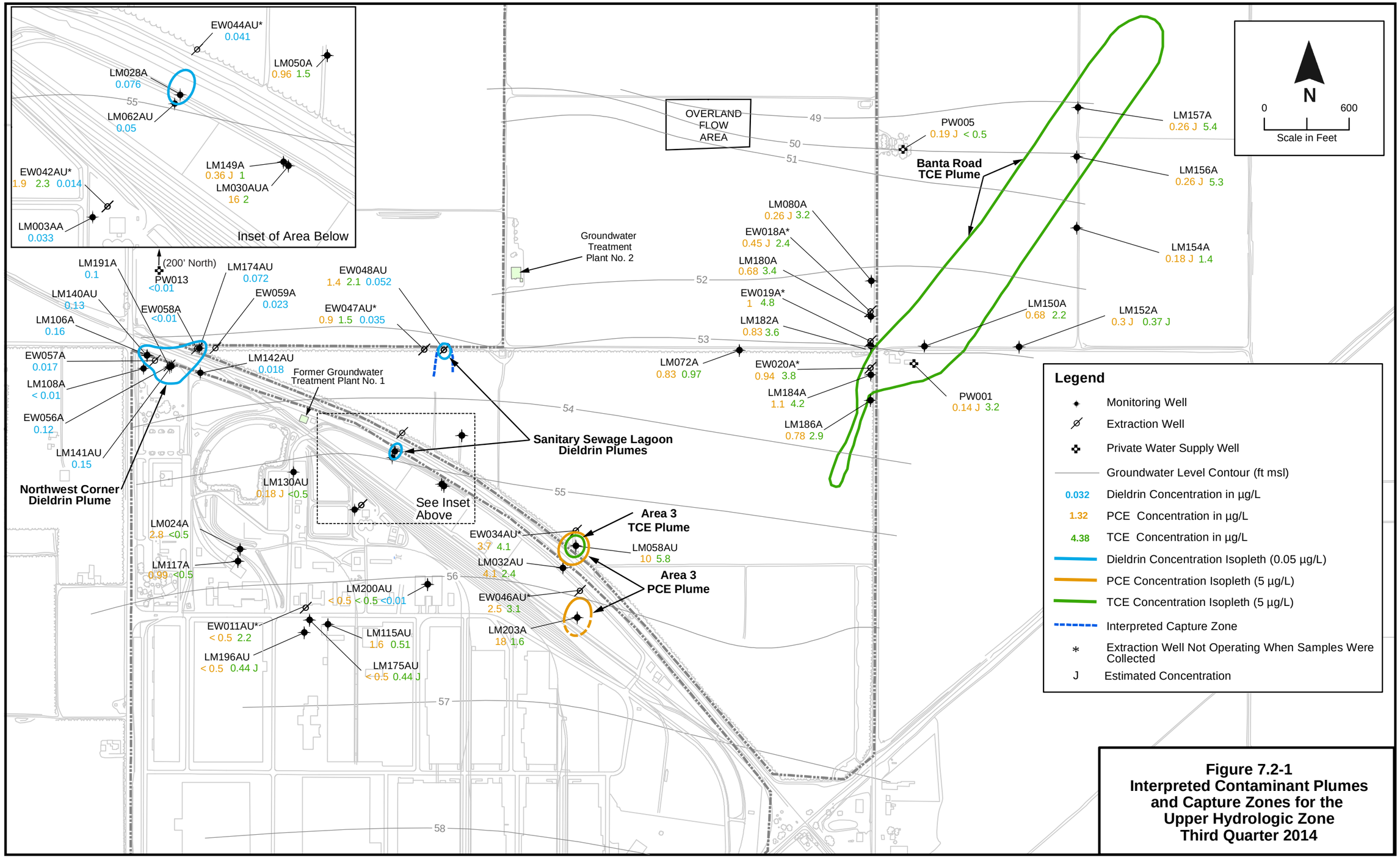
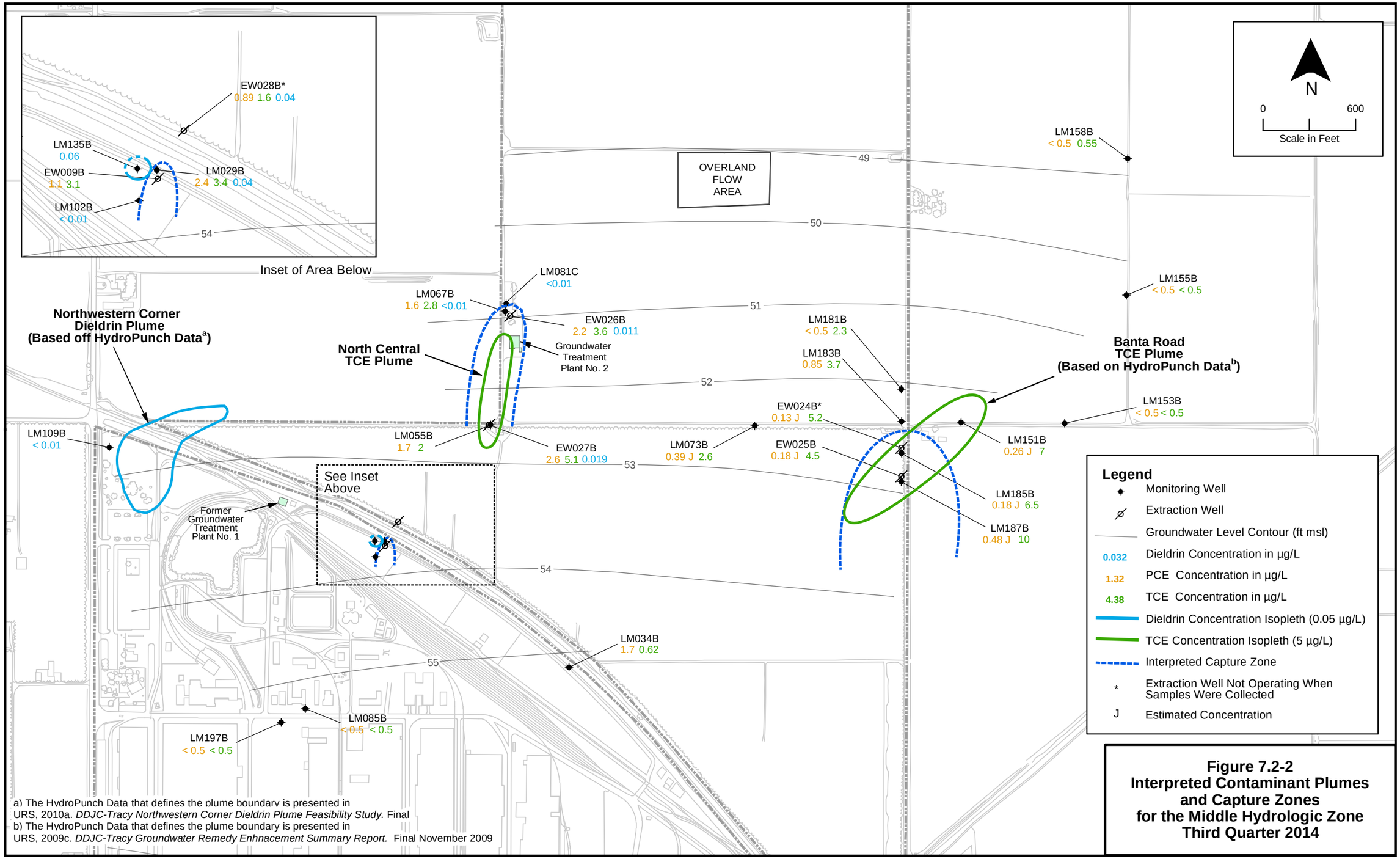
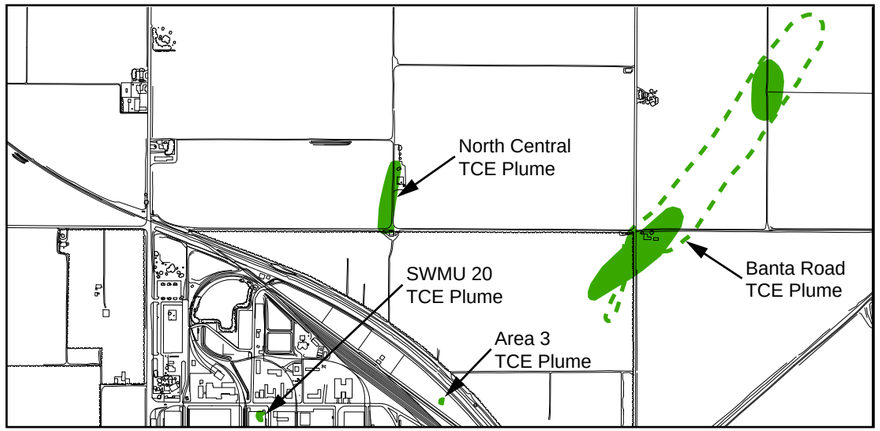


Figure 7.2-1
Interpreted Contaminant Plumes and Capture Zones for the Upper Hydrologic Zone Third Quarter 2014

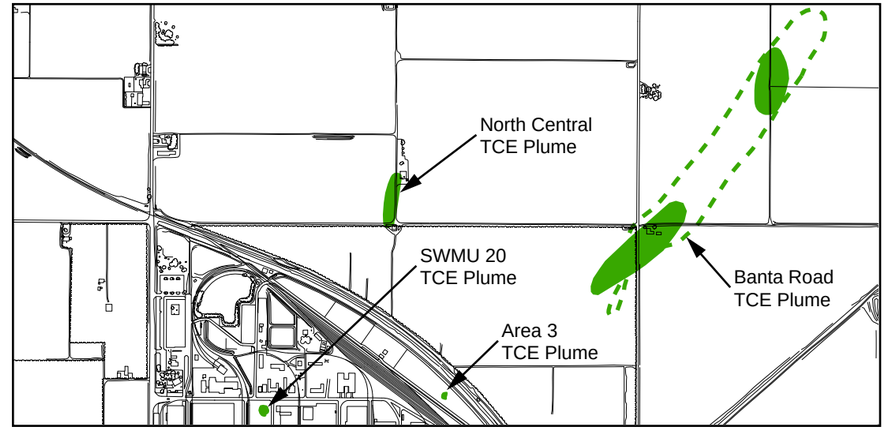


a) The HydroPunch Data that defines the plume boundary is presented in URS, 2010a. *DDJC-Tracy Northwestern Corner Dieldrin Plume Feasibility Study.* Final
b) The HydroPunch Data that defines the plume boundary is presented in URS, 2009c. *DDJC-Tracy Groundwater Remedy Enhnacement Summary Report.* Final November 2009

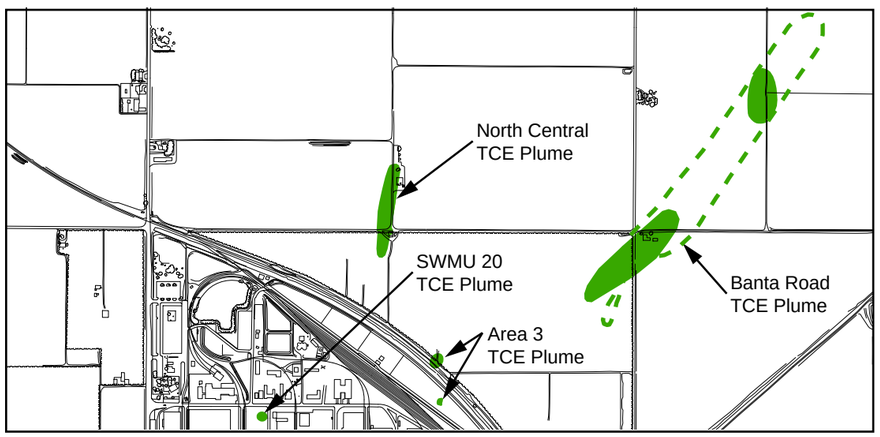
Figure 7.2-2
Interpreted Contaminant Plumes and Capture Zones for the Middle Hydrologic Zone Third Quarter 2014



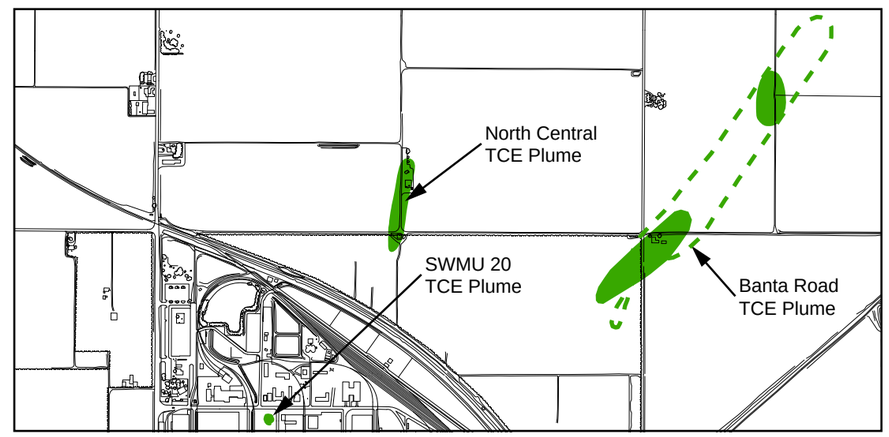
2010



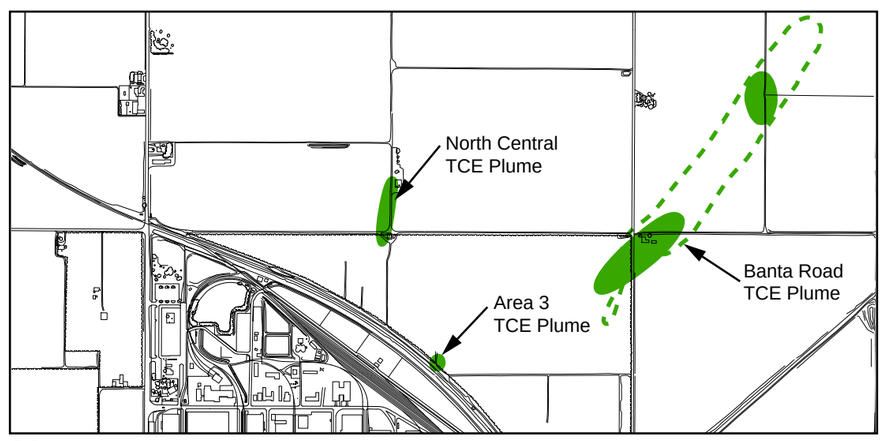
2011



2012



2013



2014

Estimated TCE Extent Exceeding the ACL Based on HydroPunch Data Collected from 1999-2001

ACL Exceedance

TCE concentrations in micrograms per liter (µg/L)

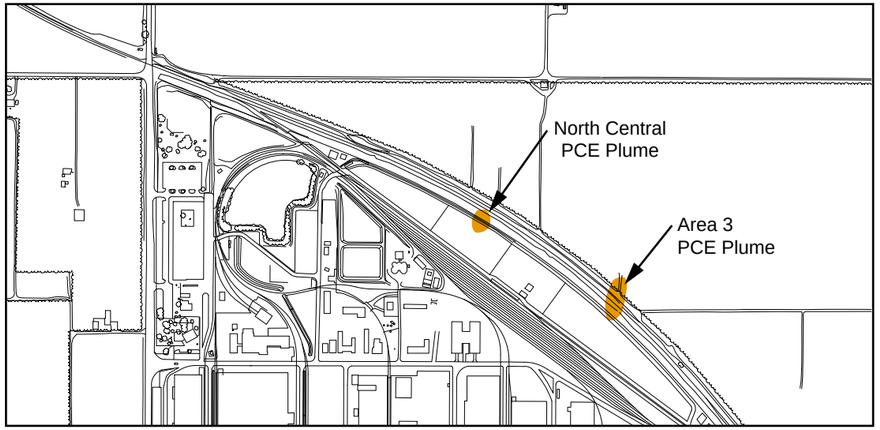
N

0 700 1,600

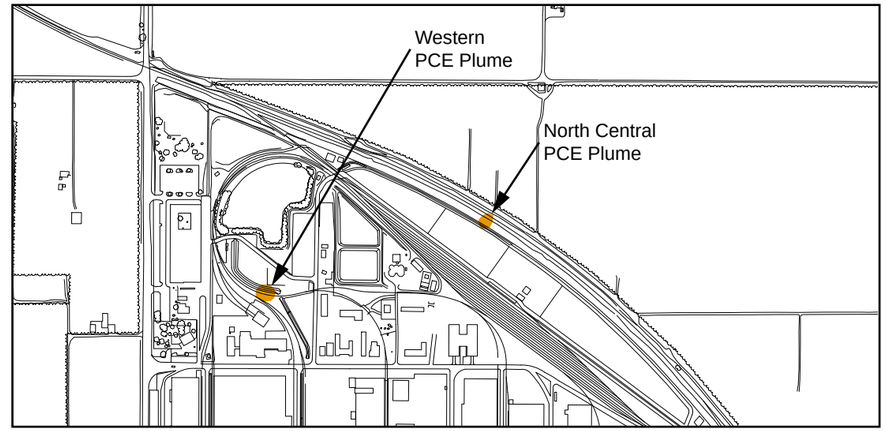
Feet

TCE concentrations are from samples collected in the third quarter of each year or most recent sampling event within the previous four quarters.

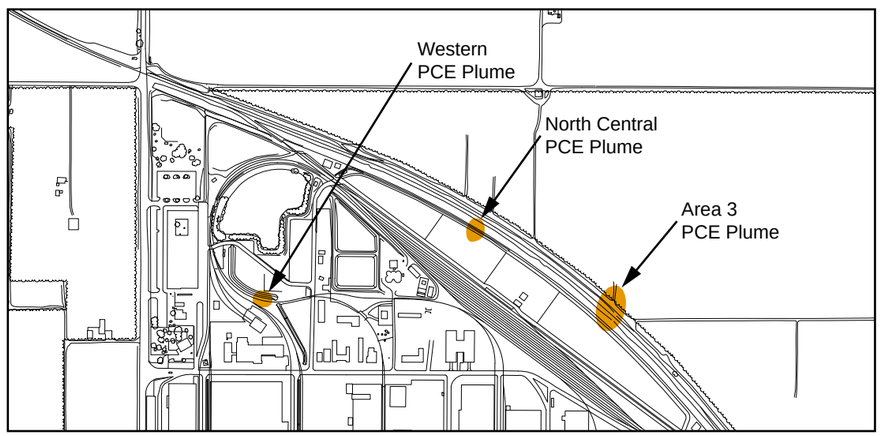
Figure 7.2-3
Comparison Map - TCE All Hydrologic Zones
2010–2014



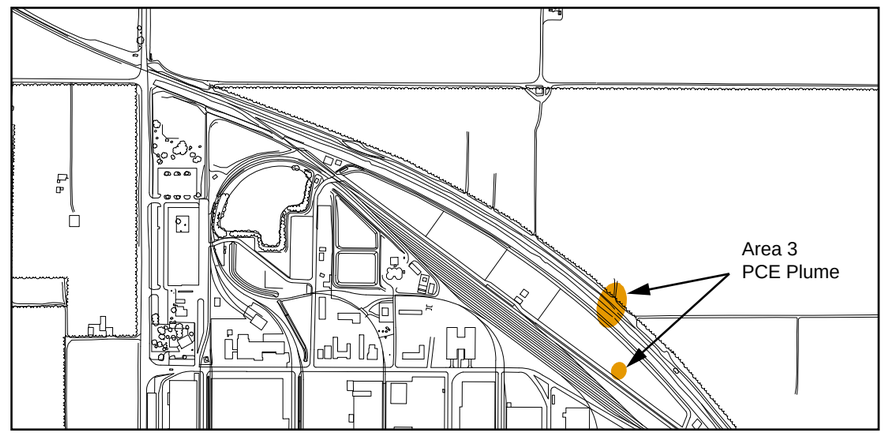
2010



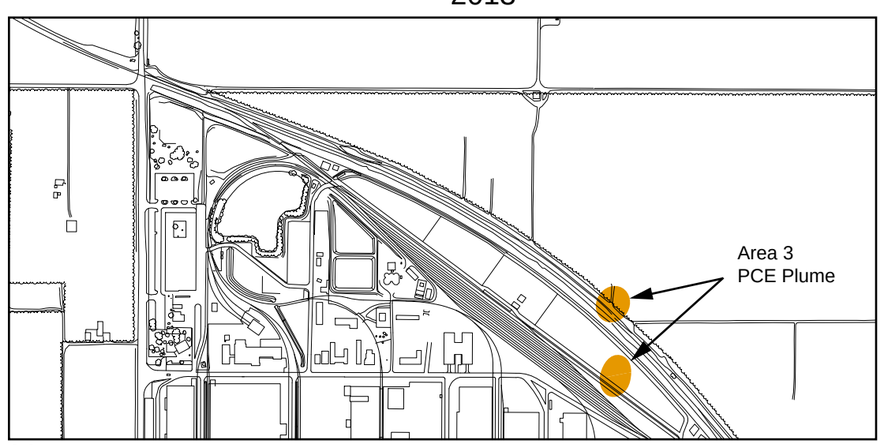
2011



2012



2013



2014

ACL Exceedance

PCE concentrations in micrograms per liter (µg/L)

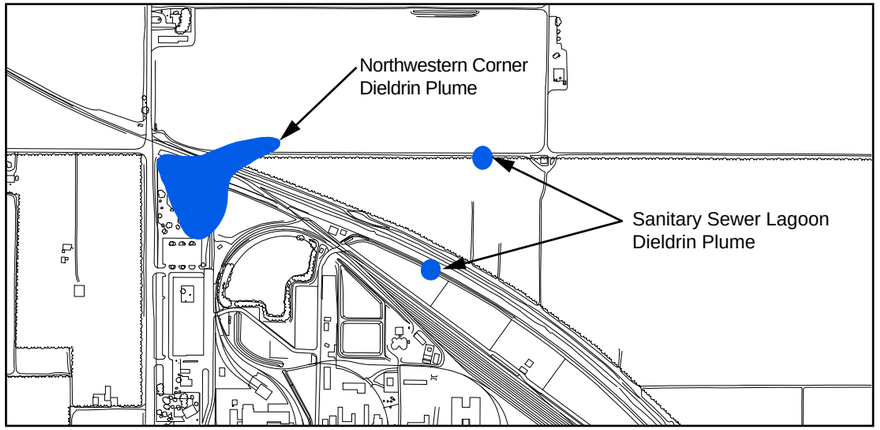
N

0 500 1,000

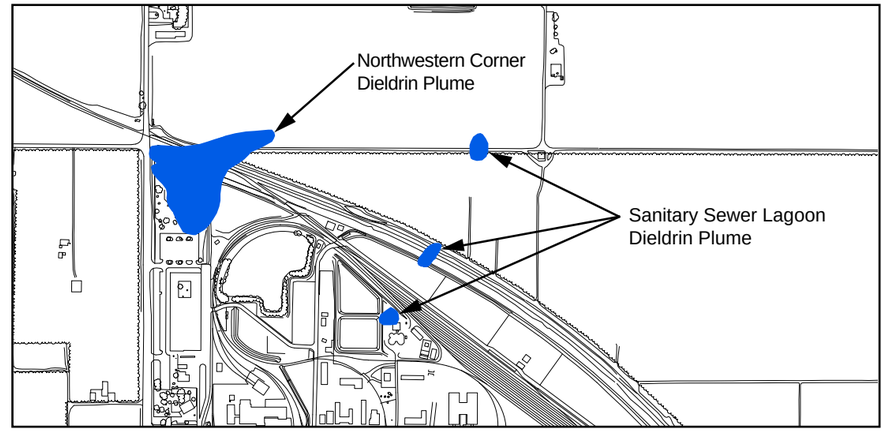
Feet

PCE concentrations are from samples collected in the third quarter of each year or most recent sampling event within the previous four quarters.

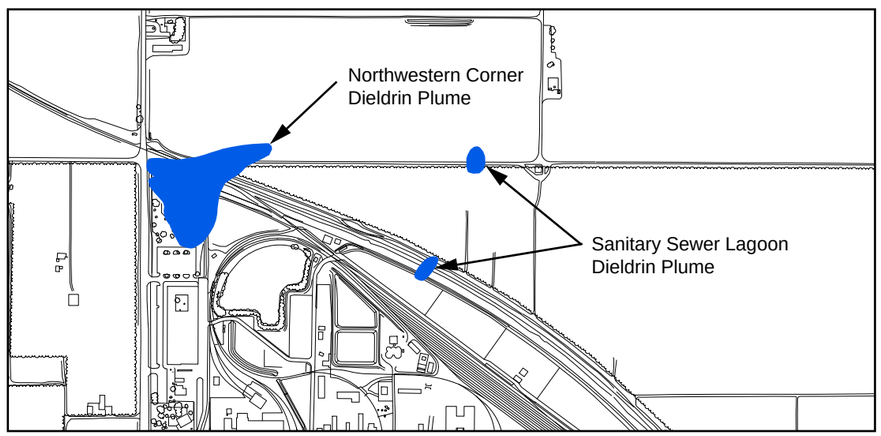
Figure 7.2-4
Comparison Map - PCE All Hydrologic Zones
2010 - 2014



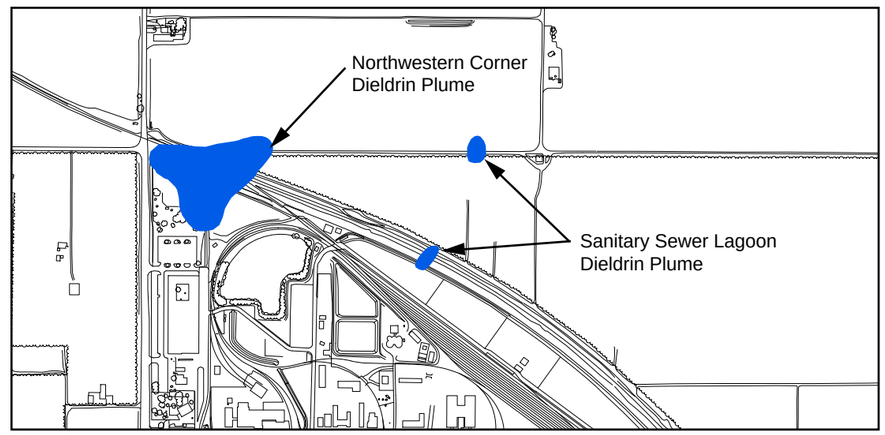
2010



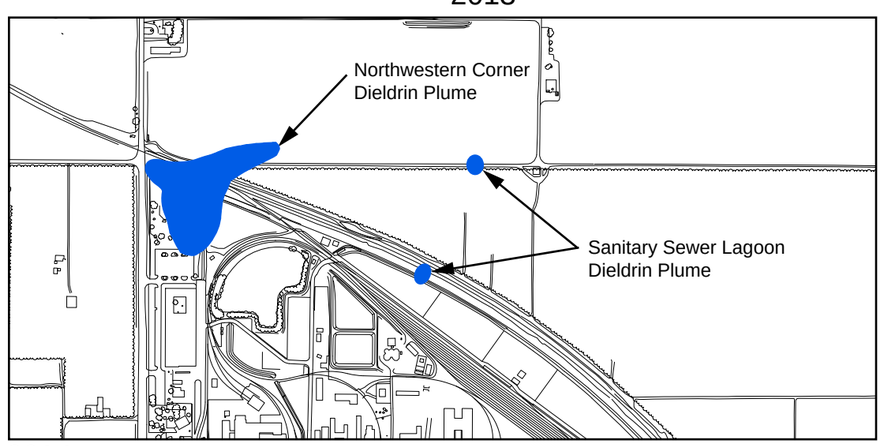
2011



2012



2013



2014

ACL Exceedance

Dieldrin Concentrations in micrograms per liter (µg/L)

N

0 500 1,000

Feet

PCE concentrations are from samples collected in the third quarter of each year or most recent sampling event within the previous four quarters.

Figure 7.2-5
Comparison Map - Dieldrin All Hydrologic Zones
2010-2014

8.0 ISSUES

This section summarizes issues identified as part of this Third Five-Year Review.

8.1 OU 1

The following minor issues do not effect the protectiveness of the remedy.

Banta Road TCE Plume. The remedy for the portion of the TCE plume east of Banta Road is dispersion; however, the lateral extent is unknown. In 2015, DLA performed site characterization activities and delineated the lateral and vertical extent of the Banta Road TCE plume.

Area 3. TCE and/or PCE continue to be detected in groundwater at Area 3 greater than the ACL and extend off the Depot to the north. In 2013, DLA conducted a soil gas investigation at Area 3 which indicated that TCE and PCE are present in the vadose zone at concentrations greater than the 1998 OU 1 ROD cleanup goals; therefore, it is probable that VOCs in the vadose zone are a source of groundwater contamination.

Northern Depot Soils Area. The remedy at the Northern Depot Soils Area is a LUC that requires three inches of gravel or an asphalt cover. During the 2014 LUC inspection, deficiencies were observed in the gravel thickness. The gravel is used to mitigate exposure pathways and human health impacts.

SWMU 27. The remedy at SWMU 27 was excavation. In 1999, confirmation soil samples collected from the excavation and sidewalls had laboratory reporting limits greater than the January 2015 residential RSLs. Therefore, despite non-detect sample results; it is unknown whether contaminants are present at SWMU 27 at concentrations that prevent unrestricted use / unrestricted exposure.

Institutional Controls. LUCs are inspected annually and results of the inspections are documented in the Annual Report. During review of the Annual Report, the regulatory agencies noted that LUC requirements vary from site to site.

Building 237. In March 2011, indoor air samples were collected from Building 237 to evaluate vapor intrusion risk from VOCs. At the time, results from this sampling event indicated the risk was acceptable; however, U.S. EPA now recommends using the California-modified commercial / industrial RSL for PCE (0.29 ppbv). The 0.5 ppbv laboratory reporting limit from the March 2011 sampling is greater than the California-modified commercial / industrial RSL. Therefore, it is unknown whether occupants of Building 237 are being exposed to PCE at concentrations which could present impacts to human health.

8.2 NWC OU

No issues were identified for the NWC OU.

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9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 9.0-1 provides recommendations and follow-up actions to address issues identified as part of this Third Five-Year Review.

Table 9.0-1. Recommendations and Follow-up Actions

Recommendations/Follow-up Actions	Implementing Party	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
Install monitoring wells downgradient of the Banta Road TCE Plume. In April 2015, groundwater samples were collected from soil borings advanced east of Banta Road. The results from this investigation will be presented in a report, used to delineate the extent of TCE in groundwater, and determine the preferred new monitoring well locations. Once installed, the monitoring wells will provide data to assess protectiveness.	Federal Facility	U.S. EPA	30-Sept-20	N	N
Restart SVE at Area 3. In February 2015, DLA submitted a work plan to perform vadose zone remediation by restarting SVE, enhanced with pneumatic fracturing. The remedy is anticipated to be installed in the third quarter of 2015 and operational by the end of 2015.	Federal Facility	U.S. EPA	30-Sept-20	N	N
Add gravel to areas of the Northern Depot Soils Area where the thickness is less than three inches. In addition, the DLA may be removing railroad tracks that are present within the boundaries of the Northern Depot Soils Area. This provides the opportunity to evaluate protectiveness / effectiveness of the current remedy and possibly replace the aggregate with an asphalt cover.	Federal Facility	U.S. EPA	30-Sept-20	N	N
Prepare a decision document to establish LUCs at SWMU 27 that prevents residential and daycare center land use or perform confirmation soil sampling to determine whether concentrations prevent unrestricted use / unrestricted exposure.	Federal Facility	U.S. EPA	30-Sept-20	N	Y
Conduct a comprehensive review of LUC sites and apply consistent requirements as appropriate for protectiveness.	Federal Facility	U.S. EPA	30-Sept-20	N	N
Collect indoor air samples at Building 237 to reevaluate vapor intrusion risk.	Federal Facility	U.S. EPA	30-Sept-20	N	N

Notes:

DLA	=	Defense Logistics Agency	Y	=	Yes
LUC	=	land use control	N	=	No
SVE	=	soil vapor extraction			
TCE	=	trichloroethene			
U.S. EPA	=	United States Environmental Protection Agency			

10.0 PROTECTIVENESS STATEMENTS

The following statements address the protectiveness of the remedial actions taken at the Tracy Site.

10.1 OU 1

The remedy at OU 1 currently protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term LUCs should be established at SWMU 27 to prevent residential and daycare center land use.

10.2 NWC OU

The remedy at the NWC OU is protective of human health and the environment and pathways that could result in unacceptable risks are being controlled.

10.3 Site Wide

Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.

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11.0 NEXT FIVE-YEAR REVIEW

The Fourth Five-Year Review for the Tracy Site will span the period from September 2015 through September 2020 and is required to be completed no later than five years from the date of this Third Five-Year Review. Actions taken in response to recommendations in this Third Five-Year Review and future optimization of or modifications to the remedies selected in the three RODs will be evaluated in the Fourth Five-Year Review to ensure that the remedies continue to be protective of human health and the environment.

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APPENDIX A

Conceptual Site Model

A.0 CONCEPTUAL SITE MODEL

This conceptual site model (CSM) provides a detailed description of the Tracy Site geology, groundwater geochemistry, and groundwater contamination migration, fate and human exposure receptors, linear and non-linear regression analysis, and human health exposure pathways.

A.1 Regional Geology and Hydrology

The Tracy Site is located within the Tracy Subbasin of the San Joaquin Valley Basin. Figure A.1-1 provides the geologic timescale, stratigraphy, geologic materials, hydrogeologic conditions and hydrologic zone assigned to the stratigraphic units. The figure also provides the approximate depths of the regional stratigraphy and aquifer zones.

For classification and organization, the subsurface is divided into three Hydrologic Zones in the vicinity of the Tracy Site. Each of these zones has at least one significant coarse grained unit (aquifer) but also contain significant clay strata. These Hydrologic zones are defined as:

Upper Hydrologic Zone: 62 to -9 feet mean sea level (ft msl)

Middle Hydrologic Zone: 25 to -34 ft msl

Lower Hydrologic Zone: -14 to -100 ft msl

Each of the Hydrologic Zones is characterized by thickening and thinning portions of the zone. Also, the depths to each interface between zones vary. The overlap in elevations between the Hydrologic Zones is due to the configuration of each zone and depth variances.

The discussion of geology in this paragraph and the following paragraph refer to the stratigraphic units outlined in Figure A.1-1. The relationship between these stratigraphic units and the three Hydrologic Zones are illustrated in Figure A.1-1. The lithological deposits at the Tracy Site from the surface to a depth of 20 to 30 ft originated from materials eroded from the Diablo Range and carried east by streams or winds. These deposits are named the Younger Alluvium (Figure A.1-1). The Younger Alluvium generally correlates with the vadose zone. Silt and clay layers occur most frequently in the interval from surface to 30 ft below ground surface (bgs).

The Younger Alluvium is difficult to distinguish from the underlying deposits of Older Alluvium. The Older Alluvium deposits extend from the water table down to a depth of approximately 65 ft. This corresponds to the Upper Hydrologic Zone. The Tulare Formation, which underlies the Older Alluvium (Upper Hydrologic Zone) is divided into Upper, Middle and Lower Members. They generally consist of poorly sorted, discontinuous deposits of clay, silt, sand, and gravel (California Department of Water Resources [DWR], 2006). However, in the vicinity of the Depot, only the Upper Member has been described during fieldwork associated with RI/FS activities. The Upper Tulare Member contains both the Middle Hydrologic Zone (65 to 100 ft bgs) and the Lower Hydrologic Zone (100 to 190 ft bgs). The bottom of the Lower Hydrologic Zone occurs within the Upper Tulare Member near its base. The Middle and Lower Tulare do not have Hydrologic Zone designations as they are deeper than what the system defines. One braided stream channel in the Older Alluvium or Upper Tulare, trending approximately northeasterly across the Depot and the Annex property, has been identified from boring logs (Montgomery Watson, 1995b).

The Upper and Lower Members are transmissive zones in the Tulare aquifer that are important to the water supply in the San Joaquin Valley. The Middle Tulare is the very poorly transmissive Corcoran Clay Member, which is estimated to be 80 to 100 ft thick. The upper surface of the Corcoran Clay Member occurs at an approximate depth of 220 ft bgs at the Tracy Site. Sedimentary deposits of the Lower Tulare Member have not been encountered in soil borings or wells at the Depot. However, the top of the Middle Tulare Member (Corcoran clay) may have been penetrated in the boring drilled for EW030C in 1996.

A.2 Tracy Site Geology and Hydrogeology

A.2.1 Overview

The geology of subsurface deposits to a depth of approximately 211 ft bgs at the Depot has been compiled from data collected during monitoring well logging, cone penetrometer test (CPT) logs, time-domain electromagnetic surveys, evaluation of agricultural well logs, and logging of extraction wells and piezometers. Data collection has focused on geology in the Upper Tulare Member and the overlying alluvial deposits. These subsurface deposits are designated to be within the Upper, Middle, or Lower Hydrologic Zones described in the preceding discussions (Figure A.1-1). No additional information on the Corcoran Clay and Lower Tulare Member is presented in this description. Surface soils are loams to sandy loams that have been disturbed by agricultural development followed by industrial development.

To help illustrate the geology, Figure A.2-1 shows the locations of five geologic cross sections. Cross section A-A′ (Figure A.2-2) shows a northeast-southwest cross section along the length of the Tracy Site and the Annex; and cross section B-B′ (Figure A.2-3) displays subsurface geology along a northwest to southeast line parallel to the northern boundary of the Depot. A third cross section C-C´ (Figure A.2-4) was developed to illustrate the geology along a north-south line parallel to Banta Road, east of the Tracy Site. Cross section D-D’ (Figure A.2-5) shows the subsurface geology below Solid Waste Management Unit (SWMU) 20. Cross section E-E’ (Figure A.2-6) shows the subsurface geology below the Tracy Site and Annex oriented northwest-southwest. These cross sections show the monitoring and extraction well depths, screen intervals, and approximate groundwater elevations for 3Q14 in selected wells. The lithologies have been grouped into three general types (clays, silts, and sands/gravels) to highlight possible contaminant migration routes and allow for correlation among borings.

The vadose zone typically consists of fine-grained clays, silts, silty sands, and clayey sands. Cross section A-A′ (Figure A.2-2) shows sandy silts and silts in the southern portion of the Depot that grade into clays and silty clays to the north. The vadose zone becomes thinner from south to north. The vadose zone in cross section B-B′ (Figure A.2-3) shows clays and silts in the northwest and interbedded sands, silts, and clays in the southeast. Cross section C-C´ (Figure A.2-4) shows predominantly clays and silts in the vadose zone. It becomes slightly thicker from southeast to northwest.

The Upper Hydrologic Zone consists of silty and poorly graded sands on the southern portion and is interbedded with clay and silt to the north (Figure A.2-2). In cross section B-B′, the Upper Hydrologic Zone consists of gravels and mostly clay at the Northwestern Corner (NWC) of the Tracy Site (Figure A.2-3). Near former Groundwater Treatment Plant 1 (GWTP1) (and the line where cross section A-A′ intersects cross section B-B′), the Upper Hydrologic Zone two layers of gravels and sands occur, but are separated by a clay lens. Southeast of former GWTP1, the Upper Hydrologic Zone is dominated by well-graded to silty sands that represent a stream channel that trends northeast (at LM031A, Figure A.2-3). The sand layers are thinner, finer grained, and interbedded with clays to the southeast of the channel

(Figure A.2-3). On cross section C-C´ (Figure A.2-4), the Upper Hydrologic Zone appears to be dominated by two sand sequences separated by thin overbank deposits (silts and clays).

The Middle Hydrologic Zone sands are consistent in thickness from south to north beneath the Depot and the southern half of the Annex property (Figure A.2-2). From the NWC of the Depot to the area of former GWTP1, the Middle Hydrologic Zone gravels and sands occur which grade to silty and sandy clay to the southeast (Figure A.2-3). East of former GWTP1 lithologic information for the Middle Horizon is sparse.

In late 2008 and early 2009 an investigation was conducted which included the collection of lithologic data from 28 CPTs (URS, 2009a). Sixteen of the 28 soil boring locations were placed in the vicinity and to the northeast of Banta Road to further evaluate the lithology in the vicinity of the Banta Road trichloroethene (TCE) Plume. The findings from this investigation indicate that deposits from 50 to 75 ft bgs (border between Upper and Middle Hydrologic Zones) in this area are characterized by the laterally continuous silty clay unit observed in other portions of the Annex and Banta Road areas. The silty clay deposits grades into a series of interbedded silt and well-graded gravel lenses to at least 100 ft bgs. The lithology under the central portion of the area east of Banta Road, characterized during this investigation, consists of clay and silt from ground surface to approximately 16 to 20 ft bgs and is underlain by a laterally continuous layer of well-graded sand that extends to approximately 35 ft bgs. This well-graded sand gradually thins and occurs at increasingly shallower depths to the northeast. The silty clay deposit observed in other portions of the Annex and Banta Road extends to the northeast in this area from approximately 35 to 80 ft bgs. Lithology in the northernmost portion of the Banta Road area is typified by a silty clay/clayey silt deposit from ground surface to 18 ft bgs. Lenses of poorly to well-graded sand, silty sand and silt are interbedded in the silty clay deposit that appear to be laterally and vertically continuous within the Banta Road investigation area from approximately 18 ft bgs to approximately 106 ft bgs.

Among the three Hydrologic Zones, the Lower Hydrologic Zone may have the greatest thickness of sand and gravel beneath the northern and central portions of the Depot; however, lithologic information for the horizon beneath the southwest portion is sparse (Figure A.2-2). The Lower Hydrologic Zone sands become thinner, finer grained, and interbedded with clays from south to north. Cross section B-B′ indicates that the Lower Hydrologic Zone contains a thick sand and gravel sequence in LM107C, LM047C, and LM048C. Overall, this horizon grades from clays in the northwest to sands and gravel in the southeast (Figure A.2-3).

Beneath the Annex portion of the Tracy Site, a 5 to 10 ft thick poorly sorted gravel, clayey sand, and sand layer occurs stratigraphically just above the Corcoran Clay Member. This layer is important because it is the deepest interval in which TCE from the Tracy Site has been detected.

A.2.1 Groundwater Flow Directions and Gradients

The saturated zones are grouped into hydrologic zones to clarify the discussion of groundwater hydrology. The remainder of Appendix A, relating to the presentation of groundwater elevations, flow direction data, horizontal hydraulic gradients, and vertical hydraulic gradients, reflects this hydrologic zone terminology. The hydrologic zones include wells with the following hydrologic zone designations:

Above Upper Hydrologic Zone (AU)

Upper Hydrologic Zone (A)

Middle Hydrologic Zone (B)

Lower Hydrologic Zone (C)

Deeper than Lower Hydrologic Zone (D)

Generally, in all the hydrologic zones, the groundwater flowed in a north to northeast direction. Variations in groundwater flow directions due to influences from groundwater extraction, changes in the horizontal and vertical gradients, and/or seasonal groundwater recharge were locally evident in the Upper and Middle Hydrologic Zones. It is evident on the Upper Hydrologic Zone potentiometric surface map that the injection of treated groundwater to the northern injection galleries produces a localized mounding effect year around and the infiltration beneath the storm water retention pond produces a localized mounding effect during winter months when water is present. This mounding effect is not observed in the Middle and Lower Hydrologic Zones due to either retardation of surface water infiltrating into the lower hydrologic zones by the fine grain confining zones or the recharge area to these hydrologic zones are located off site.

The average horizontal gradients for the 2014 reporting period for the Upper, Middle and Lower Hydrologic Zones were 0.0019 feet per foot (ft/ft), 0.0039 ft/ft, and 0.0020 ft/ft, respectively. The average vertical gradients for the 2014 reporting period between the Upper and the Middle Hydrologic Zones was a downward potential of -0.02 ft and between the Middle and the Lower Hydrologic Zones there was an upward potential of 0.007 ft.

Over the past 18 years the vertical gradient between the Upper Hydrologic Zone and the Middle/ Lower Hydrologic Zones has had a downward potential. However the vertical gradient between the Middle and Lower Hydrologic Zones has had an upward potential.

A.2.3 Hydrographs

Hydrographs were developed using monitoring wells screened in each of the three hydrologic zones at the Tracy Site (Upper, Middle, and Lower) to evaluate annual and long-term changes in groundwater elevation. The data sets used to generate the hydrographs for the hydrologic zones consists of the average water level for all monitoring wells at the Tracy Site and Annex screened within the respective hydrologic zones that have complete water levels data sets from the third quarter 1996 through the 2014 reporting period. Hydrographs for the hydrologic zones at the Tracy Site are presented on Figure A.2-7.

The hydrographs representing the Upper, Middle, and Lower Hydrologic Zones across the Tracy Site and Annex indicates that from 3Q96 through 3Q14 the water elevations dropped approximately 6.13 ft, 4.4 ft, and 7.34 ft, respectively. After the relatively high rainfall amounts in the winter months of 2004 to 2005, water elevations beneath most the Tracy Site areas rose until 3Q06. In all areas, water levels have fluctuated seasonally over a fairly narrow range since 3Q06. The average changes in elevation from 3Q13 to 3Q14 were decreasing, 1.8 ft in the Upper Hydrologic Zone, 0.69 ft in the Middle Hydrologic Zone, and 2.64 ft in the Lower Hydrologic Zone. Rainfall during 2014 reporting period was much lower than average at 3.51 inches.

A.3 Groundwater Geochemistry

An understanding of local geochemical conditions is an important element of the CSM for the Tracy Site, as these conditions may exert a controlling influence on the species, mobility, and toxicity of inorganic and organic constituents in the subsurface. This subsection briefly describes the prevailing regional geochemical conditions, the site-specific conditions in the saturated zone at the Tracy Site, and their relevance in assessing remedial action (RA) effectiveness.

A.3.1 Regional Geochemistry

Groundwater in the Tracy Subbasin of the San Joaquin Groundwater Basin is characterized by sodium-type water in the north and calcium-sodium type in the south (Sorenson, 1981). The anionic type is variable in the northern part of the basin and may include bicarbonate type, chloride type, and mixed bicarbonate-chloride type; however, sulfate-chloride and bicarbonate-chloride types are most common in the southern part (DWR, 2006).

Groundwater quality in some areas of the subbasin are impaired by: chloride, near the City of Tracy and near the San Joaquin River; nitrate, near the City of Tracy and the northwestern part of the basin; and boron, south and southeast of the City of Tracy including the Tracy Site.

A.3.2 Tracy Site-Specific Geochemistry

At the Tracy Site, contaminants have been detected in groundwater at the water table (Upper Hydrologic Zone) to depths of 197 ft bgs (Lower Hydrologic Zone). This subsection focuses on site-specific conditions in the Upper, Middle, and Lower Hydrologic Zones at the Tracy Site.

Analyses of major cations and anions indicate that the groundwater type is calcium chloride. Total dissolved solids and higher concentrations of calcium and chloride in the Upper Hydrologic Zone are indicative of the influence of recharge from agricultural drainage. Concentrations of ions and calcium concentration decrease with depth. Groundwater in the Lower Hydrologic Zone approaches sodium-chloride type, suggesting recharge occurs in an area that is less influenced by agricultural recharge (Montgomery Watson, 1995c).

The limited study of natural attenuation of chlorinated volatile organic compounds (CVOCs) in groundwater performed during 2009 indicate that little to no anaerobic degradation is occurring at the Tracy Site. Additional natural attenuation samples will be collected from new wells planned for installation within the Banta Road TCE Plume, east of Banta Road, to determine the degradation component of the natural attenuation mechanisms at those locations.

A.3.3 Geochemical Effects on Inorganic Constituents

Geochemical parameters can affect the speciation, and thus the behavior, of inorganic constituents in groundwater. For example, oxidizing aquifer conditions can increase the solubility of chromium, which is most commonly present in its relatively insoluble trivalent state. The more soluble species, hexavalent chromium, was detected in seven groundwater samples at the Tracy Site in the 2004 reporting period at concentrations ranging from 14.5 micrograms per liter (µg/L) to 34.6 µg/L, confirming that local conditions support this species in groundwater. Although hexavalent chromium is not identified as a contaminant of concern (COC) in the 1998 Record of Decision (ROD) (Radian International, 1998a), California establish a maximum contaminant level of 10 µg/L in July 2014.

A.3.4 Geochemical Effects on Organic Constituents

Organic compounds tend to sorb preferentially to organic carbon and clay particles in the aquifer, and tend to be less mobile (more persistent) in parts of the aquifer where total organic carbon (TOC) concentrations are high and/or fine-grained materials are present. TOC, from either natural or anthropogenic sources, also may serve as substrate for bacteria that use organic compounds as either electron donors or acceptors in their metabolic reactions. In general, native TOC concentrations are expected to be low in the aquifer beneath the Tracy Site because of the deposition on an alluvial fan on

which organic materials would be oxidized before they could be buried by fine-grained sediments that would preserve them. Exceptions occur in areas near leaking underground storage tanks (USTs) which provide a source of carbon via petroleum hydrocarbon contamination. As described previously, the hydrostratigraphy at the Tracy Site is characterized by heterogeneous sedimentary deposits with interfingered sands and finer-grained silts and clays. Organic contaminants tend to get locked up in silts and clays where the partitioning into the groundwater for recovery by groundwater extraction is limited.

Local geochemistry also controls the mobility of, the potential for, and rate of biologically mediated degradation of organic compounds in the subsurface. Volatile organic compounds (VOCs) with three or four chlorine atoms in their structure, such as TCE and tetrachloroethene (PCE), are most amenable to biologically mediated reductive dechlorination under neutral, anaerobic, reducing geochemical conditions. Cometabolic degradation of TCE can occur under aerobic conditions, and abiotic degradation can proceed under both aerobic and anaerobic conditions.

VOCs such as cis-1,2-dichloroethene (DCE) and trans-1,2-DCE, each with two chlorine atoms, and vinyl chloride with one chlorine atom are amenable to biodegradation under neutral, oxidizing, and aerobic conditions such as those encountered in groundwater beneath much of the Tracy Site; but such compounds typically are present as daughter products of reductive dechlorination of PCE and/or TCE. Because reductive dechlorination process requires reducing the groundwater to anaerobic conditions, which are generally lacking at the Tracy Site, the limited occurrence of DCE (detected consistently in samples from only one well) and lack of detections of vinyl chloride in the Tracy Site groundwater are expected and consistent with these groundwater conditions. Therefore, it is evident that biodegradation of the chlorinated compounds is not occurring at any measurable level at the Tracy Site.

A.4 Nature and Extent of COCs

This section describes the history of the primary COCs (TCE, PCE, and dieldrin) at the Tracy Site from their sources to their current distribution. 1,1-DCE was formerly listed as a primary COC but was removed from the list in 2013 (HDR, 2013a).

In general, distribution of groundwater contamination and concentrations of dissolved TCE and PCE in the Upper, Middle, and Lower Hydrologic Zones suggest that principal mechanisms of migration from source areas are as follows:

- Dissolution of VOC-laden soil vapor into the water table;
- Dissolution of TCE or PCE from adsorbed soil contamination by downwardly migrating surface water; and
- Former downward migration of TCE and PCE under the influence of vertical hydraulic gradients caused by historical operation of former agricultural supply wells.

A.4.1 VOC Sources and Migration Pathways

Layers of clay, silt, silty clay, or clayey silt occur from the surface to at least 20 ft bgs at SWMU 2, SWMU 3, SWMU 6, SWMU 20, and SWMU 33 (VOC and dieldrin source areas). Across the Tracy Site, silt and clay layers named the Younger Alluvium occur most frequently in the interval from the surface to 30 ft bgs. Although they have low permeabilities, these deposits did not stop vertical migration of dieldrin, TCE, or PCE. Beneath the lagoons, sumps, and pipeline segments, wastewater containing

dissolved contaminants provided some degree of saturation in the soil as well as a vertical hydraulic gradient that moved contaminants through the vadose zone and into groundwater.

After the contaminants entered groundwater they began migrating north under the influence of the local hydraulic gradient, which was likely influenced by the operation of the agricultural well (AG) 2 located at the northern edge of GWTP2. In the NWC, groundwater treated for VOCs only was injected directly into the saturated zone at IW001, IW002, and IW003, where it migrated a few hundred feet under the hydraulic influence of injection.

Data from the Remedial Investigation/Feasibility Study (RI/FS) indicated that the sources of VOC plumes in groundwater are Area 1/Building 237, SWMU 1/Area 2, Area 3, SWMUs 2/3, SWMU 6, SWMU 7, SWMU 8, SWMU 20, and SWMU 33 (Montgomery Watson, 1995b). Figure A.4-1 presents the locations of identified SWMUs at the Tracy Site. Table A.4-1 provides a basic description of each SWMU. Post-RI data collection indicates that residual VOC mass remains beneath three of these sites: Area 1/Building 237, SWMU 1/Area 2, Area 3, and SWMU 20. Soil vapor extraction (SVE) was operated and discontinued at Area 1/Building 237, SWMU 1/Area 2, and Area 3 to address elevated VOC concentrations remaining in the vadose zone that potentially threatened groundwater quality. In October 2011, an SVE system was installed at SWMU 20 and began operation to address elevated VOC concentrations remaining in the vadose zone that are impacting groundwater quality. In August 2012, the SVE system at SWMU 20 was shut down due to concentrations less than the cleanup goals in the 1998 ROD and asymptotic mass removal rates. The SVE system was operated in the 2014 reporting period to remove residual VOC concentrations beyond the remedial action objective (RAO) of the 1998 ROD. To date, an estimated 2.8 pounds of TCE have been removed by the SVE system.

Area 1 VOC Source

TCE-contaminated soil resulted from historical site activities which included cleaning asphalt tools and equipment with solvents (Radian International, 1998a). In addition, former Building 228, located south of Building 236, was a paint shed connected to the industrial waste pipeline (IWPL). TCE was likely used for the cleaning of paint equipment which may have been discharged to the IWPL or discarded to the ground surface outside of the former Building 238.

In 2009, soil gas analytical results indicate that the TCE and PCE in soil gas is widely distributed throughout Area 1 with highest PCE concentrations generally detected to the north of Buildings 231 and 237.

Area 1 Migration Pathways

Vadose zone soils consist of approximately a 20-ft thick clay, thinly interbedded with silt, which is underlain by approximately 5 ft of poorly graded sand (URS, 2008b). TCE and PCE have been detected in vadose zone soil to the north and south of Building 237. The low permeability soil has likely retarded VOC impacts to groundwater. Furthermore, the low permeability soils may have limited the effectiveness of SVE in some areas. For example, in 2009, after approximately 8 years of operation, TCE and PCE were detected in soil gas at concentrations greater than the ROD vadose zone cleanup objectives of 350 parts per billion by volume (ppbv) and 780 ppbv, respectively.

Groundwater is encountered between 19 and 21 ft bgs. The flow direction is predominantly north to northeast with an average horizontal gradient of approximately 0.001 ft/ft in the Upper Hydrologic Zone. The seasonal groundwater elevation variations in the Upper Hydrologic Zone generally range between

0.5 and 1 ft over a year. The local flow direction and gradient varies by season and was influenced by operation of downgradient groundwater extraction wells.

PCE and TCE may have been released to the ground surface and to the IWPL and thus contaminated soil, soil gas and groundwater. TCE and PCE are sorbed to fine grained soil at the site and continue to diffuse into soil gas, and groundwater. Although TCE and PCE are present in soil gas at concentrations greater than the ROD cleanup objective, TCE and PCE are detected in groundwater at concentrations less than the aquifer cleanup level (ACL). The area is predominantly paved and therefore migration of contaminants through the vadose zone in percolated rainwater is minimal. VOCs in soil gas may migrate laterally through preferential pathways which may include sanitary sewer drains in Building 231 and 237. VOCs will also migrate vertically, which could pose a chronic human health risk via vapor intrusion to indoor air; however, the 2011 indoor air sampling conducted at Building 231 and 237 revealed that VOCs in indoor air do not present a human health risk.

In 2013, Defense Logistics Agency (DLA) collected soil gas samples from soil borings and from vapor monitoring wells to evaluate whether existing land use controls (LUCs) are adequate to protect human health from vapor intrusion of chemicals to indoor air. The soil gas analytical results indicate that PCE was detected at concentrations greater than the ROD cleanup standard; however, groundwater samples collected downgradient from these detections did not yield PCE greater than the ACL. This indicates that soil gas in excess of the ROD cleanup standard does not appear to be impacting groundwater greater than the ACL in these areas (HDR, 2013b).

Area 2 VOC Source

Two sewage lagoons were formally located at Area 2. Treated effluent was discharged to the lagoons from 1942 until they were abandoned and backfilled in 1944 (WCC, 1992). Area 2 was reportedly an outdoor drum storage area where leakage of stored drums and/or accidents in the handling of drums may have occurred. Aerial photographs showed that this area was used for outside drum storage from 1957 until 1984 (Montgomery Watson, 1996). Chemicals in drums possibly leaked or were discharged accidentally (Radian International, 1998a).

Previous investigations have identified two discrete “hot spots” of TCE and PCE in soil gas. One area is located approximately 50 ft southeast of Building 258 and the other area is located near the former sewage lagoon. Review of the laboratory analytical results suggest that chemicals released adjacent to Building 258 occurred at the ground surface and that chemicals released near the sewage lagoon resulted from infiltration of contaminated waste water.

Area 2 Migration Pathways

Soil at Area 2 consists primarily of low permeability clays with interbedded silt and sand lenses in the water bearing zone. Groundwater is encountered at approximately 16 ft bgs and groundwater flow is to the north-northeast.

LM030AUA is screened from 10 to 20 ft bgs, with an average of 7 ft of screen exposed through the vadose zone. The exposed screen would allow soil gas to migrate into the well and filter pack and have direct contact with the groundwater. During the 3Q14 monitoring event, well LM030AUA yielded PCE at 16 µg/L and TCE at 2 µg/L. This represents the highest recent PCE concentration detected in groundwater at Area 2. Although soil gas and groundwater samples collected in 2008 did not yield TCE or PCE greater than the ROD cleanup objectives or ACL, the recent historical high PCE concentration detected in the groundwater sample collected from LM030AUA suggests that the PCE concentration in

soil gas has rebounded, significantly since shutdown of the SVE system, and may be partitioning into groundwater in this area. Monitoring well LM149A (0.36J µg/L for PCE during 3Q14), located 15 ft to the northwest of LM030AUA and screened from 25 to 35 ft bgs, provides a better representation of PCE impacts in groundwater in the vicinity.

TCE and PCE are sorbed to fine grained soil in the vadose zone which continue to diffuse into soil gas. TCE and PCE in soil gas may migrate laterally through course grained material used as backfill around extraction well conveyance piping; however, the PCE and TCE concentrations in these preferential pathways will attenuate with distance from the source. Vertical migration of TCE and PCE via percolating rainfall is limited as Area 2 is paved. VOCs will also migrate vertically, which could pose a chronic human health risk via vapor intrusion to indoor air.

In 2013, soil gas samples were collected from vapor monitoring wells and soil borings to assess TCE and PCE concentrations in soil gas. The soil gas analytical results indicate that PCE and TCE were present greater than the ROD cleanup standard in some areas of Area 2 and therefore may present a risk to groundwater. In most cases groundwater samples collected downgradient from these ROD cleanup standard exceedances did not yield PCE greater than the ACL; however, well LM030AUA, located in the area where PCE was detected in soil gas, consistently yields PCE greater than the ACL.

Area 3 VOC Source

Area 3 was historically used as a drum storage area, in which spills due to the leakage of stored drums and/or other accidents in the handling of stored drums may have occurred (WCC, 1992). In 2008, soil gas samples collected from CPT borings and wells revealed widespread distribution of TCE and PCE throughout Area 3. In 2008, boring CP0820 yielded a TCE concentration of 1,900 ppbv while the sample collected from well AIW2-015 yielded PCE concentration of 3,600 ppbv. These analytical results represent the greatest TCE and PCE detections during the 2008 sampling event. In most instances, shallow soil gas samples yielded higher TCE and PCE concentrations than deep samples as would be expected if chemicals were released to ground surface as part of historical drum storage.

Area 3 Migration Pathways

The vadose zone of Area 3 generally consists of low permeability soils. An approximate 2-ft-layer of medium-permeability soils separates the otherwise continuous lower permeability lithology. Groundwater at Area 3 is generally encountered at approximately 20 ft bgs and the direction of groundwater flow is to the northeast.

TCE and PCE are sorbed to fine grained soils in the vadose zone. Over time, these VOCs will diffuse from the soil into adjacent soils, soil gas, and groundwater. Area 3 is paved; therefore, vertical migration via percolated rainwater is limited. Lateral migration through course grained soil used as backfill in vapor extraction well conveyance piping may occur; however, VOC concentrations would attenuate with distance from the source. VOCs will also migrate vertically, which could pose a chronic human health risk via vapor intrusion to indoor air.

In 2013, soil gas samples were collected from soil borings and vapor monitoring wells to assess TCE and PCE concentrations. The highest TCE and PCE soil gas concentrations were detected in samples collected from the area where TCE and PCE were detected greater than the ACL in groundwater in boring CP0823 in 2008. It is likely that TCE and PCE in the vadose zone is partitioning to groundwater in this area resulting in exceedance of the ACL. To further support this hypothesis, a monitoring well (LM203A) installed in an area with elevated PCE soil gas concentrations, had a PCE concentration of 18

µg/L in groundwater in 3Q14. There are no known upgradient or surface source areas for the Area 3 PCE Plume delineated by LM203A.

A.4.2 Dieldrin Sources and Migration Pathways

The sources of dieldrin identified in the RI/FS are SWMUs 2/3, SWMU 33, and SWMU 8 (Montgomery Watson, 1996). The dieldrin plume in groundwater from SWMUs 2/3 and SWMU 33 is designated the Sanitary Sewage Lagoon (SSL) Dieldrin Plume. Excavations were performed at each of the SSL plume source areas, but it is unlikely that all residual dieldrin mass in the vadose zone from the source areas was removed. At SWMU 8, dieldrin has not been detected in groundwater collected from any of the wells, with the exception of one detection that was less than the ACL and was reported in 1994 prior to the soil excavation at SWMU 8. At Area 1/Building 237, dieldrin has been detected twice in groundwater at LM192AU; however never greater than the ACL. In 2012, a pesticide-impacted soil removal action was completed. Approximately 480 tons of soil was removed from the north side of Building 237 in the area of LM192AU. Monitoring well LM192AU was removed as part of the pesticide-impacted soil removal action. Dieldrin occurring in groundwater beneath the NWC, referred to as the NWC Dieldrin Plume, did not migrate from another source; rather, extracted groundwater that was treated for VOCs, but not dieldrin, was injected into the saturated zone using injection wells IW001 through IW003 (URS, 2007b). There is no residual dieldrin mass in the vadose zone beneath the NWC.

The SSL Dieldrin Plume is located in the North Central portion of the Tracy Site. The SSL dieldrin plume has been attributed to the percolation of dieldrin-contaminated water from SWMUs 2/3 (Industrial Waste Lagoons) that received discharge from SWMU 33 (IWPL). The source of dieldrin in the lagoons was wastewater discharged into floor drains or washed into sumps and then transported via IWPL to the outfall at SWMUs 2/3 (Montgomery Watson, 1996). Detection of dieldrin in soil samples along SWMU 33 and in lagoon sediments corroborates the source hypothesis. It is likely that dieldrin was discharged to the IWPL or sanitary sewer system in the form of a pesticide ready for spraying. Pesticide mixtures typically contain solvents to improve the miscibility of nearly insoluble dieldrin with water. In addition, while traveling through SWMU 33 and in the ponds at SWMUs 2/3, dieldrin was likely exposed to additional TCE and PCE. The solvents may have increased the mobility of dieldrin percolating in water through the vadose zone and in groundwater.

A.4.3 Groundwater Plumes

Western and North Central VOC Plumes. A plume containing TCE and PCE originated at Building 10 (SWMU 20) and migrated northerly. During its migration, the plume commingled with other plumes from SWMU 33, Area 1/Building 237, SWMUs 2/3, and SWMU 1/Area 2 and passed beyond the Depot boundary. SWMUs 2/3, and SWMU 33 have been remediated and are no longer sources of contamination.

SWMU 20 TCE Plume. SWMU 20 TCE groundwater plume was initially defined by HPT investigations followed by the installation and monitoring of LM193AU. Concentrations at the former LM193AU ranged from 63 to 104 µg/L. Review of LM193AU construction details suggested that this well's filter pack and screen intervals passed through areas of TCE contamination in the vadose zone ranging up to 13,000 ppbv. The potential exists that the dense TCE vapors entered the filter pack and well screen of LM193AU and partitioned into groundwater, thereby contaminating the groundwater samples collected at this former monitoring location. The replacement well, LM196AU is screened at the water table and is seasonally subject to TCE soil gas contamination from the vadose zone, however, LM196AU has a shorter length of well screen exposed in the vadose zone for only part of the year as compared to the former monitoring well LM193AU. The TCE concentration variability in groundwater at

these locations can be explained by the well construction. During the 2014 reporting period, LM196AU had a TCE concentration of 0.44 µg/L and LM197B was non-detect for TCE. The consistency of analytical results in LM196AU further supports the hypothesis of soil gas contributing to the previous groundwater sample results from LM193AU (104 µg/L). The reduction of TCE concentrations in groundwater is attributed to the reduction of TCE in soil gas concentrations associated with SVE system operation.

Area 3 VOC Plumes. TCE entered groundwater at SWMU 6 and migrated northeasterly beneath Area 3 where the plume acquired some TCE and PCE mass from the soils before continuing to migrate beyond the Depot boundary. SWMU 6 has been remediated via excavation and Area 3 underwent SVE for more than six years. A PCE plume originated at SWMU 8 and migrated northeasterly beyond the Depot boundary. Remediation at SWMU 8 consisted of excavation of contaminated soil and debris. No residual VOC mass is known to exist at SWMU 8. No groundwater RAs have been conducted to remediate the east Depot VOC plumes originating from SWMUs 6 and 8, and concentrations are less than ACLs in the former plume from SWMU 8. The Area 3 PCE Plume was previously based on concentrations observed in wells EW034AU and LM032AU, which both have PCE concentrations below the ACL and decreasing trends. In the 2014 reporting period, LM058AU remained greater than the ACL for TCE and PCE and EW034AU remained less than the ACL.

In 2008, a TCE plume was identified in Area 3 (URS, 2009b). There were no monitoring wells in this portion of Area 3. The nearest extraction well, EW046AU is approximately 150 ft downgradient from the plume. The 2010 groundwater modeling indicates that the Area 3 TCE Plume is within the capture zone of EW046AU and that the plume will be remediated by this well (HDR, 2011b). Currently, EW046AU is not operating; however, during the 2014 reporting period, TCE did not exceed the ACL.

In 2013, seven soil borings (SB1252 through SB1258) were advanced to the water table and groundwater samples were collected. The groundwater samples indicated the presence of TCE greater than the ACL in two of the soil borings (SB1257 and SB1252) and PCE greater than the ACL in one soil boring (SB1255). A new monitoring well (LM203A) was installed adjacent to boring SB1255 (HDR, 2013d). During the 3Q14 monitoring event, LM203A had a concentration of 1.6 µg/L for TCE and 18 µg/L for PCE.

Banta Road TCE Plume. The plume containing TCE, PCE, carbon tetrachloride, and chloroform is more than 2,000 ft from potential source areas on the Depot. The Banta Road TCE Plume is likely a cutoff plume from the original source on the Depot. No source area is known to contain residual mass of TCE and/or PCE with carbon tetrachloride. Data collected during the RI suggested that carbon tetrachloride and chloroform, possibly a degradation product of carbon tetrachloride, were released from the Olin Chlor Alkali facility (formerly Pioneer Chemicals and All Pure Chemicals) located approximately 800 ft east of the easternmost point of the Depot and east of Banta Road (Montgomery Watson, 1996). Recent data from monitoring at the Olin site confirm carbon tetrachloride and chloroform in groundwater; however, no TCE or PCE greater than reporting limits has been identified in groundwater samples from that site (SECOR, 2008).

Two groundwater monitoring wells (LM194A and LM195A) are proposed to be installed in the Upper Hydrologic Zone northeast of the Banta Road TCE plume to determine whether the plume is dispersing or migrating. Due to private property land access issues, the installation of these wells has been delayed. These wells will be installed once land access agreements are in place.

SSL Dieldrin Plume. Currently, the SSL dieldrin plume consists of two discrete plumes that are greater than the ACL. East of the source area (SWMUs 2/3), the plume spreads from the Upper Hydrologic Zone

at EW042AU to LM028A and down to the Middle Hydrologic Zone at EW028B. The other section of the plume is near EW048AU, located approximately 1,200 ft northeast of the source area and approximately 500 ft northeast of the main plume discussed above. Extraction well EW048AU is located on the boundary of the Tracy Site Annex and private property. The concentrations in this detached plume have been steadily declining over the last few years and are currently at 0.055 µg/L. The dieldrin concentrations are distributed fairly evenly downgradient of the source area suggesting that dispersion is occurring.

The time-series plots for LM003AA and EW042AU, located downgradient and adjacent to the source area, display fluctuating dieldrin concentrations. These results may be indicative of residual dieldrin mass in the vadose zone of the source area being remobilized periodically. Seasonal rainfall and discharge from the waste water treatment plant to SWMU 2 may mobilize dieldrin to the water table.

Hydrology and lithology of the site also has an affect contributing to mobility of contaminants. The Upper Hydrologic Zone consists of a sand lens extending from the ponds at SWMUs 2/3 to north of EW041AU. The Middle Hydrologic Zone consists of a sand lens that extends from the Depot boundary (EW028B) to north of the Groundwater Treatment Plant 2 (LM081C). The Upper, Middle, and Lower Hydrologic Zones have groundwater gradients flowing in the north-northeasterly direction, directly in line with the migration of the SSL Dieldrin Plume. In addition, a former agriculture irrigation well (AG-2) was operated seasonally (late spring through summer months) until late 1993. AG-2 was located on the Annex in the vicinity of GWTP2, approximately 2,000 ft northeast of the SWMUs 2/3. The well was originally screened above and below the Corcoran Clay, but due to a collapse in the well within the Corcoran Clay interval the well only extracted groundwater from the screen interval between 69-180 ft bgs. It was estimated in the 1996 RI/FS that AG-2 produced approximately 500 gallons per minute (gpm) and had a radius of influence of approximately 1,500 ft (Montgomery Watson, 1996). The operation of this irrigation well is thought to have contributed to the migration of dieldrin both vertically and laterally to the northeast.

SWMU 8 Plume. This burial pit area was considered a source of dieldrin and other contaminants because of concentrations detected in soil and groundwater during the RI (Montgomery Watson, 1996). However, dieldrin has not been detected in groundwater samples from this area at concentrations greater than the ACL; in fact, analytical results of groundwater samples collected from this area have not had dieldrin at concentrations greater than the detection limit since 1994. No extraction and treatment system was ever installed to remediate groundwater downgradient from SWMU 8. Any dieldrin that may have been present in groundwater decreased to non-detectable levels without an engineered remedy.

NWC Dieldrin Plume. The source of dieldrin in the NWC plume was groundwater extracted at the Tracy Site, treated for TCE and PCE, and then injected into three injection wells (IW001 through IW003). In December 1990 and January 1991, three injection wells were constructed with multiple screened intervals from 20 to 100 ft bgs. From 1992 and 1995, water delivered to the injection wells was effluent from the interim remedial measure (IRM) air stripper system. This system treated VOC contaminated groundwater pumped from extraction wells located within the Tracy Site SSL dieldrin plume. Dieldrin concentrations as great as 0.236 µg/L were reported in effluent samples prior to the expansion of the IRM system (Montgomery Watson, 1995c). In 1995, groundwater injection into the three injection wells in the NWC area was suspended as infeasible because the wells could not accommodate a flow rate high enough to support full-scale OU 1 design (Montgomery Watson, 1995c).

In November 1992, prior to treated water injection, dieldrin was not detected in samples from monitoring wells in the area (including LM106A, LM109B, and LM107C, located near IW003). However, after

November 1992, dieldrin was detected at concentrations ranging from 0.02 to 0.136 µg/L. The estimated mass of dieldrin injected into the NWC was 6 grams (URS, 2007b).

In 2009, a focused extraction test performed in the NWC demonstrated that dieldrin can be removed by groundwater extraction. However, it was concluded that due to the high adsorption of dieldrin to carbon present in the subsurface sediments, the removal of dieldrin is limited (URS, 2010).

In 2011, both the *Record of Decision, Remedy for Northwestern Corner Groundwater Operable Unit* (URS, 2011) and the *Northwestern Corner Remedial Design/Remedial Action Work Plan* (HDR, 2011c) were finalized and the construction of the final remedy was completed in December 2011. The NWC extraction and treatment system has been operating from January 2012 through the 3Q14. Dieldrin concentrations have remained stable to decreasing during the 2014 reporting period. Because 9.2 grams of dieldrin has been removed to date by the four extraction wells, it appears that the dieldrin contaminated groundwater is more mobile than once thought and that the dieldrin mass estimates were underestimated. This does not support the 2008 focused pump test conclusion that extraction of dieldrin in groundwater will be very limited due to the high adsorption to naturally occurring carbon.

A.4.4 Migration Pathway in Groundwater

After penetrating the low permeability layers beneath the sources, percolating water containing VOCs and dieldrin had access to higher permeability sands and gravels that are interbedded with clay and silt layers in the Upper Hydrologic Zone The sand and gravel layers represent braided stream channels trending northeasterly and topographically down the Corral Hollow fan across the Depot and the Annex (Figure A.4-2). In spite of the interbedded and heterogeneous nature of the subsurface beneath the water table, hydraulic communication existed between the hydrologic zones, and therefore, groundwater and dissolved VOCs could migrate horizontally and vertically from depths of approximately 15 ft bgs (or the top of the saturated zone) to approximately 180 ft bgs, if a sufficient vertical hydraulic gradient was active. The Western Depot, North Central, and SSL plumes containing TCE, PCE, and dieldrin were drawn northerly and vertically downward by the pumping of AG-2, which had a total depth of 607 ft bgs and unknown screen or perforated intervals. Until AG-2 was shut down in September 1993 (and decommissioned in 1994), the VOC plumes were drawn toward the well as a result of increased downward gradients from the Upper to Middle and the Middle to Lower Hydrologic Zones. Groundwater depressions extended more than 1,300 ft to the south from AG-2 in the Middle and Lower Hydrologic Zones. Although mixed with VOC contamination in groundwater at the SSL, dieldrin from the SSL source has never been detectable in groundwater collected from the Lower Hydrologic Zone (Montgomery Watson, 1995c).

The Area 3, SWMU 6, and Banta Road TCE Plumes also began a northerly migration after entering the saturated zone. The Area 3 and SWMU 6 plumes have not migrated as far to the north or as deep into the Middle and Lower Hydrologic Zones. The Banta Road TCE Plume is now more than 2,000 ft east from the northern extent of the Depot plumes and has only moved vertically into the Middle Hydrologic Zone. The migration paths of VOCs may have been influenced by the distribution of sands in the Upper and Middle Hydrologic Zones (Figure A.4-3). Since the Southern IGs began receiving treated groundwater, flow directions on the eastern portion of the Annex have been more directly northerly than they were during the RI. The occurrence of TCE and carbon tetrachloride at concentrations exceeding their ACLs is rare across much of the Depot and Annex. With no monitoring wells east of Banta Road and south of PW001, it is difficult to address the migration path of TCE and carbon tetrachloride which occur together in the Banta Road TCE Plume.

Beneath the NWC area, clay and silt layers are approximately 30 ft thick in the shallow saturated zone; however, dieldrin was injected directly through the clays and silt layers via the conduits of IW001, IW002, and IW003. Each of the injection wells were constructed with multiple screen intervals (between 20 ft bgs and 100 ft bgs) to distribute the VOC-treated effluent among the Upper, Middle, and Lower Hydrologic Zones. The NWC plume has migrated 100 to 200 ft southerly, or westerly, to LM106A and LM109B, in the Upper and Middle Hydrologic Zones, respectively, from either IW003 or IW002. Dieldrin is not present in the Lower Hydrologic Zone (URS, 2010).

A.4.5 Attenuation of Contaminants in Groundwater

Groundwater analytical data from 1994 to the present suggests that, in addition to groundwater extraction, natural attenuation mechanisms such as dispersion, volatilization, and/or sorption are likely contributing to the reduction in containment concentrations.

TCE and PCE Attenuation. Both TCE and PCE are organic compounds susceptible to natural attenuation mechanisms in groundwater. Dispersion, adsorption, volatilization, and abiotic degradation are mechanisms potentially affecting TCE or PCE plumes. TCE and PCE may degrade by step-wise dehalogenation through the action of anaerobic bacteria (Vogel and McCarty, 1985). However, over the last 15 years of monitoring at the Tracy Site, very little evidence of bacterial degradation of TCE and PCE has been found. Concentrations of breakdown products cis-1,2-DCE and vinyl chloride were rarely identified greater than reporting levels in groundwater samples. Dispersion and sorption are identified in the RI report as likely attenuation mechanisms for TCE and PCE (Montgomery Watson, 1996). Furthermore, a natural attenuation study conducted in 2009 and presented in the *Well Monitoring Program-2009 Annual Monitoring Report* (HDR|e^{2}M, 2010) found that because concentrations of COCs are either decreasing or stable in areas where groundwater extraction is not occurring, dilution, dispersion and sorption appear to be the dominant natural attenuation processes.

Carbon tetrachloride Attenuation. Carbon tetrachloride is susceptible to the same natural attenuation mechanisms as TCE and PCE. Under anaerobic conditions, carbon tetrachloride will undergo step-wise dehalogenation by bacteria. Carbon tetrachloride will degrade to chloroform which will degrade to methylene chloride, to chloromethane, and then to methane. Although carbon tetrachloride is rarely detected in groundwater beneath the Depot or Annex, chloroform was detected in samples from a number of wells during the 2014 reporting period. Not all of the chloroform may have originated from carbon tetrachloride because chloroform may also have been used as a solvent or created by chlorination of water. Chloroform detected in the Banta Road TCE Plume may be the result of carbon tetrachloride degradation; however, that has not been confirmed.

Dieldrin Attenuation. The findings reported in the *Dieldrin Natural Attenuation Investigation Results* (URS, 2007b) confirm that dieldrin is attenuated by natural mechanisms in groundwater beneath the Tracy Site and that the off-site extent of the plumes is contracting, predominantly as a result of the nondestructive mechanisms of sorption in deposits containing mostly clay or silt and dilution in zones of higher permeability. Data from monitoring wells in areas near the SSL dieldrin plumes show decreasing trends both within and outside of the influence of active groundwater remediation (URS, 2005a). The SSL dieldrin plume contracted more than 1,000 ft between 1996 and 2002 prior to active RA, and data from a past CPT investigation verify that the SSL plume footprint is continuing to contract (URS, 2005a). The potential effects of co-solvency in the SSL dieldrin plume or the hydraulic effects of agricultural well AG-2 may explain the greater-than-expected mobility of dieldrin and its longer plume footprint compared to the NWC area; co-solvency effects or the high extraction well pump rates at the SSL may also have contributed indirectly to a higher level of effectiveness in removing dieldrin by extraction in the SSL area than could otherwise have been expected. Data from past investigations do not suggest that

destructive processes, such as biological degradation, are contributing to the attenuation of dieldrin in the saturated zone (URS, 2007b).

In the NWC, concentrations of dieldrin have consistently been detected at LM106A, LM140AU, LM141AU, LM142AU, and LM174AU; however, concentrations in samples at four of the wells (LM106A, LM140AU, LM142AU, and LM174AU) show decreasing trends with time. This would indicate that the dieldrin plume is dispersing. Data from several CPT investigations show that the dieldrin plume in the NWC area has generally been immobile since injection ceased (URS, 2007b; 2010).

A.5 Groundwater Model

Groundwater modeling was last performed in 2010 and presented in detail in the *Well Monitoring Program-2010 Annual Monitoring Report* (HDR, 2011b). Groundwater modeling is only performed as necessary to evaluate the fate and transport of contaminants where empirical data is not available or a significant change in site conditions occur (i.e., extraction well flow rates, contaminant concentrations, discovery of additional plumes, etc.).

A.6 Groundwater Contaminant Migration, Fate, and Exposure

The groundwater contamination migration, fate, and human exposure receptors and pathways are discussed below.

A.6.1 Contaminant Migration in Groundwater

At the Tracy Site, wastes containing contaminants have migrated vertically through the vadose zone to groundwater. The vadose zone soil consists primarily of clay, silt, silty clay or clayey silt from ground surface to at least 20 ft bgs in most areas. Although these soils have relatively low permeabilities, they did not prevent the vertical migration of contaminants. Beneath the lagoons, sumps, pipeline segments, wastewater containing dissolved or potentially undissolved contaminants provided some degree of saturation in the soil as well as a vertical hydraulic gradient that moved contaminants through the vadose zone and into the groundwater.

Once the contaminants have entered the Upper Hydrologic Zone, the compounds have access to higher permeability sands and gravels that are interbedded with clay and silt layers. Beneath the water table, hydraulic communication exists between the hydrologic zones; therefore, dissolved VOCs could migrate horizontally and vertically from depths of approximately 15 ft bgs (or the top of the saturated zone) to approximately 180 ft bgs, if a sufficient vertical hydraulic gradient was active. The migration of COCs in groundwater beneath the Tracy Site has been influenced by the following mechanisms:

- Hydrogeology. The distribution of sands in the Upper and Middle Hydrologic Zones.
- Pumping of AG-2. This well, which had a total depth of 607 ft bgs and unknown screen or perforated intervals, was shut down in September 1993 and decommissioned in 1994 (Montgomery Watson, 1995c).
- Operation of the southern IGs. Since the Southern IGs began receiving treated groundwater, flow directions on the eastern portion of the Annex have been more directly northerly than they were during the RI (approximately 1995). Groundwater mounding was evident in the Upper Hydrologic Zone as a result of recharge from the Southern IG, but was not evident in either the Middle or Lower Hydrologic Zones. The hydraulic loading from the southern IG may have been

driving the migration of the Banta Road TCE Plume (located approximately 1,500 ft directly north) and reducing the effectiveness of extraction wells located along Banta Road. In the 2014 reporting period, the average effluent flowrate discharged to the Southern IGs was reduced to approximately 1 percent with the remaining water going to the Northern IGs.

No COCs (TCE, PCE, and dieldrin) were detected greater than their respective ACL in the Lower Hydrologic Zone during the 2014 reporting period. This indicates that vertical migration of COCs greater than the ACL to the Lower Hydrologic Zone is not occurring.

A.6.2 Contaminant Fate in Groundwater

Groundwater analytical data from 1994 to the present suggests that, in addition to groundwater extraction, natural attenuation mechanisms (dispersion, diffusion, dilution, volatilization, and/or sorption) are likely affecting VOC and dieldrin plumes. The extent of the Western VOC, Eastern VOC, and SSL Dieldrin Plumes have been reduced over a period of years in areas where extraction wells have operated as well as where no wells have operated.

The original size of the Banta Road TCE Plume is not known. Statistical analyses were also performed for detections of TCE in the Banta Road TCE Plume. Data from the monitoring and extraction wells EW019A, -020A, LM150A, -152A, -154A, -156A -180A, -181B -182A, -183B, -184A, -185B, -186A and -187B, in the Banta Road TCE Plume support a hypothesis for a decreasing trend for TCE in the Upper and Middle Hydrologic Zones. Data from the monitoring and extraction wells EW024B, LM151B, -157A and -158B, in the Banta Road TCE Plume, support a hypothesis for an increasing trend in the Upper and Middle Hydrologic Zones.

The properties of dieldrin indicate that it strongly sorbs to organic matter based on its large organic carbon partitioning coefficient and also to clay minerals in soil. Also, its solubility in water is very low. Because of these characteristics, dieldrin should not move very far in soils or groundwater unless the chemical's partitioning coefficient or solubility is changed, as may have been the case for the SSL plume because of its commingling with the VOC plumes. Monitoring well data from the Tracy Site indicated that by 1998 the SSL dieldrin plume had migrated about 2,000 ft from sources on the northern part of the Depot because of the pumping of AG-2 and potential co-solvency effects with VOCs. However, the SSL dieldrin plume now extends less than half of that distance. Natural attenuation, through the adsorption mechanism, has likely been acting on much of the plume, and extraction wells have aided the reduction in plume size.

The original size of the NWC dieldrin plume is not known. Statistical analyses performed for dieldrin detections from wells in the NWC identify the following:

- LM108A – Non-detect;
- EW056A, EW057A, EW058A, EW059A, LM106A, LM109B, LM140AU (probable), LM142AU, LM174AU, LM191A (probable) – Decreasing;
- LM141AU – Stable.

These data support a hypothesis for a stable to decreasing dieldrin plume in the NWC.

A.6.3 Human Exposure to Contaminants in Groundwater

Contaminants remain in soil, soil vapor, and groundwater beneath the Depot; therefore, the potential remains for workers or the public to be exposed to contaminants. However, the potential for exposure is limited by LUCs.

Exposure to contaminated groundwater is not occurring with the exception of personnel who collect samples from monitoring and extraction wells and who operate the GWTP. No other Tracy Site workers or the public are exposed to any COCs in groundwater because there is no complete exposure pathway.

The only contaminants beneath the off-Depot areas of the Tracy Site and private parcels are VOCs and dieldrin that have been transported in groundwater. Steps have been taken to assure that no off-Depot receptors are exposed to COCs. Only two wells can remove groundwater from the Banta Road TCE Plume. At PW001, there is no exposure pathway because the groundwater produced by the well is treated with activated carbon before it can be used in the residence. PW005 is not located within the Banta Road TCE Plume; however, it is downgradient and crossgradient of the Banta Road TCE Plume. While there is no well head treatment, the well is sampled quarterly and results are reviewed in a timely manner to confirm that receptors are not exposed to COCs greater than the ACL.

There are no known VOC plumes in soil vapor in off-Depot areas. However, VOCs may leave the upper groundwater surface and migrate toward the surface. In the open air, there is no risk to the public because any vapors rising from the groundwater surface would be reduced to very low concentrations by dispersion in soil and mixing with the atmosphere. The only occupied, enclosed space located where VOCs may migrate upward from the groundwater surface is the residence adjacent to PW001. The soil vapor intrusion model developed by Johnson and Ettinger (1991) and modified for California use by the DTSC (2004) was used to determine whether there is unacceptable risk to occupants of the residence because of contaminants in the upper groundwater surface as part of both the first and second five-year reviews performed in 2005 and 2010 (URS, 2005a and URS, 2012). The calculated cancer risk for that potential exposure was less than one chance in one million. Therefore, there is not an unacceptable risk, even though there is potential for exposure. The most recent calculations and evaluations of the soil vapor intrusion modeling are presented in the *Final Second Five-Year Review Report* (URS, 2012).

A.7 Vapor Intrusion Assessment

In 2011, vapor intrusion assessment and mitigation was conducted at Building 255, Building 231, and Area 1/Building 237. The findings and recommendations addressing vapor intrusion assessments are presented below and in the 2011 ESD (HDR, 2011a).

Building 255: Human health risk from vapor intrusion of petroleum hydrocarbons to Building 255 indoor air was evaluated. Johnson and Ettinger vapor intrusion modeling was performed using soil and groundwater analytical data collected in 2009 and 2010. The results from the Johnson and Ettinger modeling indicated that petroleum hydrocarbons in the subsurface do not pose an unacceptable cancer ($<1x10^{-6}$) or noncancer risk (<1.0 hazard index) (HDR, 2011b). Building 255 is associated with a fuel oil #2 release from UST 25 and is overseen by the RWQCB.

Building 231. Indoor air sampling results showing the presence of TCE and PCE indicated that chemicals in the subsurface had migrated to indoor air. However, based on the comparison to the EPA regional screening level (RSL) values, these low concentrations do not present an excess cancer risk greater than one in one million (HDR, 2011a).

Area 1/Building 237. The results of indoor air sampling indicated that chlorinated solvents were not detected greater than laboratory reporting limits. Adjacent Building 220 (an above ground water storage tank) and Building 236 (an open air structure used to store equipment) were not evaluated because they are unoccupied structures (HDR, 2011a). The results of this sampling event were reported by the DLA (EA, 2011).

LUCs at other VOC-contaminated locations at the Tracy Site mitigate indoor air vapor intrusion for occupants of future buildings.

Table A.4-1. List of Contaminated Sites

Unit	Background Description
DSERTS 1 (SWMU 1) / DSERTS 1(Area 2)	Old Sewage Lagoon and Former Drum Storage Area - This area was used as a drum storage area from 1957 through 1984. Chemicals in drums possibly leaked or were discharged accidentally.
DSERTS 2/3 (SWMU 2 / SWMU 3)	Sewage (SWMU 2) and Former Industrial Waste Lagoons (SWMU 3) - The wastewater treatment plant has a permitted discharge to the sewage lagoons. SWMU 3 formerly received discharge from the industrial waste pipeline (SWMU 33). The lagoons have been in operation since 1942. Sometime between 1971 and 1979, industrial wastes from SWMU 2 overflowed into SWMU 3.
DSERTS 4 (SWMU 4)	Storm Pond Lagoon - Storm water has been discharged to the lagoon since 1971. The storm drain lagoon reportedly received rinse water from paint-stripping, degreasing, and steam cleaning operations. The area was used for open storage before 1952. Manganese ore was stockpiled northeast of the lagoon area from 1957 to 1968.
DSERTS 5 (SWMU 5)	Old Industrial Lagoon, Building 255 - The site was constructed by 1952. The lagoon received rinse water from the paint-spraying and paint-stripping operations in Building 255. The lagoon was enlarged in 1963 and existed until at least 1971.
DSERTS 6 (SWMU 6)	Building 28 Sump - The sump operated from 1968 to 1977. A portion of Building 28 was used for repackaging. Wastes from the repackaging operations collected in the sump. The sump was initially abandoned in place and then removed in 1988. Former UST Site 21 was also in this area.
DSERTS 7 (SWMU 7)	Burn Pit No. 1 - Site of seven former burn pits (Pits A-G) that were used between 1942 and 1954 to dispose of medical supplies, narcotics, pharmaceuticals, radiological supplies, and electron tubes. The pits are partially or completely covered by Buildings 15, 19, and 21.
DSERTS 8 (SWMU 8)	Burn Pit No. 2 - A single large burn pit was operated between 1942 and 1971. Various containers, crates, wooden pallets, trash, unknown liquids and solids, and narcotics were burned in the pit. Explosions attributed to intermixing liquid chemicals or burning pressurized containers were reported.
DSERTS 9 (SWMU 9)	Subsistence Waste Pit - Subsistence waste, primarily food, was buried in the pit beginning in 1947. Packaging materials were also buried.
DSERTS 10 (SWMU 10)	Medical Waste Burial Pit - Former medical waste and burial pit. Outdated medical supplies, narcotics, mercury compounds, and phosphate compounds were buried. The pit operated from approximately 1949 until 1965. Since 1967, this area has been used for the storage of truck trailers.
DSERTS 33 (SWMU 10A)	Possible Medical Waste Burial Pit - A former pit was reportedly used to bury medical wastes. Possible trenches are visible in aerial photographs from 1945 to 1967.
DSERTS 11 (SWMU 11)	Burial of Lime/Foot Bath - Site was reportedly used to dispose of lime materials associated with lime foot baths. Area is currently covered with asphalt.
DSERTS 12 (SWMU 12)	Embalming Fluid Dump - An unknown, but substantial quantity of embalming fluid containing formaldehyde was buried just east of Building 30.

Table A.4-1. (Continued)

Unit	Background Description
DSERTS 14 (SWMU 14)	Lube Oil Dump - Reported site of a former lube oil dump. Reportedly 150 drums of new lube oil were emptied into a trench in 1976. The trench was backfilled in 1976. Oil seepage was visible in aerial photographs. A black viscous surface was reported by construction workers in 1992.
DSERTS 15 (SWMU 15)	Pesticide Waste Trench - Former pesticide waste trench from 1977 or 1978 until 1979. Rodenticide, crushed cans that formerly contained pesticides, phosgene (or phostoxin) slurry, and empty DDT containers may have been buried. Between 1979 and 1980, the trench was excavated and the contents were disposed off site.
DSERTS 16 (SWMU 16)	Possible Waste Disposal Area - Possible waste disposal area from 1952 till 1967. Possible wastes include asbestos, mercury, fluorescent bulbs, and medical supplies.
DSERTS 20 (SWMU 20) / DSERTS 23 (SWMU 23)	Aboveground Solvent Tank and Building 26 Recoup Operations - A 500-gallon aboveground TCE degreasing unit was located inside Building 10. Building 10 was constructed in 1950. According to warehouse plans, several cleaning facilities were used between 1950 and 1974. A spray paint booth and cleaning operations were reportedly connected to the Manhole W-1 of the industrial wastewater pipeline (SWMU 33). A 2,000 gallon tank of No. 2 fuel oil was previously located at former UST Site 13. Building 26 was used to repackage petroleum products. A wash rack was also present at this site.
DSERTS 20 (Area 1 Building 10)	SWMU 20 also included an area referred to as Area 1. Due to the proximity of Area 1 and Warehouse 10, and the similarity of contaminants, both sites were evaluated together in the RI/FS.
DSERTS 21 (SWMU 21)	Battery Acid Dump - Neutralized solution from the battery shop was discharged to the ground and a sump behind Building 201.
DSERTS 22 (SWMU 22)	Previous Hazardous Materials Storage Area - Former storage area from 1979 until 1985. Leaking containers of hazardous materials (i.e., ammonium thiosulfate) were stored here prior to repackaging or off-site disposal. The holding area was lined with bentonite clay.
DSERTS 24 (SWMU 24)	Petroleum Waste Oil Tank - A 500-gallon tank stored petroleum wastes from the materials testing in Building 247. The tank was used from 1961 until it was removed in 1988.
DSERTS 25 (SWMU 25)	Boundary Roads - Waste motor oil may have been used as a dust suppressant in the 1940s and 1950s. Most of the roads are presently paved.
DSERTS 27 (SWMU 27)	Building 206 Roundhouse Sump, Building 206 - Fluids used to clean locomotives were reportedly drained into the sump. Pesticides were reportedly stored in Building 206. A service pit in Building 206 may have been used to transfer fuel oil from UST Site 7 to the boiler room.
DSERTS 29 (SWMU 29)	Used Motor Oil Pit - Former motor oil disposal pit. Period of operation is uncertain.
DSERTS 30 (SWMU 30)	Salvage Area - Former salvage area. No information regarding the types or volumes of wastes is available.
DSERTS 31 (SWMU 31)	Wood Preservation Area - Site was used for wood preservation operations from the mid-1950s until 1960. Wood products were dipped into vats of phenolic compounds and carbolic acid to prevent the wood from rotting. The vats were covered with canvas tarps. Spills from the vats were reported.

Table A.4-1. (Continued)

Unit	Background Description
DSERTS 64 (SWMU 64)	Waste Oil Pit - A 1,000-gallon metal tank that contained waste oils from the automotive maintenance shop was located at this location. The tank was installed in 1975 and removed in 1988.
DSERTS 65 (SWMU 33)	IWPL -The IWPL was constructed in 1972. Discharges to the IWPL included paint spray wastewater, phosphoric acid and sodium hydroxide from strippers and rinse tanks, pesticide wastewaters, cleaning tank wash waters, steam cleaner wash water, and acid wash water.
DSERTS 66 (Area 1 Building 237)	Former Solvent Storage Area - previously used for cleaning asphalt application tools and equipment. A portion of Building 237 is currently used as a stock room to store various parts, tools, and supplies related to Site operations. Since 1978 the interior west side of Building 237 has been used as the Site carpentry and paint shop. The exterior area adjacent to the north and west of the building are currently used for storing equipment (pipe rods, barricades, sand bags, signs, electric motors, and other miscellaneous equipment).
DSERTS 67	The site was reportedly used as a storage area for the National Stockpile of Strategic Metals. For a period of time from shortly after World War II until the 1980s, ferrous chromium ore was stored at this site. Manganese was also stored at the site from shortly after World War II until the 1970s. Lead ballast was stored at DSERTS 67 from 1980 to 1986. Area was covered in gravel to prevent dust from escaping and becoming a human health concern.
DSERTS 69 (Building 30)	Drum Storage Area - Petroleum hydrocarbons and metals wastes were previously stored at this site. Solvents may have been stored here. The site is partially covered by the Consolidated Subsistence Facility (constructed in 1992).
Building 22	Drum Storage Area - Site includes a paved area where materials are stored. Drums of solvents may have been stored here in the past.
Former Building 23 Site	Area is adjacent to several open storage areas. Previously called Containment Area 5.
Child Care Center	A 1,200-gallon UST containing No. 2 fuel oil was previously located at this site from 1956 until 1988. Pesticide contamination was also found in soil samples.
DSERTS 72	Located immediately west of SWMU 3, residue from pesticide application trucks was discharged into the industrial waste lagoons (SWMU 3). The source of contaminants at DSERTS 72 is uncertain, but it is possible that some of the wash water used at SWMU 3 spilled onto the soil surrounding the lagoons.
DSERTS 73 (Building 201)	Former sump located at west end of Building 201. Period of operation is uncertain.
DSERTS 74 (NWC)	Dieldrin in groundwater has been detected greater than the goal of 0.05 µg/L in the NWC of the Depot. The source of dieldrin in groundwater is from discharge of VOC-treated groundwater into injection wells for approximately 3 months between 1992 - 1995 as part of the OU-1 groundwater IRM.
DSERTS 75 (Area 1/B237 Pesticide)	Pesticides in excess hazardous disposal criteria for DDT, DDE, and DDD were discovered in IDW from SVE well installation at this location. This site was a former drum storage area which may have included pesticides and is located near the pest control facility.

Table A.4-1. (Continued)

Unit	Background Description
Eastern Depot Soils Area	The site consists of non-vegetated areas on the eastern side of the Depot historically used for grader-training exercises.
Southern Depot Soils Area	The site consists of non-vegetated areas on the eastern side of the Depot historically used for grader-training exercises. The Depot's truck gate and transport control facility covers portions of the site.

Source: Radian International, 1998a

DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
DSERTS = Defense Site Environmental Reporting and Tracking System
FS = Feasibility Study
IDW = investigative derived waste
IRM = interim remedial measure
IWPL = industrial waste pipeline
NWC = northwestern corner
OU = operable unit
RI = Remedial Investigation
Site = Defense Distribution Depot San Joaquin
SVE = soil vapor extraction
SWMU = solid waste management unit
TCE = trichloroethene
UST = underground storage tank
VOC = volatile organic compound

Age	Stratigraphic Units		Description	Regional Hydrostratigraphic Zones	Geologic Horizon Description	Depth Below Surface (ft) (top of zone)	Hydrogeologic Zone and Well Designations
Quaternary (Pleistocene and Holocene)	Younger Alluvium	Gravel quarry spoils and disturbed ground	Gravel and sand.	Vadose Zone	Unconsolidated alluvial deposits in discontinuous layers and lenses; 5 to 12 feet thick sand layers; local stream deposits.	0	Unsaturated
		Levee deposits	Unconsolidated sand, silt, and gravel.				
		Holocene fan and terrace deposits	Unconsolidated clay, sand, and gravel.				
	Older Alluvium	Alluvial and fluvial depsits	Interbedded gravel, sand, silt, and clay.	Water table occurs in this unit; however, it is not hydraulically distinguishable from the Tulare Aquifer.	Unconsolidated alluvial deposits in discontinuous layers and lenses; 5 to 12 feet thick sand layers; local stream deposits.	25-35	Above Upper
					Unconsolidated alluvial deposits in discontinous layers and lenses; 5 to 12 feet thick sand layers; local stream deposits.	35-55	Upper
Tertiary & Quaternary (Pliocene and Pleistocene)	Tulare Aquifer	Upper Tulare Member	Same as above.	Upper Tulare Aquifer - Upper waterbearing zone; contains water under semiconfined and unconfined conditions.	Unconsolidated alluvial deposits in discontinuous layers and lenses; 5 to 12 feet thick sand layers; local stream deposits.	55-65	Middle
					Semi-consolidated sand, silt, and clay layers in discontinuous layers and lenses, 5 to 12 feet thick sand layers.	90-100	Lower
					Semi-consolidated sand, silt, and clay layers in discontinuous layers and lenses; 5 to 12 feet thick sand layers.	170-~220	
		Corcoran Clay Member	Sandy clay, silty clay, silt, and clay interbedded with fine-grained sand. Deposited in a lacustrine environment	Regional confining layer between the upper and lower waterbearing zones.	Corcoran clay equivalent found at 220 feet below ground surface at the depot (approximately 80 to 100 feet thick).	~220	None
		Lower Tulare Member	Lenticular and interfingering beds of gravel, sand, and clay. Deposited in alluvial and fluvial environments.	Lower Tulare Aquifer - Lower waterbearing zone; contains freshwater under confined conditions to an estimated depth of 1,600 feet.	Lower Tulare	300-320	None

NOTE: All depths and thicknesses are approximate. *Source: Hotchkiss and Balding, 1971, Bertoldi, et al, 1991*

Figure A.1-1 Stratigraphic and Hydrostratigraphic Nomenclature, Tracy Site

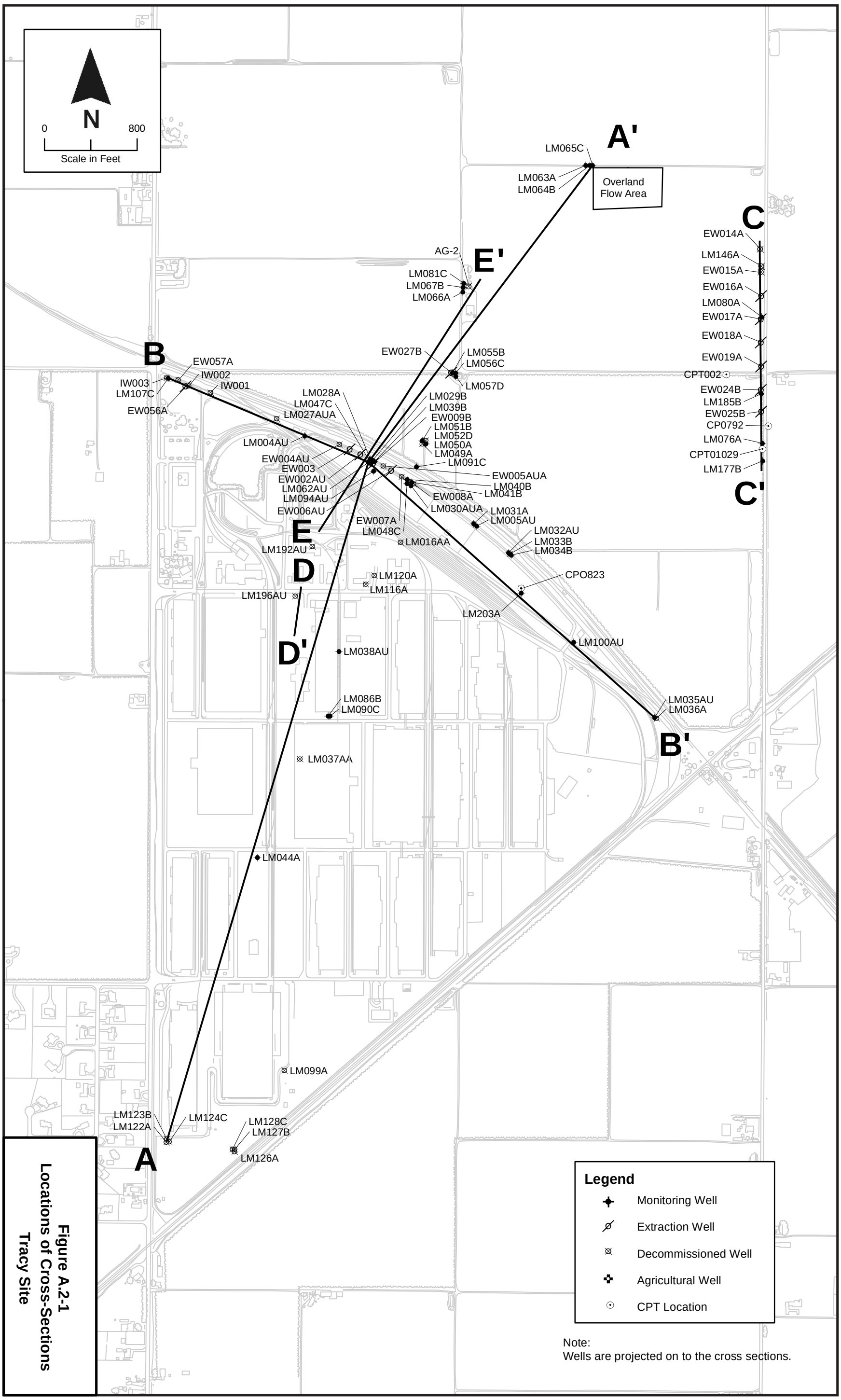
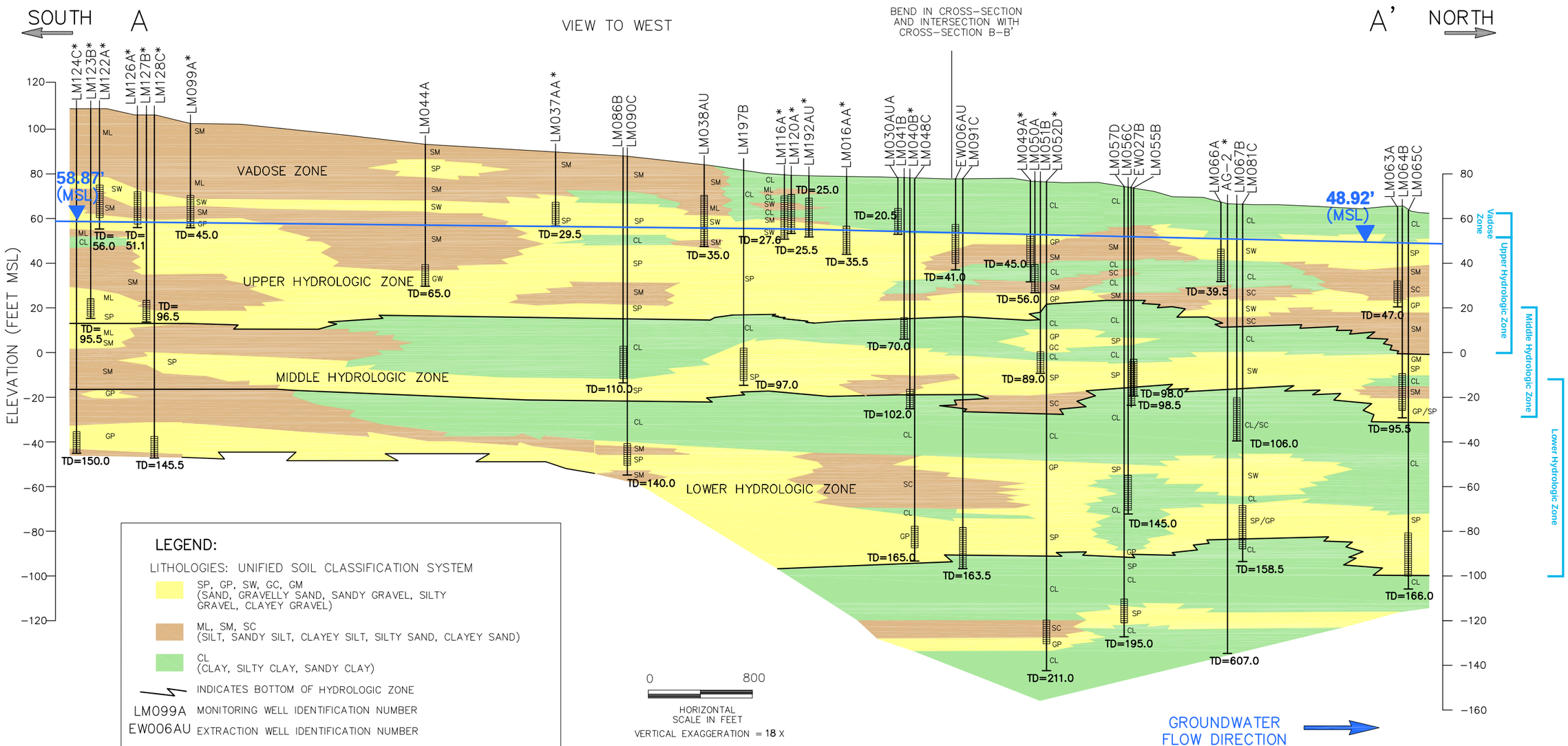


Figure A.2-1
Locations of Cross-Sections
Tracy Site



NOTE: SEE FIGURE 2.5-1 FOR LOCATION OF CROSS-SECTION AND WELLS

Figure A.2-2
Cross-Section A-A'
Tracy Site

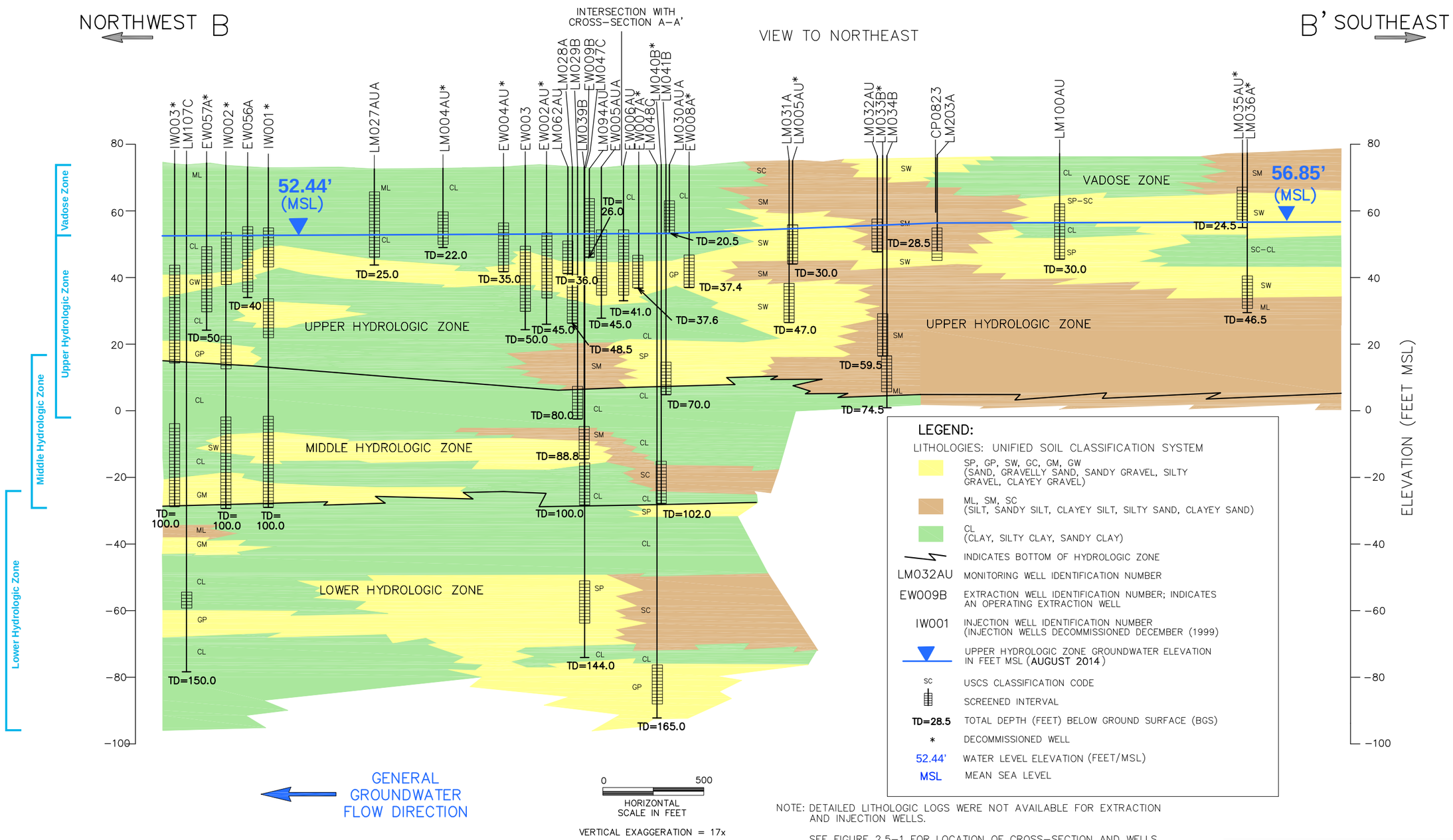


Figure A.2-3
Cross Section B-B'
Tracy Site

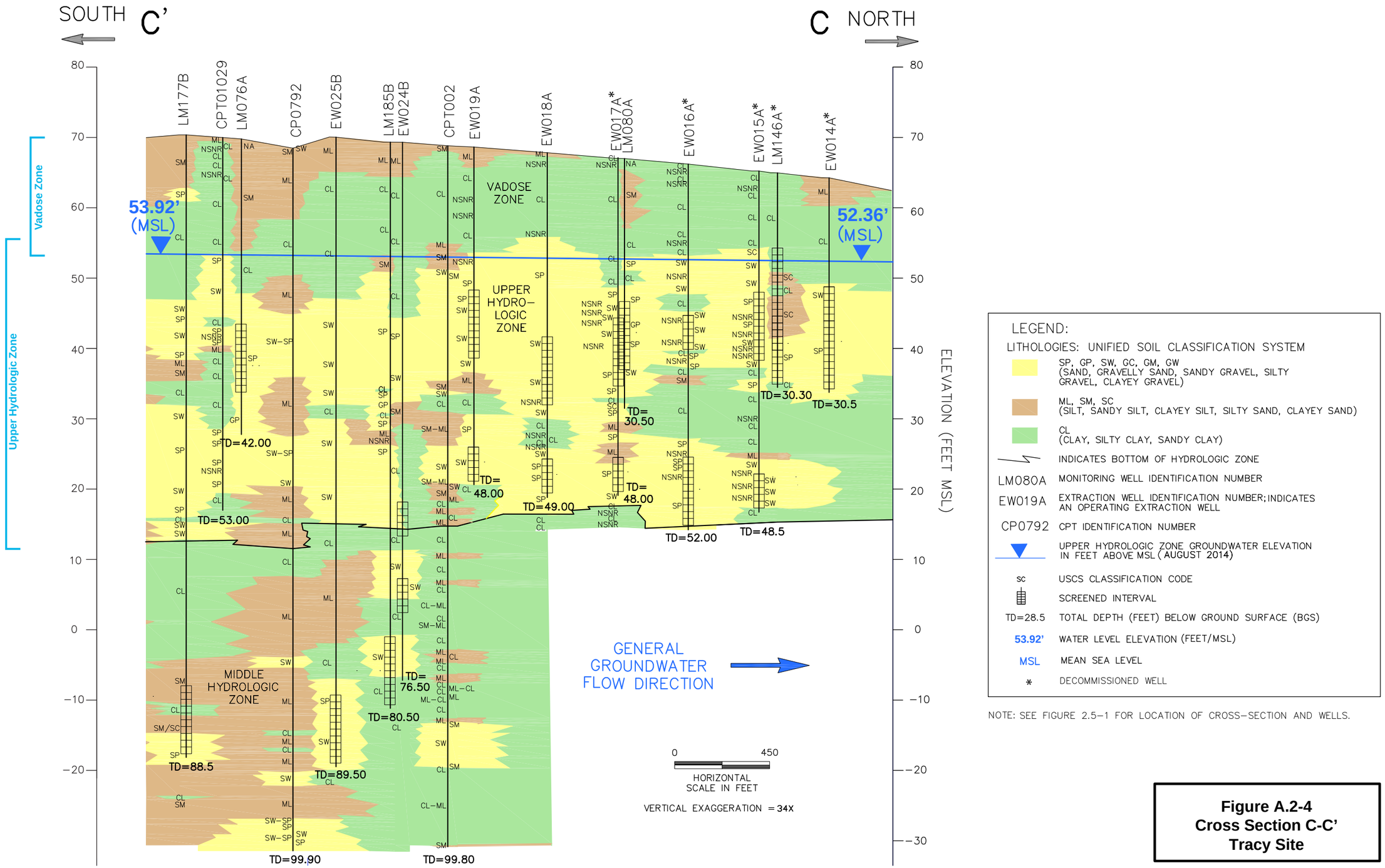


Figure A.2-4
Cross Section C-C'
Tracy Site

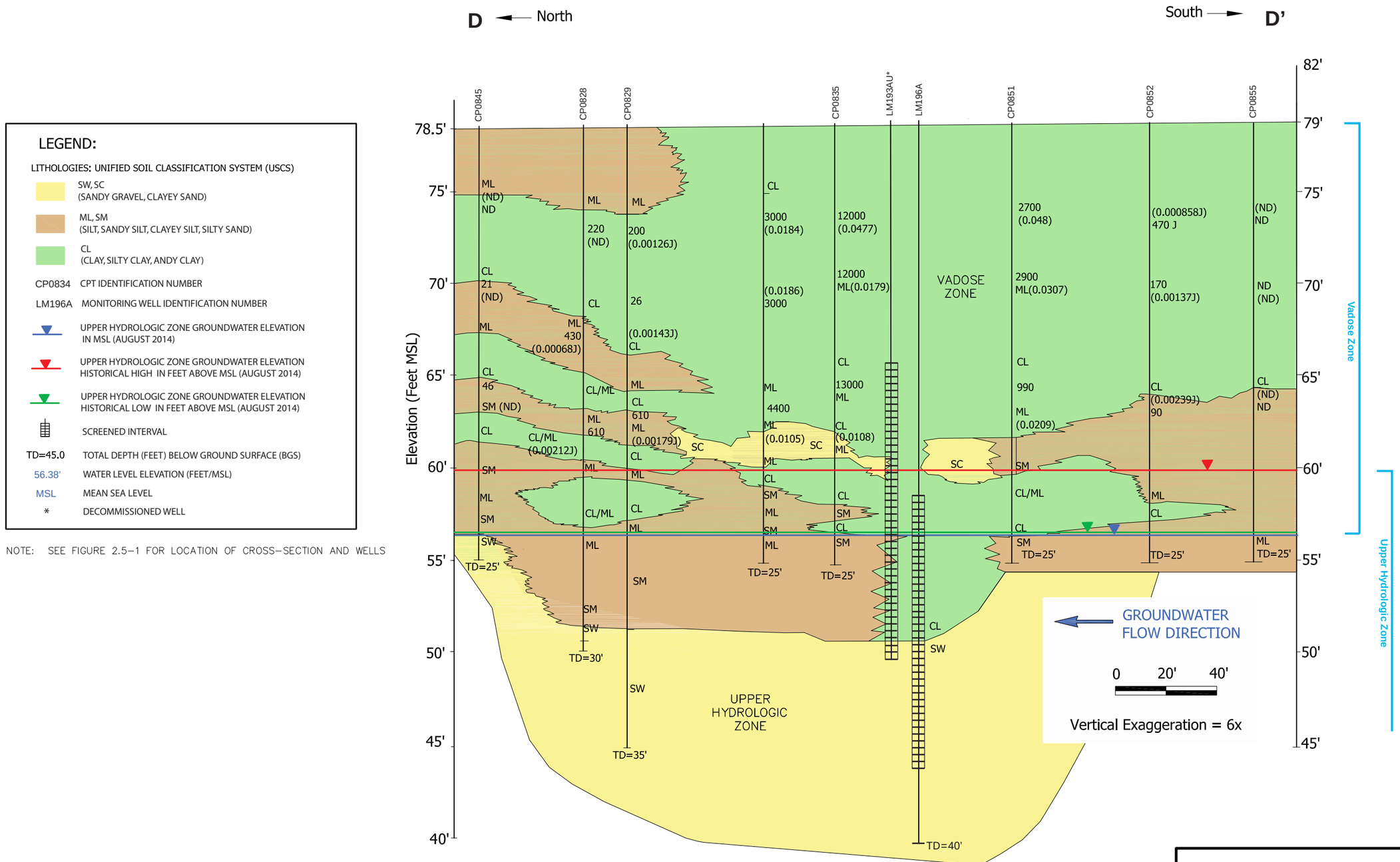
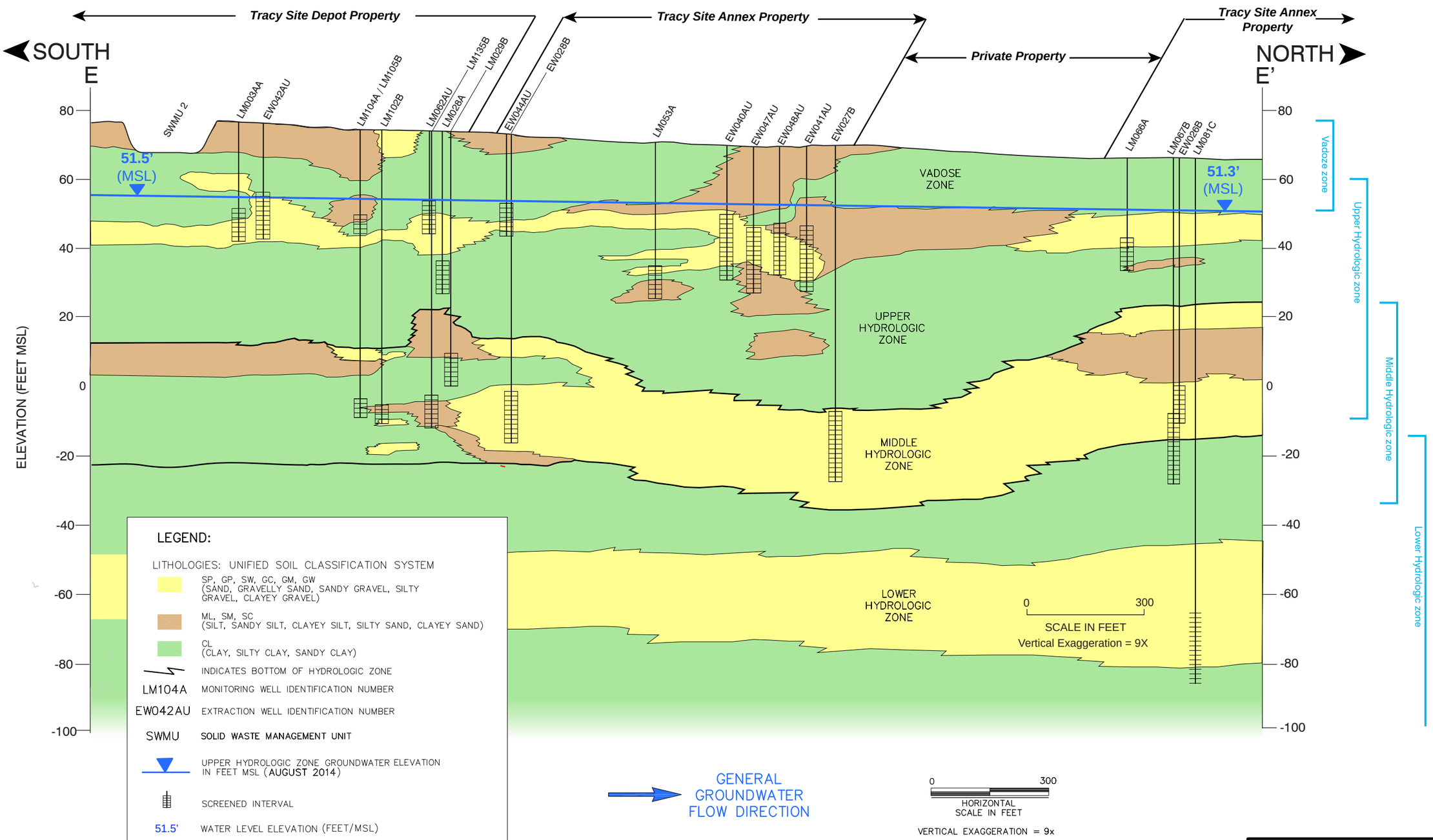


Figure A.2-5
SWMU 20 Cross Section D-D'
Tracy Site



NOTE: SEE FIGURE 2.5–1 FOR LOCATION OF CROSS–SECTION AND WELLS

Figure A.2-6
Cross Section E-E'
Tracy Site

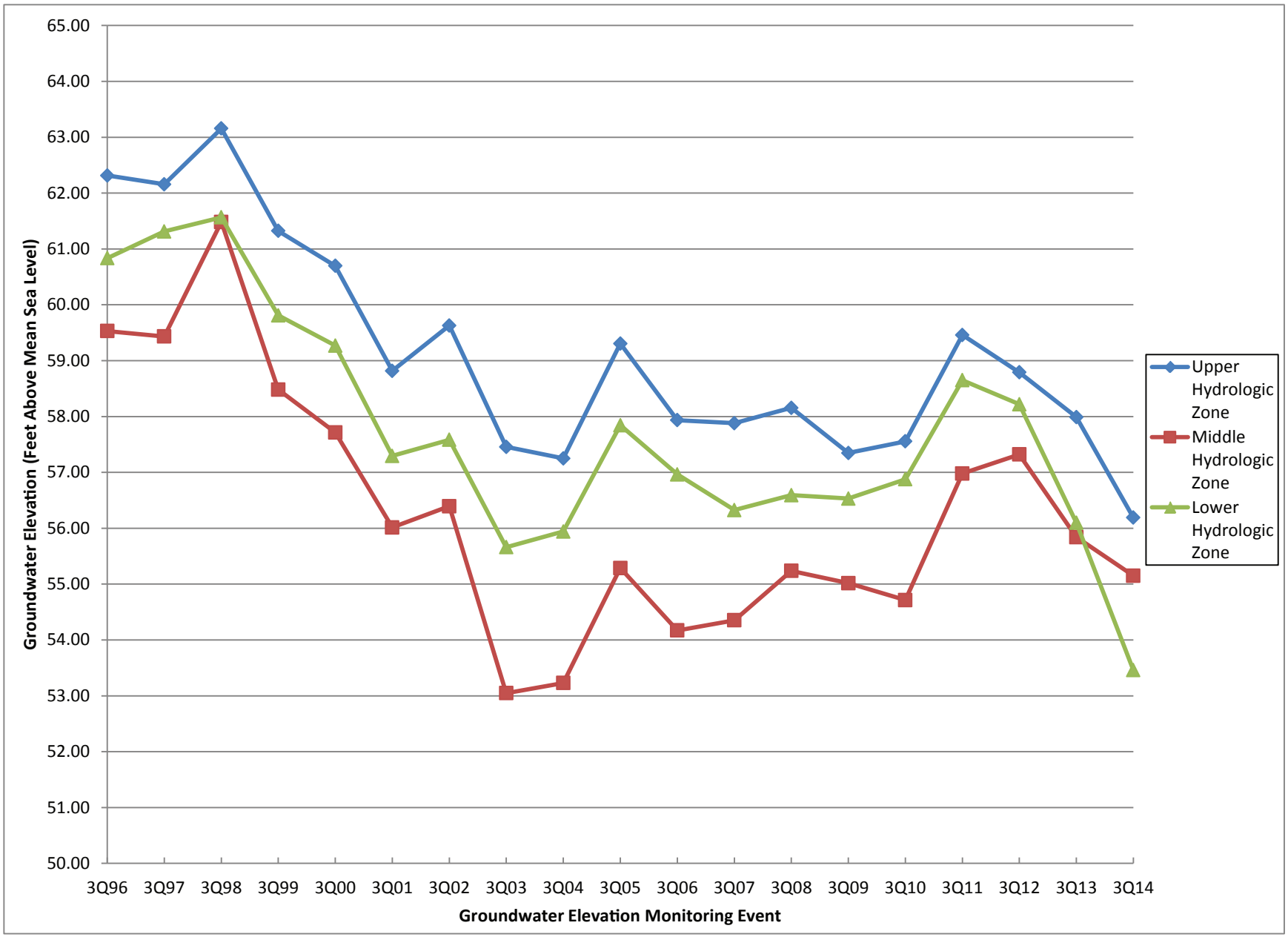


Figure A.2-7 Upper, Middle, and Lower Hydrologic Zones Average Groundwater Elevations, Tracy Site

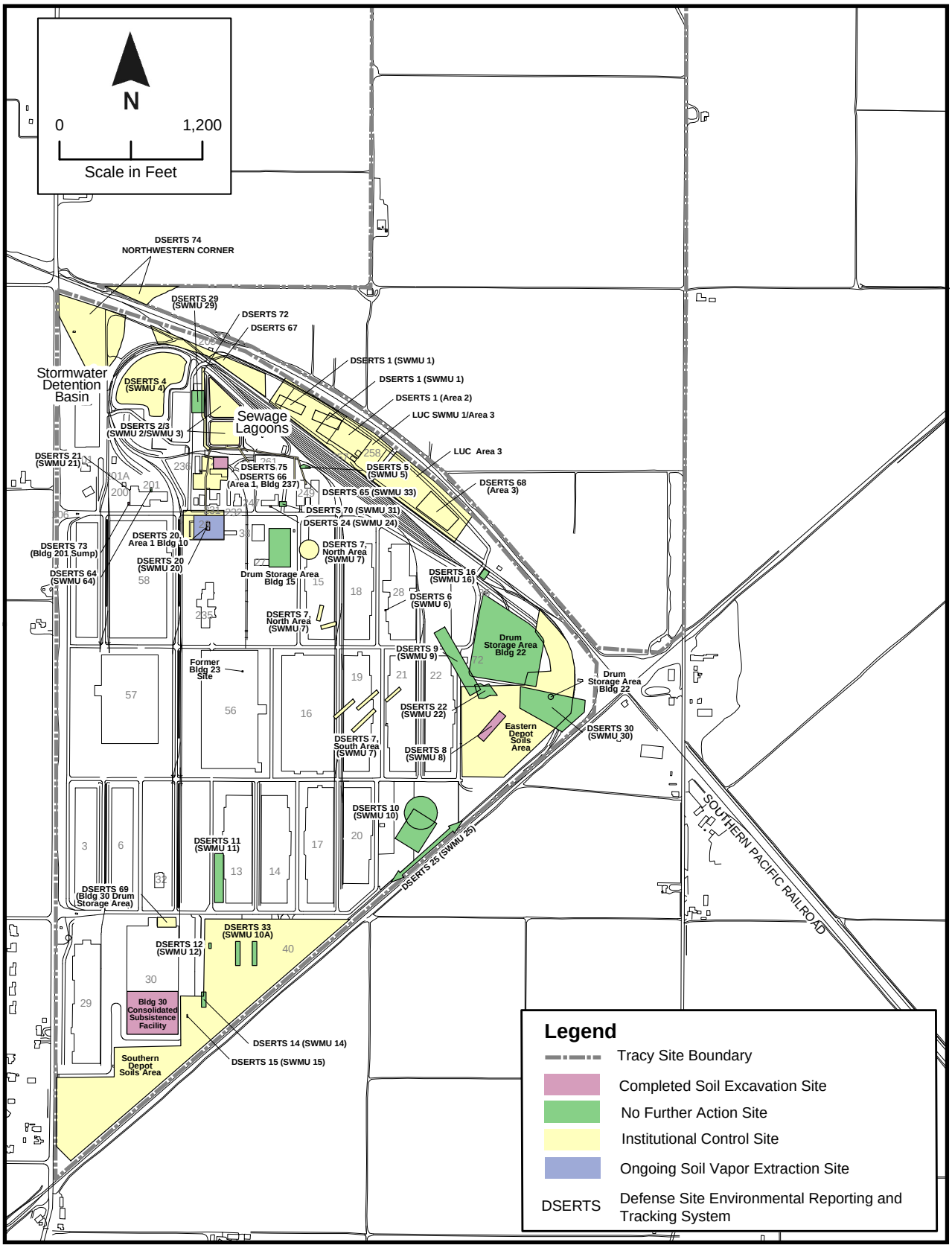


Figure A.4-1 Solid Waste Management Units (SWMUs) and Other Sites / Areas, Tracy site

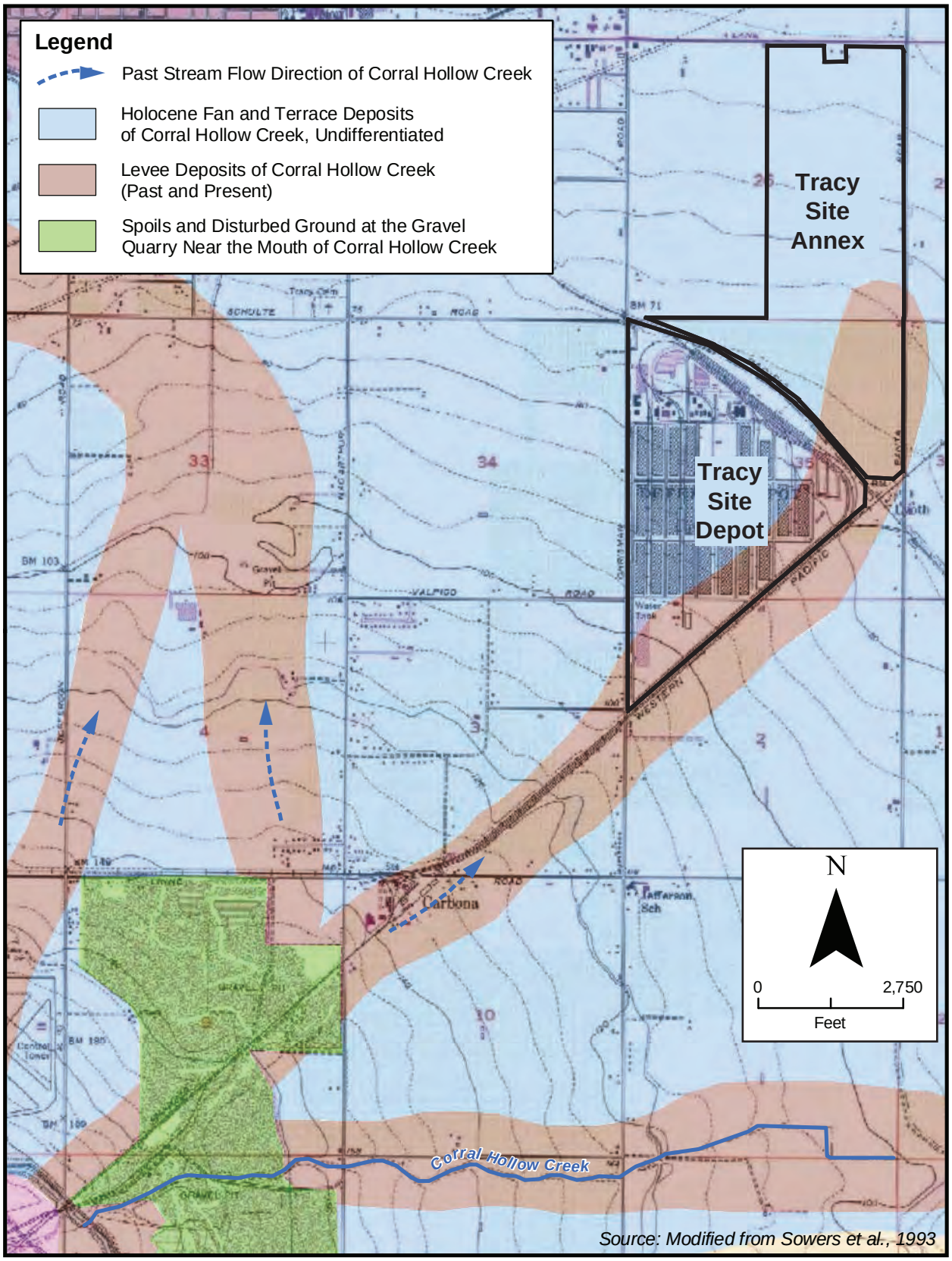
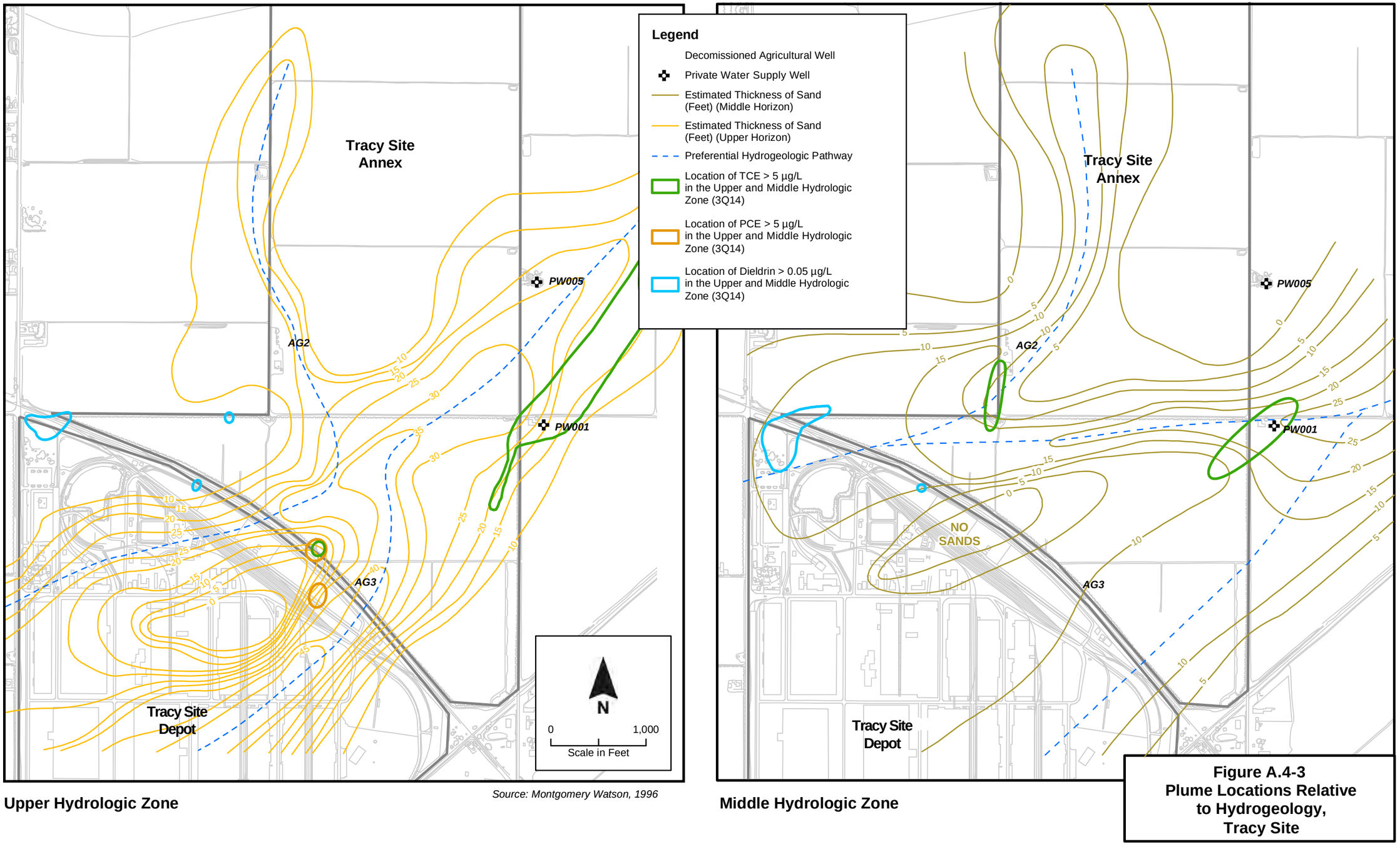


Figure A.4-2 Near Surface Geology Related to the Corral Hollow Fan, Tracy Site



Upper Hydrologic Zone

Source: Montgomery Watson, 1996

Middle Hydrologic Zone

Figure A.4-3
Plume Locations Relative to Hydrogeology, Tracy Site

APPENDIX B

Well Construction Details
and
Monitoring Well Sampling Information

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
CD1[c]	7/20/1994	AUU	2085608.38	6303443.81	79.99	79.1	54.5	5.4	53.4			8	--	DRA	NS		
EW001[d]	--	UK	2086976.68	6303763.5	73.57	71.14	--	--	--	--	--	--	--	EW			Decommissioned 4/02.
EW002AU	12/22/1990	AUU	2087042.53	6303683.21	73.22	70.66	45	20	40	53.22	33.22	6	0.06	EW	WT	43.22	Former well name EW002A.
EW003	12/21/1990	U	2087087.02	6303592.75	72.98	71.17	50	25	45	47.98	27.98	6	0.06	EW	WT	37.98	
EW004AU[d]	12/20/1990	AUU	2087127.94	6303502.28	72.86	71.03	35	15	35	57.86	37.86	6	0.06	EW			Decommissioned 4/05.
EW005AU[d]	12/26/1990	AUU	2086952.34	6303862.46	73.7	71.94	45	20	40	53.7	33.7	6	0.06	EW			Former well name EW005A. Decommissioned 5/00.
EW005AUA	4/20/1998	AU	2086943.2	6303876	73.7	71.21	54.5	24	34	49.7	39.7	6	0.01	EW	WT	44.7	Former well name EW005AU.
		U						44	54	29.7	19.7					24.7	
EW006AU	12/27/1990	AUU	2086905.18	6303948.67	73.7	72	41	18	38	55.7	35.7	6	0.06	EW	WT	45.7	Former well name EW006A.
EW007A[d]	7/6/1994	U	2086849.1	6304040.08	74.04	73.52	37.6	27.4	37.4	46.6	36.6	6	0.02	EW			Decommissioned 4/05.
EW008A[d]	7/6/1994	U	2086791.71	6304137.96	74.15	73.76	37.4	27	37.4	47.15	36.75	6	0.02	EW			Decommissioned 4/05.
EW009B	7/8/1994	M	2086963.58	6303791.62	73.7	73.2	88.8	78.5	88.8	-4.8	-14.8	6	0.03	EW	WT	-9.8	
EW010AU[d]	6/28/1994	AUU	2086429.98	6302680.53	77.09	74.2	40.3	20.1	40.3	56.99	36.79	6	0.02	EW		46.89	Former well name EW010A. Decommissioned 4/02.
EW011AU	7/7/1994	AUU	2085910.21	6303141.83	78.56	78.17	35.4	20.3	35.4	58.26	43.16	6	0.02	EW	WT	50.71	Former well name EW011A.
EW012AU	6/30/1994	AUU	2086287.66	6303358.2	76.73	76.64	37.8	22.8	37.8	53.93	38.93	6	0.02	EW	WT	43.93	Former well name EW012A. Decommissioned 5/14.
EW013C[d]	7/10/1994	L	2087777.61	6305254.42	68.69	68.24	162	122.2	161.8	-53.51	-93.11	6	0.02	EW			Former well name TW013C. Decommissioned 6/13.
EW014A[d]	5/20/1996	U	2088811.85	6307141.76	64.25	61.97	30.5	15	30	49.25	34.25	6	0.01	EW			Decommissioned 6/13.
EW015A[d]	5/22/1996	U	2088612.54	6307143.62	65.22	63.37	48.5	17	27	48.22	38.22	6	0.02	EW			Decommissioned 6/13.
								43	48	22.22	17.22						
EW016A	5/23/1996	U	2088411.56	6307142.78	66.21	64.36	52	21.5	26.5	44.71	39.71	6	0.01	EW	WT	42.21	Decommissioned 5/14.
								41.5	51.5	24.71	14.71					19.71	
EW017A	5/24/1996	U	2088211.83	6307142.51	67.11	65.24	48	22.5	32.5	44.61	34.61	6	0.01	EW	WT	39.61	Decommissioned 5/14.
								42.5	47.5	24.61	19.61					22.11	
EW018A	6/6/1996	U	2088010.61	6307141.93	67.82	65.85	49	26	36	41.82	31.82	6	0.02	EW	WT	36.82	
								43.5	48.5	24.32	19.32					21.82	
EW019A	6/10/1996	U	2087802.01	6307143.77	68.63	66.79	48	20	30	48.63	38.63	6	0.02	EW	WT	43.63	
								42.5	47.5	26.13	21.13					23.63	
EW020A	6/12/1996	U	2087612.18	6307142.22	69.35	67.39	48	22.5	32.5	46.86	36.86	6	0.01	EW	WT	41.86	
								42.5	47.5	26.85	21.85					24.35	
EW021A	6/4/1996	U	2088423.23	6304601.45	66.18	65.13	50	19.5	24.5	46.68	41.68	6	0.01	EW	WT	44.18	Decommissioned 5/14.
								44.5	49.5	21.68	16.68					19.18	
EW022A	6/18/1996	U	2087747.43	6304514.49	69.69	68.78	39	21	31	48.69	38.69	6	0.01	EW	WT	43.69	
								36.5	39	33.19	30.69					31.94	
EW024B	8/2/1996	M	2087598.78	6307142.36	69.32	67.46	76.5	60	65	9.32	4.32	6	0.01	EW	WT	7.82	
								71	76	-1.68	-6.68					-4.18	

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
EW025B	7/22/1996	M	2087412.61	6307142.77	70.25	68.31	89.5	79	89	-8.75	-18.75	6	0.01	EW	WT	-13.75	
EW026B	7/17/1996	M	2088454.01	6304602.46	66.06	65.19	77.5	67	77	-0.94	-10.94	6	0.02	EW	WT	-5.94	
EW027B	8/13/1996	M	2087748.23	6304466.75	69.44	68.88	98.5	78	98	-8.56	-28.56	6	0.02	EW	WT	-18.56	
EW028B	7/23/1996	M	2087119.25	6303875.56	72.9	71.67	90.5	75	90	-2.1	-17.1	6	0.02	EW	WT	-9.6	
EW029B	7/25/1996	M	2087162.36	6304264.14	71.86	71.24	88.5	63	68	8.86	3.86	6	0.01	EW	WT	6.36	
								78	88	-6.14	-16.14					-11.14	
EW030C	8/9/1996	L	2088436.75	6304601.78	65.8	65.26	199.5	123	143	-57.2	-72.2	6	0.02	EW	WT	37.8	
EW031C	8/13/1996	L	2087749.67	6304451.83	69.41	68.83	156.5	127	137	-57.59	-67.59	6	0.01	EW	WT	-62.79	
								151	156								
EW032AU	6/13/1996	AU	2087072.46	6304065.01	73.04	71.85	37	27	37	46.04	36.04	6	0.02	EW	WT	41.04	
EW033AU[d]	10/8/1996	AU	2086809.49	6304101.65	74.27	72.63	22	12	22	62.27	52.27	6	0.01	EW			Decommissioned 4/02.
EW034AU	6/13/1996	AU	2086459.49	6305056.18	74.97	73.98	32.5	22	32	52.97	42.97	6	0.01	EW	WT	47.97	
EW035AU[d]	10/9/1996	AU	2086209.1	6304947.34	76.67	75.99	36	20.5	35.5	56.17	41.17	6	0.01	EW			Decommissioned 4/02.
EW036AU[d]	10/4/1996	AU	2085821.18	6303146.65	78.9	78.04	31.5	16	21.5	62.9	57.9	6	0.01	EW			Decommissioned 6/99.
								21.5	31.5	57.4	47.4	6	0.02				
EW037AU[d]	10/8/1996	AU	2085934.29	6303279.18	78.61	77.84	33.4	28	33	50.61	45.61	12	0.01	EW			Decommissioned 4/02.
EW040AU	12/1/1998	AUU	2087744.41	6303853.91	69.21	68.51	40	20	40	49.21	29.21	6	0.02	EW	WT	39.21	Well connected to existing system in 2003. Decommissioned 5/14.
EW041AU	12/2/1998	AUU	2087739.99	6304239.75	69.25	68.16	41	20	40	49.25	29.25	6	0.02	EW	WT	39.25	Well connected to existing system in 2003. Decommissioned 5/14.
EW042AU	12/3/1998	AUU	2086641.85	6303533.38	75.96	76.16	35.5	20	35	55.96	40.96	6	0.02	EW	WT	48.46	Well connected to existing system in 2003.
EW043AU[d]	12/8/1998	AUU	2087448.16	6304055.93	70.04	72.52	40.5	20	40	50.04	30.04	6	0.02	EW			Used as monitoring well only. Decommissioned 6/13.
EW044AU	12/9/1998	AUU	2087152.28	6303825.18	71.81	71.65	36	20	30	51.81	41.81	6	0.02	EW	WT	46.81	Well connected to existing system in 2003.
EW045AU	4/23/2002	AU	2086111.38	6305002.26	77.42	76.55	35.5	20	35	57.42	42.42	6	0.01	EW	WT	49.92	Well connected to existing system in 2003.
EW046AU	4/24/2002	AU	2086032.43	6305084.54	77.9	77.22	34.5	21	34	56.9	43.9	6	0.01	EW	WT	50.4	Well connected to existing system in 2003.
EW047AU	10/1/2002	AU	2087743.68	6303980.93	68.78	68.44	48.5	23	43	45.78	25.78	6	0.02	EW	WT	35.78	Well connected to existing system in 2003.
EW048AU	10/3/2002	AU	2087739.4	6304119.83	69.05	68.26	55.5	22	37	47.05	32.05	6	0.01	EW	WT	39.55	Well connected to existing system in 2003.
							55	47	50	22.05	19.05	6	0.01	EW	WT	20.55	Well connected to existing system in 2003.
EW055B	9/6/2008	M	2087621.23	6302005.57	77.62	77.76	107	87	102	-9.24	-24.24	6	0.03	EW	WT		Replacement well for EW055BX.
EW055BX	8/28/2008	M	2087625.37	6302001.32	77.54	79.46	102	87	102	-9.46	-24.46	6	0.03	EW			
EW056A	8/27/2008	U	2087628.14	6302175.65	76.89	76.74	40.1	29.8	39.8	46.94	36.64	6	0.02	EW	WT		
EW057A	9/29/2011	U	2087664.86	6302072.20	76.89	74.92	50	25	45	51.89	31.89	6	0.02	EW	WT		
EW058A	9/28/2011	U	2087749.86	6302369.73	69.71	70.83	56	35.5	50.5	34.21	19.21	6	0.02	EW	WT		
EW059A	9/28/2011	U	2087754.65	6302499.86	69.71	70.11	52.5	37.5	47.5	32.21	22.21	6	0.02	EW	WT		
IW001[d]	12/28/1990	UK	2087575.37	6302388.39	72.04	70.64	100	20	30	52.04	42.04	6	0.06	IW			Decommissioned 12/99.
								40	50	32.04	22.04						
								75	100	-2.96	-27.96						

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
IW002[d]	1/3/1991	UK	2087623.05	6302191.95	76.85	74.49	100	20	35	56.85	41.85	6	0.06	IW			Decommissioned 12/99.
								50	60	26.85	16.85						
								75	100	1.85	-23.15						
IW003[d]	1/4/1991	UK	2087703.1	6302010.89	76.96	76.78	100	30	60	46.96	16.96	6	0.06	IW			Decommissioned 12/99.
								80	100	-3.04	-23.04						
IW004B	7/15/1994	UK	2086081.96	6303261.18	77.9	76.94	95	85.3	94.9	-7.4	-17	8	0.03	IW	NS		
LM001AU[d]	7/23/1980	AU	2086479.07	6302375.83	78.24	79.8	32	19	29	59.24	49.24	2	--	MW			Former well name LM001A. Decommissioned 2/13.
LM002A	7/23/1980	U	2086415.38	6303495.79	76.24	79.34	43	28	38	48.24	38.24	2	--	MW	BL	43.24	
LM003A[d]	7/24/1980	U	2086577.45	6303472.32	76.67	76.3	39	25	35	51.67	41.67	2	0.01	MW			Decommissioned.
LM003AA	12/7/1994	U	2086607.37	6303485.42	76.35	78.59	35	24.5	34.5	51.85	41.85	4	0.01	MW	LF	46.09	
LM004AU[d]	7/24/1980	AU	2087201.49	6303201.96	73.01	75.78	22	12	22	61.01	51.01	2	--	MW			Former well name LM004A. Decommissioned 2/13.
LM005AU[d]	7/24/1980	AUU	2086423.96	6304688.05	75.11	77.15	30	20	30	55.11	45.11	2	--	MW			Former well name LM005A. Decommissioned 9/08.
LM006AU	7/25/1980	AU	2084257.7	6306176.65	80.79	83.24	25	15	25	65.79	55.79	2	--	MW	NS		Former well name LM006A. Decommissioned 5/14.
LM007AU	7/25/1980	AU	2083958.43	6306034.88	81.64	84.52	25	15	25	66.64	56.64	2	--	MW			Former well name LM007A. Decommissioned 9/08.
LM008AU	7/25/1980	AU	2083784.55	6305813.91	82.9	85.72	30	20	30	62.9	52.9	2	--	MW	NS		Former well name LM008A. Decommissioned 5/14.
LM009A[d]	7/26/1980	U	2081717.36	6303460.24	98.6	101.6	32	22	32	76.6	66.6	2	--	MW	--		Decommissioned.
LM010A[d]	7/26/1980	U	2081541.67	6303261.76	99.95	102.93	30	20	30	79.95	69.95	2	--	MW	--		Decommissioned.
LM011A	7/26/1980	U	2081586.28	6301902.47	105.27	107.38	44	34	44	71.27	61.27	2	--	MW	NS		Decommissioned.
LM012AU	7/26/1980	AU	2084420.67	6301977.89	86.01	88.82	32	22	32	64.01	54.01	2	--	MW	NS		Former well name LM012A.
LM013A[d]	9/1/1992	U	2081693.96	6303217.4	99.7	101.42	36	26	36	73.7	63.7	2	--	MW			Decommissioned 9/08.
LM014A	7/28/1993	U	2082356.99	6303644.62	94.73	94.26	35	25	35	69.73	59.73	2	--	MW	BL	64.73	Decommissioned 5/14.
LM015AA	10/27/1994	U	2086920.72	6303387.68	73.9	76.53	41	25.5	40.5	48.4	33.4	4	0.01	MW	LF	35.03	
LM015AU[d]	2/14/1985	AUU	2086906.55	6303404.92	74.09	76.14	36.3	5.6	35.6	68.49	38.49	2	--	MW			Former well name LM015A. Decommissioned.
LM016AA[d]	10/27/1994	U	2086286	6304032.71	76.2	78.69	35.5	25	35	51.2	41.2	4	0.01	MW			Decommissioned 2/13.
LM016AU[d]	2/13/1985	AUU	2086290.68	6304016.86	76.23	78.69	32.2	11.5	31.5	64.73	44.73	2	--	MW			Former well name LM016A. Decommissioned.
LM017A[d]	2/16/1985	U	2085214.83	6304736.35	79.7	82.05	33.7	13	33	66.7	46.7	2	--	MW			Decommissioned 2/97.
LM017AA	2/13/1997	U	2085143.47	6304669.59	79.69	79.21	39.5	19	39	60.69	40.69	4	0.01	MW	LF	55.21	
LM018A	2/10/1985	U	2084403.16	6305565.22	81.79	83.79	38.2	7.5	37.5	74.29	44.29	2	--	MW	NS		Decommissioned 5/14.
LM019A[d]	2/13/1985	U	2084288.58	6305688.17	81.63	83.88	36.9	6.2	36.2	75.43	45.43	2	--	MW			Decommissioned 4/05.
LM020A	2/15/1985	U	2083686.71	6305180.73	85	87.31	34.1	13.4	33.4	71.6	51.6	2	--	MW	NS		Decommissioned 5/14.
LM021A[d]	2/12/1985	U	2082358.61	6303402.73	95.74	95.46	37	16.3	36.3	79.44	59.44	2	--	MW			Decommissioned 9/08.
LM022A[d]	2/11/1985	U	2082365.15	6303152.09	95.9	98.21	45.8	15.1	45.1	80.8	50.8	2	--	MW			Decommissioned.
LM023A[d]	2/13/1985	U	2085479.26	6305619.35	79.03	81.3	36.3	5.6	35.6	73.43	43.43	2	--	MW			Decommissioned 9/08.
LM024A	2/14/1985	U	2086326.24	6302676.38	77.45	79.94	30.8	10.1	30.1	67.35	47.35	2	--	MW	LF	49.94	
LM025AU[d]	2/16/1985	AU	2085932.3	6303289.46	78.58	80.82	38.9	8.2	38.2	70.38	40.38	2	--	MW			Former well name LM025A. Decommissioned.
LM025AUA	11/1/1994	AU	2085949.89	6303278.93	78.6	80.91	31	15.5	30.5	63.1	48.1	4	0.01	MW	BL	55.6	Former well name LM025AA.

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
LM026A[d]	2/15/1985	U	2084797.6	6304505.93	81.24	83.64	34.7	14	34	67.24	47.24	2	--	MW			Decommissioned 9/08.
LM027AU[d]	12/4/1985	AU	2087340.9	6302992.1	72.23	74.94	30.5	15	30	57.23	42.23	2	0.02	MW			Former well name LM027A. Decommissioned.
LM027AUA	5/12/1986	AU	2087352.07	6302962.95	72.3	74.49	25	5	25	67.3	47.3	2	0.01	MW	BL	57.3	Former well name LM027AA. Decommissioned 5/14.
LM028A	12/11/1985	U	2087002.43	6303767.86	73.49	75.11	48.5	38	48	35.49	25.49	2	0.02	MW	LF	29.61	
LM029B	12/10/1985	MU	2086991.64	6303788.09	73.57	75.65	80	64.5	74.5	9.07	-0.93	2	0.02	MW	LF	4.07	Original TOC = 75.92 feet. Wellhead elevation was modified (estimated) on 4/15/97 due to installation of low-flow pump.
LM030AU[d]	12/12/1985	AU	2086774.1	6304121.17	73.93	73.09	25.5	10	20	63.93	53.93	2	0.02	MW			Former well name LM030A. Decommissioned.
LM030AUA	11/4/1994	AU	2086773.67	6304121.3	73.26	75.48	20.5	10	20	63.26	53.26	4	0.01	MW	LF	57.48	Former well name LM030AA.
LM031A	12/5/1985	U	2086445.54	6304661.51	75.04	77.34	47	36.5	46.5	38.54	28.54	2	0.02	MW	BL	33.54	
LM032AU	12/13/1985	AU	2086195.16	6304963.17	76.65	78.18	28.5	18	28	58.65	48.65	2	0.02	MW	LF	53.68	Former well name LM032A.
LM033B[d]	12/13/1985	MU	2086184.69	6304974.93	76.81	79.08	59.5	49	59	27.81	17.81	2	0.02	MW			Decommissioned 2/13.
LM034B	12/15/1985	MU	2086174.29	6304985.6	76.94	78.84	74.5	59	69	17.94	7.94	2	0.02	MW	LF	12.94	
LM035AU	12/18/1985	AU	2084770.39	6306223.84	77.96	79.78	24.5	9	19	68.96	58.96	2	0.02	MW	LF	56.28	Former well name LM035A. Decommissioned 5/14.
LM036A	12/17/1985	U	2084759.6	6306234.75	77.98	79.81	46.5	36	46	41.98	31.98	2	0.02	MW	LF	36.78	Decommissioned 5/14.
LM037A[d]	12/18/1985	U	2084426.31	6303159.26	84.86	87.07	25.5	15	25	69.86	59.86	2	0.02	MW			Decommissioned.
LM037AA[d]	11/2/1994	U	2084414.66	6303160.67	84.85	87.28	29.5	19	29	65.85	55.85	4	0.01	MW			Decommissioned 4/03.
LM038AU	12/19/1985	AUU	2085342.38	6303497.35	80.07	81.88	35	14.5	34.5	65.57	45.57	2	0.02	MW	NS		Former well name LM038A. Decommissioned 5/14.
LM039B	5/14/1986	ML	2086982.64	6303805.76	73.68	75.83	100	90	100	-16.32	-26.32	4	0.01	MW	NS	-21.67	
LM040B[d]	5/10/1986	M	2086826.14	6304087.39	73.93	76.41	102	92	102	-18.07	-28.07	4	0.01	MW			Decommissioned 3/13.
LM041B	5/20/1986	MU	2086802.98	6304124.63	74.24	76.06	70	60	70	14.24	4.24	4	0.01	MW	LF	8.56	
LM042AU[d]	5/11/1986	AU	2085717.45	6302670.04	78.6	81.28	30	10	30	68.6	48.6	2	0.01	MW			Former well name LM042A. Decommissioned 9/08.
LM043AU	5/10/1986	AU	2085720.68	6304761.18	78.16	80.4	27.5	7.5	27.5	70.66	50.66	2	0.01	MW	NS		Former well name LM043A.
LM044A	5/21/1986	U	2083561.92	6302794.82	89.74	92.28	65	54	64	35.74	25.74	2	0.01	PZ	NS		
LM045A[d]	5/23/1986	U	2083562.61	6302690.58	89.84	92.37	65.5	55.5	65.5	34.34	24.34	2	0.01	PZ			Decommissioned 9/08.
LM046A[d]	5/27/1986	U	2083510.05	6302661.93	89.91	92.4	65.25	55.25	65.25	34.66	24.66	2	0.01	PZ			Decommissioned 9/08.
LM047C	5/18/1987	L	2086964.81	6303772.12	73.84	73.76	144	124	134	-50.16	-60.16	4	0.01	MW	LF	-55.74	
LM048C	5/13/1987	L	2086791.83	6304084	73.46	72.92	165	150	160	-76.54	-86.54	4	0.01	MW	LF	-81.54	
LM049A[d]	5/10/1987	U	2087132.9	6304219.13	71.86	74.36	45	25	35	46.86	36.86	4	0.01	MW			Decommissioned 2/13.
LM050A	5/9/1987	U	2087132.16	6304247.62	71.82	74.26	56	36	46	35.82	25.82	4	0.01	MW	LF	30.26	
LM051B	5/7/1987	M	2087162.7	6304218.36	71.75	74.19	89	74	84	-2.25	-12.25	4	0.01	MW	LF	-7.81	
LM052D[d]	5/4/1987	BL	2087163.34	6304247.34	71.86	74.13	211	191	201	-119.14	-129.14	4	0.01	MW			Decommissioned 2/13.
LM053A	10/28/1987	U	2087436.02	6304039.54	70.44	72.21	56	36	46	34.44	24.44	4	0.01	MW	LF	29.21	
LM054A	11/4/1987	U	2087131.55	6304488.64	71.55	73.61	47	32	42	39.55	29.55	4	0.01	MW	BL	34.55	Decommissioned 5/14.
LM055B	11/18/1987	M	2087747.33	6304475.94	69.35	71.23	98	73	93	-3.65	-23.65	4	0.01	MW	LF	-9.77	
LM056C	11/13/1987	L	2087747.55	6304506.02	69.58	71.28	145	120	140	-50.42	-70.42	4	0.01	MW	LF	-61.72	

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
LM057D	11/9/1987	BL	2087717.72	6304505.55	69.33	71.4	195	180	190	-110.67	-120.67	4	0.01	MW	LF	-116.1	
LM058AU	11/25/1987	AU	2086350.39	6305056.08	74.82	76.81	31	20	30	54.82	44.82	4	0.01	MW	LF	49.82	Former well name LM058A.
LM059A	11/24/1987	U	2086319.84	6305085.34	74.86	77.61	61	46	56	28.86	18.86	4	0.01	MW	BL		
LM060B[d]	11/20/1987	UK	--	--	72.78	--	105.5	80	100	-7.22	-27.22	4	0.01	MW			Decommissioned.
LM061AU	11/2/1987	AUU	2086328.23	6303362.26	76.4	78.81	35.8	20	30	56.4	46.4	4	0.01	MW	LF	50.81	Former well name LM061A. Decommissioned 5/14.
LM062AU	10/30/1987	AUU	2086974.77	6303752.26	80.85	73.64	35.8	20	30	60.85	50.85	4	0.01	MW	LF	48.14	Former well name LM062A.
LM063A	10/11/1988	U	2089537.98	6305629.41	60.27	62.07	47	32	42	28.27	18.27	4	0.01	MW	LF	22.57	
LM064B	10/10/1988	M	2089537.99	6305662.62	59.96	62.21	95.5	70	90	-10.04	-30.04	4	0.01	MW	LF	-20.04	
LM065C	10/7/1988	L	2089538.14	6305687.01	60.06	62.33	166	140.5	160.5	-80.44	-100.44	4	0.01	MW	LF	-91.17	
LM066A	9/29/1988	U	2088444.67	6304566.92	66.1	68.45	39.5	24	34	42.1	32.1	4	0.01	MW	LF	33.95	
LM067B	9/28/1988	M	2088484.5	6304571.57	65.81	68.02	106	75	95	-9.19	-29.19	4	0.01	MW	LF	-19.98	
LM068A	10/24/1988	U	2087767.83	6305338.66	68.96	71.35	56.5	41	51	27.96	17.96	4	0.01	MW	BL	22.96	
LM069B	10/21/1988	M	2087766.59	6305233.42	69.14	71.3	97	71.5	91.5	-2.36	-22.36	4	0.01	MW	LF	-13.2	
LM070C	10/20/1988	L	2087767.7	6305278.01	69.12	71.29	147.5	121.5	141.5	-52.38	-72.38	4	0.01	MW	LF	-61.21	
LM071A	10/26/1988	U	2087752.69	6303424.22	69.95	69.18	59.5	34	54	35.95	15.95	4	0.01	MW	BL	25.95	
LM072A	10/26/1988	U	2087739.3	6306214.45	68.37	69.28	37	21.5	31.5	46.87	36.87	4	0.01	MW	LF	41.28	
LM073B	10/13/1988	M	2087740.95	6306191.07	68.47	70.15	106.5	76	96	-7.53	-27.53	4	0.01	MW	LF	-18.35	
LM074A	10/25/1988	U	2086218.05	6305735.83	75.69	77.89	60	34.5	54.5	41.19	21.19	4	0.01	MW	BL	31.19	
LM075A	6/26/1990	U	2086656.78	6302286.39	79.84	79.65	56	39	49	40.84	30.84	4	0.01	MW	NS		
LM076A	6/18/1990	U	2087140.04	6307154.71	69.78	71.71	41.5	25.5	36	44.28	33.78	4	0.01	MW	LF	39.03	Original TOC = 70.99 feet. Wellhead elevation was modified (estimated) on 4/15/97 due to installation of low-flow pump.
LM077A	6/12/1990	U	2089531.87	6306721.51	59.87	61.71	61	45.5	55.5	14.37	4.37	4	0.01	MW	LF	8.71	
LM078B	6/25/1990	M	2086625.5	6302285.78	79.82	79.48	88.5	73	83	6.82	-3.18	4	0.01	MW	NS		
LM079B	6/27/1990	M	2087752.52	6303426.52	69.56	69.12	94	79	89	-9.44	-19.44	4	0.01	MW	LF	-16.88	
LM080A	8/16/1989	U	2088230.27	6307149.37	66.99	66.48	35	20	30	46.99	36.99	4	0.01	MW	LF	38.98	
LM081C	8/9/1989	L	2088520.25	6304575.74	65.4	67.98	158.5	133	153	-67.6	-87.6	4	0.01	MW	LF	-78.02	
LM082A[d]	8/17/1989	U	2084773.35	6306404.47	76.63	79.47	38	22.5	32.5	54.13	44.13	4	0.01	MW			Decommissioned 6/97.
LM083A	8/15/1989	U	2089543.77	6304814.45	60.61	62.69	38	22.5	32.5	38.11	28.11	4	0.01	MW	LF	32.69	
LM084B	8/14/1989	M	2089543.86	6304709.81	60.54	62.55	99.5	74.5	94.5	-13.96	-33.96	4	0.01	MW	LF	-24.45	
LM085B	7/3/1990	M	2085905.91	6303272.24	78.21	77.58	104	88.5	98.5	-10.29	-20.29	4	0.01	MW	LF	-15.29	
LM086B	6/20/1990	M	2084784.75	6303405.58	83.41	82.87	110	94.5	104.5	-11.09	-21.09	4	0.01	MW	NS		Decommissioned 5/14.
LM087B[d]	6/18/1990	M	2085300.41	6304885.56	79.58	78.97	96.5	81	91	-1.42	-11.42	4	0.01	MW			Decommissioned 2/97.
LM088C	6/22/1990	L	2086640.4	6302286.2	79.82	79.43	137.5	122	132	-42.18	-52.18	4	0.01	MW	NS		
LM089C	6/28/1990	L	2087751.84	6303449.98	69.52	69.21	142.5	126.5	136.5	-56.98	-66.98	4	0.01	MW	LF	-64.29	
LM090C	6/19/1990	L	2084784.54	6303420.08	83.33	82.84	140	124	134	-40.67	-50.67	4	0.01	MW	NS		
LM091C	8/4/1989	L	2086936.28	6304167.51	73.37	75.53	163.5	138.5	158.5	-65.13	-85.13	4	0.01	MW	LF	-75.97	

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
LM092C[d]	6/15/1990	L	2085299.9	6304901.15	79.52	78.83	134	118	128	-38.48	-48.48	4	0.01	MW			Decommissioned on 2/97.
LM092CC	2/12/1997	L	2085156.32	6304674.3	79.68	78.99	140.5	125	140	-45.32	-60.32	4	0.01	MW	LF	-44.01	
LM093AU[d]	7/6/1993	AU	2085821.42	6303156.67	83.37	78.08	27.5	12.5	27.25	70.87	56.12	4	0.01	MW			Former well name LM093A. Decommissioned 6/99.
LM094AU	6/17/1993	AUU	2086898.73	6303798.5	74.18	73.38	26	10.8	25.8	63.38	48.38	4	0.01	MW	LF	49.88	Former well name LM094A.
LM095AU	6/28/1993	AU	2084512	6304675.45	80.96	80.22	30	14.5	29.9	66.46	51.06	4	0.01	MW	BL	58.76	Former well name LM095A. Decommissioned 5/14.
LM096A	6/7/1993	U	2084663.98	6305340.49	80.9	80.78	29.5	14.9	29.5	66	51.4	4	0.01	MW	NS		
LM097AU[d]	11/7/1994	AU	2084157.85	6305618.24	82.27	84.63	26.5	16	26	66.27	56.27	4	0.01	MW			Former well name LM097A. Decommissioned 2002.
LM097AUA[d]	2/24/2003	AU	2084104	6305557.2	83.1	85.33	31	16	31	67.1	52.1	4	0.01	MW			Decommissioned 3/13.
LM098A[d]	6/23/1993	U	2081787.78	6303183.47	99.18	101.11	44	29	44	70.18	55.18	4	0.01	MW			Decommissioned.
LM099A[d]	6/25/1993	U	2081721.86	6303031.98	98.96	100.77	45	28.5	44.5	70.46	54.46	4	0.01	MW			Decommissioned 9/08.
LM100AU	6/22/1993	AUU	2085420.79	6305525.29	79.58	78.85	30	14.9	29.9	64.68	49.68	4	0.01	MW	NS		Former well name LM100A.
LM101A[c]	1/2/1991	U	2086902.04	6303717.9	74.28	77.1	50	27	32	47.28	42.28	2	0.06	MW	LF	44.6	
LM102B[c]	12/28/1990	M	2086892.63	6303730.07	74.11	76.6	100	80	85	-5.89	-10.89	2	0.06	MW	LF	12.6	
LM103AU[d]	1/2/1991	AUU	2086830.55	6303675.56	74.39	74.41	25	16	21	58.39	53.39	2	0.06	MW			Former well name LM103A. Decommissioned.
LM104A[c]	1/4/1991	U	2086822.78	6303689.02	74.36	76.88	50	25	30	49.36	44.36	2	0.06	MW	LF	44.45	
LM105B[c]	1/3/1991	MU	2086815.07	6303699.94	74.29	77.01	100	79	84	-4.71	-9.71	2	0.06	MW	LF	-6.99	
LM106A[c]	1/9/1991	U	2087702.91	6302017.99	76.82	79.23	27	22	27	54.82	49.82	2	0.06	MW	BL	52.32	
LM107C[c]	1/10/1991	L	2087702.12	6302024.83	76.85	79.43	150	135	140	-58.15	-63.15	2	0.06	MW	LF	-61.07	
LM108A[c]	1/9/1991	U	2087610.16	6301990.93	77.43	77.02	50	35	40	42.43	37.43	2	0.06	MW	NS		
LM109B[c]	1/7/1991	M	2087604.42	6301999.91	77.5	77.26	100	90	95	-12.5	-17.5	2	0.06	MW	LF	-15.74	
LM110C[c]	1/8/1991	L	2087603.99	6302008.46	77.56	77.39	150	137	142	-59.44	-64.44	2	0.06	MW	LF	-62.61	
LM111A	4/13/1992	U	2086061.12	6302836.59	78.39	78.22	30	15	30	63.39	48.39	4	--	MW	LF	55.72	Decommissioned 5/14.
LM112A	--	U	2082362.88	6302515.72	98.37	98.59	39	--	--	--	--	2	--	MW	NS		Decommissioned 5/14.
LM113A[d]	--	U	2081241.9	6302662.05	103.13	104.15	36.67	--	--	--	--	2	--	MW			Decommissioned on 6/97.
LM114A	6/8/1993	U	2084467.27	6305487.8	82.46	81.72	30.9	15	30.5	67.46	51.96	4	0.01	MW	NS		Decommissioned 5/14.
LM115AU	6/9/1993	AU	2085794.18	6303297.97	78.64	77.99	31.1	16	30.5	62.64	48.14	4	0.01	MW	LF	54.99	Former well name LM115A.
LM116A[d]	6/29/1993	U	2085923.85	6303724.02	80.16	77.14	27.6	12.5	27.25	67.66	52.91	4	0.01	MW			Decommissioned 2/13.
LM117A	6/10/1993	U	2086241.07	6302659.95	78.08	77.4	28.1	12.8	27.8	65.28	50.28	4	0.01	MW	LF	53.9	
LM118AU[d]	11/3/1994	AU	2085979.33	6303722.56	77.93	80.26	27.5	12	27	65.93	50.93	4	0.01	MW			Former well name LM118A. Decommissioned 2/13.
LM119A	6/8/1993	U	2084373.96	6306024.23	80.82	82.84	30	14.7	29.7	66.12	51.12	4	0.01	MW	BL	58.62	
LM120A[d]	6/30/1993	U	2085997.67	6303803.18	77.16	76.5	25.5	11	25.25	66.16	51.91	4	0.01	MW			Decommissioned 2/13.
LM121A[d]	6/11/1993	U	2086104.37	6302724.27	78.06	77.27	27	12	26.7	66.06	51.36	4	0.01	MW			Decommissioned 2/13.
LM122A[d]	6/3/1993	U	2081104.56	6302007.93	106.37	108.19	56	37.5	52.5	68.87	53.87	4	0.01	MW			Decommissioned.
LM123B[d]	6/8/1993	M	2081115.03	6302019.72	106.41	108.83	95.5	85.5	95.5	20.91	10.91	4	0.01	MW			Decommissioned.
LM124C[d]	6/10/1993	L	2081103.75	6302030.43	106.33	108.61	150	140	150	-33.67	-43.67	4	0.01	MW			Decommissioned.

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
LM125A	6/3/1993	U	2080445.31	6302007.06	110.71	113.47	53.5	38.5	53.5	72.21	57.21	4	0.01	MW	LF	60.47	Decommissioned 5/14.
LM126A[d]	6/4/1993	U	2081024.99	6302596.42	104.17	104.67	51.1	35	50.5	69.17	53.67	4	0.01	MW			Decommissioned 2/13.
LM127B[d]	6/14/1993	M	2081046.53	6302600.44	104.27	105.36	96.5	86.5	96.5	17.77	7.77	4	0.01	MW			Decommissioned 2/13.
LM128C[d]	6/16/1993	L	2081043.61	6302579.44	104.42	104.49	145.5	135.5	145.5	-31.08	-41.08	4	0.01	MW			Decommissioned 2/13.
LM129A	6/10/1993	U	2085803.29	6303003.73	78.7	78.19	28	12.8	27.8	65.9	50.9	4	0.01	MW	BL	58.4	
LM130AU	6/22/1993	AUU	2086882.41	6303051.02	74.48	74.04	31	5.4	30.4	69.08	44.08	4	0.01	PZ	NS		Former well name LM130A.
LM131AU	6/22/1994	AUU	2087242.66	6302732.91	78.24	80.49	30.7	5.5	30.5	72.74	47.74	4	0.01	PZ	NS		Former well name LM131A.
LM132AU	7/25/1994	AUU	2087171.37	6303023.58	77.33	79.38	28	4.6	27.8	72.73	49.53	4	0.01	PZ	NS		Former well name LM132A.
LM133AU	6/24/1994	AUU	2086081.75	6303265.89	77.77	77.28	29.9	4.7	29.7	73.07	48.07	4	0.01	PZ	NS		Former well name LM133A.
LM134AB	6/27/1994	MU	2086939.28	6303788.43	74.01	76.46	49.9	44.7	49.7	29.31	24.31	4	0.01	PZ	BL	26.81	
LM135B	6/26/1994	M	2086995.36	6303725.15	75.5	73.49	87.2	77	87	-1.5	-11.5	4	0.01	PZ	BL	-6.5	
LM136BC	6/22/1994	ML	2086944.43	6303775.43	75	75.83	105.8	100.5	105.5	-25.5	-30.5	4	0.01	PZ	BL	28	
LM137A	11/7/1994	U	2086392.13	6303250.94	77.02	79.41	29.5	19	29	58.02	48.08	4	0.01	MW	LF	50.91	
LM138BC	6/28/1994	ML	2087781.61	6305272.94	73.92	70.17	113.5	108.3	113.3	-34.38	-39.38	4	0.01	PZ	NS		
LM139C	6/24/1994	L	2087790.91	6305338.31	68.75	70.29	155.2	145	155	-76.25	-86.25	4	0.01	PZ	NS		
LM140AU	6/21/1994	AUU	2087699.75	6302014.87	77	79.35	30	4.7	29.7	72.3	47.3	4	0.01	PZ	BL	59.8	Former well name LM140A.
LM141AU	6/25/1994	AUU	2087625.63	6302187.64	76.3	76.6	30.5	5.3	30.3	71	46	4	0.01	PZ	BL	58.5	Former well name LM141A.
LM142AU	6/20/1994	AUU	2087575.72	6302394.32	71.79	73.87	30.7	5.45	30.45	66.34	41.34	4	0.01	PZ	BL	53.84	Former well name LM142A.
LM143AU[d]	10/24/1994	AU	2087747.3	6304526.88	69.79	71.68	25.5	10	25	59.79	44.79	4	0.01	MW			Former well name LM143A. Decommissioned 2/13.
LM144AU	10/26/1994	AU	2086547.37	6305551.14	74.3	76.8	30.5	10	30	64.3	44.3	4	0.01	MW	LF	53.3	Former well name LM144A.
LM145AU	10/25/1994	AU	2084890.66	6306715.95	74.7	77.19	25.5	10	25	64.7	49.7	4	0.01	MW	LF	56.19	Former well name LM145A. Decommissioned 5/14.
LM146A[d]	10/24/1994	U	2088665.48	6307150.33	64.96	64.56	30.5	10	30	54.96	34.96	4	0.01	MW			Decommissioned 2/13.
LM147A	10/25/1994	U	2085696.1	6306256.01	75.2	76.39	30.5	10	30	62.5	45.2	4	0.01	MW	BL	53.85	
LM148C	12/13/1994	L	2088668.14	6305655.58	64.19	65.91	150.5	125	150	-60.81	-85.81	4	0.01	MW	LF	-74.09	
LM149A	11/3/1994	U	2086786.59	6304105.23	73.32	75.5	35.5	25	35	48.32	38.32	4	0.01	MW	LF	42.5	
LM150A	6/25/2001	U	2087765.76	6307524.46	65.63	65.25	43.5	28	43	37.63	22.63	4	0.01	MW	LF	20.75	
LM151B	6/25/2001	M	2087765.84	6307531.95	65.83	65.46	82.5	72	82	-6.17	-16.17	4	0.01	MW	LF	-15.04	
LM152A	6/25/2001	U	2087761.43	6308196.01	64.52	64.27	46.5	31	46	33.52	18.52	4	0.01	MW	LF	22.77	
LM153B	6/25/2001	M	2087760.68	6308204.87	64.64	64.36	78.5	68	78	-3.36	-13.36	4	0.01	MW	LF	-12.14	
LM154A	4/1/1999	U	2088606.8	6308604.21	59.67	59.54	36.5	24	34	35.67	25.67	6	0.01	MW	LF	30.67	
LM155B	3/31/1999	M	2088591.65	6308604.74	59.87	59.8	120	105.5	115.5	-45.63	-55.63	6	0.01	MW	LF	-50.63	
LM156A	3/23/1999	U	2089110.99	6308606.14	57.5	57.34	48	20	45	37.5	12.5	6	0.01	MW	LF	25	
LM157A	3/19/1999	U	2089458.74	6308614.14	56.05	55.97	46.5	20	45	36.05	11.05	6	0.02	MW	LF	23.55	
LM158B	3/18/1999	M	2089478.64	6308613.86	55.9	55.15	92.5	81.5	91.5	-25.6	-35.6	6	0.01	MW	LF	-30.6	
LM162A	6/18/1996	U	2089069.93	6304570.37	62.94	65.5	22.5	7	22	58.5	43.5	4	0.01	MW	LF	48	
LM165A	6/21/1996	U	2086232.61	6306961.15	72.67	75.29	24	8.5	23.5	64.17	49.17	4	0.01	MW	LF	52.79	Decommissioned 5/14.

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
LM166AU[d]	11/19/1997	AU	2085075.2	6304302.64	80.1	79.41	25	10	25	70.1	55.1	4	0.01	MW			Decommissioned 2006.
LM167AU	11/24/1997	AU	2085796.34	6304120.22	77.63	76.44	26.5	11.5	26.5	66.13	51.13	4	0.01	MW	LF	53.44	
LM168AU[d]	11/20/1997	AU	2084222.61	6305684.47	81.65	84.07	25.5	10.5	25.5	71.15	56.15	4	0.01	MW			Decommissioned 2/13.
LM169A	11/24/1997	U	2082553.14	6302895.26	94.02	93.24	38	28	38	66.02	56.02	4	0.02	MW	LF	59.24	
LM170AU	6/24/1999	AU	2086138.91	6302376.02	78.7	78.49	25.15	10.15	24.15	68.55	54.55	2	0.01	MW	LF	56.49	Decommissioned 5/14.
LM171AU[d]	6/24/1999	AU	2086219.95	6302439.54	78.08	77.88	25.2	10.2	24.2	67.88	53.88	2	0.01	MW			Decommissioned 2/13.
LM172AU[d]	6/24/1999	AU	2086243.02	6302396.05	78.19	77.83	25.1	10.1	24.1	68.09	54.09	2	0.01	MW			Decommissioned 2/13.
LM173AU	6/24/1999	AU	2086366.14	6302531.75	77.35	77.18	25.2	10.2	24.2	67.15	53.15	2	0.01	MW	LF	55.18	Decommissioned 5/14.
LM174AU	12/27/1999	AU	2087751.67	6302386.15	70.48	70	37.1	17	37	53.48	33.48	6	0.02	MW	LF	42	
LM175AU	4/22/2002	AU	2085824.94	6303167.73	78.51	78.07	34	23.5	33.5	55.01	45.01	4	0.01	MW	LF	49.07	
LM176A	4/18/2002	U	2086996.5	6307155.28	70.44	69.85	53.5	43	53	27.44	17.44	4	0.02	MW	LF	21.35	
LM177B	4/17/2002	M	2086986.19	6307156.02	70.36	69.95	88.5	78	88	-7.64	-17.64	4	0.01	MW	LF	-13.55	
LM178AU[d]	2/24/2003	AU	2084349.7	6305819.2	81.2	83.52	31	16	31	65.2	50.2	4	0.01	MW			Decommissioned 2/13.
LM179D[d]	1/16/2004	L	2088563.93	6304582.12	65.22	67.71	186.5	176	181	-110.78	-115.78	4	0.01	MW			Decommissioned 2/13.
LM180A	2/14/2006	U	2087979.25	6307144.06	67.6	70.24	36.5	26	36	41.6	31.6	2	0.01	MW	LF[e]	36.6[f]	
LM181B	2/13/2006	M	2087979.25	6307144.06	67.6	70.23	75.5	65	75	2.6	-7.4	2	0.01	MW	LF[e]	-2.40[f]	
LM182A	2/8/2006	U	2087769.9	6307144.68	67.87	70.73	30.5	20	30	47.87	37.87	2	0.01	MW	LF[e]	42.87[f]	
LM183B	2/8/2006	M	2087769.9	6307144.68	67.87	70.73	75.5	65	75	2.87	-7.13	2	0.01	MW	LF[e]	-2.13[f]	
LM184A	2/7/2006	U	2087564.36	6307144.93	69.33	71.9	40.5	30	40	39.33	29.33	2	0.01	MW	LF[e]	34.33[f]	
LM185B	2/7/2006	M	2087564.36	6307144.93	69.33	71.92	80.5	70	80	-0.67	-10.67	2	0.01	MW	LF[e]	-5.67[f]	
LM186A	2/10/2006	U	2087381.73	6307143.94	69.37	72.15	38.5	28	38	41.37	31.37	2	0.01	MW	LF[e]	36.37[f]	
LM187B	2/10/2006	M	2087381.73	6307143.94	69.37	72.13	90.5	80	90	-10.63	-20.63	2	0.01	MW	LF[e]	-15.63[f]	
LM188B	8/27/2008	M	2087626.46	6302020.94	77.47	77.05	89	84	89	-6.53	-11.53	2	0.02	MW	LF	-9.03	
LM189B	08/27.08	M	2087626.52	6302020.47	77.45	76.99	101	94	99.5	-16.55	-22.05	2	0.02	MW	LF	-19.3	
LM190A	8/26/2008	AU	2087615.72	6302173.33	77.02	76.72	29.5	24	29	53.02	48.02	2	0.02	MW	LF	50.52	
LM191A	8/26/2008	U	2087617.09	6302173.9	77	76.75	40.5	35	40	42	37	2	0.02	MW	LF	39.5	
LM192A[d]	1/22/2009	U	2086248.85	6303264.86	77.4	77.3	25	10	24.5	67.4	52.9	2	0.02	MW			Decommissioned 2012.
LM193A[d]	3/1/2009	U	2085745.4	6303131.95	81.56	81.33	30	15	30	66.33	50.33	2	0.02	MW			Decommissioned 2009.
LM196AU	12/2/2010	AU	2085736.15	6303130.17	78.78	78.15	40	20	35	58.15	43.15	6	0.035	MW	LF		
LM197B	11/30/2010	M	2085815.71	6303117.08	78.21	77.5	97	79	94	-1.5	-16.5	4	0.02	MW	LF		
LM198AU	5/13/2010	AU	2085953.99	6303991.27	76.98	76.81	27	12	27	64.81	49.81	2	0.02	MW	LF		
LM199AU	5/12/2010	AU	2085998.82	6303911.86	76.8	76.41	27.5	13	27.5	63.41	48.91	2	0.02	MW	LF		
LM200AU	5/12/2010	AU	2086077.82	6304004.67	76.91	76.51	28	13	28	63.51	48.51	2	0.02	MW	LF		
LM201AU	5/13/2010	AU	2085983.71	6304032.4	77.45	76.69	26	11	26	65.69	50.69	2	0.02	MW	LF		
LM202AU	5/11/2010	AU	2085816.99	6304000.89	77.45	77.14	26	11	26	66.14	51.14	2	0.02	MW	LF		
LM203A	1/23/2013	U	2085842.87	6305063.33	78.86	78.6	32	22	32	56.6	46.6	2	0.02	MW	LF		

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
OW001A	--	U	2086968.25	6303758.94	73.84	73.56	25.5	20	25	53.84	48.84	2	--	OW	NS		
OW002A	--	U	2086953.7	6303810.48	73.8	73.52	35.8	30	35	43.8	38.8	2	--	OW	NS		
OW003AU	6/5/1995	AU	2089516.71	6304632.35	60.54	62.17	22	5	21.5	55.54	39.04	4	--	OW	NS		
OW004AU	6/13/1995	AU	2089311.58	6304779.45	61.53	62.88	22	3	21.5	58.53	40.03	4	0.02	OW	NS		Decommissioned 5/14.
OW005AU	6/13/1995	AU	2089310.78	6305059.46	61.45	63.65	23	3	21.5	58.45	39.95	4	0.02	OW	NS		
OW006AU	6/13/1995	AU	2089310.32	6305361.25	60.98	63.15	23	3	22.5	57.98	38.48	4	0.02	OW	NS		
OW007AU	6/5/1995	AU	2089487.79	6304723.52	60.42	62.3	25	5	24.5	55.42	35.92	4	0.02	OW	NS		
OW008AU	6/6/1995	AU	2089485.53	6305038.31	60.62	62.72	25	3	24.5	57.62	36.12	4	0.02	OW	NS		
OW009AU	6/6/1995	AU	2089485.24	6305319.06	60.28	62.2	25	5	24.5	55.28	35.78	4	0.02	OW	NS		
OW010AU	6/7/1995	AU	2089483.96	6305812.44	60.08	62.04	25	5	24.5	55.08	35.58	4	0.02	OW	NS		Decommissioned 5/14.
OW011AU	6/8/1995	AU	2086032.62	6307126.33	70.85	72.98	25	5	24.5	65.85	46.35	4	0.02	OW	NS		
OW012AU	6/9/1995	AU	2085734.11	6307122.7	71.02	73.03	25	5	24.5	66.02	46.52	4	0.02	OW	NS		
OW013AU	6/9/1995	AU	2085431.81	6307123.88	71.52	74.16	24	4.5	23.5	67.02	48.02	4	0.02	OW	NS		
OW014AU	6/10/1995	AU	2085133.2	6307121.7	72.3	74.89	24	4.5	23.5	67.8	48.8	4	0.02	OW	NS		
OW015AU	6/10/1995	AU	2084806.08	6307020.59	74.08	76.06	24	4.5	23.5	69.58	50.58	4	0.02	OW	NS		
OW016A	10/1/1996	U	2089126.48	6305671.13	61.61	64.22	30.5	5	30	56.61	31.61	2	0.01	OW	NS		Former well name P009. Decommissioned 6/14.
OW017A	10/1/1996	U	2089332.21	6305912.02	60.56	63.18	30.5	5	30	55.56	30.56	2	0.01	OW	NS		Former well name P001. Decommissioned 5/14.
OW018A	10/1/1996	U	2089368.76	6306186.01	60.1	62.68	30.5	5	30	55.1	30.1	2	0.01	OW	NS		Former well name P002. Decommissioned 5/14.
OW019A	6/20/1996	U	2086233.56	6307134.39	71.96	74.33	19	8.5	18.5	63.46	53.46	2	0.01	OW	NS		Former well name P003.
OW020A	6/24/1996	U	2085901.29	6306811.75	72.18	74.67	30.5	10	30	62.18	42.18	2	0.01	OW	NS		Former well name P010. Decommissioned 5/14.
OW021A	6/24/1996	U	2085877.64	6306989.82	71.31	73.89	20.5	10	20	61.31	51.31	2	0.01	OW	NS		Former well name P004.
OW022A	6/24/1996	U	2085578.83	6306990.65	71.7	74.38	20.5	10	20	61.7	51.7	2	0.01	OW	NS		Former well name P005.
OW023A	6/25/1996	U	2085278.54	6306989.41	72.31	75.1	30.5	10	30	62.31	42.31	2	0.01	OW	NS		Former well name P006.
OW024A	6/25/1996	U	2084978.02	6306987.83	73.7	76.03	35.5	10	35	63.7	38.7	2	0.01	OW	NS		Former well name P007.
OW025B	6/25/1996	M	2087159.5	6304065.52	72.19	74.46	40.5	15	40	57.19	32.19	2	0.01	OW	NS		
FW001	6/25/1996	M	2087657.4	6307357.66	--	--	--	--	--	--	--	--	--	WSW	WT		PW001 GAC effluent sample location.
PW001	--	M	2087644.95	6307443.7	68.21	--	105	55	75	--	--	6	--	WSW	WT		
PW002	--	UK	2084285.8	6307000.87	76.1	--	115	--	--	--	--	14	--	WSW	WT		
PW003	--	UK	2084317.55	6307282.49	--	--	180	--	--	--	--	6	--	WSW	WT		
PW004	--	UK	2092835.88	6305935.71	--	--	--	--	--	--	--	--	--	WSW	WT		
PW005	--	UK	2089162.67	6307374.65	--	--	--	--	--	--	--	--	--	WSW	WT		
PW006	--	M	2092794.21	6307264.39	47.1	--	103	91	103	--	--	--	--	WSW	WT		
PW007	--	UK	2092537.06	6308364.66	--	--	--	--	--	--	-	--	--	WSW	WT		
PW008	--	UK	--	--	--	--	--	--	--	--	--	--	--	WSW	WT		
PW009	--	UK	2084172.84	6307222.65	--	--	--	--	--	--	--	--	--	WSW	WT		
PW010	--	UK	--	--	--	--	--	--	--	--	--	--	--	WSW	WT		

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
PW011	--	UK	2085005.67	6307260.12	--	--	--	--	--	--	--	--	--	WSW	WT		
PW012	--	UK	2084684.32	6307302.95	--	--	--	--	--	--	--	--	--	WSW	WT		
PW013	--	UK	2088608	6302120	--	--	--	--	--	--	--	--	--	WSW	WT		Well not surveyed. Coordinates are estimated.
PZ1	6/5/2001	AU/U	2093012.36	6302296.34	49.13	49.01	14	3.5	13.5	45.63	35.63	1	0.01	PZ	NS		
PZ2	6/5/2001	AU/U	2092961.66	6307116.08	47.97	47.76	19.3	13.5	18.5	34.47	29.47	1	0.01	PZ	NS		
PZ3	6/5/2001	AU/U	2092976.06	6310555.11	43.43	43.26	64	49	59	-5.57	-15.57	1	0.01	PZ	NS		
PZ4[d]	6/5/2001	AU/U	2092507.25	6312465.35	39.63	39.32	14	9	14	27.93	22.93	1	0.01	PZ			Decommissioned 3/04.
PZ4R	7/23/2004	AU/U	2092507.62	6312504.33	39.88	39.74	14	--	--	30.88	25.88	0.75	0.01	PZ	NS		Replacement well for PZ4.
PZ5[d]	6/6/2001	AU/U	2090397.13	6312458.14	49.28	49.09	57.5	52	57	-2.72	-7.72	1	0.01	PZ			Decommissioned 3/04.
PZ5R	7/23/2004	AU/U	2090396.44	6312493.36	48.99	48.6	57.5	--	--	-3.51	-8.51	0.75	0.01	PZ	NS		Replacement well for PZ5.
PZ6	6/6/2001	AU/U	2087733.98	6312481.32	54.24	53.81	28.5	23	28	31.24	26.24	1	0.01	PZ	NS		
PZ7[d]	6/5/2001	AU/U	2090392.48	6312458.12	49.13	48.76	18.5	13	18	36.13	31.13	1	0.01	PZ			Decommissioned 3/04.
PZ7R	7/23/2004	AU/U	2090393.41	6312493.23	48.96	48.62	18	--	--	35.96	30.96	0.75	0.01	PZ	NS		Replacement well for PZ7.
PZ8	6/6/2001	AU/U	2082408.4	6312422.14	67.37	67.17	19.5	14	19.0.0	53.37	48.37	1	0.01	PZ	NS		
PZ9	6/6/2001	AU/U	2077358.78	6307144.23	97.17	96.65	28	22.5	27.5	74.67	69.67	1	0.01	PZ	NS		
PZ10	6/6/2001	AU/U	2082333.5	6307142.9	80.26	80.07	31	25.5	30.5	54.76	49.76	1	0.01	PZ	NS		
PZ11	6/8/2001	AU/U	2077379.51	6301852.3	118.97	118.82	32	26.5	31.5	92.47	87.47	1	0.01	PZ	NS		
PZ12	6/8/2001	AU/U	2082453.96	6300833.9	102.27	102.11	64	58.5	63.5	43.77	38.77	1	0.01	PZ	NS		
PZ13	6/8/2001	AU/U	2090199.75	6307173.98	56.92	56.66	19.5	14	19	42.92	37.92	1	0.01	PZ	NS		
PZ14	6/7/2001	AU/U	2085211.76	6301863.13	86.36	86.24	23	31.8	36.8	54.56	49.56	1	0.01	PZ	NS		
PZ15	6/7/2001	AU/U	2087766.74	6301352.14	73.29	73.15	58	52.5	57.5	20.79	15.79	1	0.01	PZ	NS		
PZ16	6/7/2001	AU/U	2087771.01	6300674.48	73.86	73.72	30	24.5	29.5	49.36	44.36	1	0.01	PZ	NS		
PZ17	6/7/2001	AU/U	2090432.25	6301888.81	60.52	60.3	29	23.5	28.5	37.02	32.02	1	0.01	PZ	NS		
PZ18	7/20/2004	AU	2087741.57	6303906.6	69.41	72.58	35.5	--	--	39.41	34.41	1	0.02	PZ	NS		
PZ19	7/20/2004	AU	2087744.72	6303939.53	68.99	71.98	35.6	--	--	38.99	33.99	1	0.02	PZ	NS		
PZ20	7/20/2004	AU	2087741.47	6304014.18	69.17	72.31	35.5	--	--	39.17	34.17	1	0.02	PZ	NS		
PZ21	7/20/2004	AU	2087741.79	6304079.59	69	71.66	32.5	--	--	42	37	1	0.002	PZ	NS		
PZ22	7/21/2004	AU	2087740.35	6304152.51	69.34	72.5	32.5	--	--	42.34	37.34	1	0.02	PZ	NS		
PZ23	7/21/2004	AU	2087740.62	6304183.07	69.33	72.42	32.5	--	--	42.33	37.33	1	0.02	PZ	NS		
TW001[d]	5/19/1986	UK	2083562.91	6302668.65	89.74	92.04	75	55	75	34.74	14.74	6	0.01	TW			Decommissioned 9/08.
WSW004[d]	1/1/1943	UK	2085939.36	6304177.6	--	--	--	--	--	--	--	--	--	WSW			Decommissioned.
WSW007	1/1/1950	UK	2080608.64	6301986.06	110.59	--	810	--	--	--	--	--	--	WSW	NS		Site water supply well not sampled as part of the Well Monitoring Program.
WSW008	11/25/1992	UK	2081541.12	6303080.12	101	--	905	--	--	--	--	18	--	WSW	NS		Site water supply well not sampled as part of the Well Monitoring Program.

Table B-1. Well Construction Details, Defense Distribution Depot San Joaquin (4Q13-3Q14) (Continued)

Well Name	Installation Date	Geologic Horizon	Northing[a]	Easting[a]	Surface Elevation[b] (msl)	TOC[b] Elevation (msl)	Total Well Depth (ft bgs)	Screen Beginning Depth (ft bgs)	Screen End Depth (ft bgs)	Screen Beginning Depth (ft msl)	Screen End Depth (ft msl)	Well Diameter (inches)	Screen Slot Size (inches)	Well Type	Sample Method	Sample Elevation (ft msl)	Status
WSW009	11/25/1992	UK	2082203.04	6303982.67	96.61	--	930	420	480	--	--	16	--	WSW	NS		Site water supply well not sampled as part of the Well Monitoring Program.
								570	590								
								640	700								
								740	800								
								850	910								

Notes:
[a] Coordinates in State Plane Coordinate System, North American Datum 1983 feet. Coordinates were resurveyed from June through July 2000.
[b] TOC and ground surface elevations surveyed to the NAVD88.
[c] IRM well
[d] Decommissioned well
[e] If sampled, sampling will be done using a portable low-flow pump.
[f] Samples collected by portable low-flow pump at the mid-point of the screen.

Geologic Horizon Designation Codes:
AU = Above Upper
AUU = Above Upper/Upper
AU/U = Above Upper or Upper
U = Upper
MU = Upper/Middle
M = Middle
ML = Middle/Lower
L = Lower
BL = Below Lower
UK = Unknown

Sample Method
BL = submersible and/or bailer
LF = low-flow method
NS = Not sampled. Water level only.
WT = wellhead tap/faucet
No sample method indicates well has been abandoned.

Definitions:
-- = Data not available
bgs = below ground surface
EW = extraction well
ft = feet
GAC = granular activated carbon
IRM = interim remedial measure
IW = injection well
msl = mean sea level
MW = monitoring well
NAVD88 = North American Vertical Datum of 1988
OW = observation well
PZ = piezometer
Site = Defense Distribution Depot San Joaquin
TOC = top of casing
TW = test well
WSW = water supply well

Note:
Sample elevations for monitoring wells with low-flow pumps or extraction wells with submersible pumps are based on the bottom of the pump inlet.
Sample elevations for wells that are sampled by BL method use the screen mid-point elevation.
Extraction well sample elevations are identified by mid-point elevation of each screen interval.
Private well (PW) construction data is unavailable.
LM192A has not been surveyed and the well screen elevation cannot be calculated.

AU, AUU, and U Geologic Horizon extraction and monitoring wells comprise the Upper Hydrologic Zone.
MU, M, and ML Geologic Horizon extraction and monitoring wells comprise the Middle Hydrologic Zone.
L and BL Geologic Horizon extraction and monitoring wells comprise the Lower Hydrologic Zone.
Well construction details for LM112A and LM113A are unavailable.

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD

Well[a]	Site This Well Was Intended to Monitor[a]	Date of Site Remedial Action (Remedial Action)[a]	Monitored Compounds[a]	Groundwater Concentration Requiring Evaluation (µg/L)[b]	Historical Maximum Concentration (Result and Event)	Last Exceedance of a Groundwater Concentration Requiring Evaluation, if any (Result and Event)[a]	Number of Samples Collected Since Last Exceedance	Most Recent Concentration (Result and Event)	Time Period and Number of Samples Collected Prior to Remedial Action	Time Period and Number of Samples Collected After Remedial Action	Exceed the Groundwater Concentration Requiring Evaluation in the Last Three Years Well Was Sampled?[a]	Evaluation	Monitoring Recommendations
OU 1 - VOC COC Wells													
LM055B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q13	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 21 samples	No	ROD monitoring requirements have been met. TCE and PCE have not exceeded the ACL since 3Q04, and 1,1-DCE has never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the North-Central TCE/PCE Plume.
			TCE	5.0	36.2 µg/L - 2Q97	6.7 µg/L - 3Q04	9	2.0 µg/L - 3Q14	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 21 samples	No		
			PCE	5.0	21.1 µg/L - 1Q96	5.6 µg/L - 3Q04	9	1.7 µg/L - 3Q14	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 21 samples	No		
LM056C	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q13	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14- 24 samples	No	ROD monitoring requirements have not been met for TCE. TCE exceeded the ACL within last three years. PCE has not exceeded the ACL since 3Q03, and 1,1-DCE has never been detected. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	86 µg/L - 1Q97	5.37 µg/L - 3Q12	2	4.1 µg/L - 3Q14	4Q87 - 3Q98 - 31 samples	4Q98 - 3Q14 – 24 samples	**Yes**		
			PCE	5.0	17.8 µg/L - 1Q97	8.6 µg/L - 3Q03	13	1.6 µg/L - 3Q14	4Q87 - 3Q98 - 31 samples	4Q98 - 3Q14 - 24 samples	No		
LM058AU	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	3.3 µg/L - 1Q97	Never Exceeded	NA	ND - 3Q13	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 15 samples	No	ROD monitoring requirements have not been met. PCE and TCE exceeded the ACL within last three years; and 1,1-DCE has never exceeded the ACL. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	35 µg/L - 2Q88	5.8 µg/L - 3Q14	0	5.8 µg/L - 3Q13	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 15 samples	**Yes**		
			PCE	5.0	48.3 µg/L - 1Q97	10 µg/L - 3Q14	0	10 µg/L - 3Q13	4Q87 - 3Q98 - 32 samples	4Q98 - 3Q14 - 15 samples	**Yes**		
LM065C	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q13	4Q88 - 3Q98 - 22 samples	4Q98 - 3Q14 - 34 samples	No	ROD monitoring requirements have been met. TCE, 1,1-DCE, and PCE has never exceeded the ACL. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the North-Central TCE/PCE Plume.
			TCE	5.0	1.5 µg/L - 3Q13	Never Exceeded	NA	1.4 µg/L - 3Q14	4Q88 - 3Q98 - 22 samples	4Q98 - 3Q14 – 34 samples	No		
			PCE	5.0	0.27J µg/L	Never Detected	NA	0.27J µg/L - 3Q14	4Q88 - 3Q98 - 22 samples	4Q98 - 3Q14 - 34 samples	No		
LM067B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q13	4Q88 - 3Q98 - 26 samples	4Q98 - 3Q14 - 26 samples	No	ROD monitoring requirements have not been met for TCE. TCE exceeded the ACL within last three years. PCE has not exceeded the ACL since 1Q03, and 1,1-DCE has never been detected. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	28.8 µg/L - 3Q98	5.5 µg/L - 3Q13	0	2.8 µg/L - 3Q14	4Q88 - 3Q98 - 26 samples	4Q98 - 3Q14 - 26 samples	**Yes**		
			PCE	5.0	15.3 µg/L - 2Q97	5.1 µg/L - 1Q03	15	1.6 µg/L - 3Q14	4Q88 - 3Q98 - 26 samples	4Q98 - 3Q14 - 26 samples	No		

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD (Continued)

Well[a]	Site This Well Was Intended to Monitor[a]	Date of Site Remedial Action (Remedial Action)[a]	Monitored Compounds[a]	Groundwater Concentration Requiring Evaluation (µg/L)[b]	Historical Maximum Concentration (Result and Event)	Last Exceedance of a Groundwater Concentration Requiring Evaluation, if any (Result and Event)[a]	Number of Samples Collected Since Last Exceedance	Most Recent Concentration (Result and Event)	Time Period and Number of Samples Collected Prior to Remedial Action	Time Period and Number of Samples Collected After Remedial Action	Exceed the Groundwater Concentration Requiring Evaluation in the Last Three Years Well Was Sampled?[a]	Evaluation	Monitoring Recommendations
LM081C	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	3Q89 - 3Q98 - 20 samples	4Q98 - 3Q14 - 19 samples	No	ROD monitoring requirements have been met. TCE has not exceeded the ACL since 2Q95; PCE has not exceeded the ACL since 1Q95; and 1,1-DCE has never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the North-Central TCE/PCE Plume and the SSL Dieldrin Plume.
			TCE	5.0	20 µg/L - 4Q94	9.1 µg/L - 2Q95	27	0.96 µg/L - 3Q14	3Q89 - 3Q98 - 20 samples	4Q98 - 3Q14 - 19 samples	No		
			PCE	5.0	10 µg/L - 4Q94	6.2 µg/L - 1Q95	29	0.42J µg/L - 3Q14	3Q89 - 3Q98 - 20 samples	4Q98 - 3Q14 - 19 samples	No		
LM150A	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 28 samples	No	ROD monitoring requirements have been met. TCE has not exceeded the ACL since 2Q04; PCE has never exceeded the ACL; and 1,1-DCE has never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	7.5 µg/L - 2Q03	5.8 µg/L - 2Q04	13	2.2 µg/L - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 -28 samples	No		
			PCE	5.0	1.2 µg/L - 3Q02	Never Exceeded	NA	0.68 µg/L - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 28 samples	No		
LM151B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 27 samples	No	ROD monitoring requirements have not been met for TCE. TCE exceeded the ACL within last three years. PCE has never exceeded the ACL, and 1,1-DCE has never been detected. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	9.2 µg/L - 2Q04	7.0 µg/L - 3Q14	0	7.0 µg/L - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 27 samples	**Yes**		
			PCE	5.0	0.96 µg/L - 3Q03	Never Exceeded	NA	0.26J - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 27 samples	No		
LM152A	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q13	NA - well installed after 3Q98	3Q01 - 3Q14 - 28 samples	No	ROD monitoring requirements have been met. TCE and PCE have never exceeded their ACLs, and 1,1-DCE has never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	1.6 µg/L - 3Q01	Never Exceeded	NA	0.37J µg/L - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 28 samples	No		
			PCE	5.0	0.34 µg/L - 1Q05	Never Exceeded	NA	0.3J - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 28 samples	No		
LM153B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 30 samples	No	ROD monitoring requirements have been met. TCE has never exceeded the ACL, and 1,1-DCE and PCE have never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	0.63 µg/L - 3Q02	Never Exceeded	NA	ND - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 30 samples	No		
			PCE	5.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	3Q01 - 3Q14 - 30 samples	No		
LM154A	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 42 samples	No	ROD monitoring requirements have been met. TCE has not exceeded the ACL since 2Q03; PCE has never exceeded the ACL; and 1,1-DCE has never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	7.97 µg/L - 2Q99	5.1 µg/L - 2Q03	24	1.4 µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 – 42 samples	No		
			PCE	5.0	0.29 µg/L - 1Q00	Never Exceeded	NA	0.18J µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 42 samples	No		
LM155B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 37 samples	No	ROD monitoring requirements have been met. 1,1-DCE, TCE, and PCE have never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 37 samples	No		
			PCE	5.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 37 samples	No		

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD (Continued)

Well[a]	Site This Well Was Intended to Monitor[a]	Date of Site Remedial Action (Remedial Action)[a]	Monitored Compounds[a]	Groundwater Concentration Requiring Evaluation (µg/L)[b]	Historical Maximum Concentration (Result and Event)	Last Exceedance of a Groundwater Concentration Requiring Evaluation, if any (Result and Event)[a]	Number of Samples Collected Since Last Exceedance	Most Recent Concentration (Result and Event)	Time Period and Number of Samples Collected Prior to Remedial Action	Time Period and Number of Samples Collected After Remedial Action	Exceed the Groundwater Concentration Requiring Evaluation in the Last Three Years Well Was Sampled?[a]	Evaluation	Monitoring Recommendations
LM156A	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 41 samples	No	ROD monitoring requirements have not been met for TCE. TCE exceeded the ACL within last three years. PCE has never exceeded the ACL, and 1,1-DCE has never been detected. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	9.85 µg/L - 2Q99	5.3 µg/L - 3Q14	0	5.3 µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 41 samples	**Yes**		
			PCE	5.0	0.26J µg/L - 1Q00	Never Exceeded	NA	0.26J µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 41 samples	No		
LM157A	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 41 samples	No	ROD monitoring requirements have not been met for TCE. TCE exceeded the ACL within last three years. PCE has never exceeded the ACL, and 1,1-DCE has never been detected. Sampling necessary for TCE.	Sample yearly for VOCs.
			TCE	5.0	7.61 µg/L - 3Q07	5.4 µg/L - 3Q14	0	5.4 µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14- 41 samples	**Yes**		
			PCE	5.0	0.41 µg/L - 4Q00	Never Exceeded	NA	0.23J µg/L - 3Q13	NA - well installed after 3Q98	2Q99 - 3Q14- 41 samples	No		
LM158B	OU 1	Ongoing since 4Q98 (GW P&T)	1,1-DCE	6.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 42 samples	No	ROD monitoring requirements have been met. TCE has never exceeded the ACL, and 1,1-DCE and PCE have never been detected. Sampling not necessary.	Although ROD monitoring requirements have been met, well will be sampled yearly for VOCs to provide guard well data for the Banta Road TCE Plume.
			TCE	5.0	0.55 µg/L - 3Q14	Never Exceeded	NA	0.55 µg/L - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 42 samples	No		
			PCE	5.0	Never Detected	Never Detected	NA	ND - 3Q14	NA - well installed after 3Q98	2Q99 - 3Q14 - 42 samples	No		
OU 1 - Dieldrin Wells													
LM028A	OU 1	Ongoing since 3Q03 (GW P&T)	Dieldrin	0.05	0.256 µg/L - 1Q94	0.076 µg/L - 3Q14	0	0.076 µg/L - 3Q14	2Q91 - 2Q03 - 25 samples	3Q03 - 3Q14 - 15 samples	**Yes**	ROD monitoring requirements have not been met for dieldrin. Dieldrin exceeded the ACL within last three years. Sampling necessary for dieldrin.	Sample yearly for dieldrin.
SWMU/Soil Contamination Area Wells													
LM032AU	Area 3 (DSERTS 68)	Ongoing periodically since 4Q00 (SVE)	1,1-DCE	6.0	13.6 µg/L - 1Q92	6.6 µg/L - 1Q95	46	ND - 3Q14	1Q87 - 3Q00 - 39 samples	4Q00 - 3Q14 - 24 samples	No	ROD monitoring requirements have not been met for PCE. PCE exceeded the ACL within last three years. 1,1-DCE has not exceeded the ACL since 1Q95 and TCE since 3Q07. Sampling necessary for PCE.	Sample yearly for VOCs.
			TCE	5.0	111 µg/L - 3Q91	5.79 µg/L - 3Q07	7	2.4 µg/L - 3Q14	1Q87 - 3Q00 - 39 samples	4Q00 - 3Q14 - 24 samples	No		
			PCE	5.0	240 µg/L - 2Q95	5.6 µg/L - 3Q13	1	4.1 µg/L - 3Q14	1Q87 - 3Q00 - 39 samples	4Q00 - 3Q14 - 24 samples	**Yes**		

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD (Continued)

Well[a]	Site This Well Was Intended to Monitor[a]	Date of Site Remedial Action (Remedial Action)[a]	Monitored Compounds[a]	Groundwater Concentration Requiring Evaluation (µg/L)[b]	Historical Maximum Concentration (Result and Event)	Last Exceedance of a Groundwater Concentration Requiring Evaluation, if any (Result and Event)[a]	Number of Samples Collected Since Last Exceedance	Most Recent Concentration (Result and Event)	Time Period and Number of Samples Collected Prior to Remedial Action	Time Period and Number of Samples Collected After Remedial Action	Exceed the Groundwater Concentration Requiring Evaluation in the Last Three Years Well Was Sampled?[a]	Evaluation	Monitoring Recommendations
LM003AA	SWMUs 2/3 (DSERTS 2/3)	September 1997 - July 1998 (Excavation/LUCs)	bis(2-ethylhexyl) phthalate	10	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q98 - 7 samples	4Q98 - 3Q03 - 8 samples	No	ROD requirements have not been met for dieldrin. Of the OC pesticides, only chlordane and dieldrin have ever exceeded their respective ACL and chlordane has not exceeded the ACL within the last three years. Dieldrin exceeded the ACL within the last three years. C/U pesticides have never exceeded their respective groundwater concentrations requiring evaluation, and SVOCs and 2,4-D have never been detected. Sampling necessary for dieldrin.	Sample twice a year for OC pesticides. No sampling recommended for C/U pesticides, SVOCs, or 2,4-D because they have either never exceeded their respective groundwater concentrations requiring evaluation or never been detected.
			2,4-Dimethylphenol	140	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q98 - 7 samples	4Q98 - 3Q03 - 8 samples	No		
			di-n-Butylphthalate	700	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q98 - 7 samples	4Q98 - 3Q03 - 8 samples	No		
			4-Methylphenol	10	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q98 - 7 samples	4Q98 - 3Q03 - 8 samples	No		
			Aldrin	0.05	0.014 µg/L - 2Q93	Never Exceeded	NA	ND - 3Q14	2Q91 - 3Q98 - 17 samples	4Q98 - 3Q14- 24 samples	No		
			Chlordane	0.1	0.668 µg/L - 1Q97	0.114J µg/L - 3Q11	3	ND - 3Q14	2Q91 - 3Q98 - 18 samples	4Q98 - 3Q14- 24 samples	No		
			4,4´-DDD	0.15	0.052 µg/L - 4Q94	Never Exceeded	NA	ND - 3Q14	2Q91 - 3Q98 - 17 samples	4Q98 - 3Q14- 24 samples	No		
			4,4´-DDE	0.1	0.017 µg/L - 4Q94	Never Exceeded	NA	ND - 3Q14	2Q91 - 3Q98 - 17 samples	4Q98 - 3Q14 - 24 samples	No		
			4,4´-DDT	0.1	0.017 µg/L - 4Q94	Never Exceeded	NA	ND - 3Q14	2Q91 - 3Q98 - 18 samples	4Q98 - 3Q14 - 24 samples	No		
			Dieldrin	0.05	1.0 µg/L - 4Q95	0.054 µg/L - 1Q14	1	0.033 µg/L - 3Q14	2Q91 - 3Q98 - 18 samples	4Q98 - 3Q14- 24 samples	**Yes**		
			Endrin	2	0.034 µg/L - 4Q94	Never Exceeded	NA	ND - 3Q14	2Q91 - 3Q98 - 15 samples	4Q98 - 3Q14 - 24 samples	No		
			Heptachlor Epoxide	0.01	Never Detected	Never Detected	NA	ND - 3Q14	2Q91 - 3Q98 - 16 samples	4Q98 - 3Q14 - 24 samples	No		
			Lindane (gamma-BHC)	0.03	Never Detected	Never Detected	NA	ND - 3Q08	2Q91 - 3Q98 - 16 samples	4Q98 - 3Q08 - 13 samples	No		
			Diuron	14	1.17 µg/L - 4Q93	Never Exceeded	NA	ND - 3Q03	3Q92 - 3Q98 - 12 samples	4Q98 - 3Q03 - 8 samples	No		
			Monuron	1	0.27 µg/L - 4Q94	Never Exceeded	NA	ND - 3Q03	3Q92 - 3Q98 - 12 samples	4Q98 - 3Q03 - 8 samples	No		
			2,4-D	70	Never Detected	Never Detected	NA	ND - 3Q03	3Q91 - 3Q98 - 6 samples	4Q98 - 3Q03 - 5 samples	No		
LM085B	SWMU 20 (DSERTS 20)	September 1997 - July 1998/June - November 1999 (Excavation/LUCs) SVE Treatment System Operation from 2011-2013	Ethylbenzene	29	Never Detected	Never Detected	NA	ND - 3Q14	3Q90 - 3Q12 - 30 samples	3Q13 - 3Q14 - 2 samples	No	The ROD remedy for SWMU 20 was modified in the 2011 ESD to include an SVE remedy. The remedy for groundwater protection was complete in 2012. ROD monitoring requirements have not been met. VOCs and TPHD have never exceeded their respective groundwater concentrations requiring evaluation, and SVOCs, OC and C/U pesticides, and herbicides have never been detected.	No sampling recommended for SVOCs, TPHD, and OC and C/U pesticides and herbicides because they have never been detected. ROD required sampling for VOCs will occur for three years post remedial action.
			Xylenes	17	Never Detected	Never Detected	NA	ND - 3Q14	3Q90 - 3Q12 - 30 samples	3Q13 - 3Q14 - 2 samples	No		
			PCE	2	0.96 µg/L - 3Q91	Never Exceeded	NA	ND - 3Q14	3Q90 - 3Q12 - 30 samples	3Q13 - 3Q14 - 2 samples	No		
			TCE	2.3	Never Detected	Never Detected	NA	ND - 3Q14	3Q90 - 3Q12 - 30 samples	3Q13 - 3Q14 - 2 samples	No		
			Diethylphthalate	5,600	Never Detected	Never Detected	NA	ND - 3Q07	1Q97 - 3Q07 - 13 samples	NA	No		
			2,4-Dinitrophenol	50	Never Detected	Never Detected	NA	ND - 3Q07	1Q97 - 3Q07 - 13 samples	NA	No		
			Pentachlorophenol	50	Never Detected	Never Detected	NA	ND - 3Q07	1Q97 - 3Q07- 13 samples	NA	No		
			2,4,6-Trichlorophenol	10	Never Detected	Never Detected	NA	ND - 3Q07	1Q97 - 3Q07 - 13 samples	NA	No		
			Dieldrin	0.05	Never Detected	Never Detected	NA	ND - 3Q09	2Q91 - 3Q09 - 17 samples	NA	No		
			Methiocarb	5	Never Detected	Never Detected	NA	ND - 3Q03	4Q94 - 3Q03 - 11 samples	NA	No		
			Linuron	2	Never Detected	Never Detected	NA	ND - 3Q03	4Q94 - 3Q03 - 11 samples	NA	No		
			MCPA	380	Never Detected	Never Detected	NA	ND - 3Q07	3Q91 - 3Q07 - 15 samples	NA	No		
			TPHD	100	80 µg/L - 3Q03	Never Exceeded	NA	ND - 3Q09	2Q91 - 3Q09 - 17 samples	NA	No		

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD (Continued)

Well[a]	Site This Well Was Intended to Monitor[a]	Date of Site Remedial Action (Remedial Action)[a]	Monitored Compounds[a]	Groundwater Concentration Requiring Evaluation (µg/L)[b]	Historical Maximum Concentration (Result and Event)	Last Exceedance of a Groundwater Concentration Requiring Evaluation, if any (Result and Event)[a]	Number of Samples Collected Since Last Exceedance	Most Recent Concentration (Result and Event)	Time Period and Number of Samples Collected Prior to Remedial Action	Time Period and Number of Samples Collected After Remedial Action	Exceed the Groundwater Concentration Requiring Evaluation in the Last Three Years Well Was Sampled?[a]	Evaluation	Monitoring Recommendations
LM115AU	SWMU 20 (DSERTS 20)	September 1997 - July 1998/June - November 1999 (Excavation/LUCs) SVE Treatment System Operation from 2011-2013	Ethylbenzene	29	Never Detected	Never Detected	NA	ND - 3Q14	3Q93 - 3Q12 - 41 samples	3Q13 - 3Q14 - 2 samples	No	The ROD remedy for SWMU 20 was modified in the 2011 ESD to include an SVE remedy. The remedy for groundwater protection was complete in 2012. ROD monitoring requirements have not been met. TCE has not exceeded the groundwater concentrations requiring evaluation since 1Q01. PCE has not exceeded the groundwater concentrations requiring evaluation since 3Q11.	No sampling recommended for SVOCs, and OC and C/U pesticides and herbicides because they have never been detected. ROD required sampling for VOCs will occur for three years post remedial action.
			Xylenes	17	Never Detected	Never Detected	NA	ND - 3Q14	3Q93 - 3Q12 - 41 samples	3Q13 - 3Q14 - 2 samples	No		
			PCE	2	39 µg/L - 4Q94	2.01 µg/L - 3Q11	3	1.6 µg/L - 3Q14	3Q93 - 3Q12 - 41 samples	3Q13 - 3Q14 - 2 samples	No		
			TCE	2.3	130 µg/L - 4Q94	3.4 µg/L - 1Q01	14	0.51 µg/L - 3Q14	3Q93 - 3Q12 - 41 samples	3Q13 - 3Q14 - 2 samples	No		
			Diethylphthalate	5,600	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 18 samples	NA	No		
			2,4-Dinitrophenol	50	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 19 samples	NA	No		
			Pentachlorophenol	50	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 19 samples	NA	No		
			2,4,6-Trichlorophenol	10	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 19 samples	NA	No		
			Dieldrin	0.05	Never Detected	Never Detected	NA	ND - 3Q09	4Q93 - 3Q09 - 30 samples	NA	No		
			Methiocarb	5	Never Detected	Never Detected	NA	ND - 3Q03	4Q93 - 3Q03 - 25 samples	NA	No		
			Linuron	2	Never Detected	Never Detected	NA	ND - 3Q03	4Q93 - 3Q03 - 25 samples	NA	No		
			MCPA	380	Never Detected	Never Detected	NA	ND - 3Q03	4Q93 - 3Q03 - 25 samples	NA	No		
LM093AU/LM175AU (Note: LM093AU was replaced by LM175AU because it was decommissiond prior to the excavation at SWMU 20.)	SWMU 20 (DSERTS 20)	September 1997 - July 1998/June - November 1999 (Excavation/LUCs) SVE Treatment System Operation from 2011-2013	Ethylbenzene	29	Never Detected	Never Detected	NA	ND - 3Q14	3Q93 - 3Q12 - 42 samples	3Q13 - 3Q14 - 2 samples	No	The ROD remedy for SWMU 20 was modified in the 2011 ESD to include an SVE remedy. The remedy for groundwater protection was complete in 2012. ROD monitoring requirements have not been met for VOCs and OC pesticides. TCE has not exceeded the ACL since 3Q03 and PCE has never exceeded the ACL. Other VOCs have never exceeded their respective groundwater concentrations requiring evaluation. Dieldrin has not exceeded its groundwater concentration requiring evaluation since 3Q02.	No sampling recommended for SVOCs, and C/U pesticides because they have never been detected. ROD required sampling for VOCs and OC pesticides will occur for three years post remedial action.
			Xylenes	17	Never Detected	Never Detected	NA	ND - 3Q14	3Q93 - 3Q12 - 42 samples	3Q13 - 3Q14 - 2 samples	No		
			PCE	2	4.77 µg/L - 2Q08	4.77 µg/L - 2Q08	5	ND - 3Q14	3Q93 - 3Q12 - 42 samples	3Q13 - 3Q14 - 2 samples	No		
			TCE	2.3	200 µg/L - 4Q93	5.4 µg/L - 3Q03	12	0.44J µg/L - 3Q14	3Q93 - 3Q12 - 42 samples	3Q13 - 3Q14 - 2 samples	No		
			Diethylphthalate	5,600	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 10 samples	NA	No		
			2,4-Dinitrophenol	50	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 10 samples	NA	No		
			Pentachlorophenol	50	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 10 samples	NA	No		
			2,4,6-Trichlorophenol	10	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 10 samples	NA	No		
			Dieldrin	0.05	0.091 µg/L - 3Q02	0.091 µg/L - 3Q02	7	0.0132J µg/L - 3Q09	3Q93 - 3Q09 - 32 samples	NA	No		
			Methiocarb	5	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 17 samples	NA	No		
			Linuron	2	Never Detected	Never Detected	NA	ND - 3Q03	3Q93 - 3Q03 - 17 samples	NA	No		

Table B-2. Groundwater Monitoring Information for Existing Wells Specified in the Comprehensive ROD (Continued)

[a] Information in these columns was used for determining whether ROD monitoring requirements have been fulfilled.
[b] For OU 1 and three SVE sites (SWMU 1/Area 2, Area 1/Building 237, and Area 3), the groundwater concentrations requiring evaluation are the ACLs for 1,1-DCE, TCE, PCE, and/or dieldrin. For the other SWMUs/DSERTS sites, the groundwater concentrations requiring evaluation are not ACLs, unless noted otherwise (see footnote c).
[c] VOCs are required for monitoring as listed in Table 9-2 of the 1998 ROD, but a groundwater concentration requiring evaluation was not provided for specific VOC. Therefore, the VOCs to be monitored were assumed to be the VOC COCs (1,1-DCE, TCE, and PCE), and the ACLs for those COCs were used for comparison.

= Wells that have satisfied ROD monitoring requirements; no sampling is recommended.
= Wells that have not satisfied ROD monitoring requirements; sampling is recommended.
= Wells that have satisfied ROD monitoring requirements; however, sampling is recommended by the Well Monitoring Program.

ACL = aquifer cleanup level
Be = beryllium
BHC = hexachlorocyclohexane
COC = contaminant of concern
CPT = cone penetrometer test
C/U = carbamate/urea
D = dichlorophenoxyacetic acid
DCE = dichloroethene
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
DSERTS = Defense Site Environmental Restoration Tracking System
ESD = explanation of significant difference
GW = groundwater
J = estimated concentration
LUC = land use control
MCPA = 2-methyl-4-chlorophenoxyacetic acid
NA = not applicable
ND = not detected
NFA = no further action
NWC = northwest corner
OC = organochlorine
OU = operable unit
PAH = polycyclic aromatic hydrocarbon
PCE = tetrachloroethene
P&T = pump-and-treat
ROD = record of decision
SSL = sanitary sewage lagoon
SVE = soil vapor extraction
SVOC = semivolatile organic compound
SWMU = solid waste management unit
TCE = trichloroethene
TPHD = total petroleum hydrocarbon as diesel
TPHMO = total petroleum hydrocarbon as motor oil
Site = Defense Distribution Depot San Joaquin
VOC = volatile organic compound
µg/L = micrograms per liter
4Q98 = fourth quarter 1998 (quarter/year)

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APPENDIX C

Third Five-Year Review Questionnaires

Defense Distribution Depot San Joaquin

Third Five-Year Review Survey – Questionnaire A

This questionnaire is being distributed to individuals who are, or have previously been involved with the Installation Restoration Program (IRP) at the Defense Distribution Depot San Joaquin (Tracy Site) and community members who may provide insight on the public's impression of the Tracy Site IRP program. Details on the Tracy Site IRP program are available on the following Environmental protection Agency webpage:

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CA4971520834

Please respond to the following questions and return this survey by mail to Charles O'Neill, 2365 Iron Point Road, Suite 300, Folsom, California 95630 or by electronic mail to: charles.oneill@hdrinc.com by December 1, 2014

Name: _____Jim Brownell_____

Affiliation: ____Central Valley Water Board, former RPM for site____

Date: _____12 November 2014_____

1. What is your general impression of the effectiveness of IRP remedies at the Tracy Site and do you feel that they are adequately protecting human health and the environment?

I think the remedies haves worked well. The protection of human health and the environment

2. Are you aware of any potential remedy optimizations that could lower cost while complying with decision document requirements?

No.

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

The potential for agricultural pumping in the aquifer above the Corcoran Clay to spread the plumes of contaminants, although this is becoming much less of an issue as the groundwater the plumes become smaller and concentrations less.

4. Are you aware of any impending land use changes, on or in the vicinity of the Tracy Site that could result in a change of the IRP remedy protectiveness?

No.

5. Are you aware of any impending changes in the regulatory climate that may result in changes to the cleanup goals, thereby reducing the protectiveness of IRP remedies?

No.

6. Has the Tracy Site complied with permitting and reporting requirements?

As far as I know, yes.

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

None during my tenure that I'm aware of. And I'm not aware of any since that time.

8. Have there been unexpected Operations and Maintenance difficulties or costs at the Tracy Site in the last five years?

I don't think so.

9. How has the Tracy Site progressed toward meeting decision document remedial actions since the last Five-year Review in 2010?

Very well. I have been impressed with how much the concentrations of TCE and PCE have reduced.

10. Do you have any comments, suggestions, or recommendations regarding the Tracy Site IRP?

No.

Defense Distribution Depot San Joaquin – Tracy Site

Third Five-Year Review Survey

This questionnaire is being distributed to individuals who are, or have previously been involved with the Installation Restoration Program (IRP) at the Defense Distribution Depot San Joaquin (Tracy Site) and community members who may provide insight on the public's impression of the Tracy Site IRP program. Details on the Tracy Site IRP program are available on the following Environmental protection Agency webpage:

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CA4971520834

Please respond to the following questions and return this survey by mail to Charles O'Neill, 2365 Iron Point Road, Suite 300, Folsom, California 95630 or by electronic mail to: charles.oneill@hdrinc.com by December 1, 2014

Name: Paul Marsden_____

Affiliation: HDR Inc._____

Date:12/4/14_____

1. What is your overall impression of the Tracy Site IRP?

I feel that the site is operating well but i am concerned with the removal of extraction wells during droughts.

2. Are the remedies functioning as expected? How well are the remedies performing?

The repairs and modifications that we have made are preforming properly and have helped improve the system performance. But it is an ongoing task and will constantly need updating and improving.

3. What does the monitoring data show? Are there any trends that show contaminant levels are increasing or decreasing?

There are no data points in my area of work that tell me weather or not contaminate levels are getting better or not. I do not see the reports from the labs on the sampling, the SCADA system doesn't check for contaminate.

4. not a continuous on-site presence, describe staff and frequency of treatment plant inspections and activities.

I am the onsite staff for the O&M, I do have others that I can call on for the times when I am out of town or sick. Inspections are preformed daily on the treatment plant, extraction wells and SCADA system. Some of the equipment is quite old and all of it is exposed in one way or the other to the outside elements….. ie. Cold, heat, dust, dampness, insects at times and wild life.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedies? Please describe changes and impacts.

The only changes are the upgrades that we make to the system, replacing pumps, motors, computers, programs, repairing damaged wiring, fiber optics. All of these effect the production of the plant bt over all they do help

6. Have there been unexpected O&M difficulties or costs associated with the IRP at the Tracy Site in the last five years? If so, please give details.

From my prospective there have just been normal maintenance issues with the system. Things like the upgrading the PLC's and the MCP are part of the normal maintenance of the systems but are no always seen as that. Pumps burn out, pipes break, computers need replacing, and communications is lost. All of these things are normal, just never planed for and always happen when least expected

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

I feel we have been staying on top of all of the opportunities to optimize the sampling and O&M system. Or at least making sure the client is aware of what is need, what could be done and what has to be done.

As the system has been slowing down we have made changes to it, like the replacement of a 40Hp transfer pump to a much smaller and more efficient motor and pump. The upgrade of the MCP and LCP's, both have reduced the Emergency Reponses (System shutting down) tremendously. They have improved reliability and control of the over all system.

8. Do you have any comments, suggestions, or recommendations regarding the IRP?

Just that I am concerned with us being in a drought … water table being lower than normal and that when we do start to get rain and the water table comes back up. We might see contamination levels return and at that point we will need to increase the extraction wells running. They will need LCP's replaced, possibly pumps and level transducers….. just a good overhaul and possibly a lot of money.

Defense Distribution Depot San Joaquin – Tracy Site

Third Five-Year Review Survey

This questionnaire is being distributed to individuals who are, or have previously been involved with the Installation Restoration Program (IRP) at the Defense Distribution Depot San Joaquin (Tracy Site) and community members who may provide insight on the public's impression of the Tracy Site IRP program. Details on the Tracy Site IRP program are available on the following Environmental protection Agency webpage:

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CA4971520834

Please respond to the following questions and return this survey by mail to Charles O'Neill, 2365 Iron Point Road, Suite 300, Folsom, California 95630 or by electronic mail to: charles.oneill@hdrinc.com by December 1, 2014

Name: Glenn S Robertson

Affiliation:

Date: 11/12/14

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

   64 yrs Local Resident

2. What is your overall impression of the Tracy Site IRP?

   Fine

3. What effects has Tracy Site IRP operations had on the surrounding community?

   Minimal, except for Raspo Family interests.

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

No

5. Are you aware of any events, incidents, or activities at the Tracy Site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

Midnight dumping by UnSubs
Metal theft at night
} same hazard as everyone in area

6. Do you feel well informed about the Tracy Site's activities and progress?

Yes

7. Are you aware that Tracy Site IRP documents are available to the public on the State of California GeoTracker webpage?

No

8. Do you have any comments, suggestions, or recommendations regarding the Tracy Site's management or operation?

Overkill by EPA
DOD needed to use funds expended on this Site in other endeavers

Defense Distribution Depot San Joaquin

Third Five-Year Review Survey – Questionnaire A

This questionnaire is being distributed to individuals who are, or have previously been involved with the Installation Restoration Program (IRP) at the Defense Distribution Depot San Joaquin (Tracy Site) and community members who may provide insight on the public's impression of the Tracy Site IRP program. Details on the Tracy Site IRP program are available on the following Environmental protection Agency webpage:

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CA4971520834

Please respond to the following questions and return this survey by mail to Charles O'Neill, 2365 Iron Point Road, Suite 300, Folsom, California 95630 or by electronic mail to: charles.oneill@hdrinc.com by December 1, 2014

Name:__Christopher Sherman__

Affiliation:____DTSC_____

Date:_____November 13, 2014_____

1. What is your general impression of the effectiveness of IRP remedies at the Tracy Site and do you feel that they are adequately protecting human health and the environment?

   The opinion of the DTSC is that the remedies in place are effective and are adequately protecting the human health and the environment.

2. Are you aware of any potential remedy optimizations that could lower cost while complying with decision document requirements?

   The DLA and their contractor HDR have done a good job of evaluating alternative remedies and optimizations.

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

   Containment of the Banta Road plume.

4. Are you aware of any impending land use changes, on or in the vicinity of the Tracy Site that could result in a change of the IRP remedy protectiveness?

   No.

5. Are you aware of any impending changes in the regulatory climate that may result in changes to the cleanup goals, thereby reducing the protectiveness of IRP remedies?

   No.

6. Has the Tracy Site complied with permitting and reporting requirements?

   Yes.

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

   No.

8. Have there been unexpected Operations and Maintenance difficulties or costs at the Tracy Site in the last five years?

   No.

9. How has the Tracy Site progressed toward meeting decision document remedial actions since the last Five-year Review in 2010?

   Good progress.

10. Do you have any comments, suggestions, or recommendations regarding the Tracy Site IRP?

    Good team. Good progress. No recommendations.

Defense Distribution Depot San Joaquin – Tracy Site

Third Five-Year Review Survey

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Name: Luis Mejia

Affiliation: City of Tracy Representative

Date: November 29, 2014

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

   I have worked in the City of Tracy since 2003. I am employed in the capacity of Police Lieutenant with the City of Tracy Police Department.

2. What is your overall impression of the Tracy Site IRP?

   I have a favorable impression of the Tracy site. Recently I've had increased interaction with the DLA Police Department. This is a positive step towards working together and building partnerships.

3. What effects has Tracy Site IRP operations had on the surrounding community?

   The sites operations stay within the perimeter of the installation. I do not have any information on negative or positive effects of operations on the surrounding community.

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

   I am not aware of any community concerns regarding the Tracy Site or the IRP operations or administration.

5. Are you aware of any events, incidents, or activities at the Tracy Site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

   In August 2014, the Tracy Police Department participated in a large scale active shooter exercise with the Defense Depot. This was an opportunity to work with the DLA Police Department and work through a live emergency preparedness exercise.

6. Do you feel well informed about the Tracy Site's activities and progress?

   I do not feel well informed about the Tracy Site's activities and progress. I had no idea the site was working on ground water contamination issues until I read about it on the EPA's website.

7. Are you aware that Tracy Site IRP documents are available to the public on the State of California GeoTracker webpage?

   I had no idea the documents were available to the public.

8. Do you have any comments, suggestions, or recommendations regarding the Tracy Site's management or operation?

   I would recommend the continued efforts to work with the City of Tracy. The DLA is a large installation and the only time we interact is during training or if we have a meeting with someone. Overall, the operation seems to run efficiently with no assistance from local authorities.

APPENDIX D

ProUCL Output Data

Table 7.Supplement.1. Data Summary Input for ProUCL - Operable Unit 1 Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
EW026B	2/19/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW026B	5/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW026B	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
EW026B	9/5/13	BD1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
EW026B	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.00	0.05	U	N	0.05	0
EW027B	2/19/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW027B	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW028B	2/20/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW028B	6/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
EW028B	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
EW028B	12/11/13	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
EW042AU	2/20/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW042AU	5/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
EW042AU	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW042AU	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.03	0.05	J	Y	0.03	1
EW044AU	5/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW044AU	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW044AU	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.03	0.06	J	Y	0.03	1
EW047AU	2/19/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW047AU	2/19/13	BD1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW047AU	5/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW047AU	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW047AU	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.05	0.05	J	Y	0.05	1
EW048AU	2/19/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01		Y	0.06	1
EW048AU	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01	J	Y	0.06	1
EW048AU	9/5/13	BD1	SW8081B	SW3510C	Dieldrin	0.04	0.01	J	Y	0.04	1
LM003AA	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM028A	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM029B	9/11/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01		Y	0.06	1
LM050A	9/16/13	NS1	SW8081B	SW3510C	Dieldrin	0.00	0.01	U	N	0.01	0
LM062AU	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01	J	Y	0.06	1
LM062AU	9/10/13	BD1	SW8081B	SW3510C	Dieldrin	0.00	0.01	UJ	N	0.01	0
LM066A	9/13/13	NS1	SW8081B	SW3510C	Dieldrin	0.00	0.01	UJ	N	0.01	0
LM067B	9/13/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
LM081C	9/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
LM102B	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.00	0.01	U	N	0.01	0
LM117A	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.00	0.01	U	N	0.01	0
LM135B	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01		Y	0.06	1
LM200AU	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01		Y	0.06	1
BC001	2/19/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
BC001	5/1/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
BC001	9/12/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
BC001	12/11/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW009B	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.30	0.50		Y	1.30	1
EW009B	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.00	0.50		Y	1.00	1
EW009B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.10	0.50		Y	1.10	1
EW009B	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	1.56	0.50		Y	1.56	1
EW009B	12/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.60	0.50		Y	1.60	1
EW011AU	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW011AU	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW011AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW011AU	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW018A	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.51	0.50		Y	0.51	1
EW018A	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.46	0.50	J	Y	0.46	1
EW018A	5/1/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.45	0.50	J	Y	0.45	1
EW018A	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.47	0.50	J	Y	0.47	1

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Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
EW018A	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	0.48	0.50	J	Y	0.48	1
EW018A	12/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.47	0.50	J	Y	0.47	1
EW019A	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.20	0.50		Y	1.20	1
EW019A	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.98	0.50		Y	0.98	1
EW019A	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.00	0.50		Y	1.00	1
EW019A	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	1.07	0.50		Y	1.07	1
EW020A	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.72	0.50		Y	0.72	1
EW020A	2/19/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.75	0.50		Y	0.75	1
EW020A	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.61	0.50		Y	0.61	1
EW020A	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.63	0.50		Y	0.63	1
EW020A	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	0.77	0.50		Y	0.77	1
EW024B	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.14	0.50	J	Y	0.14	1
EW024B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.14	0.50	J	Y	0.14	1
EW024B	12/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.13	0.50	J	Y	0.13	1
EW024B	12/11/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.16	0.50	J	Y	0.16	1
EW025B	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.43	0.50	J	Y	0.43	1
EW025B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.33	0.50	J	Y	0.33	1
EW026B	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.60	0.50		Y	2.60	1
EW026B	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.70	0.50		Y	1.70	1
EW026B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.70	0.50		Y	2.70	1
EW026B	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	4.06	0.50		Y	4.06	1
EW026B	12/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.20	0.50		Y	2.20	1
EW027B	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.10	0.50		Y	3.10	1
EW027B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.80	0.50		Y	2.80	1
EW028B	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.10	0.50		Y	1.10	1
EW028B	6/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.97	0.50		Y	0.97	1
EW028B	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.00	0.50		Y	1.00	1
EW028B	12/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.10	0.50		Y	1.10	1
EW031C	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.49	0.50	J	Y	0.49	1
EW031C	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.29	0.50	J	Y	0.29	1
EW031C	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.37	0.50	J	Y	0.37	1
EW031C	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	0.49	0.50	J	Y	0.49	1
EW034AU	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.90	0.50		Y	3.90	1
EW034AU	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.40	0.50		Y	3.40	1
EW034AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.60	0.50		Y	3.60	1
EW034AU	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	3.74	0.50		Y	3.74	1
EW042AU	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.70	0.50		Y	2.70	1
EW042AU	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.70	0.50		Y	1.70	1
EW042AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.60	0.50		Y	1.60	1
EW042AU	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	3.67	0.50		Y	3.67	1
EW042AU	12/4/12	BD1	SW8260B	SW5030C	Tetrachloroethene (PCE)	3.91	0.50		Y	3.91	1
EW044AU	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.70	0.50		Y	1.70	1
EW046AU	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.50	0.50		Y	2.50	1
EW046AU	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.20	0.50		Y	2.20	1
EW046AU	5/1/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.20	0.50		Y	2.20	1
EW046AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.30	0.50		Y	2.30	1
EW046AU	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	2.33	0.50		Y	2.33	1
EW047AU	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.90	0.50		Y	1.90	1
EW047AU	6/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
EW047AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.82	0.50		Y	0.82	1
EW047AU	12/4/12	NS1	SW8260B	SW5030C	Tetrachloroethene (PCE)	0.82	0.50		Y	0.82	1
EW048AU	2/19/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.70	0.50		Y	1.70	1
EW048AU	2/19/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.80	0.50		Y	1.80	1
EW048AU	9/5/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.80	0.50		Y	1.80	1
FW001	2/19/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
FW001	5/1/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0

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Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
FW001	9/12/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
FW001	12/11/13	NS1	E524.2	METHOD	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM024A	9/10/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	4.50	0.50		Y	4.50	1
LM029B	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.00	0.50		Y	3.00	1
LM030AUA	9/9/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	16.00	0.50		Y	16.00	1
LM032AU	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	5.60	0.50		Y	5.60	1
LM034B	9/9/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.40	0.50		Y	1.40	1
LM041B	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM050A	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.75	0.50		Y	0.75	1
LM050A	9/16/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.73	0.50		Y	0.73	1
LM055B	9/13/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.90	0.50		Y	1.90	1
LM056C	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.80	0.50		Y	1.80	1
LM057D	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM058AU	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	10.00	0.50		Y	10.00	1
LM063A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM064B	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM065C	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.27	0.50	J	Y	0.27	1
LM066A	9/13/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.10	0.50		Y	2.10	1
LM067B	9/13/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.70	0.50		Y	3.70	1
LM067B	9/13/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.50	0.50		Y	3.50	1
LM068A	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.33	0.50	J	Y	0.33	1
LM069B	9/13/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.25	0.50	J	Y	0.25	1
LM070C	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.14	0.50	J	Y	0.14	1
LM072A	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.00	0.50		Y	1.00	1
LM073B	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.42	0.50	J	Y	0.42	1
LM080A	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.18	0.50	J	Y	0.18	1
LM081C	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.35	0.50	J	Y	0.35	1
LM085B	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM085B	9/11/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM115AU	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	2.00	0.50		Y	2.00	1
LM117A	9/10/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.80	0.50		Y	0.80	1
LM137A	9/9/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	4.30	0.50		Y	4.30	1
LM149A	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.29	0.50	J	Y	0.29	1
LM150A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.74	0.50		Y	0.74	1
LM150A	9/12/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.69	0.50		Y	0.69	1
LM151B	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.35	0.50	J	Y	0.35	1
LM152A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.31	0.50	J	Y	0.31	1
LM153B	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM154A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.16	0.50	J	Y	0.16	1
LM155B	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM156A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.24	0.50	J	Y	0.24	1
LM157A	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.23	0.50	J	Y	0.23	1
LM158B	9/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM175AU	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM180A	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.65	0.50		Y	0.65	1
LM181B	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM181B	9/16/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM182A	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.96	0.50		Y	0.96	1
LM183B	9/16/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.97	0.50		Y	0.97	1
LM184A	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.40	0.50		Y	1.40	1
LM185B	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.24	0.50	J	Y	0.24	1
LM186A	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.20	0.50		Y	1.20	1
LM186A	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	1.30	0.50		Y	1.30	1
LM187B	9/17/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.54	0.50		Y	0.54	1
LM196AU	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM197B	9/6/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0

Table 7.Supplement.1. Data Summary Input for ProUCL - Operable Unit 1 Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
LM197B	9/5/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM198AU	2/21/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM198AU	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM198AU	9/11/13	BD4	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM199AU	2/21/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM199AU	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM200AU	2/21/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM200AU	9/10/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM201AU	2/21/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM201AU	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM202AU	2/21/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM202AU	2/21/13	BD1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM202AU	9/11/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
LM203A	2/20/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	3.00	0.50		Y	3.00	1
LM203A	5/1/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	27.00	0.50		Y	27.00	1
LM203A	9/10/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	15.00	0.50		Y	15.00	1
LM203A	12/12/13	NS1	SW8260B	SW5030	Tetrachloroethene (PCE)	15.00	0.50		Y	15.00	1
BC001	12/4/12	NS1	524.2		Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
FW001	12/4/12	NS1	524.2		Tetrachloroethene (PCE)	0.00	0.50	U	N	0.50	0
BC001	2/19/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
BC001	5/1/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.09	0.50	J	Y	0.09	1
BC001	9/12/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
BC001	12/11/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.16	0.50	J	Y	0.16	1
EW009B	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.70	0.50		Y	3.70	1
EW009B	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	6.00	0.50		Y	6.00	1
EW009B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.50	0.50		Y	3.50	1
EW009B	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	6.08	0.50		Y	6.08	1
EW009B	12/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	6.40	0.50		Y	6.40	1
EW011AU	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.67	0.50		Y	0.67	1
EW011AU	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.82	0.50		Y	0.82	1
EW011AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.90	0.50		Y	1.90	1
EW011AU	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	0.67	0.50		Y	0.67	1
EW018A	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.80	0.50		Y	2.80	1
EW018A	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.70	0.50		Y	2.70	1
EW018A	5/1/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	2.60	0.50		Y	2.60	1
EW018A	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.70	0.50		Y	2.70	1
EW018A	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	2.73	0.50		Y	2.73	1
EW018A	12/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.50	0.50		Y	2.50	1
EW019A	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.00	0.50		Y	5.00	1
EW019A	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.90	0.50		Y	4.90	1
EW019A	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.70	0.50		Y	4.70	1
EW019A	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	4.55	0.50		Y	4.55	1
EW020A	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.50	0.50		Y	2.50	1
EW020A	2/19/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	2.70	0.50		Y	2.70	1
EW020A	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.60	0.50		Y	2.60	1
EW020A	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.60	0.50		Y	2.60	1
EW020A	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	2.87	0.50		Y	2.87	1
EW024B	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.20	0.50		Y	5.20	1
EW024B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.00	0.50		Y	5.00	1
EW024B	12/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.80	0.50		Y	4.80	1
EW024B	12/11/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	4.60	0.50		Y	4.60	1
EW025B	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	9.30	0.50		Y	9.30	1
EW025B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	8.10	0.50		Y	8.10	1
EW026B	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.30	0.50		Y	4.30	1
EW026B	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.20	0.50		Y	3.20	1
EW026B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.20	0.50		Y	4.20	1

Table 7.Supplement.1. Data Summary Input for ProUCL - Operable Unit 1 Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
EW026B	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	5.66	0.50		Y	5.66	1
EW026B	12/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.60	0.50		Y	3.60	1
EW027B	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.50	0.50		Y	5.50	1
EW027B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.20	0.50		Y	5.20	1
EW028B	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.20	0.50		Y	2.20	1
EW028B	6/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.30	0.50		Y	2.30	1
EW028B	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.30	0.50		Y	2.30	1
EW028B	12/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.60	0.50		Y	3.60	1
EW031C	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.60	0.50		Y	1.60	1
EW031C	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.95	0.50		Y	0.95	1
EW031C	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.10	0.50		Y	1.10	1
EW031C	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	1.31	0.50		Y	1.31	1
EW034AU	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.00	0.50		Y	5.00	1
EW034AU	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.60	0.50		Y	4.60	1
EW034AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.90	0.50		Y	3.90	1
EW034AU	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	3.99	0.50		Y	3.99	1
EW042AU	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.70	0.50		Y	1.70	1
EW042AU	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.97	0.50		Y	0.97	1
EW042AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.75	0.50		Y	0.75	1
EW042AU	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	2.57	0.50		Y	2.57	1
EW042AU	12/4/12	BD1	SW8260B	SW5030C	Trichloroethene (TCE)	2.46	0.50		Y	2.46	1
EW044AU	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.40	0.50		Y	1.40	1
EW046AU	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.40	0.50		Y	3.40	1
EW046AU	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.60	0.50		Y	3.60	1
EW046AU	5/1/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	3.70	0.50		Y	3.70	1
EW046AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.60	0.50		Y	2.60	1
EW046AU	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	2.59	0.50		Y	2.59	1
EW047AU	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.90	0.50		Y	2.90	1
EW047AU	6/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
EW047AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.30	0.50		Y	1.30	1
EW047AU	12/4/12	NS1	SW8260B	SW5030C	Trichloroethene (TCE)	0.98	0.50		Y	0.98	1
EW048AU	2/19/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.30	0.50		Y	2.30	1
EW048AU	2/19/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	2.40	0.50		Y	2.40	1
EW048AU	9/5/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.90	0.50		Y	2.90	1
FW001	2/19/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
FW001	5/1/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
FW001	9/12/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
FW001	12/11/13	NS1	E524.2	METHOD	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM024A	9/10/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM029B	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.50	0.50		Y	3.50	1
LM030AUA	9/9/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.20	0.50		Y	2.20	1
LM032AU	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.70	0.50		Y	2.70	1
LM034B	9/9/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.53	0.50		Y	0.53	1
LM041B	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.38	0.50	J	Y	0.38	1
LM050A	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.50	0.50		Y	1.50	1
LM050A	9/16/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	1.60	0.50		Y	1.60	1
LM055B	9/13/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.40	0.50		Y	2.40	1
LM056C	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.80	0.50		Y	4.80	1
LM057D	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.33	0.50	J	Y	0.33	1
LM058AU	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.80	0.50		Y	4.80	1
LM063A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM064B	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.21	0.50	J	Y	0.21	1
LM065C	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.50	0.50		Y	1.50	1
LM066A	9/13/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.10	0.50		Y	2.10	1
LM067B	9/13/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.50	0.50		Y	5.50	1
LM067B	9/13/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	5.20	0.50		Y	5.20	1

Table 7.Supplement.1. Data Summary Input for ProUCL - Operable Unit 1 Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
LM068A	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.60	0.50		Y	1.60	1
LM069B	9/13/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.00	0.50		Y	1.00	1
LM070C	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.47	0.50	J	Y	0.47	1
LM072A	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.20	0.50		Y	1.20	1
LM073B	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.80	0.50		Y	2.80	1
LM080A	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.00	0.50		Y	3.00	1
LM081C	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.95	0.50		Y	0.95	1
LM085B	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM085B	9/11/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM115AU	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.64	0.50		Y	0.64	1
LM117A	9/10/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM137A	9/9/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.90	0.50		Y	3.90	1
LM149A	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.87	0.50		Y	0.87	1
LM150A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.30	0.50		Y	2.30	1
LM150A	9/12/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	2.30	0.50		Y	2.30	1
LM151B	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	8.70	0.50		Y	8.70	1
LM152A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.34	0.50	J	Y	0.34	1
LM153B	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM154A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.20	0.50		Y	1.20	1
LM155B	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM156A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.10	0.50		Y	5.10	1
LM157A	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.30	0.50		Y	5.30	1
LM158B	9/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.51	0.50		Y	0.51	1
LM175AU	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.51	0.50		Y	0.51	1
LM180A	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.70	0.50		Y	3.70	1
LM181B	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	2.60	0.50		Y	2.60	1
LM181B	9/16/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	2.50	0.50		Y	2.50	1
LM182A	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.40	0.50		Y	4.40	1
LM183B	9/16/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.40	0.50		Y	4.40	1
LM184A	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.10	0.50		Y	5.10	1
LM185B	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	7.70	0.50		Y	7.70	1
LM186A	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	3.70	0.50		Y	3.70	1
LM186A	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	4.00	0.50		Y	4.00	1
LM187B	9/17/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	12.00	0.50		Y	12.00	1
LM196AU	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	5.10	0.50		Y	5.10	1
LM197B	9/6/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM197B	9/5/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	0.49	0.50	J	Y	0.49	1
LM198AU	2/21/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM198AU	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM198AU	9/11/13	BD4	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM199AU	2/21/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.25	0.50		Y	0.25	1
LM199AU	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.28	0.50	J	Y	0.28	1
LM200AU	2/21/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM200AU	9/10/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM201AU	2/21/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM201AU	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
LM202AU	2/21/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.31	0.50		Y	0.31	1
LM202AU	2/21/13	BD1	SW8260B	SW5030	Trichloroethene (TCE)	0.32	0.50		Y	0.32	1
LM202AU	9/11/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	0.34	0.50	J	Y	0.34	1
LM203A	2/20/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.50	0.50		Y	1.50	1
LM203A	5/1/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.60	0.50		Y	1.60	1
LM203A	9/10/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.60	0.50		Y	1.60	1
LM203A	12/12/13	NS1	SW8260B	SW5030	Trichloroethene (TCE)	1.30	0.50		Y	1.30	1
BC001	12/4/12	NS1	524.2		Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0
FW001	12/4/12	NS1	524.2		Trichloroethene (TCE)	0.00	0.50	U	N	0.50	0

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:28:58 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (dieldrin)

General Statistics

Total Number of Observations	39	Number of Distinct Observations	7
Number of Detects	33	Number of Non-Detects	6
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	0.01	Minimum Non-Detect	0.01
Maximum Detect	0.1	Maximum Non-Detect	0.05
Variance Detects	3.8201E-4	Percent Non-Detects	15.38%
Mean Detects	0.0385	SD Detects	0.0195
Median Detects	0.03	CV Detects	0.508
Skewness Detects	0.814	Kurtosis Detects	1.535
Mean of Logged Detects	-3.402	SD of Logged Detects	0.584

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0344	Standard Error of Mean	0.00331
SD	0.0203	95% KM (BCA) UCL	0.0398
95% KM (t) UCL	0.04	95% KM (Percentile Bootstrap) UCL	0.0397
95% KM (z) UCL	0.0399	95% KM Bootstrap t UCL	0.0405
90% KM Chebyshev UCL	0.0444	95% KM Chebyshev UCL	0.0489
97.5% KM Chebyshev UCL	0.0551	99% KM Chebyshev UCL	0.0673

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.915	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.752	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.154	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.623	k star (bias corrected MLE)	3.314
Theta hat (MLE)	0.0106	Theta star (bias corrected MLE)	0.0116
nu hat (MLE)	239.1	nu star (bias corrected)	218.7
MLE Mean (bias corrected)	0.0385	MLE Sd (bias corrected)	0.0211

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.894	nu hat (KM)	225.7
Approximate Chi Square Value (225.70, α)	191.9	Adjusted Chi Square Value (225.70, β)	190.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0405	95% Gamma Adjusted KM-UCL (use when n<50)	0.0408

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0345
Maximum	0.1	Median	0.03
SD	0.0204	CV	0.592
k hat (MLE)	2.718	k star (bias corrected MLE)	2.526
Theta hat (MLE)	0.0127	Theta star (bias corrected MLE)	0.0136
nu hat (MLE)	212	nu star (bias corrected)	197.1
MLE Mean (bias corrected)	0.0345	MLE Sd (bias corrected)	0.0217
		Adjusted Level of Significance (β)	0.0437
Approximate Chi Square Value (197.05, α)	165.6	Adjusted Chi Square Value (197.05, β)	164.4
95% Gamma Approximate UCL (use when n>=50)	0.041	95% Gamma Adjusted UCL (use when n<50)	0.0413

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0344	Mean in Log Scale	-3.573
SD in Original Scale	0.0205	SD in Log Scale	0.686
95% t UCL (assumes normality of ROS data)	0.0399	95% Percentile Bootstrap UCL	0.0398
95% BCA Bootstrap UCL	0.0403	95% Bootstrap t UCL	0.0404
95% H-UCL (Log ROS)	0.0448		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0338	Mean in Log Scale	-3.652
SD in Original Scale	0.0213	SD in Log Scale	0.836
95% t UCL (Assumes normality)	0.0396	95% H-Stat UCL	0.0497

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.0489

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (tetrachloroethene)

General Statistics

Total Number of Observations	148	Number of Distinct Observations	75
Number of Detects	106	Number of Non-Detects	42

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater			
Number of Distinct Detects	74	Number of Distinct Non-Detects	1
Minimum Detect	0.13	Minimum Non-Detect	0.5
Maximum Detect	27	Maximum Non-Detect	0.5
Variance Detects	13.35	Percent Non-Detects	28.38%
Mean Detects	2.16	SD Detects	3.653
Median Detects	1.085	CV Detects	1.691
Skewness Detects	4.487	Kurtosis Detects	23.87
Mean of Logged Detects	0.1	SD of Logged Detects	1.114
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.51	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0861	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	1.636	Standard Error of Mean	0.263
SD	3.189	95% KM (BCA) UCL	2.092
95% KM (t) UCL	2.072	95% KM (Percentile Bootstrap) UCL	2.09
95% KM (z) UCL	2.069	95% KM Bootstrap t UCL	2.339
90% KM Chebyshev UCL	2.426	95% KM Chebyshev UCL	2.785
97.5% KM Chebyshev UCL	3.281	99% KM Chebyshev UCL	4.258
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.654	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.105	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.0909	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.875	k star (bias corrected MLE)	0.857
Theta hat (MLE)	2.468	Theta star (bias corrected MLE)	2.521
nu hat (MLE)	185.6	nu star (bias corrected)	181.7
MLE Mean (bias corrected)	2.16	MLE Sd (bias corrected)	2.334
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.263	nu hat (KM)	77.92
Approximate Chi Square Value (77.92, α)	58.58	Adjusted Chi Square Value (77.92, β)	58.42
95% Gamma Approximate KM-UCL (use when n>=50)	2.176	95% Gamma Adjusted KM-UCL (use when n<50)	2.182
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.552
Maximum	27	Median	0.62
SD	3.237	CV	2.086
k hat (MLE)	0.403	k star (bias corrected MLE)	0.399
Theta hat (MLE)	3.855	Theta star (bias corrected MLE)	3.891
nu hat (MLE)	119.2	nu star (bias corrected)	118.1
MLE Mean (bias corrected)	1.552	MLE Sd (bias corrected)	2.457

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater

		Adjusted Level of Significance (β)	0.0484
Approximate Chi Square Value (118.07, α)	93.98	Adjusted Chi Square Value (118.07, β)	93.77
95% Gamma Approximate UCL (use when n>=50)	1.95	95% Gamma Adjusted UCL (use when n<50)	1.954

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0472	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0861	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.642	Mean in Log Scale	-0.293
SD in Original Scale	3.198	SD in Log Scale	1.185
95% t UCL (assumes normality of ROS data)	2.077	95% Percentile Bootstrap UCL	2.119
95% BCA Bootstrap UCL	2.234	95% Bootstrap t UCL	2.258
95% H-UCL (Log ROS)	1.901		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.283	95% H-UCL (KM -Log)	1.803
KM SD (logged)	1.142	95% Critical H Value (KM-Log)	2.337
KM Standard Error of Mean (logged)	0.0989		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.618	Mean in Log Scale	-0.322
SD in Original Scale	3.206	SD in Log Scale	1.157
95% t UCL (Assumes normality)	2.055	95% H-Stat UCL	1.772

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	2.785

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (trichloroethene)

General Statistics

Total Number of Observations	148	Number of Distinct Observations	78
Number of Detects	124	Number of Non-Detects	24
Number of Distinct Detects	77	Number of Distinct Non-Detects	1
Minimum Detect	0.09	Minimum Non-Detect	0.5
Maximum Detect	12	Maximum Non-Detect	0.5
Variance Detects	4.445	Percent Non-Detects	16.22%
Mean Detects	2.932	SD Detects	2.108
Median Detects	2.6	CV Detects	0.719
Skewness Detects	1.17	Kurtosis Detects	2.364
Mean of Logged Detects	0.737	SD of Logged Detects	0.953

Normal GOF Test on Detects Only

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater			
Shapiro Wilk Test Statistic	0.916	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	5.1371E-9	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0796	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	2.506	Standard Error of Mean	0.178
SD	2.152	95% KM (BCA) UCL	2.808
95% KM (t) UCL	2.801	95% KM (Percentile Bootstrap) UCL	2.792
95% KM (z) UCL	2.799	95% KM Bootstrap t UCL	2.824
90% KM Chebyshev UCL	3.04	95% KM Chebyshev UCL	3.281
97.5% KM Chebyshev UCL	3.616	99% KM Chebyshev UCL	4.275
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.143	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.11	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.0847	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.623	k star (bias corrected MLE)	1.589
Theta hat (MLE)	1.807	Theta star (bias corrected MLE)	1.846
nu hat (MLE)	402.4	nu star (bias corrected)	394
MLE Mean (bias corrected)	2.932	MLE Sd (bias corrected)	2.326
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	1.356	nu hat (KM)	401.3
Approximate Chi Square Value (401.30, α)	355.9	Adjusted Chi Square Value (401.30, β)	355.5
95% Gamma Approximate KM-UCL (use when n>=50)	2.826	95% Gamma Adjusted KM-UCL (use when n<50)	2.83
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.526
Maximum	12	Median	2.3
SD	2.143	CV	0.848
k hat (MLE)	1.072	k star (bias corrected MLE)	1.055
Theta hat (MLE)	2.356	Theta star (bias corrected MLE)	2.395
nu hat (MLE)	317.3	nu star (bias corrected)	312.2
MLE Mean (bias corrected)	2.526	MLE Sd (bias corrected)	2.46
		Adjusted Level of Significance (β)	0.0484
Approximate Chi Square Value (312.23, α)	272.3	Adjusted Chi Square Value (312.23, β)	271.9
95% Gamma Approximate UCL (use when n>=50)	2.897	95% Gamma Adjusted UCL (use when n<50)	2.9
Lognormal GOF Test on Detected Observations Only			
Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0796	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			

Table 7.Supplement.2. ProUCL Output Operable Unit 1 Groundwater			
Mean in Original Scale	2.532	Mean in Log Scale	0.479
SD in Original Scale	2.134	SD in Log Scale	1.068
95% t UCL (assumes normality of ROS data)	2.823	95% Percentile Bootstrap UCL	2.819
95% BCA Bootstrap UCL	2.846	95% Bootstrap t UCL	2.85
95% H-UCL (Log ROS)	3.487		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.497	Mean in Log Scale	0.393
SD in Original Scale	2.169	SD in Log Scale	1.173
95% t UCL (Assumes normality)	2.792	95% H-Stat UCL	3.707
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (BCA) UCL	2.808		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.3. Data Summary Input for ProUCL - Northwestern Corner Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
EW056A	1/7/14	NS1	SW8081B	SW3510C	Dieldrin	0.16	0.01		Y	0.16	1
EW056A	2/6/13	NS1	SW8081B	SW3510C	Dieldrin	0.15	0.01	J	Y	0.15	1
EW056A	2/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.16	0.01	J	Y	0.16	1
EW056A	2/5/14	BD1	SW8081B	SW3510C	Dieldrin	0.23	0.01		Y	0.23	1
EW056A	3/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.19	0.01		Y	0.19	1
EW056A	3/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	4/2/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW056A	4/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01	J	Y	0.12	1
EW056A	5/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	5/7/13	BD1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	5/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW056A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	6/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
EW056A	7/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
EW056A	7/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1
EW056A	8/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.13	0.01		Y	0.13	1
EW056A	8/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
EW056A	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.13	0.01		Y	0.13	1
EW056A	9/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
EW056A	10/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.13	0.01		Y	0.13	1
EW056A	10/8/14	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	11/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
EW056A	11/3/14	NS1	SW8081B	SW3510C	Dieldrin	0.08	0.01		Y	0.08	1
EW056A	12/5/12	NS1	SW8081A	SW3510C	Dieldrin	0.12	0.05		Y	0.12	1
EW056A	12/3/13	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW056A	12/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
EW057A	1/7/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	2/6/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01	J	Y	0.03	1
EW057A	2/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	3/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW057A	3/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	4/2/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW057A	4/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01	J	Y	0.02	1
EW057A	4/1/14	BD1	SW8081B	SW3510C	Dieldrin	0.02	0.01	J	Y	0.02	1
EW057A	5/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	5/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
EW057A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	6/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW057A	7/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	8/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	8/7/13	BD1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
EW057A	8/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW057A	9/4/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW057A	10/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	10/8/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	11/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	11/3/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	12/5/12	NS1	SW8081A	SW3510C	Dieldrin		0.05	U	N	0.05	0
EW057A	12/3/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW057A	12/10/14	BD1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW057A	12/10/14	BD1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW057A	12/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1

Table 7.Supplement.3. Data Summary Input for ProUCL - Northwestern Corner Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
EW057A	12/1/14	BD1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW058A	2/20/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW058A	2/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
EW058A	5/2/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW058A	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J-	Y	0.01	1
EW058A	8/20/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW058A	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW058A	12/6/12	NS1	SW8081A	SW3510C	Dieldrin	0.03	0.05	J	Y	0.03	1
EW058A	12/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
EW058A	12/9/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01	J	Y	0.01	1
EW059A	1/7/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	2/6/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01	J	Y	0.03	1
EW059A	2/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	3/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW059A	3/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	4/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01	J	Y	0.03	1
EW059A	4/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01	J	Y	0.03	1
EW059A	5/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	5/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.15	0.01		Y	0.15	1
EW059A	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	6/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	7/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW059A	7/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW059A	7/1/14	BD1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW059A	8/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW059A	8/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW059A	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
EW059A	9/4/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
EW059A	10/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW059A	10/1/13	BD1	SW8081B	SW3510C	Dieldrin	0.04	0.01		Y	0.04	1
EW059A	10/8/14	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	11/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	11/3/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
EW059A	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.03	0.06	J	Y	0.03	1
EW059A	12/3/13	NS1	SW8081B	SW3510C	Dieldrin	0.03	0.01		Y	0.03	1
EW059A	12/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM106A	2/22/13	NS1	SW8081B	SW3510C	Dieldrin	0.20	0.01	J	Y	0.20	1
LM106A	2/22/13	BD1	SW8081B	SW3510C	Dieldrin	0.17	0.01		Y	0.17	1
LM106A	2/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.21	0.01		Y	0.21	1
LM106A	5/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.13	0.01		Y	0.13	1
LM106A	5/8/14	NS1	SW8081B	SW3510C	Dieldrin	0.05	0.01		Y	0.05	1
LM106A	8/19/14	NS1	SW8081B	SW3510C	Dieldrin	0.16	0.01		Y	0.16	1
LM106A	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.19	0.01		Y	0.19	1
LM106A	12/5/12	NS1	SW8081A	SW3510C	Dieldrin	0.20	0.06		Y	0.20	1
LM106A	12/11/13	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM106A	12/11/14	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
LM108A	2/21/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	2/5/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	5/2/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	5/2/13	BD1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
LM108A	5/20/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	8/19/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	9/9/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	12/6/12	NS1	SW8081A	SW3510C	Dieldrin		0.05	U	N	0.05	0

Table 7.Supplement.3. Data Summary Input for ProUCL - Northwestern Corner Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
LM108A	12/12/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM108A	12/10/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM109B	2/21/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM109B	5/2/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM109B	8/19/14	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM109B	9/9/13	NS1	SW8081B	SW3510C	Dieldrin		0.01	U	N	0.01	0
LM109B	12/5/12	NS1	SW8081A	SW3510C	Dieldrin		0.06	U	N	0.06	0
LM140AU	2/21/13	NS1	SW8081B	SW3510C	Dieldrin	0.23	0.01		Y	0.23	1
LM140AU	2/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.21	0.01		Y	0.21	1
LM140AU	5/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.14	0.01		Y	0.14	1
LM140AU	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM140AU	8/19/14	NS1	SW8081B	SW3510C	Dieldrin	0.13	0.01		Y	0.13	1
LM140AU	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM140AU	12/5/12	NS1	SW8081A	SW3510C	Dieldrin	0.22	0.06		Y	0.22	1
LM140AU	12/11/13	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM140AU	12/11/14	NS1	SW8081B	SW3510C	Dieldrin	0.20	0.01		Y	0.20	1
LM141AU	2/21/13	NS1	SW8081B	SW3510C	Dieldrin	0.27	0.01		Y	0.27	1
LM141AU	2/4/14	BD1	SW8081B	SW3510C	Dieldrin	0.12	0.01	J	Y	0.12	1
LM141AU	2/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.20	0.01		Y	0.20	1
LM141AU	5/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM141AU	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM141AU	8/19/14	NS1	SW8081B	SW3510C	Dieldrin	0.15	0.01		Y	0.15	1
LM141AU	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.20	0.01		Y	0.20	1
LM141AU	12/6/12	NS1	SW8081A	SW3510C	Dieldrin	0.24	0.05		Y	0.24	1
LM141AU	12/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM141AU	12/10/14	NS1	SW8081B	SW3510C	Dieldrin	0.19	0.01		Y	0.19	1
LM142AU	2/22/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	2/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	5/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	8/19/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	9/9/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	12/5/12	NS1	SW8081A	SW3510C	Dieldrin	0.02	0.05	J	Y	0.02	1
LM142AU	12/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM142AU	12/11/14	NS1	SW8081B	SW3510C	Dieldrin	0.02	0.01		Y	0.02	1
LM174AU	1/7/14	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
LM174AU	2/6/13	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01	J	Y	0.11	1
LM174AU	2/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM174AU	3/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM174AU	3/12/13	BD1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
LM174AU	3/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1
LM174AU	4/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM174AU	4/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01	J	Y	0.07	1
LM174AU	5/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM174AU	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM174AU	5/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.01	0.01		Y	0.01	1
LM174AU	6/4/13	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM174AU	6/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM174AU	7/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM174AU	7/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM174AU	8/7/13	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1
LM174AU	8/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM174AU	9/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM174AU	9/4/14	NS1	SW8081B	SW3510C	Dieldrin	0.06	0.01		Y	0.06	1
LM174AU	10/1/13	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1

Table 7.Supplement.3. Data Summary Input for ProUCL - Northwestern Corner Groundwater

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ug/L)	Reporting Limit (ug/L)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/L)	For ProUCL d_Result
LM174AU	10/8/14	BD1	SW8081B	SW3510C	Dieldrin	0.08	0.01		Y	0.08	1
LM174AU	10/8/14	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM174AU	11/5/13	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM174AU	11/3/14	NS1	SW8081B	SW3510C	Dieldrin	0.08	0.05		Y	0.08	1
LM174AU	12/4/12	NS1	SW8081A	SW3510C	Dieldrin	0.10	0.05		Y	0.10	1
LM174AU	12/3/13	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM174AU	12/3/13	BD1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM174AU	12/11/13	BD1	SW8081B	SW3510C	Dieldrin	0.18	0.01		Y	0.18	1
LM174AU	12/1/14	NS1	SW8081B	SW3510C	Dieldrin	0.09	0.01		Y	0.09	1
LM191A	2/22/13	NS1	SW8081B	SW3510C	Dieldrin	0.21	0.01	J	Y	0.21	1
LM191A	2/6/14	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM191A	5/2/13	NS1	SW8081B	SW3510C	Dieldrin	0.12	0.01		Y	0.12	1
LM191A	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM191A	5/20/14	BD1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1
LM191A	8/19/14	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM191A	9/10/13	NS1	SW8081B	SW3510C	Dieldrin	0.07	0.01		Y	0.07	1
LM191A	12/6/12	NS1	SW8081A	SW3510C	Dieldrin	0.10	0.05		Y	0.10	1
LM191A	12/6/12	BD1	SW8081A	SW3510C	Dieldrin	0.09	0.05		Y	0.09	1
LM191A	12/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.10	0.01		Y	0.10	1
LM191A	12/10/14	NS1	SW8081B	SW3510C	Dieldrin	0.11	0.01		Y	0.11	1
LM109B	2/5/14	NS1	SW8081B	SW3510C	Dieldrin	0.0017	0.01	J	Y	0.0017	1
LM109B	5/20/14	NS1	SW8081B	SW3510C	Dieldrin	0.0028	0.01	J	Y	0.0028	1
LM109B	12/12/13	NS1	SW8081B	SW3510C	Dieldrin	0.0015	0.01	J	Y	0.0015	1
LM109B	12/10/14	NS1	SW8081B	SW3510C	Dieldrin	0.012	0.010	J	Y	0.012	1

Table 7.Supplement.4. ProUCL Output Northwestern Corner Groundwater

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:27:44 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (dieldrin)

General Statistics

Total Number of Observations	189	Number of Distinct Observations	29
Number of Detects	166	Number of Non-Detects	23
Number of Distinct Detects	29	Number of Distinct Non-Detects	3
Minimum Detect	0.0015	Minimum Non-Detect	0.01
Maximum Detect	0.27	Maximum Non-Detect	0.06
Variance Detects	0.00435	Percent Non-Detects	12.17%
Mean Detects	0.0858	SD Detects	0.066
Median Detects	0.09	CV Detects	0.769
Skewness Detects	0.551	Kurtosis Detects	-0.713
Mean of Logged Detects	-2.891	SD of Logged Detects	1.079

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.895	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0688	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0759	Standard Error of Mean	0.00491
SD	0.0673	95% KM (BCA) UCL	0.0833
95% KM (t) UCL	0.084	95% KM (Percentile Bootstrap) UCL	0.0839
95% KM (z) UCL	0.0839	95% KM Bootstrap t UCL	0.0844
90% KM Chebyshev UCL	0.0906	95% KM Chebyshev UCL	0.0973
97.5% KM Chebyshev UCL	0.107	99% KM Chebyshev UCL	0.125

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.885	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.776	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.143	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0741	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.289	k star (bias corrected MLE)	1.27
Theta hat (MLE)	0.0666	Theta star (bias corrected MLE)	0.0676
nu hat (MLE)	428	nu star (bias corrected)	421.6
MLE Mean (bias corrected)	0.0858	MLE Sd (bias corrected)	0.0762

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.272	nu hat (KM)	481
Approximate Chi Square Value (480.99, α)	431.1	Adjusted Chi Square Value (480.99, β)	430.8

Table 7.Supplement.4. ProUCL Output Northwestern Corner Groundwater

95% Gamma Approximate KM-UCL (use when n>=50)	0.0846	95% Gamma Adjusted KM-UCL (use when n<50)	0.0847

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0015	Mean	0.0771
Maximum	0.27	Median	0.06
SD	0.0662	CV	0.859
k hat (MLE)	1.124	k star (bias corrected MLE)	1.11
Theta hat (MLE)	0.0686	Theta star (bias corrected MLE)	0.0695
nu hat (MLE)	424.8	nu star (bias corrected)	419.4
MLE Mean (bias corrected)	0.0771	MLE Sd (bias corrected)	0.0732
		Adjusted Level of Significance (β)	0.0487
Approximate Chi Square Value (419.40, α)	372.9	Adjusted Chi Square Value (419.40, β)	372.6
95% Gamma Approximate UCL (use when n>=50)	0.0867	95% Gamma Adjusted UCL (use when n<50)	0.0867

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0688	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0764	Mean in Log Scale	-3.143
SD in Original Scale	0.0669	SD in Log Scale	1.233
95% t UCL (assumes normality of ROS data)	0.0844	95% Percentile Bootstrap UCL	0.0844
95% BCA Bootstrap UCL	0.0846	95% Bootstrap t UCL	0.0846
95% H-UCL (Log ROS)	0.114		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0763	Mean in Log Scale	-3.157
SD in Original Scale	0.067	SD in Log Scale	1.255
95% t UCL (Assumes normality)	0.0844	95% H-Stat UCL	0.117

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.0973

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table 7.Supplement.5. Data Summary Input for ProUCL - Areas 1 Building 237 Soil

Sample ID	Sample Date	Depth (ft bgs)	Chemical Name	Result (ug/kg)	Reporting Limit (ug/kg)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/kg)	For ProUCL d_Result
SB1237SO001-NS	7/19/2012	3.5	4,4-DDD	193			Y	193	1
SB1237SO002-NS	7/19/2012	3	4,4-DDD	4.94		J	Y	4.94	1
SB1237SO003-NS	7/19/2012	3	4,4-DDD	66			Y	66	1
SB1237SO004-NS	7/19/2012	1.5	4,4-DDD	9.94		J	Y	9.94	1
SB1237SO005-NS	7/19/2012	1.5	4,4-DDD	2.31		J	Y	2.31	1
SB1237SO006-NS	7/19/2012	1.5	4,4-DDD	40.5		J	Y	40.5	1
SB1237SO007-NS	7/19/2012	3.5	4,4-DDD		2.17	UJ	N	2.17	0
SB1237SO008-NS	7/19/2012	7	4,4-DDD		2	UJ	N	2	0
SB1237SO009-NS	7/19/2012	7	4,4-DDD		2.03	UJ	N	2.03	0
SB1237SO010-NS / 8081A-FD1	7/19/2012	3.5	4,4-DDD	4.8		J	Y	4.8	1
SB1237SO011-NS	7/19/2012	7	4,4-DDD		1.9	UJ	N	1.9	0
SB1237SO012-NS	7/19/2012	7	4,4-DDD	6.63		J	Y	6.63	1
SB1237SO013-NS	7/19/2012	3.5	4,4-DDD	0.881		J	Y	0.881	1
SB1237SO014-NS	7/19/2012	3.5	4,4-DDD		1.88	U	N	1.88	0
SB1237SO016-NS	8/6/2012	1.5	4,4-DDD	10.8		J	Y	10.8	1
SB1237SO017-NS	8/6/2012	1.5	4,4-DDD	234			Y	234	1
SB1237SO018-NS	8/6/2012	3	4,4-DDD	12900			Y	12900	1
SB1237SO001-NS	7/19/2012	3.5	4,4-DDE	57.2			Y	57.2	1
SB1237SO002-NS	7/19/2012	3	4,4-DDE	16.3			Y	16.3	1
SB1237SO003-NS	7/19/2012	3	4,4-DDE	63.8			Y	63.8	1
SB1237SO004-NS	7/19/2012	1.5	4,4-DDE	4.82			Y	4.82	1
SB1237SO005-NS	7/19/2012	1.5	4,4-DDE	4.21			Y	4.21	1
SB1237SO006-NS	7/19/2012	1.5	4,4-DDE	26.1			Y	26.1	1
SB1237SO007-NS	7/19/2012	3.5	4,4-DDE		2.17	UJ	N	2.17	0
SB1237SO008-NS	7/19/2012	7	4,4-DDE		2	UJ	N	2	0
SB1237SO009-NS	7/19/2012	7	4,4-DDE	2.28			Y	2.28	1
SB1237SO010-NS / 8081A-FD1	7/19/2012	3.5	4,4-DDE	3.65			Y	3.65	1
SB1237SO011-NS	7/19/2012	7	4,4-DDE		1.9	UJ	N	1.9	0
SB1237SO012-NS	7/19/2012	7	4,4-DDE	9.29			Y	9.29	1
SB1237SO013-NS	7/19/2012	3.5	4,4-DDE		2.06	U	N	2.06	0
SB1237SO014-NS	7/19/2012	3.5	4,4-DDE		1.88	U	N	1.88	0
SB1237SO016-NS	8/6/2012	1.5	4,4-DDE	4.11			Y	4.11	1
SB1237SO017-NS	8/6/2012	1.5	4,4-DDE	361			Y	361	1
SB1237SO018-NS	8/6/2012	3	4,4-DDE	448			Y	448	1
SB1237SO001-NS	7/19/2012	3.5	4,4-DDT	356			Y	356	1
SB1237SO002-NS	7/19/2012	3	4,4-DDT	118			Y	118	1
SB1237SO003-NS	7/19/2012	3	4,4-DDT	1660			Y	1660	1
SB1237SO004-NS	7/19/2012	1.5	4,4-DDT	46.5			Y	46.5	1
SB1237SO005-NS	7/19/2012	1.5	4,4-DDT	35.2			Y	35.2	1
SB1237SO006-NS	7/19/2012	1.5	4,4-DDT	256			Y	256	1
SB1237SO007-NS	7/19/2012	3.5	4,4-DDT		2.17	UJ	N	2.17	0
SB1237SO008-NS	7/19/2012	7	4,4-DDT	8.53			Y	8.53	1
SB1237SO009-NS	7/19/2012	7	4,4-DDT	2.41			Y	2.41	1
SB1237SO010-NS / 8081A-FD1	7/19/2012	3.5	4,4-DDT	6.98			Y	6.98	1
SB1237SO011-NS	7/19/2012	7	4,4-DDT		1.9	UJ	N	1.9	0
SB1237SO012-NS	7/19/2012	7	4,4-DDT	132			Y	132	1

Table 7.Supplement.5. Data Summary Input for ProUCL - Areas 1 Building 237 Soil

Sample ID	Sample Date	Depth (ft bgs)	Chemical Name	Result (ug/kg)	Reporting Limit (ug/kg)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ug/kg)	For ProUCL d_Result
SB1237SO013-NS	7/19/2012	3.5	4,4-DDT	0.524			Y	0.524	1
SB1237SO014-NS	7/19/2012	3.5	4,4-DDT	1.05			Y	1.05	1
SB1237SO016-NS	8/6/2012	1.5	4,4-DDT	44.9			Y	44.9	1
SB1237SO017-NS	8/6/2012	1.5	4,4-DDT	6320			Y	6320	1
SB1237SO018-NS	8/6/2012	3	4,4-DDT	7180			Y	7180	1
SB1237SO001-NS	7/19/2012	3.5	Dieldrin	93.1			Y	93.1	1
SB1237SO002-NS	7/19/2012	3	Dieldrin	14.9			Y	14.9	1
SB1237SO003-NS	7/19/2012	3	Dieldrin	1470			Y	1470	1
SB1237SO004-NS	7/19/2012	1.5	Dieldrin	6.02			Y	6.02	1
SB1237SO005-NS	7/19/2012	1.5	Dieldrin	3.7			Y	3.7	1
SB1237SO006-NS	7/19/2012	1.5	Dieldrin	60.9			Y	60.9	1
SB1237SO007-NS	7/19/2012	3.5	Dieldrin		2.17	UJ	N	2.17	0
SB1237SO008-NS	7/19/2012	7	Dieldrin		2	UJ	N	2	0
SB1237SO009-NS	7/19/2012	7	Dieldrin		2.03	UJ	N	2.03	0
SB1237SO010-NS / 8081A-FD1	7/19/2012	3.5	Dieldrin	1.46			Y	1.46	1
SB1237SO011-NS	7/19/2012	7	Dieldrin		1.9	UJ	N	1.9	0
SB1237SO012-NS	7/19/2012	7	Dieldrin	3.85			Y	3.85	1
SB1237SO013-NS	7/19/2012	3.5	Dieldrin	0.748			Y	0.748	1
SB1237SO014-NS	7/19/2012	3.5	Dieldrin	22			Y	22	1
SB1237SO016-NS	8/6/2012	1.5	Dieldrin	1.28			Y	1.28	1
SB1237SO017-NS	8/6/2012	1.5	Dieldrin	464			Y	464	1
SB1237SO018-NS	8/6/2012	3	Dieldrin	1230			Y	1230	1

Note:

Data are from the October 2012 Final Areas 1/Building 237 Removal Action Report, Table 4-1.

The data are refined to use the maximum concentration of the parent sample and field duplicate in the calculation of the exposure point concentration (i.e., parent sample SB1237SO010-NS and duplicate 8081A-FD1).

Sample SB1237SO015-NS and its field duplicate 8081A-FD2 were removed during Phase II of excavation and their concentrations are removed from the data set.

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/25/2015 11:20:09 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (4,4-ddd)

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	12	Number of Non-Detects	5
Number of Distinct Detects	12	Number of Distinct Non-Detects	5
Minimum Detect	0.881	Minimum Non-Detect	1.88
Maximum Detect	12900	Maximum Non-Detect	2.17
Variance Detects	13761791	Percent Non-Detects	29.41%
Mean Detects	1123	SD Detects	3710
Median Detects	10.37	CV Detects	3.304
Skewness Detects	3.461	Kurtosis Detects	11.99
Mean of Logged Detects	3.21	SD of Logged Detects	2.609

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.342	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.511	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	792.8	Standard Error of Mean	766.9
SD	3028	95% KM (BCA) UCL	2311
95% KM (t) UCL	2132	95% KM (Percentile Bootstrap) UCL	2296
95% KM (z) UCL	2054	95% KM Bootstrap t UCL	51743
90% KM Chebyshev UCL	3094	95% KM Chebyshev UCL	4136
97.5% KM Chebyshev UCL	5582	99% KM Chebyshev UCL	8424

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.864	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.877	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.337	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.272	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.194	k star (bias corrected MLE)	0.201
Theta hat (MLE)	5791	Theta star (bias corrected MLE)	5587
nu hat (MLE)	4.654	nu star (bias corrected)	4.823
MLE Mean (bias corrected)	1123	MLE Sd (bias corrected)	2505

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0686	nu hat (KM)	2.332
Approximate Chi Square Value (2.33, α)	0.206	Adjusted Chi Square Value (2.33, β)	0.166

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
95% Gamma Approximate KM-UCL (use when n>=50)	8995	95% Gamma Adjusted KM-UCL (use when n<50)	11150
Gamma (KM) may not be used when k hat (KM) is < 0.1			
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	792.6
Maximum	12900	Median	4.94
SD	3121	CV	3.938
k hat (MLE)	0.135	k star (bias corrected MLE)	0.151
Theta hat (MLE)	5857	Theta star (bias corrected MLE)	5261
nu hat (MLE)	4.601	nu star (bias corrected)	5.122
MLE Mean (bias corrected)	792.6	MLE Sd (bias corrected)	2042
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (5.12, α)	1.209	Adjusted Chi Square Value (5.12, β)	1.024
95% Gamma Approximate UCL (use when n>=50)	3358	95% Gamma Adjusted UCL (use when n<50)	3964
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	792.6	Mean in Log Scale	1.813
SD in Original Scale	3121	SD in Log Scale	3.107
95% t UCL (assumes normality of ROS data)	2114	95% Percentile Bootstrap UCL	2302
95% BCA Bootstrap UCL	3081	95% Bootstrap t UCL	51531
95% H-UCL (Log ROS)	119444		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.229	95% H-UCL (KM -Log)	9442
KM SD (logged)	2.592	95% Critical H Value (KM-Log)	5.503
KM Standard Error of Mean (logged)	0.657		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	792.9	Mean in Log Scale	2.265
SD in Original Scale	3121	SD in Log Scale	2.638
95% t UCL (Assumes normality)	2114	95% H-Stat UCL	12492
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	8424		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (4,4-dde)

General Statistics			
Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	12	Number of Non-Detects	5
Number of Distinct Detects	12	Number of Distinct Non-Detects	5
Minimum Detect	2.28	Minimum Non-Detect	1.88
Maximum Detect	448	Maximum Non-Detect	2.17
Variance Detects	23274	Percent Non-Detects	29.41%
Mean Detects	83.4	SD Detects	152.6
Median Detects	12.8	CV Detects	1.829
Skewness Detects	2.041	Kurtosis Detects	2.911
Mean of Logged Detects	2.918	SD of Logged Detects	1.801

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.586	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.384	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	59.42	Standard Error of Mean	32.48
SD	128.2	95% KM (BCA) UCL	119.6
95% KM (t) UCL	116.1	95% KM (Percentile Bootstrap) UCL	115.8
95% KM (z) UCL	112.8	95% KM Bootstrap t UCL	381.2
90% KM Chebyshev UCL	156.9	95% KM Chebyshev UCL	201
97.5% KM Chebyshev UCL	262.3	99% KM Chebyshev UCL	382.6

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.007	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.261	Detected data appear Gamma Distributed at 5% Significance Level
Detected data follow Appr. Gamma Distribution at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.432	k star (bias corrected MLE)	0.379
Theta hat (MLE)	193.1	Theta star (bias corrected MLE)	219.8
nu hat (MLE)	10.36	nu star (bias corrected)	9.106
MLE Mean (bias corrected)	83.4	MLE Sd (bias corrected)	135.4

Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.215	nu hat (KM)	7.303
Approximate Chi Square Value (7.30, α)	2.338	Adjusted Chi Square Value (7.30, β)	2.055
95% Gamma Approximate KM-UCL (use when n>=50)	185.6	95% Gamma Adjusted KM-UCL (use when n<50)	211.2

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
Minimum	0.01	Mean	58.87
Maximum	448	Median	4.21
SD	132.4	CV	2.249
k hat (MLE)	0.216	k star (bias corrected MLE)	0.217
Theta hat (MLE)	272.8	Theta star (bias corrected MLE)	271.4
nu hat (MLE)	7.337	nu star (bias corrected)	7.376
MLE Mean (bias corrected)	58.87	MLE Sd (bias corrected)	126.4
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (7.38, α)	2.379	Adjusted Chi Square Value (7.38, β)	2.092
95% Gamma Approximate UCL (use when n>=50)	182.5	95% Gamma Adjusted UCL (use when n<50)	207.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.894	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	58.94	Mean in Log Scale	1.649
SD in Original Scale	132.4	SD in Log Scale	2.518
95% t UCL (assumes normality of ROS data)	115	95% Percentile Bootstrap UCL	112.7
95% BCA Bootstrap UCL	132.8	95% Bootstrap t UCL	397
95% H-UCL (Log ROS)	3623		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.246	95% H-UCL (KM -Log)	275.6
KM SD (logged)	1.785	95% Critical H Value (KM-Log)	3.992
KM Standard Error of Mean (logged)	0.452		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	59.16	Mean in Log Scale	2.06
SD in Original Scale	132.3	SD in Log Scale	2.027
95% t UCL (Assumes normality)	115.2	95% H-Stat UCL	580.7
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	201	95% GROS Adjusted Gamma UCL	207.5
95% Adjusted Gamma KM-UCL	211.2		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
result (4,4-ddt)			
General Statistics			
Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	15	Number of Non-Detects	2

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
Number of Distinct Detects	15	Number of Distinct Non-Detects	2
Minimum Detect	0.524	Minimum Non-Detect	1.9
Maximum Detect	7180	Maximum Non-Detect	2.17
Variance Detects	5503744	Percent Non-Detects	11.76%
Mean Detects	1078	SD Detects	2346
Median Detects	46.5	CV Detects	2.177
Skewness Detects	2.293	Kurtosis Detects	4.046
Mean of Logged Detects	4.113	SD of Logged Detects	2.928
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.517	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.421	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	951.2	Standard Error of Mean	541.5
SD	2157	95% KM (BCA) UCL	1796
95% KM (t) UCL	1897	95% KM (Percentile Bootstrap) UCL	1836
95% KM (z) UCL	1842	95% KM Bootstrap t UCL	5404
90% KM Chebyshev UCL	2576	95% KM Chebyshev UCL	3312
97.5% KM Chebyshev UCL	4333	99% KM Chebyshev UCL	6339
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.821	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.86	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.243	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.248	k star (bias corrected MLE)	0.243
Theta hat (MLE)	4349	Theta star (bias corrected MLE)	4441
nu hat (MLE)	7.435	nu star (bias corrected)	7.282
MLE Mean (bias corrected)	1078	MLE Sd (bias corrected)	2188
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.194	nu hat (KM)	6.611
Approximate Chi Square Value (6.61, α)	1.96	Adjusted Chi Square Value (6.61, β)	1.706
95% Gamma Approximate KM-UCL (use when n>=50)	3209	95% Gamma Adjusted KM-UCL (use when n<50)	3686
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	951.1
Maximum	7180	Median	44.9
SD	2223	CV	2.338
k hat (MLE)	0.196	k star (bias corrected MLE)	0.2
Theta hat (MLE)	4857	Theta star (bias corrected MLE)	4744
nu hat (MLE)	6.658	nu star (bias corrected)	6.816
MLE Mean (bias corrected)	951.1	MLE Sd (bias corrected)	2124

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (6.82, α)	2.07	Adjusted Chi Square Value (6.82, β)	1.808
95% Gamma Approximate UCL (use when n>=50)	3131	95% Gamma Adjusted UCL (use when n<50)	3586
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0919	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	951.1	Mean in Log Scale	3.558
SD in Original Scale	2223	SD in Log Scale	3.155
95% t UCL (assumes normality of ROS data)	1893	95% Percentile Bootstrap UCL	1853
95% BCA Bootstrap UCL	2264	95% Bootstrap t UCL	5396
95% H-UCL (Log ROS)	922896		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	3.594	95% H-UCL (KM -Log)	403178
KM SD (logged)	3.015	95% Critical H Value (KM-Log)	6.323
KM Standard Error of Mean (logged)	0.758		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	951.2	Mean in Log Scale	3.631
SD in Original Scale	2223	SD in Log Scale	3.058
95% t UCL (Assumes normality)	1893	95% H-Stat UCL	542800
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	3312	95% GROS Adjusted Gamma UCL	3586
95% Adjusted Gamma KM-UCL	3686		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
result (dieldrin)			
General Statistics			
Total Number of Observations	17	Number of Distinct Observations	17
Number of Detects	13	Number of Non-Detects	4
Number of Distinct Detects	13	Number of Distinct Non-Detects	4
Minimum Detect	0.748	Minimum Non-Detect	1.9
Maximum Detect	1470	Maximum Non-Detect	2.17
Variance Detects	252302	Percent Non-Detects	23.53%
Mean Detects	259.4	SD Detects	502.3
Median Detects	14.9	CV Detects	1.937
Skewness Detects	1.986	Kurtosis Detects	2.727

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
Mean of Logged Detects	3.059	SD of Logged Detects	2.601
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.584	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.399	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.246	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	198.6	Standard Error of Mean	110.1
SD	436	95% KM (BCA) UCL	399.1
95% KM (t) UCL	390.8	95% KM (Percentile Bootstrap) UCL	387
95% KM (z) UCL	379.7	95% KM Bootstrap t UCL	834.7
90% KM Chebyshev UCL	528.8	95% KM Chebyshev UCL	678.4
97.5% KM Chebyshev UCL	886	99% KM Chebyshev UCL	1294
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.901	Anderson-Darling GOF Test	
5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.227	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.257	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.279	k star (bias corrected MLE)	0.266
Theta hat (MLE)	929.1	Theta star (bias corrected MLE)	975
nu hat (MLE)	7.259	nu star (bias corrected)	6.917
MLE Mean (bias corrected)	259.4	MLE Sd (bias corrected)	502.9
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.208	nu hat (KM)	7.056
Approximate Chi Square Value (7.06, α)	2.201	Adjusted Chi Square Value (7.06, β)	1.928
95% Gamma Approximate KM-UCL (use when n>=50)	636.6	95% Gamma Adjusted KM-UCL (use when n<50)	726.8
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	198.4
Maximum	1470	Median	3.85
SD	449.5	CV	2.266
k hat (MLE)	0.185	k star (bias corrected MLE)	0.191
Theta hat (MLE)	1074	Theta star (bias corrected MLE)	1037
nu hat (MLE)	6.279	nu star (bias corrected)	6.504
MLE Mean (bias corrected)	198.4	MLE Sd (bias corrected)	453.5
		Adjusted Level of Significance (β)	0.0346
Approximate Chi Square Value (6.50, α)	1.903	Adjusted Chi Square Value (6.50, β)	1.654
95% Gamma Approximate UCL (use when n>=50)	678	95% Gamma Adjusted UCL (use when n<50)	780.1
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.924	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level	

Table 7.Supplement.6. ProUCL Output Area 1 Building 237 Soil			
Lilliefors Test Statistic	0.148	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	198.5	Mean in Log Scale	2.275
SD in Original Scale	449.5	SD in Log Scale	2.683
95% t UCL (assumes normality of ROS data)	388.8	95% Percentile Bootstrap UCL	386.6
95% BCA Bootstrap UCL	443.1	95% Bootstrap t UCL	855.5
95% H-UCL (Log ROS)	16019		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.366	95% H-UCL (KM -Log)	7549
KM SD (logged)	2.522	95% Critical H Value (KM-Log)	5.369
KM Standard Error of Mean (logged)	0.639		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	198.6	Mean in Log Scale	2.342
SD in Original Scale	449.4	SD in Log Scale	2.617
95% t UCL (Assumes normality)	388.9	95% H-Stat UCL	12087
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	678.4	95% GROS Adjusted Gamma UCL	780.1
95% Adjusted Gamma KM-UCL	726.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.7. Data Summary Input for ProUCL - SWMU 20 Soil Gas

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ppbv)	Reporting Limit (ppbv)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ppbv)	For ProUCL d_Result
VE0054	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.79	0.64	J	Y	0.79	1
VE0054	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	U	N	0.50	0
VE0054	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	1.90	0.32		Y	1.90	1
VE0055	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.60	0.50		Y	1.60	1
VE0055	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	2.10	0.50		Y	2.10	1
VE0055	11/25/13	BD1	TO-15	METHOD	Tetrachloroethene (PCE)	0.92	0.50	J+	Y	0.92	1
VE0055	11/25/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.93	0.50	J+	Y	0.93	1
VE0055	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	2.90	1.00		Y	2.90	1
VE0056	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	3.60	0.50	J	Y	3.60	1
VE0056	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	U	N	0.50	0
VE0056	6/13/13	BD1	TO-15	METHOD	Tetrachloroethene (PCE)	0.49	0.50	J	Y	0.49	1
VE0056	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	1.50	0.26		Y	1.50	1
VE0057	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.80	0.50	J	Y	1.80	1
VE0057	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		5.00	D,U	N	5.00	0
VE0057	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	1.90	0.26		Y	1.90	1
VE0058	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.00	1.00		Y	1.00	1
VE0058	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	2.10	0.50		Y	2.10	1
VE0058	11/25/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	U	N	0.50	0
VE0058	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	1.70	0.71		Y	1.70	1
VE0059	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		4.50	U	N	4.50	0
VE0059	2/24/14	BD1	TO-15	METHOD	Tetrachloroethene (PCE)		4.00	U	N	4.00	0
VE0059	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.44	0.50	J	Y	0.44	1
VE0059	11/25/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	U	N	0.50	0
VE0059	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	2.50	0.59		Y	2.50	1
VE0060	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	5.10	1.00	J	Y	5.10	1
VE0060	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.44	0.50	J	Y	0.44	1
VE0060	10/23/14	BD1	TO-15	NONE	Tetrachloroethene (PCE)	4.80	0.26		Y	4.80	1
VE0060	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	4.00	0.26		Y	4.00	1
VE0061	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	21.00	0.50	J	Y	21.00	1
VE0061	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.60	0.50		Y	1.60	1
VE0061	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	30.00	0.86		Y	30.00	1
VE0062	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	7.50	0.50	J	Y	7.50	1
VE0062	6/13/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	U	N	0.50	0
VE0062	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	16.00	1.20		Y	16.00	1
VM0012	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	3.30	3.00	J	Y	3.30	1
VM0012	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.42	0.50	J	Y	0.42	1
VM0012	10/23/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	19.00	1.20		Y	19.00	1
VM0076d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.30	0.50	J+	Y	0.30	1
VM0076d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0076d	6/12/13	BD1	TO-15	METHOD	Tetrachloroethene (PCE)	0.45	0.50	J	Y	0.45	1
VM0076d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	0.48	0.56	J	Y	0.48	1
VM0076s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		3.00	UJ	N	3.00	0
VM0076s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0076s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	0.68	0.30		Y	0.68	1
VM0077d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		1.00	U	N	1.00	0
VM0077d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.93	0.50	J	Y	0.93	1
VM0077d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	1.70	0.53		Y	1.70	1
VM0077s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.50	1.00	J	Y	1.50	1
VM0077s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0077s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	5.20	1.20		Y	5.20	1
VM0078d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	3.00	0.50	J	Y	3.00	1
VM0078d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	11.00	0.50	J	Y	11.00	1
VM0078d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	9.80	0.29		Y	9.80	1
VM0078d	10/22/14	BD1	TO-15	NONE	Tetrachloroethene (PCE)	9.00	0.29		Y	9.00	1
VM0078s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.30	1.00	J	Y	1.30	1
VM0078s	2/24/14	BD1	TO-15	METHOD	Tetrachloroethene (PCE)	1.40	1.00	J	Y	1.40	1

Table 7.Supplement.7. Data Summary Input for ProUCL - SWMU 20 Soil Gas

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ppbv)	Reporting Limit (ppbv)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ppbv)	For ProUCL d_Result
VM0078s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	8.80	0.50	J	Y	8.80	1
VM0078s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	4.40	0.28		Y	4.40	1
VM0079d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.60	1.00		Y	1.60	1
VM0079d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0079d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	4.50	0.56		Y	4.50	1
VM0079s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.00	1.00	J	Y	1.00	1
VM0079s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.99	0.50	J	Y	0.99	1
VM0079s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	2.20	0.31		Y	2.20	1
VM0080d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	4.80	0.50		Y	4.80	1
VM0080d	2/24/14	BD1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0080d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	2.80	0.50	J	Y	2.80	1
VM0080d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	13.00	0.27		Y	13.00	1
VM0080s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	4.00	0.50	J	Y	4.00	1
VM0080s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0080s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	7.00	0.26		Y	7.00	1
VM0081d	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	1.60	0.50	J	Y	1.60	1
VM0081d	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)	0.74	0.50	J	Y	0.74	1
VM0081d	6/12/13	BD1	TO-15	METHOD	Tetrachloroethene (PCE)	0.92	0.50	J	Y	0.92	1
VM0081d	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	2.60	0.53		Y	2.60	1
VM0081s	2/24/14	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0081s	6/12/13	NS1	TO-15	METHOD	Tetrachloroethene (PCE)		0.50	UJ	N	0.50	0
VM0081s	10/22/14	NS1	TO-15	NONE	Tetrachloroethene (PCE)	0.76	0.29		Y	0.76	1
VM0081s	10/22/14	BD1	TO-15	NONE	Tetrachloroethene (PCE)	0.82	0.28		Y	0.82	1
VE0054	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	11.00	0.64	J	Y	11.00	1
VE0054	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)		0.50	U	N	0.50	0
VE0055	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	91.00	14.00		Y	91.00	1
VE0055	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	96.00	2.00		Y	96.00	1
VE0055	11/25/13	BD1	TO-15	METHOD	Trichloroethene (TCE)	15.00	0.50		Y	15.00	1
VE0055	11/25/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	15.00	0.50		Y	15.00	1
VE0056	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	48.00	6.50	J	Y	48.00	1
VE0056	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	2.50	0.50	J	Y	2.50	1
VE0056	6/13/13	BD1	TO-15	METHOD	Trichloroethene (TCE)	16.00	0.50	J	Y	16.00	1
VE0057	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	37.00	3.00	J	Y	37.00	1
VE0057	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	2.70	5.00	J	Y	2.70	1
VE0058	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	49.00	6.50		Y	49.00	1
VE0058	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	53.00	5.00		Y	53.00	1
VE0058	11/25/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	8.60	0.50		Y	8.60	1
VE0059	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	21.00	4.50		Y	21.00	1
VE0059	2/24/14	BD1	TO-15	METHOD	Trichloroethene (TCE)	20.00	4.00		Y	20.00	1
VE0059	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	31.00	0.50	J	Y	31.00	1
VE0059	11/25/13	NS1	TO-15	METHOD	Trichloroethene (TCE)		0.50	U	N	0.50	0
VE0060	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	39.00	6.50	J	Y	39.00	1
VE0060	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	8.50	0.50	J	Y	8.50	1
VE0061	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	75.00	6.00	J	Y	75.00	1
VE0061	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	9.00	0.50		Y	9.00	1
VE0062	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	150.00	6.50	J	Y	150.00	1
VE0062	6/13/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	4.00	0.50		Y	4.00	1
VM0012	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	68.00	3.00	J	Y	68.00	1
VM0012	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	11.00	0.50	J	Y	11.00	1
VM0076d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	8.90	0.50	J+	Y	8.90	1
VM0076d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	0.87	0.50	J	Y	0.87	1
VM0076d	6/12/13	BD1	TO-15	METHOD	Trichloroethene (TCE)	7.20	0.50	J	Y	7.20	1
VM0076s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)		3.00	UJ	N	3.00	0
VM0076s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	0.21	0.50	J	Y	0.21	1
VM0077d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	6.40	1.00		Y	6.40	1
VM0077d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	29.00	5.00	J	Y	29.00	1

Table 7.Supplement.7. Data Summary Input for ProUCL - SWMU 20 Soil Gas

Location	Date	Sample Code	Method	Extraction Method	Analyte	Result (ppbv)	Reporting Limit (ppbv)	Interpreted Qualifier	Detect Flag	For ProUCL Result (ppbv)	For ProUCL d_Result
VM0077s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	78.00	6.50	J	Y	78.00	1
VM0077s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	0.81	0.50	J	Y	0.81	1
VM0078d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	4.10	0.50	J	Y	4.10	1
VM0078d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	15.00	0.50	J	Y	15.00	1
VM0078s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	0.86	1.00	J	Y	0.86	1
VM0078s	2/24/14	BD1	TO-15	METHOD	Trichloroethene (TCE)	0.90	1.00	J	Y	0.90	1
VM0078s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	2.90	0.50	J	Y	2.90	1
VM0079d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	43.00	1.00		Y	43.00	1
VM0079d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)		0.50	UJ	N	0.50	0
VM0079s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	27.00	1.00	J	Y	27.00	1
VM0079s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	20.00	2.00	J	Y	20.00	1
VM0080d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	23.00	0.50		Y	23.00	1
VM0080d	2/24/14	BD1	TO-15	METHOD	Trichloroethene (TCE)	0.29	0.50	J	Y	0.29	1
VM0080d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	7.40	0.50	J	Y	7.40	1
VM0080s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	15.00	0.50	J	Y	15.00	1
VM0080s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)		0.50	UJ	N	0.50	0
VM0081d	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	39.00	10.00	J	Y	39.00	1
VM0081d	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	21.00	2.00	J	Y	21.00	1
VM0081d	6/12/13	BD1	TO-15	METHOD	Trichloroethene (TCE)	19.00	5.00	J	Y	19.00	1
VM0081s	2/24/14	NS1	TO-15	METHOD	Trichloroethene (TCE)	6.40	0.50	J	Y	6.40	1
VM0081s	6/12/13	NS1	TO-15	METHOD	Trichloroethene (TCE)	0.28	0.50	J	Y	0.28	1
VE0054	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	110.00	3.20		Y	110.00	1
VE0055	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	270.00	1.30		Y	270.00	1
VE0056	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	84.00	2.60		Y	84.00	1
VE0057	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	64.00	0.33		Y	64.00	1
VE0058	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	180.00	2.70		Y	180.00	1
VE0059	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	120.00	0.74		Y	120.00	1
VE0060	10/23/14	BD1	TO-15	NONE	Trichloroethene (TCE)	71.00	2.60		Y	71.00	1
VE0060	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	65.00	0.33		Y	65.00	1
VE0061	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	200.00	1.10		Y	200.00	1
VE0062	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	390.00	4.60		Y	390.00	1
VM0012	10/23/14	NS1	TO-15	NONE	Trichloroethene (TCE)	350.00	4.60		Y	350.00	1
VM0076d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	23.00	0.70		Y	23.00	1
VM0076s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	13.00	0.37		Y	13.00	1
VM0077d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	150.00	2.70		Y	150.00	1
VM0077s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	290.00	2.90		Y	290.00	1
VM0078d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	22.00	0.36		Y	22.00	1
VM0078d	10/22/14	BD1	TO-15	NONE	Trichloroethene (TCE)	21.00	0.36		Y	21.00	1
VM0078s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	5.40	0.35		Y	5.40	1
VM0079d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	180.00	2.80		Y	180.00	1
VM0079s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	77.00	3.20		Y	77.00	1
VM0080d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	58.00	0.34		Y	58.00	1
VM0080s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	31.00	0.33		Y	31.00	1
VM0081d	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	140.00	0.67		Y	140.00	1
VM0081s	10/22/14	NS1	TO-15	NONE	Trichloroethene (TCE)	55.00	0.37		Y	55.00	1
VM0081s	10/22/14	BD1	TO-15	NONE	Trichloroethene (TCE)	59.00	0.35		Y	59.00	1

Table 7.Supplement.8. ProUCL Output SWMU 20 Soil Gas

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:31:41 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (tetrachloroethene (pce))

General Statistics

Total Number of Observations	79	Number of Distinct Observations	50
Number of Detects	61	Number of Non-Detects	18
Number of Distinct Detects	48	Number of Distinct Non-Detects	6
Minimum Detect	0.3	Minimum Non-Detect	0.5
Maximum Detect	30	Maximum Non-Detect	5
Variance Detects	31.17	Percent Non-Detects	22.78%
Mean Detects	4.108	SD Detects	5.583
Median Detects	1.9	CV Detects	1.359
Skewness Detects	2.74	Kurtosis Detects	8.488
Mean of Logged Detects	0.791	SD of Logged Detects	1.09

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.657	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.113	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	3.316	Standard Error of Mean	0.578
SD	5.087	95% KM (BCA) UCL	4.31
95% KM (t) UCL	4.277	95% KM (Percentile Bootstrap) UCL	4.32
95% KM (z) UCL	4.266	95% KM Bootstrap t UCL	4.747
90% KM Chebyshev UCL	5.049	95% KM Chebyshev UCL	5.834
97.5% KM Chebyshev UCL	6.924	99% KM Chebyshev UCL	9.064

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.853	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.147	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.117	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.936	k star (bias corrected MLE)	0.901
Theta hat (MLE)	4.389	Theta star (bias corrected MLE)	4.561
nu hat (MLE)	114.2	nu star (bias corrected)	109.9
MLE Mean (bias corrected)	4.108	MLE Sd (bias corrected)	4.328

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.425	nu hat (KM)	67.12
Approximate Chi Square Value (67.12, α)	49.27	Adjusted Chi Square Value (67.12, β)	48.98

Table 7.Supplement.8. ProUCL Output SWMU 20 Soil Gas

95% Gamma Approximate KM-UCL (use when n>=50)	4.517	95% Gamma Adjusted KM-UCL (use when n<50)	4.544

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.185
Maximum	30	Median	1.5
SD	5.187	CV	1.629
k hat (MLE)	0.439	k star (bias corrected MLE)	0.431
Theta hat (MLE)	7.251	Theta star (bias corrected MLE)	7.39
nu hat (MLE)	69.39	nu star (bias corrected)	68.09
MLE Mean (bias corrected)	3.185	MLE Sd (bias corrected)	4.851
		Adjusted Level of Significance (β)	0.047
Approximate Chi Square Value (68.09, α)	50.1	Adjusted Chi Square Value (68.09, β)	49.81
95% Gamma Approximate UCL (use when n>=50)	4.329	95% Gamma Adjusted UCL (use when n<50)	4.353

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0791	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.113	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.297	Mean in Log Scale	0.432
SD in Original Scale	5.124	SD in Log Scale	1.205
95% t UCL (assumes normality of ROS data)	4.257	95% Percentile Bootstrap UCL	4.243
95% BCA Bootstrap UCL	4.488	95% Bootstrap t UCL	4.6
95% H-UCL (Log ROS)	4.464		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.462	95% H-UCL (KM -Log)	4.235
KM SD (logged)	1.153	95% Critical H Value (KM-Log)	2.423
KM Standard Error of Mean (logged)	0.133		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.324	Mean in Log Scale	0.41
SD in Original Scale	5.121	SD in Log Scale	1.26
95% t UCL (Assumes normality)	4.283	95% H-Stat UCL	4.785

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	5.834

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (trichloroethene (tce))

Table 7.Supplement.8. ProUCL Output SWMU 20 Soil Gas

General Statistics			
Total Number of Observations	79	Number of Distinct Observations	63
Number of Detects	74	Number of Non-Detects	5
Number of Distinct Detects	61	Number of Distinct Non-Detects	2
Minimum Detect	0.21	Minimum Non-Detect	0.5
Maximum Detect	390	Maximum Non-Detect	3
Variance Detects	6476	Percent Non-Detects	6.329%
Mean Detects	57.92	SD Detects	80.47
Median Detects	23	CV Detects	1.389
Skewness Detects	2.382	Kurtosis Detects	5.973
Mean of Logged Detects	3.057	SD of Logged Detects	1.713

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.695	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.103	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	54.28	Standard Error of Mean	8.905
SD	78.61	95% KM (BCA) UCL	68.7
95% KM (t) UCL	69.1	95% KM (Percentile Bootstrap) UCL	69.5
95% KM (z) UCL	68.93	95% KM Bootstrap t UCL	74.59
90% KM Chebyshev UCL	81	95% KM Chebyshev UCL	93.1
97.5% KM Chebyshev UCL	109.9	99% KM Chebyshev UCL	142.9

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.345	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.806	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0845	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.109	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.614	k star (bias corrected MLE)	0.599
Theta hat (MLE)	94.27	Theta star (bias corrected MLE)	96.77
nu hat (MLE)	90.93	nu star (bias corrected)	88.58
MLE Mean (bias corrected)	57.92	MLE Sd (bias corrected)	74.87

Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.477	nu hat (KM)	75.33
Approximate Chi Square Value (75.33, α)	56.34	Adjusted Chi Square Value (75.33, β)	56.04
95% Gamma Approximate KM-UCL (use when n>=50)	72.58	95% Gamma Adjusted KM-UCL (use when n<50)	72.97

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	54.26
Maximum	390	Median	21
SD	79.13	CV	1.458

Table 7.Supplement.8. ProUCL Output SWMU 20 Soil Gas			
k hat (MLE)	0.454	k star (bias corrected MLE)	0.445
Theta hat (MLE)	119.6	Theta star (bias corrected MLE)	122
nu hat (MLE)	71.68	nu star (bias corrected)	70.29
MLE Mean (bias corrected)	54.26	MLE Sd (bias corrected)	81.35
		Adjusted Level of Significance (β)	0.047
Approximate Chi Square Value (70.29, α)	51.99	Adjusted Chi Square Value (70.29, β)	51.69
95% Gamma Approximate UCL (use when n>=50)	73.36	95% Gamma Adjusted UCL (use when n<50)	73.77
Lognormal GOF Test on Detected Observations Only			
Lilliefors Test Statistic	0.095	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.103	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	54.31	Mean in Log Scale	2.85
SD in Original Scale	79.09	SD in Log Scale	1.845
95% t UCL (assumes normality of ROS data)	69.13	95% Percentile Bootstrap UCL	69.67
95% BCA Bootstrap UCL	72.13	95% Bootstrap t UCL	73.01
95% H-UCL (Log ROS)	186.6		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.788	95% H-UCL (KM -Log)	228.5
KM SD (logged)	1.949	95% Critical H Value (KM-Log)	3.372
KM Standard Error of Mean (logged)	0.221		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	54.29	Mean in Log Scale	2.798
SD in Original Scale	79.11	SD in Log Scale	1.944
95% t UCL (Assumes normality)	69.1	95% H-Stat UCL	228.1
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	93.1	95% GROS Approximate Gamma UCL	73.36
95% Approximate Gamma KM-UCL	72.58		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.9. Data Summary Input for ProUCL - Areas 1, 2 and 3 Soil Gas

Area	Sample Location	Sample ID	Sample Date	Chemical	Result (ppbv)	Detection Limit (ppbv)	Interpreted Qualifier	Detect Flag	Data Note	For ProUCL Result (ppbv)	For ProUCL d_Result
Area 1	SB1259	SB1259GS001-NS	5/31/2013	Tetrachloroethene (PCE)	1,600			Y	a	1,600	1
Area 1	SB1260	SB1260GS001-NS	5/31/2013	Tetrachloroethene (PCE)	56			Y	a	56	1
Area 1	SB1261	SB1261GS001-NS	5/30/2013	Tetrachloroethene (PCE)	41			Y	a	41	1
Area 1	SB1262	SB1262GS001-NS	5/30/2013	Tetrachloroethene (PCE)	130			Y	a	130	1
Area 1	SB1263	SB1263GS001-NS	5/30/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 1	SB1264	SB1264GS001-NS	5/30/2013	Tetrachloroethene (PCE)	170			Y	a	170	1
Area 1	SB1265	SB1265GS001-NS	5/30/2013	Tetrachloroethene (PCE)	250			Y	a	250	1
Area 1	SB1266	SB1266GS001-NS	5/31/2013	Tetrachloroethene (PCE)	400			Y	a	400	1
Area 1	SB1267	SB1267GS001-NS	5/31/2013	Tetrachloroethene (PCE)	39			Y	a	39	1
Area 1	SB1268	SB1268GS001-NS	5/31/2013	Tetrachloroethene (PCE)	5			Y		5	1
Area 1	SB1269	SB1269GS001-NS	5/31/2013	Tetrachloroethene (PCE)	160		J	Y	a	160	1
Area 1	VM0005	VM0005GS001-NS	6/5/2013	Tetrachloroethene (PCE)	270			Y	a	270	1
Area 1	VM0013	VM0013GS001-NS	6/4/2013	Tetrachloroethene (PCE)	340		J	Y	a	340	1
Area 1	VM0014D	VM0014DGS001-NS	6/4/2013	Tetrachloroethene (PCE)	340			Y	a	340	1
Area 1	VM0014S	VM0014SGS001-NS	6/4/2013	Tetrachloroethene (PCE)	110			Y	a	110	1
Area 1	VM0015	VM0015GS001-NS	6/5/2013	Tetrachloroethene (PCE)	24			Y	a	24	1
Area 1	VM0016	VM0016GS001-NS	6/5/2013	Tetrachloroethene (PCE)	440			Y	a	440	1
Area 1	VM0017	VM0017GS001-NS	6/4/2013	Tetrachloroethene (PCE)	910			Y	a	910	1
Area 1	VM0018	VM0018GS001-NS	6/5/2013	Tetrachloroethene (PCE)	160			Y	a	160	1
Area 1	VM0019	VM0019GS001-NS	6/4/2013	Tetrachloroethene (PCE)	160			Y	a	160	1
Area 1	VM0020D	VM0020DGS001-NS	6/4/2013	Tetrachloroethene (PCE)	480			Y	a	480	1
Area 1	VM0020S	VM0020SGS001-NS	6/4/2013	Tetrachloroethene (PCE)	1,300			Y	a	1,300	1
Area 2	SB1270	SB1270GS001-NS	5/29/2013	Tetrachloroethene (PCE)	7.1			Y	a	7.1	1
Area 2	SB1271	SB1271GS001-NS	5/28/2013	Tetrachloroethene (PCE)	230			Y		230	1
Area 2	SB1272	SB1272GS001-NS	5/28/2013	Tetrachloroethene (PCE)	51		J	Y	a	51	1
Area 2	SB1273	SB1273GS001-NS	5/29/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 2	SB1274	SB1274GS001-NS	5/29/2013	Tetrachloroethene (PCE)	19		J	Y		19	1
Area 2	SB1275	SB1275GS001-NS	5/29/2013	Tetrachloroethene (PCE)	1,100			Y	a	1,100	1
Area 2	SB1286	SB1286GS001-NS	5/31/2013	Tetrachloroethene (PCE)	1.7			Y		1.7	1
Area 2	VM0002	VM0002GS001-NS	6/6/2013	Tetrachloroethene (PCE)	9.1		J	Y	a	9.1	1
Area 2	VM0004	VM0004GS001-NS	6/6/2013	Tetrachloroethene (PCE)	26			Y	a	26	1
Area 2	VM0033	VM0033GS001-NS	6/5/2013	Tetrachloroethene (PCE)	130			Y	a	130	1
Area 2	VM0034	VM0034GS001-NS	6/3/2013	Tetrachloroethene (PCE)	58			Y	a	58	1
Area 2	VM0035D	VM0035DGS001-NS	6/5/2013	Tetrachloroethene (PCE)	840			Y	a	840	1
Area 2	VM0035S	VM0035SGS001-NS	6/5/2013	Tetrachloroethene (PCE)	1,000			Y	a	1,000	1
Area 2	VM0036	VM0036GS001-NS	6/5/2013	Tetrachloroethene (PCE)	30		J	Y		30	1
Area 2	VM0037D	VM0037DGS001-NS	6/3/2013	Tetrachloroethene (PCE)	21			Y		21	1
Area 2	VM0037S	VM0037SGS001-NS	6/3/2013	Tetrachloroethene (PCE)	28			Y	a	28	1
Area 2	VM0038	VM0038GS001-NS	6/5/2013	Tetrachloroethene (PCE)	120		J	Y		120	1
Area 2	VM0039	VM0039GS001-NS	6/6/2013	Tetrachloroethene (PCE)	970		J-	Y	a	970	1
Area 2	VM0040D	VM0040DGS001-NS	6/5/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 2	VM0040S	VM0040SGS001-NS	6/5/2013	Tetrachloroethene (PCE)	2.5			Y		2.5	1
Area 2	VM0041D	VM0041DGS001-NS	6/3/2013	Tetrachloroethene (PCE)	0.8		J	Y		0.8	1
Area 2	VM0041S	VM0041SGS001-NS	6/3/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 2	VM0042	VM0042GS001-NS	6/4/2013	Tetrachloroethene (PCE)	14			Y	a	14	1
Area 3	SB1276	SB1276GS001-NS	5/28/2013	Tetrachloroethene (PCE)	37			Y	a	37	1
Area 3	SB1277	SB1277GS001-NS	5/28/2013	Tetrachloroethene (PCE)	0.94			Y		0.94	1
Area 3	SB1278	SB1278GS001-NS	5/28/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	SB1279	SB1279GS001-NS	5/28/2013	Tetrachloroethene (PCE)	0.54			Y		0.54	1
Area 3	SB1280b	SB1280GS001-NS	5/28/2013	Tetrachloroethene (PCE)	70		J	Y		70	1
Area 3	SB1281	SB1281GS001NS	5/28/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	SB1282	SB1282GS001-NS	5/28/2013	Tetrachloroethene (PCE)	47			Y	a	47	1
Area 3	SB1283	SB1283GS001-NS	5/28/2013	Tetrachloroethene (PCE)	13			Y		13	1
Area 3	SB1284	SB1284GS001-NS	5/29/2013	Tetrachloroethene (PCE)	3,700			Y	a	3,700	1
Area 3	SB1285	SB1285GS001-NS	5/29/2013	Tetrachloroethene (PCE)	850		J	Y	a	850	1
Area 3	VM0048	VM0048GS001-NS	6/4/2013	Tetrachloroethene (PCE)	50			Y	a	50	1

Table 7.Supplement.9. Data Summary Input for ProUCL - Areas 1, 2 and 3 Soil Gas

Area	Sample Location	Sample ID	Sample Date	Chemical	Result (ppbv)	Detection Limit (ppbv)	Interpreted Qualifier	Detect Flag	Data Note	For ProUCL Result (ppbv)	For ProUCL d_Result
Area 3	VM0049D	VM0049DGS001-NS	6/3/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	VM0049S	VM0049SGS001-NS	6/3/2013	Tetrachloroethene (PCE)	11			Y	a	11	1
Area 3	VM0050	VM0050GS001-NS	6/6/2013	Tetrachloroethene (PCE)	2.6			Y	a	2.6	1
Area 3	VM0051	VM0051GS001-NS	6/4/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	VM0052D	VM0052DGS001-NS	5/31/2013	Tetrachloroethene (PCE)	31		J	Y		31	1
Area 3	VM0052S	VM0052SGS001-NS	5/31/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	VM0053	VM0053GS001-NS	6/3/2013	Tetrachloroethene (PCE)		0.063	UJ	N		0.063	0
Area 3	VM0054	VM0054GS001-NS	6/5/2013	Tetrachloroethene (PCE)	33			Y	a	33	1
Area 3	VM0055	VM0055GS001-NS	6/4/2013	Tetrachloroethene (PCE)	5.2			Y	a	5.2	1
Area 3	VM0056	VM0056GS001-NS	6/4/2013	Tetrachloroethene (PCE)	800			Y	a	800	1
Area 3	VM0057	VM0057GS001-NS	5/30/2013	Tetrachloroethene (PCE)	440			Y	a	440	1
Area 3	VM0058S	VM0058SGS001-NS	6/3/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	VM0059	VM0059GS001-NS	6/6/2013	Tetrachloroethene (PCE)	380			Y	a	380	1
Area 3	VM0060	VM0060GS001-NS	6/5/2013	Tetrachloroethene (PCE)	53			Y	a	53	1
Area 3	VM0061	VM0061GS001-NS	5/31/2013	Tetrachloroethene (PCE)	1.6			Y		1.6	1
Area 3	VM0062	VM0062SGS001-NS	6/4/2013	Tetrachloroethene (PCE)	52			Y	a	52	1
Area 3	VM0063D	VM0063DGS001-NS	6/3/2013	Tetrachloroethene (PCE)	200		J	Y	a	200	1
Area 3	VM0063S	VM0063SGS001-NS	6/3/2013	Tetrachloroethene (PCE)	180			Y	a	180	1
Area 3	VM0064	VM0064GS001-NS	6/4/2013	Tetrachloroethene (PCE)	310			Y	a	310	1
Area 3	VM0065	VM0065GS001-NS	6/4/2013	Tetrachloroethene (PCE)	1,200			Y	a	1,200	1
Area 3	VM0066	VM0066GS001-NS	5/30/2013	Tetrachloroethene (PCE)	9.6			Y		9.6	1
Area 3	VM0067	VM0067GS001-NS	5/29/2013	Tetrachloroethene (PCE)	7.9			Y		7.9	1
Area 3	VM0068	VM0068GS001-NS	6/6/2013	Tetrachloroethene (PCE)	370			Y	a	370	1
Area 3	VM0069D	VM0069DGS001-NS	5/29/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 3	VM0069S	VM0069SGS001-NS	5/29/2013	Tetrachloroethene (PCE)	32		J	Y		32	1
Area 3	VM0070	VM0070GS001-NS	6/4/2013	Tetrachloroethene (PCE)	1		J	Y		1	1
Area 3	VM0071	VM0071GS001-NS	6/5/2013	Tetrachloroethene (PCE)	200			Y	a	200	1
Area 3	VM0072D	VM0072DGS001-NS	6/4/2013	Tetrachloroethene (PCE)	2.7			Y		2.7	1
Area 3	VM0072S	VM0072SGS001-NS	6/3/2013	Tetrachloroethene (PCE)	2.9			Y		2.9	1
Area 3	VM0073	VM0073GS001-NS	6/3/2013	Tetrachloroethene (PCE)	24		J	Y		24	1
Area 3	VM0074	VM0074GS001-NS	5/29/2013	Tetrachloroethene (PCE)	37			Y		37	1
Area 3	VM0075	VM0075GS001-NS	5/29/2013	Tetrachloroethene (PCE)		0.063	U	N		0.063	0
Area 1	SB1259	SB1259GS001-NS	5/31/2013	Trichloroethene (TCE)	12		J	Y	a	12	1
Area 1	SB1260	SB1260GS001-NS	5/31/2013	Trichloroethene (TCE)	3			Y		3	1
Area 1	SB1261	SB1261GS001-NS	5/30/2013	Trichloroethene (TCE)	1.7			Y		1.7	1
Area 1	SB1262	SB1262GS001-NS	5/30/2013	Trichloroethene (TCE)	10			Y		10	1
Area 1	SB1263	SB1263GS001-NS	5/30/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 1	SB1264	SB1264GS001-NS	5/30/2013	Trichloroethene (TCE)	17		J+	Y	a	17	1
Area 1	SB1265	SB1265GS001-NS	5/30/2013	Trichloroethene (TCE)	9.9		J+	Y	a	9.9	1
Area 1	SB1266	SB1266GS001-NS	5/31/2013	Trichloroethene (TCE)	70			Y	a	70	1
Area 1	SB1267	SB1267GS001-NS	5/31/2013	Trichloroethene (TCE)	19			Y		19	1
Area 1	SB1268	SB1268GS001-NS	5/31/2013	Trichloroethene (TCE)	1.2			Y		1.2	1
Area 1	SB1269	SB1269GS001-NS	5/31/2013	Trichloroethene (TCE)	21			Y	a	21	1
Area 1	VM0005	VM0005GS001-NS	6/5/2013	Trichloroethene (TCE)	200			Y	a	200	1
Area 1	VM0013	VM0013GS001-NS	6/4/2013	Trichloroethene (TCE)	12		J	Y	a	12	1
Area 1	VM0014D	VM0014DGS001-NS	6/4/2013	Trichloroethene (TCE)	130			Y	a	130	1
Area 1	VM0014S	VM0014SGS001-NS	6/4/2013	Trichloroethene (TCE)	28			Y	a	28	1
Area 1	VM0015	VM0015GS001-NS	6/5/2013	Trichloroethene (TCE)	7.2			Y		7.2	1
Area 1	VM0016	VM0016GS001-NS	6/5/2013	Trichloroethene (TCE)	10			Y	a	10	1
Area 1	VM0017	VM0017GS001-NS	6/4/2013	Trichloroethene (TCE)	47			Y	a	47	1
Area 1	VM0018	VM0018GS001-NS	6/5/2013	Trichloroethene (TCE)	96			Y	a	96	1
Area 1	VM0019	VM0019GS001-NS	6/4/2013	Trichloroethene (TCE)	210			Y	a	210	1
Area 1	VM0020D	VM0020DGS001-NS	6/4/2013	Trichloroethene (TCE)	16		J	Y	a	16	1
Area 1	VM0020S	VM0020SGS001-NS	6/4/2013	Trichloroethene (TCE)	12		J	Y	a	12	1
Area 2	SB1270	SB1270GS001-NS	5/29/2013	Trichloroethene (TCE)	210			Y	a	210	1
Area 2	SB1271	SB1271GS001-NS	5/28/2013	Trichloroethene (TCE)	3.6		J+	Y		3.6	1

Table 7.Supplement.9. Data Summary Input for ProUCL - Areas 1, 2 and 3 Soil Gas

Area	Sample Location	Sample ID	Sample Date	Chemical	Result (ppbv)	Detection Limit (ppbv)	Interpreted Qualifier	Detect Flag	Data Note	For ProUCL Result (ppbv)	For ProUCL d_Result
Area 2	SB1272	SB1272GS001-NS	5/28/2013	Trichloroethene (TCE)	0.49		J	Y		0.49	1
Area 2	SB1273	SB1273GS001-NS	5/29/2013	Trichloroethene (TCE)		0.063	U	N		0.063	0
Area 2	SB1274	SB1274GS001-NS	5/29/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 2	SB1275	SB1275GS001-NS	5/29/2013	Trichloroethene (TCE)	8.9			Y	a	8.9	1
Area 2	SB1286	SB1286GS001-NS	5/31/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 2	VM0002	VM0002GS001-NS	6/6/2013	Trichloroethene (TCE)	230			Y	a	230	1
Area 2	VM0004	VM0004GS001-NS	6/6/2013	Trichloroethene (TCE)	680			Y	a	680	1
Area 2	VM0033	VM0033GS001-NS	6/5/2013	Trichloroethene (TCE)	0.48		J	Y		0.48	1
Area 2	VM0034	VM0034GS001-NS	6/3/2013	Trichloroethene (TCE)	29			Y	a	29	1
Area 2	VM0035D	VM0035DGS001-NS	6/5/2013	Trichloroethene (TCE)	62			Y	a	62	1
Area 2	VM0035S	VM0035SGS001-NS	6/5/2013	Trichloroethene (TCE)	60			Y	a	60	1
Area 2	VM0036	VM0036GS001-NS	6/5/2013	Trichloroethene (TCE)	0.37		J	Y		0.37	1
Area 2	VM0037D	VM0037DGS001-NS	6/3/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 2	VM0037S	VM0037SGS001-NS	6/3/2013	Trichloroethene (TCE)	0.2		J	Y		0.2	1
Area 2	VM0038	VM0038GS001-NS	6/5/2013	Trichloroethene (TCE)	2.4		J	Y		2.4	1
Area 2	VM0039	VM0039GS001-NS	6/6/2013	Trichloroethene (TCE)	10		J-	Y	a	10	1
Area 2	VM0040D	VM0040DGS001-NS	6/5/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 2	VM0040S	VM0040SGS001-NS	6/5/2013	Trichloroethene (TCE)	20			Y		20	1
Area 2	VM0041D	VM0041DGS001-NS	6/3/2013	Trichloroethene (TCE)	6.9		J	Y		6.9	1
Area 2	VM0041S	VM0041SGS001-NS	6/3/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 2	VM0042	VM0042GS001-NS	6/4/2013	Trichloroethene (TCE)	480			Y	a	480	1
Area 3	SB1276	SB1276GS001-NS	5/28/2013	Trichloroethene (TCE)	7.9			Y	a	7.9	1
Area 3	SB1277	SB1277GS001-NS	5/28/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 3	SB1278	SB1278GS001-NS	5/28/2013	Trichloroethene (TCE)	0.33		J	Y		0.33	1
Area 3	SB1279	SB1279GS001-NS	5/28/2013	Trichloroethene (TCE)	1		J+	Y		1	1
Area 3	SB1280b	SB1280GS001-NS	5/28/2013	Trichloroethene (TCE)	0.78		J+	Y		0.78	1
Area 3	SB1281	SB1281GS001NS	5/28/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 3	SB1282	SB1282GS001-NS	5/28/2013	Trichloroethene (TCE)	4.2			Y		4.2	1
Area 3	SB1283	SB1283GS001-NS	5/28/2013	Trichloroethene (TCE)	0.24		J	Y		0.24	1
Area 3	SB1284	SB1284GS001-NS	5/29/2013	Trichloroethene (TCE)	2,000			Y	a	2,000	1
Area 3	SB1285	SB1285GS001-NS	5/29/2013	Trichloroethene (TCE)	260		J+	Y	a,	260	1
Area 3	VM0048	VM0048GS001-NS	6/4/2013	Trichloroethene (TCE)	29		J	Y		29	1
Area 3	VM0049D	VM0049DGS001-NS	6/3/2013	Trichloroethene (TCE)	0.66			Y		0.66	1
Area 3	VM0049S	VM0049SGS001-NS	6/3/2013	Trichloroethene (TCE)	230			Y	a	230	1
Area 3	VM0050	VM0050GS001-NS	6/6/2013	Trichloroethene (TCE)	89			Y	a	89	1
Area 3	VM0051	VM0051GS001-NS	6/4/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 3	VM0052D	VM0052DGS001-NS	5/31/2013	Trichloroethene (TCE)	3.8			Y		3.8	1
Area 3	VM0052S	VM0052SGS001-NS	5/31/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 3	VM0053	VM0053GS001-NS	6/3/2013	Trichloroethene (TCE)	37			Y	a	37	1
Area 3	VM0054	VM0054GS001-NS	6/5/2013	Trichloroethene (TCE)	58			Y	a	58	1
Area 3	VM0055	VM0055GS001-NS	6/4/2013	Trichloroethene (TCE)	73			Y	a	73	1
Area 3	VM0056	VM0056GS001-NS	6/4/2013	Trichloroethene (TCE)	180			Y	a	180	1
Area 3	VM0057	VM0057GS001-NS	5/30/2013	Trichloroethene (TCE)	18			Y	a	18	1
Area 3	VM0058S	VM0058SGS001-NS	6/3/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0
Area 3	VM0059	VM0059GS001-NS	6/6/2013	Trichloroethene (TCE)	110			Y	a	110	1
Area 3	VM0060	VM0060GS001-NS	6/5/2013	Trichloroethene (TCE)	85			Y	a	85	1
Area 3	VM0061	VM0061GS001-NS	5/31/2013	Trichloroethene (TCE)	220			Y		220	1
Area 3	VM0062	VM0062SGS001-NS	6/4/2013	Trichloroethene (TCE)	54			Y	a	54	1
Area 3	VM0063D	VM0063DGS001-NS	6/3/2013	Trichloroethene (TCE)	81			Y	a	81	1
Area 3	VM0063S	VM0063SGS001-NS	6/3/2013	Trichloroethene (TCE)	38			Y	a	38	1
Area 3	VM0064	VM0064GS001-NS	6/4/2013	Trichloroethene (TCE)	640			Y	a	640	1
Area 3	VM0065	VM0065GS001-NS	6/4/2013	Trichloroethene (TCE)	360			Y	a	360	1
Area 3	VM0066	VM0066GS001-NS	5/30/2013	Trichloroethene (TCE)	5.9			Y		5.9	1
Area 3	VM0067	VM0067GS001-NS	5/29/2013	Trichloroethene (TCE)	5.2			Y		5.2	1
Area 3	VM0068	VM0068GS001-NS	6/6/2013	Trichloroethene (TCE)	720		J	Y	a	720	1
Area 3	VM0069D	VM0069DGS001-NS	5/29/2013	Trichloroethene (TCE)		0.05	U	N		0.05	0

Table 7.Supplement.9. Data Summary Input for ProUCL - Areas 1, 2 and 3 Soil Gas

Area	Sample Location	Sample ID	Sample Date	Chemical	Result (ppbv)	Detection Limit (ppbv)	Interpreted Qualifier	Detect Flag	Data Note	For ProUCL Result (ppbv)	For ProUCL d_Result
Area 3	VM0069S	VM0069SGS001-NS	5/29/2013	Trichloroethene (TCE)	0.74			Y		0.74	1
Area 3	VM0070	VM0070GS001-NS	6/4/2013	Trichloroethene (TCE)	8.3		J	Y		8.3	1
Area 3	VM0071	VM0071GS001-NS	6/5/2013	Trichloroethene (TCE)	620			Y	a	620	1
Area 3	VM0072D	VM0072DGS001-NS	6/4/2013	Trichloroethene (TCE)	1.7			Y		1.7	1
Area 3	VM0072S	VM0072SGS001-NS	6/3/2013	Trichloroethene (TCE)	50			Y		50	1
Area 3	VM0073	VM0073GS001-NS	6/3/2013	Trichloroethene (TCE)	38			Y		38	1
Area 3	VM0074	VM0074GS001-NS	5/29/2013	Trichloroethene (TCE)	49			Y	a	49	1
Area 3	VM0075	VM0075GS001-NS	5/29/2013	Trichloroethene (TCE)		0.06	U	N		0.06	0

Notes:
Data are from the December 2013 Final Areas 1, 2, and 3 Soil Gas Optimization Report, Tables 3-1 to 3-3.
a - Practical quantitation limits and method detection limits are raised due to sample dilution

Table 7.Supplement.10. ProUCL Output Area 1 Building 237 Soil Gas

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:33:21 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (tetrachloroethene (pce))

General Statistics

Total Number of Observations	22	Number of Distinct Observations	19
Number of Detects	21	Number of Non-Detects	1
Number of Distinct Detects	18	Number of Distinct Non-Detects	1
Minimum Detect	5	Minimum Non-Detect	0.063
Maximum Detect	1600	Maximum Non-Detect	0.063
Variance Detects	178664	Percent Non-Detects	4.545%
Mean Detects	351.7	SD Detects	422.7
Median Detects	170	CV Detects	1.202
Skewness Detects	2.018	Kurtosis Detects	3.682
Mean of Logged Detects	5.167	SD of Logged Detects	1.378

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.732	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	335.7	Standard Error of Mean	89.49
SD	409.6	95% KM (BCA) UCL	486.8
95% KM (t) UCL	489.7	95% KM (Percentile Bootstrap) UCL	484.3
95% KM (z) UCL	482.9	95% KM Bootstrap t UCL	599.6
90% KM Chebyshev UCL	604.1	95% KM Chebyshev UCL	725.8
97.5% KM Chebyshev UCL	894.5	99% KM Chebyshev UCL	1226

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.287	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.778	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.112	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.196	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.847	k star (bias corrected MLE)	0.758
Theta hat (MLE)	415.2	Theta star (bias corrected MLE)	464.1
nu hat (MLE)	35.57	nu star (bias corrected)	31.83
MLE Mean (bias corrected)	351.7	MLE Sd (bias corrected)	404

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.672	nu hat (KM)	29.55
Approximate Chi Square Value (29.55, α)	18.14	Adjusted Chi Square Value (29.55, β)	17.47

Table 7.Supplement.10. ProUCL Output Area 1 Building 237 Soil Gas			
95% Gamma Approximate KM-UCL (use when n>=50)	546.8	95% Gamma Adjusted KM-UCL (use when n<50)	567.7
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	335.7
Maximum	1600	Median	165
SD	419.3	CV	1.249
k hat (MLE)	0.57	k star (bias corrected MLE)	0.522
Theta hat (MLE)	589.3	Theta star (bias corrected MLE)	642.8
nu hat (MLE)	25.06	nu star (bias corrected)	22.98
MLE Mean (bias corrected)	335.7	MLE Sd (bias corrected)	464.5
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (22.98, α)	13.07	Adjusted Chi Square Value (22.98, β)	12.52
95% Gamma Approximate UCL (use when n>=50)	590	95% Gamma Adjusted UCL (use when n<50)	616.2
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	336	Mean in Log Scale	5.016
SD in Original Scale	419	SD in Log Scale	1.52
95% t UCL (assumes normality of ROS data)	489.7	95% Percentile Bootstrap UCL	484.9
95% BCA Bootstrap UCL	518.8	95% Bootstrap t UCL	631.9
95% H-UCL (Log ROS)	1468		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	4.807	95% H-UCL (KM -Log)	8526
KM SD (logged)	2.111	95% Critical H Value (KM-Log)	4.378
KM Standard Error of Mean (logged)	0.461		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	335.7	Mean in Log Scale	4.775
SD in Original Scale	419.3	SD in Log Scale	2.278
95% t UCL (Assumes normality)	489.5	95% H-Stat UCL	16194
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	725.8	95% GROS Adjusted Gamma UCL	616.2
95% Adjusted Gamma KM-UCL	567.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

Table 7.Supplement.10. ProUCL Output Area 1 Building 237 Soil Gas

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (trichloroethene (tce))

General Statistics

Total Number of Observations	22	Number of Distinct Observations	19
Number of Detects	21	Number of Non-Detects	1
Number of Distinct Detects	18	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	0.05
Maximum Detect	210	Maximum Non-Detect	0.05
Variance Detects	3940	Percent Non-Detects	4.545%
Mean Detects	44.43	SD Detects	62.77
Median Detects	16	CV Detects	1.413
Skewness Detects	1.9	Kurtosis Detects	2.668
Mean of Logged Detects	2.916	SD of Logged Detects	1.415

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.674	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.318	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	42.41	Standard Error of Mean	13.23
SD	60.56	95% KM (BCA) UCL	64.05
95% KM (t) UCL	65.18	95% KM (Percentile Bootstrap) UCL	65.04
95% KM (z) UCL	64.17	95% KM Bootstrap t UCL	79.82
90% KM Chebyshev UCL	82.1	95% KM Chebyshev UCL	100.1
97.5% KM Chebyshev UCL	125	99% KM Chebyshev UCL	174

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.926	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.198	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.69	k star (bias corrected MLE)	0.623
Theta hat (MLE)	64.39	Theta star (bias corrected MLE)	71.3
nu hat (MLE)	28.98	nu star (bias corrected)	26.17
MLE Mean (bias corrected)	44.43	MLE Sd (bias corrected)	56.28

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.49	nu hat (KM)	21.58
Approximate Chi Square Value (21.58, α)	12.02	Adjusted Chi Square Value (21.58, β)	11.49
95% Gamma Approximate KM-UCL (use when n>=50)	76.12	95% Gamma Adjusted KM-UCL (use when n<50)	79.64

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table 7.Supplement.10. ProUCL Output Area 1 Building 237 Soil Gas			
Minimum	0.01	Mean	42.41
Maximum	210	Median	14
SD	61.98	CV	1.462
k hat (MLE)	0.536	k star (bias corrected MLE)	0.493
Theta hat (MLE)	79.16	Theta star (bias corrected MLE)	86.02
nu hat (MLE)	23.57	nu star (bias corrected)	21.69
MLE Mean (bias corrected)	42.41	MLE Sd (bias corrected)	60.4
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (21.69, α)	12.11	Adjusted Chi Square Value (21.69, β)	11.57
95% Gamma Approximate UCL (use when n>=50)	75.98	95% Gamma Adjusted UCL (use when n<50)	79.48
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	42.44	Mean in Log Scale	2.758
SD in Original Scale	61.97	SD in Log Scale	1.567
95% t UCL (assumes normality of ROS data)	65.17	95% Percentile Bootstrap UCL	65.56
95% BCA Bootstrap UCL	68.64	95% Bootstrap t UCL	78.64
95% H-UCL (Log ROS)	175.2		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.648	95% H-UCL (KM -Log)	352.3
KM SD (logged)	1.826	95% Critical H Value (KM-Log)	3.887
KM Standard Error of Mean (logged)	0.399		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	42.41	Mean in Log Scale	2.616
SD in Original Scale	61.98	SD in Log Scale	1.972
95% t UCL (Assumes normality)	65.15	95% H-Stat UCL	567.4
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	125		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.11. ProUCL Output SWMU 1/Area 2 Soil Gas

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:34:29 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (tetrachloroethene (pce))

General Statistics

Total Number of Observations	23	Number of Distinct Observations	21
Number of Detects	20	Number of Non-Detects	3
Number of Distinct Detects	20	Number of Distinct Non-Detects	1
Minimum Detect	0.8	Minimum Non-Detect	0.063
Maximum Detect	1100	Maximum Non-Detect	0.063
Variance Detects	150801	Percent Non-Detects	13.04%
Mean Detects	232.9	SD Detects	388.3
Median Detects	29	CV Detects	1.667
Skewness Detects	1.596	Kurtosis Detects	0.813
Mean of Logged Detects	3.731	SD of Logged Detects	2.142

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.617	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	202.5	Standard Error of Mean	77.35
SD	361.6	95% KM (BCA) UCL	338.6
95% KM (t) UCL	335.4	95% KM (Percentile Bootstrap) UCL	332.7
95% KM (z) UCL	329.8	95% KM Bootstrap t UCL	421.8
90% KM Chebyshev UCL	434.6	95% KM Chebyshev UCL	539.7
97.5% KM Chebyshev UCL	685.6	99% KM Chebyshev UCL	972.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.014	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.827	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.208	Detected data appear Gamma Distributed at 5% Significance Level

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

Gamma Statistics on Detected Data Only

k hat (MLE)	0.385	k star (bias corrected MLE)	0.361
Theta hat (MLE)	604.9	Theta star (bias corrected MLE)	645.9
nu hat (MLE)	15.4	nu star (bias corrected)	14.42
MLE Mean (bias corrected)	232.9	MLE Sd (bias corrected)	387.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.314	nu hat (KM)	14.44
Approximate Chi Square Value (14.44, α)	6.87	Adjusted Chi Square Value (14.44, β)	6.494

Table 7.Supplement.11. ProUCL Output SWMU 1/Area 2 Soil Gas			
95% Gamma Approximate KM-UCL (use when n>=50)	425.6	95% Gamma Adjusted KM-UCL (use when n<50)	450.2
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	202.5
Maximum	1100	Median	26
SD	369.7	CV	1.825
k hat (MLE)	0.264	k star (bias corrected MLE)	0.259
Theta hat (MLE)	767.3	Theta star (bias corrected MLE)	783.4
nu hat (MLE)	12.14	nu star (bias corrected)	11.89
MLE Mean (bias corrected)	202.5	MLE Sd (bias corrected)	398.3
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (11.89, α)	5.156	Adjusted Chi Square Value (11.89, β)	4.837
95% Gamma Approximate UCL (use when n>=50)	467.1	95% Gamma Adjusted UCL (use when n<50)	497.9
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.198	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	202.6	Mean in Log Scale	3.081
SD in Original Scale	369.7	SD in Log Scale	2.638
95% t UCL (assumes normality of ROS data)	334.9	95% Percentile Bootstrap UCL	334
95% BCA Bootstrap UCL	354.2	95% Bootstrap t UCL	405.8
95% H-UCL (Log ROS)	12711		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.884	95% H-UCL (KM -Log)	44113
KM SD (logged)	2.929	95% Critical H Value (KM-Log)	5.641
KM Standard Error of Mean (logged)	0.627		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	202.5	Mean in Log Scale	2.793
SD in Original Scale	369.7	SD in Log Scale	3.177
95% t UCL (Assumes normality)	334.9	95% H-Stat UCL	155556
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	539.7	95% GROS Adjusted Gamma UCL	497.9
95% Adjusted Gamma KM-UCL	450.2		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			

Table 7.Supplement.11. ProUCL Output SWMU 1/Area 2 Soil Gas

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (trichloroethene (tce))

General Statistics			
Total Number of Observations	23	Number of Distinct Observations	19
Number of Detects	17	Number of Non-Detects	6
Number of Distinct Detects	17	Number of Distinct Non-Detects	2
Minimum Detect	0.2	Minimum Non-Detect	0.05
Maximum Detect	680	Maximum Non-Detect	0.063
Variance Detects	37951	Percent Non-Detects	26.09%
Mean Detects	106.1	SD Detects	194.8
Median Detects	10	CV Detects	1.835
Skewness Detects	2.235	Kurtosis Detects	4.527
Mean of Logged Detects	2.505	SD of Logged Detects	2.587

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.617	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.354	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	78.46	Standard Error of Mean	36.33
SD	169	95% KM (BCA) UCL	145.8
95% KM (t) UCL	140.8	95% KM (Percentile Bootstrap) UCL	141.3
95% KM (z) UCL	138.2	95% KM Bootstrap t UCL	228.9
90% KM Chebyshev UCL	187.5	95% KM Chebyshev UCL	236.8
97.5% KM Chebyshev UCL	305.3	99% KM Chebyshev UCL	439.9

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.536	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.838	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.165	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.226	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.317	k star (bias corrected MLE)	0.3
Theta hat (MLE)	335.3	Theta star (bias corrected MLE)	353.9
nu hat (MLE)	10.76	nu star (bias corrected)	10.2
MLE Mean (bias corrected)	106.1	MLE Sd (bias corrected)	193.8

Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.215	nu hat (KM)	9.912
Approximate Chi Square Value (9.91, α)	3.887	Adjusted Chi Square Value (9.91, β)	3.617
95% Gamma Approximate KM-UCL (use when n>=50)	200.1	95% Gamma Adjusted KM-UCL (use when n<50)	215

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table 7.Supplement.11. ProUCL Output SWMU 1/Area 2 Soil Gas			
Minimum	0.01	Mean	78.45
Maximum	680	Median	3.6
SD	172.8	CV	2.203
k hat (MLE)	0.198	k star (bias corrected MLE)	0.202
Theta hat (MLE)	395.3	Theta star (bias corrected MLE)	389.2
nu hat (MLE)	9.13	nu star (bias corrected)	9.273
MLE Mean (bias corrected)	78.45	MLE Sd (bias corrected)	174.7
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (9.27, α)	3.493	Adjusted Chi Square Value (9.27, β)	3.239
95% Gamma Approximate UCL (use when n>=50)	208.3	95% Gamma Adjusted UCL (use when n<50)	224.6
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.215	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	78.46	Mean in Log Scale	0.896
SD in Original Scale	172.8	SD in Log Scale	3.592
95% t UCL (assumes normality of ROS data)	140.3	95% Percentile Bootstrap UCL	142.2
95% BCA Bootstrap UCL	161.3	95% Bootstrap t UCL	226.2
95% H-UCL (Log ROS)	286992		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	1.07	95% H-UCL (KM -Log)	39611
KM SD (logged)	3.239	95% Critical H Value (KM-Log)	6.186
KM Standard Error of Mean (logged)	0.696		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	78.46	Mean in Log Scale	0.9
SD in Original Scale	172.8	SD in Log Scale	3.537
95% t UCL (Assumes normality)	140.3	95% H-Stat UCL	201859
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	236.8	95% GROS Adjusted Gamma UCL	224.6
95% Adjusted Gamma KM-UCL	215		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.12. ProUCL Output Area 3 Soil Gas

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/24/2015 7:36:10 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (tetrachloroethene (pce))

General Statistics

Total Number of Observations	43	Number of Distinct Observations	33
Number of Detects	34	Number of Non-Detects	9
Number of Distinct Detects	32	Number of Distinct Non-Detects	1
Minimum Detect	0.54	Minimum Non-Detect	0.063
Maximum Detect	3700	Maximum Non-Detect	0.063
Variance Detects	446449	Percent Non-Detects	20.93%
Mean Detects	269.3	SD Detects	668.2
Median Detects	37	CV Detects	2.481
Skewness Detects	4.445	Kurtosis Detects	22.16
Mean of Logged Detects	3.608	SD of Logged Detects	2.26

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.441	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	212.9	Standard Error of Mean	92.18
SD	595.5	95% KM (BCA) UCL	394.5
95% KM (t) UCL	368	95% KM (Percentile Bootstrap) UCL	384.6
95% KM (z) UCL	364.5	95% KM Bootstrap t UCL	635.1
90% KM Chebyshev UCL	489.5	95% KM Chebyshev UCL	614.7
97.5% KM Chebyshev UCL	788.6	99% KM Chebyshev UCL	1130

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.138	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.847	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.208	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.163	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.34	k star (bias corrected MLE)	0.33
Theta hat (MLE)	792.1	Theta star (bias corrected MLE)	817.1
nu hat (MLE)	23.12	nu star (bias corrected)	22.41
MLE Mean (bias corrected)	269.3	MLE Sd (bias corrected)	469

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.128	nu hat (KM)	10.99
Approximate Chi Square Value (10.99, α)	4.572	Adjusted Chi Square Value (10.99, β)	4.429

Table 7.Supplement.12. ProUCL Output Area 3 Soil Gas			
95% Gamma Approximate KM-UCL (use when n>=50)	512	95% Gamma Adjusted KM-UCL (use when n<50)	528.6
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	212.9
Maximum	3700	Median	24
SD	602.5	CV	2.83
k hat (MLE)	0.21	k star (bias corrected MLE)	0.211
Theta hat (MLE)	1012	Theta star (bias corrected MLE)	1008
nu hat (MLE)	18.09	nu star (bias corrected)	18.16
MLE Mean (bias corrected)	212.9	MLE Sd (bias corrected)	463.3
		Adjusted Level of Significance (β)	0.0444
Approximate Chi Square Value (18.16, α)	9.505	Adjusted Chi Square Value (18.16, β)	9.287
95% Gamma Approximate UCL (use when n>=50)	406.7	95% Gamma Adjusted UCL (use when n<50)	416.3
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0869	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	213	Mean in Log Scale	2.511
SD in Original Scale	602.5	SD in Log Scale	2.989
95% t UCL (assumes normality of ROS data)	367.5	95% Percentile Bootstrap UCL	380.1
95% BCA Bootstrap UCL	467.7	95% Bootstrap t UCL	601.5
95% H-UCL (Log ROS)	11491		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.274	95% H-UCL (KM -Log)	32544
KM SD (logged)	3.262	95% Critical H Value (KM-Log)	5.556
KM Standard Error of Mean (logged)	0.505		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	212.9	Mean in Log Scale	2.129
SD in Original Scale	602.5	SD in Log Scale	3.531
95% t UCL (Assumes normality)	367.5	95% H-Stat UCL	111273
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
99% KM (Chebyshev) UCL	1130		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table 7.Supplement.12. ProUCL Output Area 3 Soil Gas

result (trichloroethene (tce))

General Statistics			
Total Number of Observations	43	Number of Distinct Observations	37
Number of Detects	36	Number of Non-Detects	7
Number of Distinct Detects	35	Number of Distinct Non-Detects	2
Minimum Detect	0.24	Minimum Non-Detect	0.05
Maximum Detect	2000	Maximum Non-Detect	0.06
Variance Detects	133500	Percent Non-Detects	16.28%
Mean Detects	168.9	SD Detects	365.4
Median Detects	43.5	CV Detects	2.164
Skewness Detects	3.988	Kurtosis Detects	18.5
Mean of Logged Detects	3.257	SD of Logged Detects	2.375

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.501	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.322	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	141.4	Standard Error of Mean	51.89
SD	335.5	95% KM (BCA) UCL	245.6
95% KM (t) UCL	228.7	95% KM (Percentile Bootstrap) UCL	229.9
95% KM (z) UCL	226.7	95% KM Bootstrap t UCL	328.3
90% KM Chebyshev UCL	297.1	95% KM Chebyshev UCL	367.6
97.5% KM Chebyshev UCL	465.4	99% KM Chebyshev UCL	657.7

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.623	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.844	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.358	k star (bias corrected MLE)	0.347
Theta hat (MLE)	471.8	Theta star (bias corrected MLE)	487.2
nu hat (MLE)	25.77	nu star (bias corrected)	24.96
MLE Mean (bias corrected)	168.9	MLE Sd (bias corrected)	286.9

Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.178	nu hat (KM)	15.28
Approximate Chi Square Value (15.28, α)	7.455	Adjusted Chi Square Value (15.28, β)	7.265
95% Gamma Approximate KM-UCL (use when n>=50)	289.8	95% Gamma Adjusted KM-UCL (use when n<50)	297.4

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	141.4

Table 7.Supplement.12. ProUCL Output Area 3 Soil Gas			
Maximum	2000	Median	29
SD	339.5	CV	2.401
k hat (MLE)	0.24	k star (bias corrected MLE)	0.239
Theta hat (MLE)	588.3	Theta star (bias corrected MLE)	591.4
nu hat (MLE)	20.67	nu star (bias corrected)	20.56
MLE Mean (bias corrected)	141.4	MLE Sd (bias corrected)	289.2
		Adjusted Level of Significance (β)	0.0444
Approximate Chi Square Value (20.56, α)	11.27	Adjusted Chi Square Value (20.56, β)	11.03
95% Gamma Approximate UCL (use when n>=50)	258.1	95% Gamma Adjusted UCL (use when n<50)	263.7
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.143	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	141.4	Mean in Log Scale	2.389
SD in Original Scale	339.4	SD in Log Scale	2.966
95% t UCL (assumes normality of ROS data)	228.5	95% Percentile Bootstrap UCL	231.7
95% BCA Bootstrap UCL	276.2	95% Bootstrap t UCL	337.3
95% H-UCL (Log ROS)	9166		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	2.239	95% H-UCL (KM -Log)	18338
KM SD (logged)	3.15	95% Critical H Value (KM-Log)	5.384
KM Standard Error of Mean (logged)	0.487		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	141.4	Mean in Log Scale	2.131
SD in Original Scale	339.5	SD in Log Scale	3.374
95% t UCL (Assumes normality)	228.5	95% H-Stat UCL	49315
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	367.6	95% GROS Adjusted Gamma UCL	263.7
95% Adjusted Gamma KM-UCL	297.4		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

APPENDIX E

Site Inspection Forms

Tracy Site Annual Site Inspection Form

Inspection at **Area 1 Building / 237** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing structures and pavement	/		
Warning signs	/		
Compliance with land use change procedures (if land use has changed)	/		
Controls restored after construction			/
Soils from excavation sampled and disposed			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **Building 30 Drum Storage Area** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing structures and pavement	/		
Warning signs	/		
Compliance with land use change procedures (if land use has changed)			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **DSERTS 68 (Area 3)** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing structures and pavement	✓		
Warning signs	✓		
Compliance with land use change procedures (if land use has changed)			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **DSERTS 72** was conducted J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	✓		
Compliance with land use change procedures	✓		
Change in conditions (stockpiles, on-going construction, site usage, etc.)	✓		

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

New storage area, newly paved with parimeter fence. Environmental office was notified & DSERTS 72 was located prior to construction. No construction on DSERTS 72.

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **Eastern Depot Soils Area/SWMU 8** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	/		
Compliance with land use change procedures			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **Northern Depot Soils Area (DSERTS 67)** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures); existing structures; aggregate base, gravel, and asphalt covers; and vegetation;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing structures and cover (vegetation, compacted gravel cover, asphalt, aggregate base)		/	
Warning signs	/		
Compliance with land use change procedures (if land use has changed)	/		
Controls restored after construction		/	
Change in conditions (stockpiles, on-going construction, site usage, etc.)		/	

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*] Inadequate soil cover west of bldg 205. 100' x 100' arc look like it was bladed. Northeast corner is also missing soil cover. ~ 200ft² area missing soil cover, in total.

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*] Place / fix gravel cover in the two sections.

Tracy Site Annual Site Inspection Form

Inspection at **Northwestern Corner** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Prevent use of contaminated groundwater (untreated) within the contaminant plumes;
- Protect infrastructure associated with NWC Groundwater OU groundwater monitoring, extraction, treatment, and disposal;
- Post appropriate signage at the NWC Groundwater OU Site indicating restrictions on groundwater use and production well installations;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Implement notification procedure for construction activities or land use changes;
- Maintain administrative controls;
- Perform annual reviews to ensure compliance with instituted controls and to correct any deficiencies in the notification procedure;

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Prevent use of contaminated groundwater	/		
Protect NWC OU infrastructure	/		
Warning signs			/
Compliance with land use change procedures			/
Change in conditions (ex-construction/boring or well installation)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection of **OU 1 Groundwater** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Prevent domestic use of contaminated groundwater (untreated);
- Protect infrastructure associated with OU 1 groundwater monitoring, extraction, treatment, and disposal;
- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure; and
- Follow defined procedures in the event of a change in land use.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Prevent domestic use of contaminated groundwater	/		
Protect OU1 infrastructure	/		
Compliance with land use change procedures	/		
Change in conditions (ex-construction/boring or well installation)	/		

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection of **Southern Depot Soils Area** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	/		
Compliance with land use change procedures	/		
Change in conditions (stockpiles, on-going construction, site usage, etc.)	/		

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 1/Area 2** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	/		
Compliance with land use change procedures			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Pavement is cracked with weeds growing thru, but in fair condition.

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 2/3** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	✓		
Compliance with land use change procedures			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 20** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures) and existing structures;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing Structures	✓		
Warning signs	✓		
Compliance with land use change procedures (if land use has changed)			✓
Controls restored after construction			✓
Soils from excavation sampled and disposed			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 24** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs		/	
Compliance with land use change procedures			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

Warning signs were removed when building was painted. Signs can not be found, possibly thrown away.

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

Have new signs created & hung up.

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 33** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement/compacted gravel;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing Structures and pavement/ compacted gravel	/		
Warning signs		/	
Compliance with land use change procedures (if land use has changed)			/
Controls restored after construction			/
Change in conditions (stockpiles, on-going construction, site usage, etc.)			/

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

Need to replace sign that was on former building 10.

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

Create sign and hang on utility pole near SWMU 20.

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 4** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	✓		
Compliance with land use change procedures			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

SWMU 4

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 6** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures);
- Perform annual review to ensure compliance with controls and to correct any deficiencies in the notification procedure;
- Follow defined procedures in the event of a change in land use; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Warning signs	✓		
Compliance with land use change procedures			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

SWMU 6

Tracy Site Annual Site Inspection Form

Inspection at **SWMU 7** was conducted by J. Ruffing on 8/26/14.

Land use controls:

- Implement notification procedure for construction activities or land use changes in the IMP;
- Maintain administrative controls (i.e., IMP appendix and notification procedures), existing structures, and pavement;
- Perform annual site inspection and review to ensure compliance with controls and to correct any deficiencies in the existing cover or notification procedure;
- Follow defined procedures in the event of a change in land use;
- Install warning signs;
- Ensure controls are restored following construction activities; and
- Sample and properly dispose of soil generated from any future excavation activities.

Verification that land use restrictions are being accomplished and LUCs remain effective

LUC Protectiveness Measure	Observation		
	Satisfactory	Not Satisfactory	NA
Existing structures and pavement	✓		
Warning signs	✓		
Compliance with land use change procedures (if land use has changed)			✓
Change in conditions (stockpiles, on-going construction, site usage, etc.)			✓

NA = not applicable

Description of any deficiency or violation of the land use restrictions [*Provide detailed summary of what was observed. If known, indicate which owner/occupant is responsible for the deficiency/violation. Include the location of where the deficiency/violation was observed.*]

None

Description of any proposed measures or corrective actions taken to remedy the deficiency or violation [*Provide detailed summary of any proposed measures that will be undertaken to mitigate or remedy the deficiency/violation. Indicate the responsible party and a time frame for completing the necessary actions.*]

None

APPENDIX F

Response to Agency Comments

U.S. Army Corps of Engineers (USACE) – Fort Worth District

DESIGN REVIEW COMMENTS

Project: Final Third Five-Year Review Report
Contract No. NGB W90FYQ-09-D-0005 Task Order: DY11
Response to Comments

☐ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS	

REVIEW DATE August 26, 2015
NAME U.S. EPA

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1	Section 8.1	The description of SWMU 27 in Section 8.1 does not identify the issue, it only states the solution. Section 8.1 should identify the issue for SWMU 27.	Section 8.1 of the Final Third Five Year Review Report (Report) was updated to include the following issue for SWMU 27: In 1999, the excavation remedy at SWMU 27 was implemented. However, laboratory analytical detection limits for the confirmation samples exceed the January 2015 RSL for benzo(a)pyrene. Therefore, despite non-detect sample results it is unknown whether contaminants are present at SWMU 27 at concentrations that prevent unrestricted use / unrestricted exposure.
2	DLA response to EPA Specific Comment 18	DLA's response is shown below, the highlighted text is confusing: *Section 7, Technical Assessment, of the Report will continue to state that some areas have established LUCs to protect exposure to COCs where maximum concentrations are less than allowable for unrestricted use or unrestricted exposure. The Report was updated to clarify that DLA can remove LUCs via a decision document once it is demonstrated that the COCs at that location(s) do not present a risk to human health or the environment.* DLA's response for Specific Comment 18 should be modified as follows "…some areas have LUCs to protect from exposure to COCs that exceed unrestricted use levels.	The highlighted text was provided in the DLA's response to U.S. EPA comments on the Draft Final Report; but was not written into the Draft Final Report. DLA was merely stating that LUCs have been established for some sites where maximum detected COC concentrations are less than residential RSLs; therefore, it is unlikely that COCs at these sites present a risk to human health. While cumulative effects from exposure to multiple COCs may present an unacceptable health risk, review of documentation did not identify cumulative COC exposure risk as the reason for establishing LUCs at these sites. Therefore, in the future DLA may prepare a decision document that removes LUC requirements from SWMU 6 and Building 30 Drum Storage Area. While the EPA is correct that numerous sites have LUCs to protect receptors from exposure to COCs that exceed unrestricted use levels, DLA wanted to point out that LUCs have been established at two sites where maximum detected COC concentrations are less than unrestricted use levels. These sites can be removed from LUC requirements via decision document.
3	DLA response to EPA specific Comment 28	The additions of the cumulative risks for each area is sufficient but a column with the EPC (exposure point concentration) from that site/area, for each chemical should be added.	The Report was updated to include the exposure point concentrations calculated from data collected during this Report Review period or prior to this Report review period if recent data is unavailable.

U.S. Army Corps of Engineers (USACE) – Fort Worth District

DESIGN REVIEW COMMENTS

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☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	NAME U.S. EPA
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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		The final risk for each chemical is a simple "ratio" (spelling error in previous comment) of the current RSL to the EPC. The problem is that the way the risk is currently presented there is no way to verify if the cumulative risk is based on the 2015 RSLs or if it is a copy of the calculated risk from a previous document. Specifically for table 7.1-4, why is the RSL comparison to 2013 and not 2015, since the other comparisons are for 2015?	Table 7.1-4 was updated to include the *HHRA Note 3 – May 2015 DTSC – Modified Screening Levels* as requested.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
Contract No. W90FYQ-09-D-0005 Task Order: DY11
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☐ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW DATE 04 May 2015
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	NAME John Lucey, U.S. EPA
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☒ OTHER	
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1	General Comment	These comments refer to specific sections of the Five Year Review (5YR), for example many of the comments are specific to the Executive Summary and the Summary Form. When changes and revisions are made in the Executive Summary and/or the Summary Form, then additional changes will be needed throughout other sections of the 5YR to make the document accurate and consistent. These comments do not address every specific change required throughout the document and additional changes will be needed in other sections of the document.	As requested, comments addressed in the Executive Summary and Summary Form and elsewhere in the Five-Rear Review (Report) have also been incorporated throughout the Report for consistency.
2	Specific Comment	The entire 5YR should be organized according to operable units (OUs). There are only two operable units at Tracy and the report should describe each OU and the sites within the OU. For example Section ES.1 (on page ES-2) describes Groundwater Sites (OU1 and OU2); SVE sites and Soil sites. This should be organized by OUs and list the sites for each OU. The entire report should consistently follow this format.	The Report is organized by operable units (OU 1 and NWC OU) and reference to sites as “groundwater”, “soil”, or “SVE” were removed from the Executive Summary and body of the Report, with the exception of Section 5.1 Protectiveness Statements from Previous Review. Removal of the groundwater, SVE, and soil naming designation in this section would require rewriting the second five year review protectiveness statements.
3	Specific Comment	The report should consistently refer to OUs, Areas and Sites. For example, in Section ES.2 issues are described for the Banta Road plume, Area 2, Area 3, GWTP 2, NWC OU, SWMU 20, DSERTS 6 etc. Area 2 and 3 are vague terms and if they need to be used in the report they should be described and shown on maps. If the RODs do not refer to Areas then it may be better to not use Area 2 and 3 in the 5YR. Please remove the DSERTS site name from the figures and throughout report and use only the original site names used in RODs.	The Report has been revised to make naming designations consistent with the RODs. As suggested, DSERTS were removed from the Report.
4	Specific Comment	Executive Summary, page ES-1; The list of previous RODs and ESDs is good but some of the titles do not indicate what the document is about. Please revise this list into a chronological table with the title and a separate column to provide a detailed description of the document. For example, if the document title says it is an ESD then describe the specific actions that required an ESD.	Table 1.0-1 Description of Decision Documents; was added to Section 1 of the Report and referenced in the Executive Summary. Table 1.0-1 identifies the decision document date, the title, and the specific actions which required a decision document.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5	Specific Comment	Executive Summary, page ES-2; Section ES.1 is the Progress Made Since the Last 5YR. This section should be organized by OU. Therefore describe the progress for OU1 (groundwater, soil, SVE etc.) The description of progress made since the last 5YR should not include minor O&M actions that do not effect protectiveness. The recent major documents listed on page ES-1 should be included in the progress made section. In addition, explain the details of the memo to file (MTF) and the ESDs in the last 5 years. Modifications to treatment plants, LUCs and remedy modifications should be included as progress made. Any site which was closed in the last five years should be discussed in this section and included in Table 1.2-2 "Sites not included in this 5YR"	The executive summary was revised as suggested to include the following changes: • Reference to sites by matrix (ie; soil or groundwater) were removed from the Report and sites are now referenced by OU (OU 1 or NWC OU). • Minor O&M activities, such as installation of LUC signs, collection of soil gas samples, and the installation/decommissioning of individual wells, was removed from this section.
6	Specific Comment	Executive Summary, page ES-2; In Section ES.1 the first bullet under OU1 says that the MTF removed a COC. Please remove this item. The next three bullets talk about specific O&M actions such as collecting groundwater samples from soil borings. It would be better to use general terminology and say that a specific investigation was conducted and describe why the investigation was performed.	Section ES.1 Progress Since Second Five-Year Review was modified as follows: • Sites are no longer differentiated by matrix (groundwater, soil or soil gas), but are now referenced by their OU (OU 1 or NWC OU). • Greater detail is provided on purpose of decision documents. Minor O&M activities, such as the installation/decommissioning of specific wells or the collection of soil gas samples, was removed.
7	Specific Comment	Executive Summary, page ES-5; SWMU 20; This figure should be added to Appendix G as soon as possible. Then this item should be removed from the 5YR.	In June 2015, copies of Figure 10 which accurately delineate the extent of LUCs at SWMU 20, were provided to the Tracy Site master planner and the Remedial Project Manager with instructions to replace page G-22 of the *Real Property Master Plan;* therefore, this issue has been removed from the Report.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
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Response to Comments

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
8	Specific Comment	Executive Summary, page ES-5; Future Five Year Review Site Evaluation; The last item in Section ES.3 says that SWMU 6 should be removed from the next 5 year review report. This is also found in Section 8.3 on page 8-2. This should be removed from the 5YR. Alternatively, the site description for SWMU 6 (Sections 5 and 7) should explain that DLA is planning to submit a RACR closure report for site close because the remedy is complete.	The request to remove SWMU 6 from future Five-Year review reports was removed as an issue and the recommendation to submit an appropriate decision document to close SWMU 6 as a site is presented in Section 7.9.2.3.
9	Specific Comment	Executive Summary, page ES-3 to 5; The summary in Sections ES.2 and ES.3 is good, but the two sections should be combined into one section. It should be organized by OU sites and have the issues and recommendations next to each other. The issues and recommendations should be revised to be consistent with the revised Summary Form and the entire 5YR.	The issues, recommendations, and follow up actions documented in Sections ES.2 and ES.3 were revised to present the information in a more tabular format with the issue and recommendation juxtaposed. Changes made in the Executive Summary and Summary Form were also incorporated into their respective sections in the Report.
10	Specific Comment	Executive Summary, page ES-5 to 6; The Protectiveness Statements for each OU and the Sitewide statement should be revised to be consistent with the revised issues and recommendations in the Summary Form	Protectiveness statements have been revised as follows: **OU 1** The remedy at OU 1 currently protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term LUCs should be established at SWMU 27 to prevent residential and daycare center land use. **NWC OU** The remedy at the NWC OU is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. **Site Wide** Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
11	Specific Comment	Executive Summary, page ES-7; Table ES.1-1 should be revised to reflect changes in these comments.	Table ES.1-1 was revised and minor O&M issues or issues that had been corrected, i.e., NWC signs, SWMU 20 figure in the RPMP, were removed from Table ES.1-1.
12	Specific Comment	Summary Form, page SF-1; The review period should go from the date of the site inspection to 09/29/2015	The review period presented in the Summary Form was revised to start at the date of the most recent site inspection (26 August 2014) and end on 29 September 2015. As discussed below, after completing the 2015 site inspection in August 2015, the Final version of the Report will be updated to indicate that the review period is from the August 2015 inspection date to 9/29/15.
13	Specific Comment	Summary Form, page SF-1; The date of the site inspection should be the same date as the last annual LUC/IC inspection completed in August 2014.	The *Comprehensive Five-Year Review Guidance* suggests that Five-Year Review Reports include a "recent" site inspection. Recent is defined to generally mean no more than nine months from the expected signature date of the review. Given the 09/29/2015 expected signature date, the August 2014 inspection does not meet the recent requirement of the *Comprehensive Five-Year Review Guidance.* To comply with the *Comprehensive Five-Year Review Guidance* and allow for sufficient time to correct any minor issues prior to the signature date it is suggested that the LUC inspections occur no later than 7 August 2015. The Summary Form of the Final Report will be updated to reflect the most recent LUC inspection date and findings.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
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REVIEW DATE 04 May 2015
NAME John Lucey, U.S. EPA

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
14	Specific Comment	Summary Form, page SF-2 (OU1 first issue, Banta Road Plume); This issue should be revised to better reflect the current status of the site. This issue should say that DLA is conducting an investigation and the regulators approved a workplan. The purpose of the investigation is to collect groundwater samples and determine the full extent of the offsite portion of the plume. The recommended action should be revised to say that DLA will complete the investigation, determine the full extent of contamination and determine if additional monitoring wells or other actions are needed off base. The issue description may need to be brief but more details should be provided in the site description in Sections 5 & 7. Explain that the off-base plume is beneath private property that is a large agricultural field. Describe the difficulties in obtaining property access. Explain that there are no complete exposure pathways and the data will be used to determine the long term protectiveness of the current remedy.	The referenced issue on Summary Form, page SF-2 was revised to state: *"In April 2015, groundwater samples were collected from soil borings advanced east of Banta Road. The results from this investigation will be presented in a report, used to delineate the extent of TCE in groundwater, and determine the preferred new monitoring well locations. Once installed, the monitoring wells will provide data to determine future protectiveness."*
15	Specific Comment	Summary Form, page SF-2 (OU1 second issue, Area 3); This issue should be revised to better reflect the current status of the site saying; "*In 2013 DLA conducted a soil gas investigation at Area 3 which indicated that TCE and PCE are present in the vadose zone at concentrations greater than the 1998 ROD cleanup goals. DLA plans to submit a new work plan for regulatory approval to implement a remedial action for contamination in the soil and vadose zone at Area 3. At this time there is no groundwater contamination at this site and groundwater will continue to be monitored."* The recommended action should say that DLA will submit the workplan and conduct the investigation. The site description in Sections 5 & 7 should provide more specific details as necessary.	The referenced issue was revised to state: *"In 2013, DLA conducted a soil gas investigation at Area 3 which indicated that TCE and PCE are present in the vadose zone at concentrations greater than the 1998 ROD cleanup goals. TCE and PCE are detected in groundwater at Area 3 at concentrations greater than the ACL; therefore, it is probable that VOCs in the vadose zone are a source of groundwater contamination."* The recommendation was revised to state: *"In February 2015, DLA submitted a workplan to perform vadose zone remediation by restarting SVE, enhanced with pneumatic fracturing. The remedy is anticipated to be installed in the third quarter of 2015 and operational by the end of 2015."*

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
16	Specific Comment	Summary Form, page SF-3 (OU1 third issue, GWTP); This issue should be removed from the Summary Form. This is an ongoing O&M activity which does not impact protectiveness of the remedy. This O&M activity should be fully described in the site description in Sections 5 & 7. Describe the current status and the data objectives of the activity and explain why the action is needed. Describe how and why the treatment plant will be updated. The site description should explain that modification of the treatment plant was approved by the regulatory agencies. If this action is now complete then it should be included in Section ES.1 Progress Since Second Five-Year Review.	This issue was removed from the Summary Form. The modifications to the GWTP were outside of this Report period; therefore, a detailed discussion of the O&M activity was not included in this Report; however, Sections 5.3.2 and 7.2.2.6 of the Report were updated to state that DLA modified the treatment remedy in the 2014 MTF, submitted a work plan to present GWTP upgrades, the regulatory agency-approved upgrades were completed in March 2015, and documentation of GWTP improvements will be presented in 2015 Annual Report.
17	Specific Comment	Summary Form, page SF-3 (OU1 fourth issue, DSERTS 67 gravel cover); This issue should be removed from the Summary Form. This is an ongoing O&M activity which does not impact protectiveness of the remedy. New gravel should be added to the site as soon as possible. When remedy deficiencies are discovered during routine inspections they should be corrected as soon as possible. The remedy for this site calls for covering the site with a protective gravel cover. If routine site inspections find that this remedy is not performing adequately then the remedy should be revised in accordance with the ROD.	The August 2014 LUC inspection identified inadequate cover at portions of the Northern Depot Soils Area. The deficiency has not been corrected; therefore, the issue to maintain the cover in accordance with *Remedial Action Report for Institutional Controls at SWMU 7and 33, and Building 30 Drum Storage Area, and the Northern Depot Soils Area* is appropriate and remains; however, the inadequate cover is identified as a minor issue which does not need to be tracked by the EPA.
18	Specific Comment	Summary Form, page SF-3 (OU1 fifth issue, remove COCs); This issue should be removed from the Summary Form. A ROD amendment and new risk assessment is required to remove COCs from a ROD. Typically EPA will not remove any COCs from a ROD because cumulative site risk still needs to be evaluated in an updated risk assessment when the remedy is complete. Once the remedy is complete and shown to be protective it will be documented in a site closure report. The ongoing monitoring program can be modified to add and remove COCs depending on site conditions. All proposed changes to the monitoring program require routine regulatory approval.	The Executive Summary and Summary Form, Section 8 and Section 9 of the Report were updated and the issue to remove COCs has been deleted from the Report. Section 7, Technical Assessment, of the Report will continue to state that some areas have established LUCs to protect exposure to COCs where maximum concentrations are less than allowable for unrestricted use or unrestricted exposure. The Report was updated to clarify that DLA can remove LUCs via a decision document once it is demonstrated that the COCs at that location(s) do not present a risk to human health or the environment.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
Contract No. W90FYQ-09-D-0005 Task Order: DY11
Response to Comments

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REVIEW DATE 04 May 2015
NAME John Lucey, U.S. EPA

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
19	Specific Comment	Summary Form, page SF-4 (OU1 sixth issue, well LM030AUA); This issue should be removed from the Summary Form. This is an ongoing O&M activity which does not impact protectiveness of the remedy. The issue regarding well LM030AUA should be fully described in the site description in Sections 5 & 7. Describe the current status of the O&M at the site. If DLA believes that well LM030AUA is a conduit for contaminant migration then the well should be proposed for routine well decommissioning.	This issue has been removed from the Summary Form, Executive Summary, and Sections 8 and 9 of the Report. This well may be proposed for routine well decommissioning in an upcoming annual monitoring report.
20	Specific Comment	Summary Form, page SF-4 (NWC OU first issue, LUC signs); The required signs should be installed as soon as possible and this issue should be removed from the Summary Form. If the ROD requires signs to be posted then the signs should be posted as described in the ROD.	On 14 May 2015, LUC signs were installed at the NWC; therefore, the remedy is in compliance with the NWC OU ROD and the issue was removed from the Executive Summary, Summary Form and Section 8 and 9 of the Report.
21	Specific Comment	Summary Form, page SF-5; The Protectiveness Statements in the Summary Form should be revised to be consistent with the new issues and recommendations.	Protectiveness statements in the Summary Form have been revised as follows: **OU 1** The remedy at OU 1 currently protects human health and the environment in the short term. For the OU 1 remedy to be protective in the long term LUCs should be established at SWMU 27 to prevent residential and daycare land use. **NWC OU** The remedy at the NWC OU is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. **Site Wide** Because the remedial actions at all OUs are protective, the site is protective of human health and the environment

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
22	Specific Comment	Section 1.0, page 1-1; The list of documents should include a brief description of the documents contents and purpose. A similar table is included in the Annual Report and could be used in the 5YR.	The Report was updated to include Table 1.0-1. This table presents a summary and purpose for the documents listed on page 1-1.
23	Specific Comment	Section 1.2, pages 1-5 to 1-7; This section has two tables and one figure that describes all of the sites at Tracy. The following changes should be made to Section 1.2 and throughout the entire report: • Clarify, consolidate and describe the various terms used in the report (i.e. Areas, SWMUs, etc.) • Page ES-3 references Ares 2 and Area 3 but they are not shown in Section 1.2. • Remove the DSERTS name to simplify the site names (throughout the report). • Change the name of Table 1.2.1 to "Sites Included in this Five Year Review". • Expand Table 1.2.1 and add new columns for site name, OU, site description, status of remedial action, comments. In the "status of remedial action" column describe what is currently happening at the site (i.e. ongoing P&T remedy in progress). • Change the name of table 1.2.2 to "Sites not included in this Five Year Review". • Add new columns for site name, OU, site description, closure status. In the "Closure Status" column reference the specific document used to close the site. This could be an RI/FS, ROD, ESD or RACR/closure report. Make sure that this list includes the entire universe of site at Tracy. Make sure this list is consistent with the previous PCOR document. If any of the UST sites were previously included in CERCLA and then removed from CERCLA they should be included in this list. • Please have individual maps for each OU at Tracy. Also show the locations of each site in the OU. Define and describe Areas 2 & 3.	As suggested, the following changes were made to Section 1.2 and throughout the Report: • Area designations were changed to reflect nomenclature used in the decisions documents in which the sites were established. For each area, one name was selected, and used throughout the Report. • Sites are no longer referred to by their DSERTS designation. • The title of Table 1.2-1 was revised to “Sites included in this Five-Year Review” • Table 1.2-1 was revised to include a site description and the status of the remedial action. • The title of Table 1.2-2 was revised to “Sites not included in this Five-Year Review.” • Table 1.2-2 was updated to include the site’s OU, a brief description and the document which was used to close the site. • Figure 1.2-1 was updated to define plume names and identify site names used in the Report.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
Contract No. W90FYQ-09-D-0005 Task Order: DY11
Response to Comments

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
24	Specific Comment	Section 2.0, page 2-1; The revised table on page ES-1 should be included in this section.	The revised table on page ES-1 was included in Section 1.0 and referenced in Section 2.0.
25	Specific Comment	Section 3.5.2, page 3-9 and Table 3.5.1; This section does a good job of explaining the risk assessments performed at Tracy. Section 3.5.2 and the rest of the 5YR should use the California Modifies Risk Screening Level (RSL) which is 0.4 ug/m3 in residential and 2 ug/m3 industrial.	While DLA concurs that the California modified RSL, as presented in the 3 December 2013 *EPA Region 9 Guidelines and Supplemental information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites,* is appropriate for use when evaluating human health risk from vapor intrusion, these RSLs are not cleanup standards; therefore, inclusion in Table 3.5-1 COCs and Cleanup Standards is not appropriate. Table 3.5-1 COCs and Cleanup Standards identifies promulgated cleanup standards established by ARARs or decision documents. The California modified RSL was included in relevant subsections of Section 7 and Table 7.1-4 was updated to include a calculated soil gas screening level based on the California modified RSL for TCE.
26	Specific Comment	Table 4.2.1, page 4-49; This table shows that some LUCs still need to implemented. These LUCs should be implemented as soon as possible and the table should be revised accordingly. If any of these LUCs cannot be implemented before this report is finalized then it will need to included as an issue and the protectiveness statement will need to be non protective.	With reference to table 4.2-1, LUC deficiencies identified in the Draft Third Five-Year Review Report (LUC signs at the NWC OU and replacement of the SWMU 20 figure in the RPMP) have been corrected. Table 4.2-1 was updated and the issues were removed. However, the gravel cover deficiencies are the Northern Depot Soils Area have not yet been corrected.
27	Specific Comment	Section 5.0, page 5-1; This section should be organized by OU similar to the revised executive summary.	Section 5.1, page 5-1 is the presentation of what was reported in the *Second Five-Year Review.* If separated by OUs as suggested, the protectiveness statements would have to be rewritten and therefore would not accurately present protectiveness statements included in the Second Five-Year Review Report; however, as suggested, Section 5.2 and 5.3 of the Report were organized by OUs and references to sites as “soil”, “groundwater” or “SVE Sites” were removed.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
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28	Specific Comment	Tables 7.1.2 to 7.1.4; pages 7-39 to7-54; These tables present comparisons of old and new RSLs but they don't present total risk for each site. These tables should present total risk for each site by a simple ration method and present the aggregate risk and hazard index.	As suggested, Tables 7.1-2 - 7.1-4 were updated to include a total cumulative excess cancer and non cancer risk. As previously discussed, additional information on the “ration method” from the U.S. EPA is required to address the remainder of this comment.
29	Specific Comment	Table 8.3-1, pages 8-3 to 8-12; Table 8.3.1 should be removed. The table and the title should reflect the fact that CA screening levels are included in the table. Groundwater COCs should also be included in addition to the soil and soil gas COCs. The table should indicate which cleanup levels are State cleanup levels with an asterisk.	Table 8.3-1 was removed and the California-modified RSLs for TCE and PCE are presented on Table 7.1-4. Groundwater COCs and their respective cleanup level are presented on Table 7.1-2.
30	Specific Comment	Table 8.3.2, page 8-13: This table should be removed from the 5YR and all references to removing COCs should be taken out of the report. A ROD Amendment is required to remove a COC from a ROD and a new risk assessment is needed to recalculate the cumulative risk at the site. In general, EPA does not support removal of individual COCs from the original list of COCs which are the basis for selecting an appropriate remedy in the ROD.	Table 8.3-2 was removed and the recommendation to remove COCs from LUCs was removed from The Executive Summary, Summary Form, Section 8 and Section 9 of the Report.
31	Specific Comment	It is much easier to remove a COC from a site's analytical program during routine modifications to the long term operations and maintenance program and make changes to the annual monitoring program. The 3rd and 4th sentences sound like they directly conflict. Can you explain why it would be ok to modify the analytical program during routing site modifications?	The issue that COCs can be removed via decision document was removed from the Executive Summary, Summary Form, Section 8 and Section 9; but the issue was retained in Section 7.0 as it pertains to remedy optimization.
32	Specific Comment	Section 11.0, page 11-1; The next five year review period will run from September 2015 to September 2020. Please revise the text.	Section 11 was updated to state that the Fourth Five-Year Review will cover the period from September 2015 through September 2020.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

Project: Draft Third Five-Year Review
Contract No. W90FYQ-09-D-0005 Task Order: DY11
Response to Comments

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REVIEW DATE 05 May 2015
NAME Marcus Pierce, Central Valley Regional Water Quality Control Board

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1	General Comment	With few exceptions, Central Valley Water Board staff is pleased with the progress made to date in implementing the remedial actions specified in the Record of Decision (ROD) for the Tracy Site. Soil and soil vapor remedial actions are nearing completion and institutional controls are in-place to prevent human exposure to soil and groundwater contaminants of concern. Groundwater remediation has been successful in most areas on and off the Depot as evidenced by the numerous extraction wells that have achieved ROD-specified cleanup levels and have been shut down.	Noted.
2	General Comment	Based on review of Section 4 in the Draft FYRR, there appears to be some inconsistencies in the institutional controls that were implemented at sites with residual soil contamination. For example, some require installation of warning signs and others do not. Some of these sites also have a requirement to "ensure controls are restored following construction activities" and others don't. Are the remedies at sites that do not have these additional institutional controls still sufficiently protective? If not, the Defense Logistics Agency (DLA) should consider making this an issue to be addressed during the fourth five-year review.	The Third-Five Review Report was updated to include the following issue and recommendation. Issue: LUCs have not been established for some areas where COCs are present which do not allow for unrestricted use or unrestricted exposure. In addition, LUC requirements (e.g. required posting of signs) is required for some areas but not others. Recommendation: DLA will conduct a comprehensive review of all sites with COCs which do not allow for unrestricted use or unrestricted exposure to determine if a decision document is required so that consistent LUC requirements are applied to each site.
3	General Comment	Based on the project team's discussion of the Draft FYRR at the 30 April 2015 RPM meeting, some of the problems identified in the document as major issues are actually anticipated minor operation and maintenance issues and should not affect the overall protectiveness of the remedy. A good example of these issues is the deficiency observed in the thickness of the aggregate cover at DSERTS 67. This is a minor maintenance issue that should be corrected before the Final FYRR is issued. We concur with the EPA's recommendation to retain minor problems like this one in the document, but not identify them as major issues to be tracked during the next five-year review period.	The Executive Summary, Summary Page, Sections 7 and 8 of the Report have been revised to remove deficiencies in the cover at the Northern Depot Soils Area as a major issue; however, the cover deficiency is retained in the Report as a minor operations and maintenance issue until corrected. Other items recommended to be removed as issues by EPA were corrected and removed.

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4	Specific Comment	Page 3-8, Section 3.4.1, Initial OU1 Response Actions: The last sentence of the first paragraph refers to Table 3.4-1 for the well monitoring program. There is no Table 3.4-1 and the only table associated with Section 3 does not present the well monitoring program. Please provide a table summarizing the well monitoring program.	Reference to Table 3.4-1 was a typographical error. The table which summarizes the well monitoring program is Table B-2 in Appendix B. The Draft Final Report was updated to make this correction.
5	Specific Comment	Page 3-9, Section 3.4.2, Initial Site-Wide Response Actions: This section indicates there was a 1998 ROD Amendment covering one site. Is this correct or should this be the 2003 ROD Amendment?	The Draft Final Report was corrected to state "*Remedial actions for three additional sites were selected in the 2003 OU 1 ROD Amendment (one site) and the 2001 ESD (two sites).*"
6	Specific Comment	Page 3-10, Section 3.5.2, Basis for 1998 ROD Actions: The sentence at the top of the page states "potential future residents were evaluated solely to provide benchmarks for evaluating receptors with lower potential risk..". Revise "lower" to "higher" in this sentence.	The second paragraph of section 3.5.2 of the Report was corrected to state: "*Both existing and potential future risks (e.g., residential use) to human health were estimated. However, because there is little potential for the Depot to become a residential development in the foreseeable future, potential future residents were evaluated solely to provide benchmarks for evaluating receptors with higher potential risk and to help determine suitable uses for parcels of land on the active Depot and Annex.*"
7	Specific Comment	Page 4-2, Section 4.1.1.1, Remedy Selection: To support discussion of the well notification procedures, add a figure showing the area where San Joaquin County is expected to notify DLA and Central Valley Water Board staff about a proposed well installation.	Figure 4.1-1, which identifies the Well Permit Application Notification Boundary, was added to the Report.
8	Specific Comment	Page 4-29, Section 4.3.2.4, Groundwater Monitoring Program: This section indicates groundwater monitoring well LM027AUA met ROD requirements in 1997 and was decommissioned. Briefly explain how this well was able to satisfy ROD requirements before the ROD was issued. Also, please add this former well to referenced Figure 4.4-2.	Section 4.7.4 was revised to state "*Well LM027AUA never yielded TCE or PCE above laboratory detection limits and dieldrin had not been detected since 1994. In May 2014, well LM027AUA was decommissioned.*" LM027AUA is shown on Figure 4.4-1 (which replaces Figure 4.4-2).

U.S. Army Corps of Engineers (USACE) – Fort Worth

DESIGN REVIEW COMMENTS

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9	Specific Comment	Page 4-32, Section 4.3.4.3, Groundwater Monitoring Program: Revise this section to state whether LM166AU met ROD requirements before it was decommissioned in 2006. Add this monitoring well to referenced Figure 4.4-4.	Section 4.9.3 Groundwater Monitoring Program was revised to state "*1998 OU 1 ROD groundwater monitoring requirements were not met for bis(2-ethylhexyl)phthalalate in well LM166AU; however, this well was decommissioned as part of a construction project in 2006. Other COCs met 1998 ROD groundwater monitoring requirements in well LM166AU.*" The well has been included on Figure 4.6-1, and shown as being decommissioned.
10	Specific Comment	Page 5-9, Section 5.2.3, Residual Contamination Status: In the last sentence on this page, revise "SWMU 20" to "SWMU 24".	The last sentence on Page 5-9 (now Section 5.2.2.14) was revised to state "*SWMU 24 - Residual contaminant concentrations nearby and below Building 247 have not been reduced to the 1998 OU 1 ROD cleanup standards*."