UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

SEP 24 2012

Col. Victor S. Hagan
Commander, Letterkenny Army Depot
ATTN: AMLD-C, Building 10
1 Overcash Avenue
Chambersburg, PA 17201-4150

Re: *Final Five-Year Review Report Letterkenny Army Depot Southeastern Area (Third Review) and Property Disposal Area (Second Review),* September 2012

Dear Colonel Hagan:

The U.S. Environmental Protection Agency (EPA) concurs with the Letterkenny Army Depot Five-Year Review Report entitled, *"Final Five-Year Review Report Letterkenny Army Depot Southeastern Area (Third Review) and Property Disposal Area (Second Review)"* dated September 2012. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires that Five-Year Reviews be completed for Sites with remedial actions that have resulted in hazardous substances, pollutants, or contaminants remaining at the Sites above levels that allow for unlimited use and unrestricted exposure (UU/UE). Five-Year Reviews are conducted in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations.

This report satisfies the Five-Year Review requirements for both the Southeastern Area (SE) and Property Disposal Area (PDO) National Priority List Sites. Previously, The SE and PDO Five-Year Reviews were conducted separately. This report marks the third Five-Year Review for the SE Area and the second for PDO. This report was triggered by the EPA concurrence on the first Five-Year Review for the PDO on March 12, 2007. The second Five-Year review for the SE was completed on June 24, 2008. Although the Five-Year review for the SE is not yet due, the two reports were combined at the Army's request.

Five SE and one PDO Operable Units (OUs) are addressed in this report:

- SE OU1 K-Areas
- SE OU2 Industrial Wastewater Sewer System
- SE OU7 Truck Open Storage Area/Waste Oil Sump
- SE OU8 BRAC Waste Sites
- SE OU10 Southern Southeast Industrial Area VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)
- PDO OU6 BRAC Waste Sites

A Five-Year Review summary of issues, recommendations and follow-up actions that will be tracked by EPA are provided below.

Issues

- *SE OU1 – The Vegetative Cover Standard Operating Procedure (SOP) states that inspections should be completed quarterly. The Army's experience has shown that annual inspections in the fall are adequate.*
- *The Land Use Control Assurance Plan Memorandum of Agreement (LUCAP MOA) expired in August 2012.*
- *PDO OU6 – groundwater restrictions for the interim remedy for Phase I and II exist in the LUCAP MOA and will ultimately be addressed in the Record of Decisions (RODs) and Remedial Designs for PDO OUs 2 and 4.*

Recommendations and Follow-up Actions

- *The SOP for SE OU1 will be revised to indicate cap inspections should be completed annually.*
- *The Land Use Control Remedial Design, which replaces the LUCAP MOA will be completed in 2012.*
- *The RODs for PDO OUs 2 and 4 are currently being developed by the Army.*

The following Protectiveness Statements will be reported to Congress:

Remedies have been completed for SE OU 1, SE OU 2, SE OU 3B, SE OU 4, SE OU 7, portions of SE OU 8, SE OU 10 and SE OU 13 and are protective of human health and the environment. Note that the selected remedies for SE OU 3B, SE OU 4, and two phases of (Phases III and IV) of SE OU 8 were no action or no further action.

The remedy for PDO OU 6 has been completed and is protective of human health and the environment. Note that an ESD to lift LUCs was completed for a subset of PDO OU 6 BRAC Parcels and those parcels are now cleared for UU/UE.

Furthermore, as part of the Five-Year Review, EPA has evaluated the Government Performance and Results Act (GPRA) measures for LEAD and has determined their status is as follows:

Environmental Indicators

Human Health: Under control for both SE and PDO
Groundwater Migration: Under control for both SE and PDO

Sitewide Ready for Anticipated Use

The SE or PDO Sites are not Site-Wide Ready for Anticipated Use but are expected to be on 9/30/2018 and 6/30/2017, respectively.

EPA concurs with the protectiveness determinations for each OU. The next combined Five-Year Review report will be due March 12, 2017.

If you have any questions, please contact Steve Hirsh, Acting Chief of the NPL/BRAC Federal Facilities Branch at 215-814-3351, Jerry Hoover at 215-814-2077, or Susanne Haug at 215-814-3394.

Sincerely,

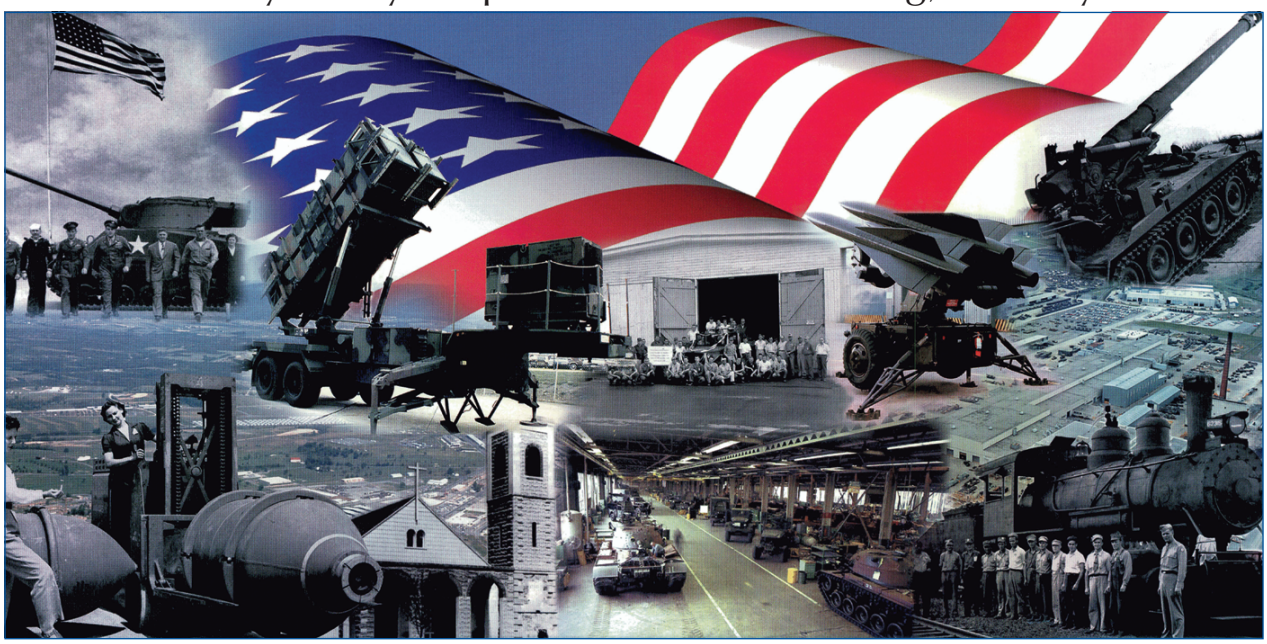
Ronald J. Borsellino, Director
Hazardous Site Cleanup Division

cc: Bryan Hoke, LEAD
Ruth Bishop, PADEP, Harrisburg

FINAL

FIVE-YEAR REVIEW REPORT
LETTERKENNY ARMY DEPOT
SOUTHEASTERN AREA (THIRD REVIEW)
AND
PROPERTY DISPOSAL AREA (SECOND REVIEW)
NATIONAL PRIORITIES LIST SITES

Letterkenny Army Depot • Chambersburg, Pennsylvania



AUGUST 2012

Prepared For:

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FIVE-YEAR REVIEW REPORT

LETTERKENNY ARMY DEPOT
SOUTHEASTERN AREA (THIRD REVIEW)
AND
PROPERTY DISPOSAL AREA (SECOND REVIEW)
NATIONAL PRIORITIES LIST SITES
CHAMBERSBURG, PENNSYLVANIA

FINAL

Letterkenny Army Depot
Chambersburg, Pennsylvania

August 2012

This report documents completion of the third five-year review for the Southeastern Area and the second five-year review for the Property Disposal Area of the Letterkenny Army Depot as required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in accordance with CERCLA §121 (c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

United States Department of the Army

By: _____ Date: 21 SEP 12
Victor S. Hagan
Colonel, U.S. Army
Commanding Officer
Letterkenny Army Depot

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LIST OF ACRONYMS

ºC	degree Celsius
ºF	degree Fahrenheit
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
1,1,1-TCA	1,1,1-trichloroethane
1,1-DCA	1,1-dichloroethane
1,2-DCE	1,2-dichloroethene
AA	Ammunition Area
AEDB-R	Army Environmental Database—Restoration
ARARs	applicable or relevant and appropriate requirements
ARM	air release manifold
ARS	alternative remedial strategy
AST	aboveground storage tank
BCT	BRAC Cleanup Team
BEC	BRAC Environmental Coordinator
BHHRA	Baseline Human Health Risk Assessment
BIDS	Biological Integrated Detection System
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethylbenzene, xylene
C/I	Commercial/Industrial
CASD	Chambersburg Area School District
CCRs	Covenants, Conditions, and Restrictions
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
CFR	Code of Federal Regulations
cm	centimeters
COC	contaminant of concern
COPC	contaminant of potential concern
CVBP	Cumberland Valley Business Park
CVOC	chlorinated volatile organic compound
DA	Disposal Area
DAF	dilution attenuation factor
DDOB2	Drainageways Downstream of Open Burning Ground No. 2
DLA	Defense Logistics Agency
DNAPL	dense non-aqueous phase liquid

LIST OF ACRONYMS (CONTINUED)

DRMO	Defense Reutilization Marketing Office
dscf	dry standard cubic foot
DSR	Drum Storage Revetments
DSERTS	Defense Site Environmental Restoration Tracking System
EBPS	enhanced bioremediation pilot study
E&S	erosion and sedimentation
EC	engineering controls
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
EDIP	epikarst dye injection point
ER,A	Environmental Restoration, Army
ERH	electrical resistance heating
ESD	Explanation of Significant Differences
ESE	Environmental Science and Engineering, Inc.
FCGA	Franklin County General Authority
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FOSL	Finding of Suitability to Lease
FOST	Finding of Suitability to Transfer
FS	Feasibility Study
ft	feet
ft/day	feet per day
FVSA	Former Vehicle Storage Area
gpm	gallon per minute
GWTP	groundwater treatment plant
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HRS	Hazard Ranking Score
IA	installation assessment
IAG	Interagency Agreement
IC	Institutional Control
IRP	Installation Restoration Program
ISCO	in situ chemical oxidation
IWTP	Industrial Wastewater Treatment Plant
IWWS	Industrial Wastewater Sewers
LDR	Land Disposal Restriction
LEAD	Letterkenny Army Depot
LIDA	Letterkenny Industrial Development Authority
LT^3	Low Temperature Thermal Treatment

LIST OF ACRONYMS (CONTINUED)

LUC RD	Land Use Controls Remedial Design
LUCs	Land Use Controls
LUCAP	Land Use Controls Assurance Plan
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MMPV	medium mine protected vehicle
MMR	Megan Mackenzie Run
MOA	Memorandum of Agreement
mph	miles per hour
MSC	medium-specific concentration
msl	mean sea level
MVL	maximum containment level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NSIA	Northern Southeast Industrial Area
OBP	Oil Burn Pit
ORNL	Oak Ridge National Laboratory
OU	Operable Unit
OVSA	Open Vehicle Storage Area
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PDO	Property Disposal Office
POL	petroleum, oil, and lubricant
ppb	parts per billion
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RA	Risk Assessment
RAB	Restoration Advisory Board
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RSL	regional screening level
SE	Southeastern Area
SI	site investigation

LIST OF ACRONYMS (CONTINUED)

SIA	Southeast Industrial Area
SLERA	screening level environmental risk assessment
SLRA	screening level risk assessment
SMSR	Southern Martinsburg Shale Region
SSIA	Southern Southeast Industrial Area
SSL	Soil Screening Level
SVOC	semivolatile organic compound
TAL	Target Analyte List
TBC	To Be Considered
TCDD TEQ	2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalent
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	time-critical removal action
TDS	total dissolved solids
TeCA	1,1,2,2-tetrachloroethane
TI	technical impracticability
TNTWO	TNT Washout Plant
TOSA	Truck Open Storage Area
TPH	total petroleum hydrocarbon
trans-1,2-DCE	trans-1,2-dicholorethene
TSCA	Toxic Substances Control Act
U.S.	United States
U.S.C.	United States Code
USAF	U.S. Air Force
UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
VC	vinyl chloride
VIP	vapor intrusion pathway
VOCs	volatile organic compounds
WESTON®	Weston Solutions, Inc. (formerly Roy F. Weston, Inc.)
WOS	Waste Oil Sump
WQC	water quality criteria
yd^3	cubic yard

EXECUTIVE SUMMARY

The United States (U.S.) Army, with review and input from the U.S. Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP), has conducted a five-year (statutory) review of the remedial actions implemented at Property Disposal Office (PDO) Operable Unit (OU) 6 and Southeastern (SE) Area OUs 1, 2, 7, 8, and 10, Letterkenny Army Depot (LEAD), Franklin County, Pennsylvania. The review was conducted from 11 March 2011 to 22 August 2012.

This report presents the results of the third five-year review performed for the SE Area and the second five-year review for the PDO Area National Priorities List (NPL) sites, which are located at LEAD in Chambersburg, Pennsylvania. The trigger for this five-year review was the execution of the first five-year review for the PDO Area NPL Site, for which EPA concurrence was received on 12 March 2007. EPA concurrence with the second SE Area five-year review for the SE Area NPL Site was received on 24 June 2008. Although the next SE Area five-year review is not due until 2013, the review is being conducted earlier than the standard five year period to facilitate integration of the PDO and SE NPL sites into this single five-year review document.

Currently, 15 OUs are established for the SE Area NPL Site and 8 OUs are established for the PDO Area NPL Site, as described in the following table. Since the last five-year review cycle, LEAD created PDO OU 8 (discussed in detail in Subsection 1.3). This report covers the remedies selected in the signed Records of Decision (RODs) for SE OUs 1, 2, 7, portions of SE OU 8, SE OU 10, and portions of PDO OU 6.

Summary of SE Area and PDO Area OU Status[1]

OU Description	Status	Evaluated in Five-Year Review
SE Area OUs		
SE OU 1—K-Areas	ROD (2 August 1991): Remedy-In-Place – soils treated and capped with LUCs and Cap Inspection Plan to ensure proper coverage and maintenance.	Yes
SE OU 2—Industrial Wastewater Sewer System	ROD (September 2006): Selected Remedy – cleaning and abandonment of sewer and drain lines at Buildings 37 and 57 with LUCs to ensure C/I use only.	Yes
SE OU 3A—Disposal Area VOC-Contaminated Groundwater	Final action not selected	No
SE OU 3B—Area Upgradient of VOC Contamination Source in SE OU 3A	ROD (July 2006): No Action	No
SE OU 4—Stormwater Sewer Lines and Associated Drainageways	ROD (August 2005): No Further Action	No
SE OU 5—Area A and B Contaminated Soils	Final action not selected	No
SE OU 6—Off-Post VOC-Contaminated Groundwater North of Gate 6 and East of East Patrol Road (Rowe Run Drainage System)	Final action not selected	No
SE OU 7—Truck Open Storage Area/Waste Oil Sump (TOSA/WOS)	ROD for Phase V (June 2012): Selected Remedy – LUCs	Yes

OU Description	Status	Evaluated in Five-Year Review
SE OU 8—Base Realignment and Closure (BRAC) Waste Sites	ROD for Phase I of OU 8 (September 1998): LUCs for C/I use only ROD for Phase II of OU 8 (July 2001): LUCs for C/I use only ROD for Phase III of OU 8 (August 2003): No Action ROD for Phase IV of OU 8 (July 2006): No Further Action ROD for Phase V of OU 8 (June 2012): Selected Remedy – LUCs	Yes (No Action not included)
SE OU 9—Landfill J	Final action not selected	No
SE OU 10—Southern Southeast Industrial Area (SSIA) VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)	ROD (September 2006): Selected Remedy – groundwater treatment with Monitored Natural Attenuation (MNA) and LUCs.	Yes
SE OU 11—Northern Southeast Industrial Area (NSIA) VOC-Contaminated Groundwater North of Gate 6	Final action not selected	No
SE OU 12—Landfill G	Final action not selected	No
SE OU 13—Southern Martinsburg Shale Region	ROD (August 2003): No Action	No
SE OU 14—Former Test Track Area	Final action not selected	No
PDO Area OUs[2]		
PDO OU 1—Source Area Soils	ROD (July 1991): No Action	No
PDO OU 2—PDO Area Groundwater and Surface Water	Final action not selected	No
PDO OU 3—Mercury Detections in Rocky Spring Lake	ROD (February 2000): No Further Action	No
PDO OU 4—Soil, Sediment and Groundwater Associated with the Oil Burn Pit	Final action not selected	No
PDO OU 5—Rocky Spring Drainage System Area	Final action not selected	No
PDO OU 6—BRAC Waste Sites	ROD for Phase I of OU 6 (September 1998): LUCs for C/I use only ROD for Phase II of OU 6 (July 2001): LUCs for C/I use only ROD for Phase III of OU 6 (August 2003): No Further Action	Yes (No Action not included)
PDO OU 7—Southern Martinsburg Shale Region (SMSR)	ROD (August 2003): No Further Action	No
PDO OU 8—Upper PDO Waste Sites	Final action not selected	No

[1] A table providing a cross reference list of the EPA OU and Army Environmental Database-Restoration (AEDB-R) tracking numbers is provided in **Attachment 1**.

[2] Two sites in the Ammunition Area (TNT Washout Plant and Drainageways Downstream of Open Burning Ground No. 2) are being included in the five-year review along with the PDO and SE Areas because the sites were identified as Solid Waste Management Units regulated under RCRA and are subject to the requirements in the 1989 Federal Facilities Agreement.

The OUs with no action or no further action remedies in place include SE OU 3B, SE OU 4, portions of SE OU 8, SE OU 13, PDO OU 1, PDO OU 3, portions of PDO OU 6, and PDO OU 7. The OUs with no remedies in place as of the completion of this five-year review include SE OUs 3A, 5, 6, 9, 11, 12, and 14, and PDO OUs 2, 4, 5, and 8.

Issues that were identified during the previous five-year reviews for the SE and PDO Areas were resolved and consisted of the following:

- SE OU 1: Issues related to cap integrity were identified. The Army posted "Please Keep Off" signs in early September 2007 as part of cap maintenance to prevent vehicle traffic. The capped areas (K-1, K-2, and K-3) are included in the Depot's mowing and landscape plan. It was noted in the second five-year review that the mowing of the K-Areas should occur annually at a minimum. Therefore, the K-Areas have been mowed at a minimum frequency of once per year to prevent the growth of woody plants that could possibly compromise the integrity of the cover.

- SE OU 2: The lack of a Land Use Controls Remedial Design (LUC RD) was identified as an issue; the document was completed in March 2010 (Shaw, 2010 LKD.RT-336).

- SE OU 8 and PDO OU 6 (BRAC waste sites): Deeds for road parcels 2R-80, 2R-81, 2R-84, 2R-85, 2R-86, and 2R-87 did not include or reference the land use restrictions required by the Phase II ROD. Because the land use restrictions recorded in the May 3, 2002 Phase II deed "run with the land," they are enforceable. However, because the restrictions were not explicitly stated in the deeds, more research was required by potential future owners to be aware of them. This issue was noted during the first PDO Area five-year review and discussions have been initiated with Letterkenny Industrial Development Authority (LIDA) to address this issue.

  Preparation of a deed of correction was implemented during the previous five-year review of the SE Area to provide additional legal certainty that the land use restrictions are being fully implemented. The deed of correction was completed and recorded in the Franklin County Courthouse in Chambersburg on April 15, 2008.

  In addition, the LUCs for a subset of the Phase I and Phase II BRAC Parcels were lifted as part of the *Explanation of Significant Differences (ESD) for a Subset of the Phase I and Phase II BRAC Parcels, Letterkenny Army Depot, Chambersburg, PA*, which was submitted and finalized in May 2012 (WESTON, 2012a LKD.RT-363).

- SE OU 8 and PDO OU 6 (BRAC waste sites): The BRAC Environmental Coordinator (BEC) had been signing annual LUC inspection reports rather than the Letterkenny Army Depot Commander. To address this issue in the interim, there is an e-mail from EPA dated 10/19/06 stating that it is acceptable for the BEC to sign the annual letter instead of the Commander. Eventually, the Phase I, II, and V LUC RD will specify that the BEC will sign the annual letter.

- SE OU 8 and PDO OU 6 (BRAC waste sites): Two issues were noted in the second SE Area five-year review as a result of the inspection of Phase I/II deeds and leases:

1. Copies of deeds/leases were not being sent to the required parties as stated in the deed/lease as follows: CERCLA Remediation Section, Paragraph C.2. Deed/Lease: Within 14 days after the effective date of the transaction, GRANTEE, its successors and assigns, will provide to the GRANTOR, EPA, and PADEP, copies of the deed, lease, or other conveying instrument evidencing such transaction.
2. A lease from a Cumberland Valley Business Park (CVBP) tenant was reviewed and discovered not to reference the corresponding Phase I deed, thus confirming that not all leases reference the corresponding Phase I or II deed.

To address these issues, the Army has worked with LIDA and CVBP tenants to determine an effective method to ensure that the deeds/leases are sent to the specified parties. In addition, the Army has completed the review of leases and has determined that all applicable LUCs are referenced in the deed.

- Interim Commercial/Industrial (C/I) Land Use (SE and PDO Areas): The remedies for SE OUs 3A, 5, 6, 9, 11, 12, 14, and for the remaining portions (BRAC Phase VII Parcels) of SE OU 8 have not yet been selected. The remedies for PDO OUs 2, 4, 5, and 8 also have not yet been selected. To be protective of human health and the environment, the interim land use of these areas must be restricted to C/I use. It was noted in the first five-year review for the PDO Area NPL Site and in the second five-year review for the SE Area NPL Site that the LEAD Master Plan did not explicitly restrict land use at these OUs (listed above) to C/I use only. The LEAD Master Plan was amended in January 2010 to address this issue.

Issues identified as a result of this five-year review for the SE and PDO Areas consist of the following:

- SE OU 1: The *Vegetative Cover Standard Operating Procedure* for the SE OU 1 caps states that inspections of the caps should take place quarterly (USACE, 2000). The main threat to cap integrity is burrowing animals, which are most active in the warmer months (i.e., summer, early fall) of the year; therefore, cap inspections are being completed on an annual basis in the fall. The SOP will be revised to indicate cap inspections should be completed annually.

- SE OU 2, SE OU 8, and PDO OU 6: The LUCAP MOA expires in August 2012 and is being replaced by the LUC RD for the Phase I, II, and V BRAC parcels to document the LUCs at LEAD as required under CERCLA. No issue exists at this time, but could if the LUC RD is not completed by August 2012 and a lapse occurs in the enforcement of the LUCs. The preparation of the LUC RD is currently in progress and will be completed in 2012.

- For PDO OU 6, groundwater restrictions for the interim remedy for Phase I and II exist in the LUCAP MOA and will ultimately be addressed by the RODs and RDs for PDO OUs 2 and 4. No issues exist at this time, but could if the RODs and RDs for PDO OUs 2 and 4 are not completed by August 2012 and a lapse occurs in the enforcement of the LUCs.

These issues, in the short term, do not impact the protectiveness of the remedies for SE OU 1, SE OU 2, SE OU 8, or PDO OU 6 under current conditions.

The remedies for SE OUs 1, 2, 7, portions of 8 and 10 and portions of PDO OU 6 are functioning as designed, are protective of human health and the environment, and are being operated and maintained in an appropriate manner.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: LEAD Southeastern (SE) Area		
EPA ID: PA6213820503		
Region: 3	**State:** PA	**City/County:** Chambersburg/Franklin

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** U.S. Army
Author name (Federal or State Project Manager): Bryan Hoke
Author affiliation: U.S. Army
Review period: 11 March 2011 – 22 August 2012
Date of site inspection: 10 July 2012
Type of review: Statutory
Review number: 3
Triggering action date: 24 June 2008
Due date *(five years after triggering action date)*: 12 March 2012

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: LEAD Property Disposal Office (PDO) Area		
EPA ID: PA2210090054		
Region: 3	**State:** PA	**City/County:** Chambersburg/Franklin

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** U.S. Army
Author name (Federal or State Project Manager): Bryan Hoke
Author affiliation: U.S. Army
Review period: 11 March 2011 – 22 August 2012
Date of site inspection: 10 July 2012
Type of review: Statutory
Review number: 2
Triggering action date: 12 March 2007
Due date *(five years after triggering action date)*: 12 March 2012

FIVE-YEAR REVIEW SUMMARY REPORT

Issues:

Three minor issues were identified as a result of this five-year review for the SE and PDO Areas:

1. SE OU 1: The Vegetative Cover SOP for the SE OU 1 caps states that inspections of the caps should take place quarterly (USACE, 2000). Currently, cap inspections are being completed on an annual basis. The SOP will be revised to indicate cap inspections should be completed annually.

2. SE OU 2, SE OU 8, and PDO OU 6: The LUCAP MOA expires in August 2012 and is being replaced by the LUC RD for the Phase I, II, and V BRAC Parcels to document the LUCs at LEAD as required under CERCLA. No issue exists at this time, but could if the LUC RD is not completed by August 2012 and a lapse occurs in the enforcement of the LUCs. The preparation of the LUC RD is currently in progress and will be completed in 2012.

3. For PDO OU 6, groundwater restrictions for the interim remedy for Phase I and II exist in the LUCAP MOA and will ultimately be addressed by the RODs and RDs for PDO OUs 2 and 4. No issues exist at this time, but could if the RODs and RDs for PDO OUs 2 and 4 are not completed by August 2012 and a lapse occurs in the enforcement of the LUCs.

Recommendations and Follow-up Actions:

Follow-up actions include:

1. Revise Vegetative Cover SOP by 30 September 2012 to require annual cap inspection instead of quarterly inspection.

2. Ensure the LUC RD for Phases I, II, and V is completed before the LUCAP MOA expires in August 2012.

3. In August 2012, the Army and EPA will conduct a review to determine whether additional measures are necessary to enforce groundwater restrictions in PDO OU6. This review is in accordance with the LUCAP MOA, Termination, Section XIV(b).

Protectiveness Statement(s):

The remedies for SE OUs 1, 2, 7, 8, and 10 and PDO OU 6 are functioning as designed, are protective of human health and the environment, and are being operated and maintained in an appropriate manner. The OUs with no action or no further action remedies in place are SE OU 3B, SE OU 4, portions of SE OU 8, SE OU 13, PDO OU 1, PDO OU 3, portions of PDO OU 6, and PDO OU 7.

Other Comments:

1. INTRODUCTION

The United States (U.S.) Army, with review and input from the U.S. Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP), has conducted a five-year (statutory) review of the remedial actions implemented at Southeastern (SE) Area OUs 1, 2, 7, a portion of 8, and 10, and at a portion of Property Disposal Office (PDO) Operable Unit (OU) 6, Letterkenny Army Depot (LEAD), Franklin County, Pennsylvania. The review was conducted from 11 March 2011 to 22 August 2012. In addition, Section 1 of this five-year review discusses the status of the remaining SE and PDO OUs for which there are No Further Action decisions or no signed Records of Decision (RODs).

This report presents the results of the third five-year review performed for the SE Area and the second five-year review for the PDO Area National Priorities List (NPL) sites, which are located at LEAD in Chambersburg, Pennsylvania (**Figure 1**). The trigger for this five-year review was the execution of the first five-year review for the PDO Area NPL Site, for which EPA concurrence was received on 12 March 2007. EPA concurrence with the second SE Area five-year review for the SE Area NPL Site was received on 24 June 2008. Although the next SE Area five-year review is not due until 2013, the review is being conducted earlier than the standard five-year period to facilitate integration of the PDO and SE NPL sites into this single five-year review document.

This five-year review is necessary due to the presence of contaminants at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The purpose of five-year reviews is to determine whether the remedies selected for implementation in the RODs for a site remain protective of human health and the environment. The methods, findings, and conclusions of five-year reviews are documented in five-year review reports, which identify issues found during the review, if any, and recommendations to address them.

The U.S. Army, the lead agency for LEAD, is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). CERCLA 121(c), as amended, 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.*

The NCP part 300.430(f)(4)(ii) of the CFR states:

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

In addition, if after such review, it is the judgment of the President that action is appropriate at such site in accordance with CERCLA §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.

Currently, 15 OUs are established for the SE Area NPL Site and 8 OUs are established for the PDO Area NPL Site. Since the last five-year review cycle, LEAD created PDO OU 8 (discussed in detail in Subsection 1.3). This report covers the remedies selected in the signed RODs for SE OUs 1, 2, 7, a portion of 8, and 10, and at a portion of PDO OU 6. The drainage divide that separates the SE Area from the PDO Area at LEAD is shown in **Figure 2**. The specific OUs in the SE and PDO Areas at LEAD are shown in **Figures 3 and 4**.

The following subsections provide a brief discussion and current status of each of the SE and PDO OUs. Documents that are referenced in this five-year review and have an associated LEAD Administrative number (e.g., LKD.RT-001) can be viewed by clicking the following link http://www.leadenv.com/leadenv/ and then clicking on "Public Library/Public Announcement." This link will direct your web browser to the LEAD Administrative Record (username: guest; password: guest).

1.1 LEAD BACKGROUND

LEAD is located on the western side of the Cumberland Valley, in the central part of Franklin County, 5 miles North of Chambersburg, PA (**Figure 1**). The Depot fronts on Pennsylvania State Highway 997. Chambersburg is the county seat, and based on the 2000 Census, is the largest town in Franklin County with 17,862 inhabitants. Surrounding population centers with populations greater than 9,000 include Greene Township (12,284), Guilford Township (13,100), Waynesboro (9,614), and Antrim Township (12,504). LEAD is located within the boundaries of three townships: Greene, Letterkenny, and Hamilton.

Prior to the establishment of LEAD, the area consisted of agricultural and forest lands. The area was predominantly single-family farms used for both subsistence and commercial purposes. The Letterkenny Ordnance Depot was established in January 1942 as an ammunition storage facility. In subsequent years, the following missions were added:

- Reserve storage and export, advance storage of parts, tools, supplies, and equipment for combat vehicles, artillery, small munitions, and vehicle fire control equipment (1943).
- Receipt and storage of hardware, heavy-duty trucks, and parts (1944).
- Establishment of transport and combat vehicle shops and expansion of the maintenance program (1947).
- Establishment of a rebuild system for guided missile ground control, launching, and handling equipment; missile propellant systems; and internal guidance systems (1954).

- Assignment of the special weapons mission (1958).
- Designation of the Depot as the Eastern Equipment Assembly Area (1959). This mission gave the Depot responsibility for the handling and shipment of equipment for guided missile and special weapons units to overseas locations.
- Acceptance and destruction of U.S. Air Force (USAF) missile fuel (1961).
- Letterkenny Ordnance Depot was renamed the Letterkenny Army Depot (1962).
- Disposal of explosive ordnance from the Army as well as from state and local police (1964).
- Rebuilding artillery recoil mechanisms and maintenance and storage of USAF missiles (1966).
- Receipt, storage, and dispersal of batteries and tires to Army units (1972).
- Operation of a washout facility to reclaim explosives from munitions (1973).

Current and past operations conducted at LEAD involved cleaning, stripping, plating, lubrication, demolition, chemical/petroleum transfer/storage, and washout/deactivation of ammunition. Many of the previously listed missions/activities were accomplished using petroleum hydrocarbons and various chlorinated solvents including trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA).

During the 1970s and 1980s, LEAD undertook several construction and modernization projects. New facilities, including a care and preservation building, chrome plating facility, and radiographic inspection facility, were constructed. Several large modernization projects were completed, including the Automated Storage and Retrieval System-Plus, which provides state-of-the-art support to maintenance operations. During the cold war years, new missions in the maintenance of weapon systems – particularly Hawk, Patriot, and Paladin – were added. More recently, LEAD has expanded its product line to include the overhaul of tactical wheeled vehicles, material handling equipment (cranes), and mobile kitchen trailers. In addition, as the Center for Industrial and Technical Excellence for Mobile Electric Power Systems, LEAD repairs and remanufactures power generation sets. LEAD has also expanded its capabilities to include aviation ground power units. Other vital Defense Department products LEAD supports include the Force Provider (the Army's mobile, fully enclosed base camp/buildings that supply food, dining, and heating/cooling systems), mobile power generators, and the Biological Integrated Detection System (BIDS). BRAC 2005 named LEAD as number one in military value for tactical wheeled vehicles. Work from this decade has centered on cranes, generators, high mobility multipurpose wheeled vehicles (HMMWV), the Patriot recapitalization program, as well as medium mine protected vehicles (MMPV), and mine resistant ambush protected (MRAP) systems.

As a result of the 1995 Base Realignment and Closure (BRAC) Commission's recommendation, LEAD's mission was to be realigned by transferring the towed and self-propelled howitzer mission to Anniston Army Depot and by transitioning missile guidance and control to

Tobyhanna Army Depot. As a result of this realignment, property at LEAD is in the process of being excessed (i.e., transferred to the local community for reuse).

In July 1987, the SE Area of LEAD was listed on the NPL with a Hazard Ranking Score (HRS) of 34.21. On March 1989, the PDO Area of LEAD was placed on the NPL; the HRS was 37.51. Major tenant activity on Depot includes the Defense Reutilization Marketing Office (DRMO) and the Defense Logistics Agency (DLA).

On 3 February 1989, a Federal Facility Interagency Agreement (IAG) was signed by the U.S. Army, EPA, and Pennsylvania Department of Environmental Resources (PADER) (pertaining to Resource Conservation and Recovery Act [RCRA] and Clean Streams Law issues). The IAG established the framework for the CERCLA response actions at LEAD and required the review of all documents concerning the investigation of environmental contamination at LEAD produced prior to the IAG. PADER has since changed its name to PADEP.

1.2 DESCRIPTION AND BACKGROUND OF LEAD SE AREA OUs

The locations of the 15 OUs in the SE Area are shown in **Figures 3 and 4**. At the time the K-Area ROD was signed in 1991 (LEAD, 1991 LKD.RT-061), the following three OUs were identified:

- SE OU 1—K-Areas
- SE OU 2—Industrial Wastewater Sewer System
- SE OU 3—Disposal Area VOC-Contaminated Groundwater

In 2002, SE OU 3 was divided into two OUs (SE OU 3A and SE OU 3B) to facilitate the BRAC transfer and to allow management of the area upgradient of the groundwater contaminated with volatile organic compounds (VOCs) from the Disposal Area (DA) source separately as SE OU 3B. The designations of the new OUs are as follows:

- SE OU 3A—Disposal Area VOC-Contaminated Groundwater
- SE OU 3B[1]—Area Upgradient of VOC Contamination Source in SE OU 3A

Additional OUs were designated based on the results of the former SE OU 3 Remedial Investigation (RI) Report (ESE, 1993 LKD.RT-086). The four additional OUs created within the SE Area included:

- SE OU 4—Stormwater Sewer Lines and Associated Drainageways
- SE OU 5—Area A and B Contaminated Soils
- SE OU 6—Off-Post VOC-Contaminated Groundwater North of Gate 6 and East of East Patrol Road (Rowe Run Drainage System)
- SE OU 7—Truck Open Storage Area/Waste Oil Sump (TOSA/WOS)

[1] Denotes that the OU is covered under BRAC program.

SE OU 6 originally included all off-post SE Area VOC-contaminated groundwater; however, in 2002, the portion of this OU associated with SE OU 10 (south of the groundwater divide in the vicinity of the old Gate 6) was moved to SE OU 10 in 2002 to facilitate the BRAC transfer and so that SE OU 6 is associated only with the Rowe Run drainage.

To support the 1995 BRAC decision to realign the LEAD mission, SE OU 8 was created to deal with all waste sites within the BRAC property boundary:

- SE OU 8[1]—BRAC Waste Sites

In February 1999, two additional OUs were created:

- SE OU 9—Landfill J
- SE OU 10[1]—Southern Southeast Industrial Area (SSIA) VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)

SE OU 10 was originally part of SE OU 3 but was separated from SE OU 3 because there is a different source of contamination and due to the presence of a groundwater divide between the two areas.

In 2001, two additional OUs were created:

- SE OU 11—Northern Southeast Industrial Area (NSIA) VOC-Contaminated Groundwater North of Gate 6
- SE OU 12—Landfill G

SE OU 11 was originally part of SE OU 3 and was separated from SE OU 3 because there is a different source of contamination.

In 2002, SE OU 13 was added so that the Southern Martinsburg Shale Region (SMSR) could be managed separately (originally, this was a part of SE OU 10 and SE OU 11) to facilitate the BRAC transfer:

- SE OU 13[1]—Southern Martinsburg Shale Region

SE OU 14 was created in 2007 to track sites that were formerly BRAC sites and are now Army-retained land:

- SE OU 14—Former Test Track Area

The Army Environmental Database-Restoration (AEDB-R) sites and corresponding ID numbers for the SE Area OUs are presented in **Attachment 1**.

[1] Denotes that the OU is covered under BRAC program.

1.2.1 SE OU 1—K-Areas

SE OU 1 is located in the Environmental Restoration, Army (ER,A) (i.e., Army-retained) portion of LEAD. The K-Areas were used for the disposal of waste solvents used in painting, paint stripping, and degreasing operations at LEAD. The K-1 Area was in use from 1957 to 1970. The K-2 Area was in use from 1965 to 1970 and included five partially revetted areas used to accumulate solid waste prior to disposal into a nearby landfill. The K-3 Area was in use as a drum storage area from 1965 to 1970.

An Initial Installation Assessment of LEAD was performed in 1978 and the Discovery Phase was initiated in January 1979. In 1983, Roy F. Weston, Inc. (WESTON®) completed an investigation of the DA, which included areas K-1, K-2, and K-3. This investigation revealed the presence of VOCs, including TCE, 1,2-dichloroethene (1,2-DCE), and 1,1,2,2-tetrachloroethane, at elevated concentrations in the K-Areas. In 1992, Environmental Science and Engineering, Inc. (ESE) conducted a soil boring program to delineate the boundaries of the K-Areas. The results of this effort showed that the K-Areas contained higher levels of VOCs than originally thought. Polychlorinated biphenyls (PCBs), metals, and semivolatile organic compounds (SVOCs) were also discovered.

The ROD (LEAD, 1991) and an Explanation of Significant Differences (ESD) (LEAD, 1991 [included in the ROD]) for SE OU 1 were issued in 1991. The ESD was for clarification of applicable or relevant and appropriate requirements (ARARs). Based on the remedy selected in the ROD, a remedial action was initiated at SE OU 1 in 1993 and was completed in September 1995.

SE OU 1 soils were treated from July 1993 to December 1994. Contaminated soil was excavated to bedrock and to the defined horizontal limits, except at area K2 where just the upper 3 feet of soil was removed, treated with Low Temperature Thermal Treatment (LT^3), and fixated as necessary. The soil was sampled to confirm it met both the TCE remediation criteria and the Toxicity Characteristic Leaching Procedure (TCLP) requirements for metals. All soil (including fixated material) was placed back in the original excavations upon successful treatment. A residual waste cap was installed over the treated soil areas in October 1995. The *Technology Remedial Action Report*, which documents the remedial actions conducted at the K-Areas, was finalized in August 1997 (McLaren/Hart, 1997 LKD.RT-131).

Following the remedial action, a second ESD was issued in 2004 (LEAD, 2004, LKD.RT-245). This ESD provided for land use controls (LUCs) and a Cap Inspection Plan to protect the integrity of the cap. In accordance with the Cap Inspection Standard Operating Procedure, yearly inspections of the K-1, 2, and 3 capped areas are required (and corrective actions, if necessary) to maintain protectiveness of human health and the environment. Inspections of the cap have been conducted yearly since 2007, and the most recent inspection occurred in September 2011. Cap inspections have indicated that the vegetative cover, drainage system, and liner are intact.

1.2.2 SE OU 2—Industrial Wastewater Sewer System

The Industrial Wastewater Sewers (IWWS) carry waste from various buildings in the Southeast Industrial Area (SIA) at LEAD to the industrial wastewater treatment plant (IWTP) at LEAD. Prior to 1965, most concentrated wastes were trucked to the DA for disposal. After the IWTP line (4-inch terra cotta) was installed in 1965, solvents and other chemicals were routinely discharged for treatment. Drainage laterals were added, deleted, and modified numerous times over the years. As a result of undocumented modifications, cross-connections, breaks, and dead ends were very likely to be present in the building drains. These factors, plus normally expected leaks in jointed terra cotta pipe, are likely to have resulted in past inadvertent discharges of solvents, dirt, oil, grease, and other petroleum, oil, and lubricants (POLs) to the IWWS, storm sewer, or ground (ESE, 1996 LKD.RT-119).

Problems with the IWWS lines were first identified in the 1993 RI Report for the Southeastern Area (ESE, 1993). Studies of the IWWS lines showed that numerous breaks and/or leaks existed in both the IWWS and stormwater sewer lines. Leak testing and sampling indicated that VOCs had leaked from the IWWS and migrated to the soil/bedrock interface. Emergency repairs were made to the IWWS beginning in October 1994 and completed in December 1995. An engineering evaluation/cost analysis (EE/CA) was prepared by LEAD to address the removal of contaminated soils associated with the leaking IWWS lines (ESE, 1996). LEAD conducted an interim removal action of the IWWS-contaminated soils in summer 1997.

A Proposed Plan for SE OU 2 was finalized in May 2005 (Shaw, 2005a LKD.RT-290) and a final ROD was completed in August 2006 (signed in September 2006) (Shaw, 2006a LKD.RT-284). The selected remedy for SE OU 2 was cleaning followed by abandonment of the sewer and drain lines at Buildings 37 and 57 to prevent future use of the existing sewers. The risk assessment showed that there are acceptable risks for commercial/industrial (C/I) use; therefore, the remedy included LUCs to prohibit uses less restrictive than C/I (e.g., residential housing, elementary and secondary schools, child care facilities, and playgrounds) at the property. The remedial action was completed in spring 2006. The Army installed a replacement force main (in the vicinity of the abandoned force main) in October 2010 to direct flow from both buildings to the IWTP.

1.2.3 SE OU 3A—Disposal Area VOC-Contaminated Groundwater

SE OU 3A is located in the ER,A (i.e., Army-retained) portion of LEAD and is associated with on-post groundwater contamination in the DA at LEAD. **Figure 4** shows the locations of the groundwater OUs at LEAD. Prior to the installation of the IWWS lines in 1965 in the SE Area at LEAD, spent wastes from buildings were disposed in the DA. The unlined lagoons in the K-Areas and the Spill Area in Area A (see Subsection 1.2.6) were the sources of groundwater contamination consisting primarily of chlorinated solvents that were disposed in unlined lagoons at the K-Areas. Although the primary sources of contamination have been addressed, VOCs are still being detected, most likely due to the presence of contaminated subsurface soils and VOC contamination within the bedrock matrix, which is continuing to act as a secondary source.

Several pilot studies and site investigations have been conducted at the site, including a vapor intrusion pilot study conducted from July 2004 to January 2006, for which a draft report was submitted to EPA and PADEP in May 2006 (WESTON, 2006a); a recirculation well Pilot Study; an in situ H_2O_2 Pilot Study conducted in April 2000; and additional investigations to verify the vertical extent of groundwater contamination as requested by EPA (2005 to 2006). The results of the additional investigations were reported in the *Focused Feasibility Study (FFS) for Southeastern (SE) Area Operable Unit (OU) 3A (AEDB-R Site LEAD-081), OU 11 (AEDB-R Site LEAD-131), and OU 6 (AEDB-R Sites LEAD-068, -076, -084, 086, -087, -088, -096, and -104)*, (WESTON, 2010a LKD.RT-343). The Proposed Remedial Action Plan (PRAP) for SE OUs 3A, 11, and 6 is in progress and recommends an Alternative Remedial Strategy (ARS) under a front-end Technical Impracticability (TI) Waiver of in-situ chemical oxidation (ISCO) to destroy the contaminant mass at the source areas in SE OUs 3A and 11 (see Subsection 1.2.12), thereby reducing the concentrations of VOCs in the dissolved-phase plume in SE OUs 3A, 11, and 6, with LUCs and long-term groundwater monitoring as a component of the CERCLA five-year review process. The Army will be responsible for enforcing the LEAD Master Plan on-post in SE OUs 3A and 11. To address groundwater contamination off-post in SE OU 6, the Army will monitor and report on off-post groundwater use restrictions and cooperate with Greene Township and other local government entities with regard to monitoring, maintaining, and reporting on codes, zoning ordinances, and other restrictions in SE OU 6. The Army will also inform the community of the potential risks associated with the use of or contact with groundwater. Under this alternative, LUCs would remain in effect in each OU until plume concentrations decline and remain below ARARs, as approved by the Army, EPA, and PADEP.

A ROD has not been completed for SE OU 3A; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 3A in the remainder of this document.

1.2.4 SE OU 3B—Area Upgradient of VOC-Contaminated Source in SE OU 3A

SE OU 3B addresses the area approximately 1,000 feet upgradient and west of the VOC-contaminated groundwater from the DA source in SE OU 3A. There are no known historic sources of contamination for this area, and the area was characterized separately to facilitate accelerated property transfer. Groundwater sampling was initiated in August 2003 and a final Site Investigation (SI) Report was completed in May 2005 (WESTON, 2005a LKD.RT-265). A Proposed Plan was issued for public review in May 2005 (WESTON, 2005b LKD.RT-267). A No Action ROD (WESTON, 2006b LKD.RT-275) and a Finding of Suitability to Transfer (FOST) (WESTON, 2006c LKD.RT-279) were completed and signed in June 2006. The ROD specifies no action for SE OU 3B groundwater and for soil associated with four Parcels (Parcels 4-92, 4-93, 4-94, and 4-95) that make up a portion of SE OU 8; these parcels were transferred as part of the Phase IV BRAC property transfer.

A final No Action ROD remains in place for SE OU 3B; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 3B in the remainder of this document.

1.2.5 SE OU 4—Stormwater Sewer Lines and Associated Drainageways

SE OU 4, which is located in areas of LEAD that are handled administratively by both the BRAC and Installation Restoration Program (IRP), consists of the stormwater sewer system lines, associated sediments, and drainageways. Prior to installation and connection to the IWTP, industrial wastewaters from the SE Area at LEAD were discharged untreated to the Depot stormwater sewer system. Wastewater generated south of Gate 6 was run through oil/water separators then to the stormwater sewers. The southern portion of the depot was connected to the IWTP system in the 1970s. In accordance with an EE/CA completed in March 1997 (Fluor Daniel, 1997a LKD.RT-129), contaminated sediments were removed and disposed off-site, and the filling of associated sinkholes was completed by spring 1997. A total of 1,037 tons of contaminated sediment was removed from the Southeast Drainageway and the Rowe Run Drainageway and disposed of as residual waste.

A Removal Action Summary Report for SE OU 4 was finalized in September 2003 (Shaw, 2003 LKD.RT-241). A Proposed Plan was issued for public review in November 2004 (Shaw, 2004a LKD.RT-255), and a final ROD (Shaw, 2005b LKD.RT-270) was completed in July 2005 (signed August 2005). The selected remedy was No Further Action. The No Further Action ROD remains in place for SE OU 4; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 4 in the remainder of this document.

1.2.6 SE OU 5—Area A and B Contaminated Soils

SE OU 5 is located in the ER,A (i.e., Army-retained) portion of LEAD. The Spill Area in Area A was first identified during the Area A perimeter soil boring program in May 1995 when a small container was encountered during the advancement of a soil boring (Fluor Daniel, 1997b LKD.RT-130). High concentrations of VOCs were found in soil saturated with liquid that had leaked from the container. Area B is a former clay-lined burning pit that was used from the 1950s to the 1960s to dispose of oil, fuels, used paint, thinners, and other combustible materials. The contaminants detected in Area B may have originated from other known VOC-contaminated areas such as the K-Areas and the Spill Area in Area A (Shaw, 2004b LKD.RT-259).

Areas A and B were initially investigated in the 1980s. Contaminants detected in Area A consisted primarily of total petroleum hydrocarbons (TPH) and metals, with a small amount of VOCs. The most recent rounds of sampling conducted to delineate the extent of contamination were completed in July 1995, when a localized spill area of elevated VOC concentrations was identified. An EE/CA was prepared and an interim removal action was conducted in summer 1997 to excavate and dispose of the VOC-contaminated soil in the Spill Area of Area A (Fluor Daniel, 1997b). The remainder of Area A was evaluated as part of the CERCLA RI process. Final RI and Risk Assessment (RA) Reports for both Area A and Area B were completed in September 2004 (Shaw, 2004b and Shaw, 2004c LKD.RT-321), which also documented the post-removal action conditions for the Spill Area of Area A.

The soil in Area B was found to contain TPH, metals, and a small amount of VOCs; groundwater was also found to contain VOCs. Area B was further evaluated as part of the CERCLA RI

process. A Final RI/RA was completed in September 2004 (Shaw 2004b and 2004c), published separately as an RI and an RA. A worm study was conducted in accordance with comments from EPA Biological Technical Assistance Group (BTAG), and an addendum to the ecological RA was finalized in December 2007 (Shaw, 2007 LKD.RT-303). A Feasibility Study (FS) for SE OU 5 will be prepared to address both Areas A and B.

A ROD has not been completed for SE OU 5; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 5 in the remainder of this document.

1.2.7 SE OU 6—VOC-Contaminated Groundwater North of Gate 6 and East of East Patrol Road (Rowe Run Drainage System)

SE OU 6 consists of off-post VOC-contaminated groundwater associated with on-post source areas at SE OU 3A and SE OU 11 and includes the discharge points of 6 VOC-impacted off-post springs and residential drinking water wells. A dye study, which included the placement of dye in monitor wells located near LEAD's property line and in Rowe Run (boundary trace), was initiated in September 1995 and completed in December 1995.

In addition to the springs, off-post wells were also evaluated as part of SE OU 6. Approximately 50 wells were sampled and results were analyzed for VOC and metals concentrations during a period of 2 years. The results from this sampling indicated no additional VOC-contaminated off-post wells other than those previously identified.

A third study of the off-post groundwater impacts was an evaluation of farm animals and farm animal products located on farms near the SE Area. Samples of eggs, milk, and meat were collected from numerous farms. Results from this sampling did not indicate the presence of VOCs or metals in the various media at concentrations above literature values or regional background levels.

The following is a chronology of recent activity at SE OU 6:

- July 2002—A draft RI/RA Report for SE OU 6 was submitted.
- November 2004—A final RI was submitted in November 2004 (Shaw, 2004d LKD.RT-296).
- 2005 to 2006—Additional investigations were conducted to verify the vertical extent of groundwater contamination, as requested by EPA.
- July 2004 to January 2006—A vapor intrusion pilot study was conducted and a draft summary report was submitted to EPA and PADEP in May 2006 (WESTON, 2006a). EPA comments were received in August 2006.
- July 2006—A final RA was submitted in July 2006 (Shaw, 2006c LKD.RT-298).

- June 2007—The Work Plan for the Evaluation of the Vapor Intrusion Pathway (VIP) at SE OUs 6 and 11 finalized (WESTON, 2007a LKD.RT-297).
- 2008 to 2009—The VIP was evaluated at SE OU 6 residences.
- October 2010—The Focused Feasibility Study (FFS) for SE OU 3A, OU 11, and OU 6 was finalized (WESTON, 2010a).

Evaluation of the VIP in SE OU 6 consisted of soil gas, sub-slab, and indoor air sampling at residences from March 2008 to May 2009. The results of the risk assessment, which indicated that risks to receptors in SE OU 6 were within or below the risk management range of 1E-06 to 1E-04, were included in the FFS for SE OUs 3A, 11, and 6 (WESTON, 2010a).

The PRAP for SE OUs 3A, 11, and 6 is in progress and recommends an ARS under a front-end TI Waiver of ISCO to destroy the contaminant mass at the source areas in SE OUs 3A and 11 (see also Subsection 1.2.3), thereby reducing the concentrations of VOCs in the dissolved-phase plume in SE OUs 3A, 11, and 6, with LUCs and long-term groundwater monitoring as a component of the CERCLA five-year review process.

A ROD has not been completed for SE OU 6; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 6 in the remainder of this document.

1.2.8 SE OU 7—Truck Open Storage Area/ Waste Oil Sump

SE OU 7 consisted of an open storage area for trucks and an abandoned septic system used as an oil/water separator. The Truck Open Storage Area (TOSA) was used as an open storage area for vehicles that were to undergo refurbishing and was later used to store and demilitarize military vehicles. The septic tank, or Waste Oil Sump (WOS), which is located on the northern side of the site, was installed around 1942 and was used in conjunction with the leach field for approximately 1 year for disposal of sanitary waste from the warehouse area. In 1943, the warehouse area was connected to the sanitary sewer system and the septic tank and leach field were then used to dispose of septage from sewage holding tanks, boiler slops, hydraulic fluids, and oily wastes from other parts of the facility; it was also used by Reserve/National Guard units to change oil in military vehicles. The Army abandoned the septic tank in March 1997 in accordance with state health regulations dealing with septic tank closures (Fluor Daniel, GTI and QST, 1997).

Sampling and investigative activities at SE OU 7 were initially conducted in summer 1994. Analytical results from this sampling indicated no significant soil contamination present at SE OU 7. The detected groundwater contamination is attributable to SE OU 10, not SE OU 7. During the investigation of SE OU 7, an abandoned septic system was found. The abandoned septic system was used as an oil/water separator for disposal of “boiler slops” and sanitary sewage from LEAD holding tanks. A removal action was conducted in spring 1997, which consisted of characterization, solidification and removal of the tank contents, backfilling of the tank, and restoration of the site.

A supplemental investigation was conducted in 1999 for the presence of polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins/furans), and PCBs. The results of the investigation were published in July 2000 (WESTON, 2000d LKD.RT-177) and indicated that dioxins/furans in burned material were present at concentrations greater than the published (EPA Region III) industrial direct contact human health level. A time-critical removal action (TCRA) was completed in this area in December 2000.

The TOSA/WOS Site was evaluated and determined to be suitable for C/I use in the Summary of BRAC Investigations at the TOSA/WOS Site, SE OU 7, Letterkenny Army Depot, Chambersburg, PA, which was finalized in August 2009.

The TOSA/WOS Site is included in the Phase V BRAC property transfer along with 16 SE OU 8 BRAC waste sites. Remedial alternatives were evaluated for the Phase V BRAC Sites in an FS, which was finalized for the Phase V BRAC Parcels in August 2009 (WESTON, 2009a LKD.RT-324). A PRAP was completed for the Phase V BRAC Sites in May 2010 (WESTON, 2010d LKD.RT-339), and the ROD was completed and signed in June 2012 (WESTON, 2012b). The Selected Remedy for the Phase V BRAC Sites was LUCs to restrict the sites to C/I.

SE OU 7 will be included in the Phase V BRAC property transfer, which will take place following the completion of the FOST for the Phase V BRAC property.

1.2.9 SE OU 8—BRAC Waste Sites

SE OU 8 is composed of potential waste sites identified in the “to-be-excessed” or “BRAC” portion of the SE Area of LEAD. These sites primarily consist of buildings used for industrial use or vehicle maintenance, or open areas used for equipment or vehicle storage. Previous activities at these sites have resulted in soil contamination consisting of VOCs, SVOCs, metals, and dioxins. The groundwater underlying SE OU 8 is addressed under SE OU 10, which is discussed in Subsection 1.2.11. Groundwater underlying the Phase III SE OU 8 sites was addressed under SE OU 14, as discussed in Subsection 1.2.14. The locations of the SE OU 8 BRAC sites are shown in **Figure 5**. The Phases of BRAC property transfer at LEAD are shown in **Figure 6**.

The BRAC waste sites within SE OU 8 are listed in the following table.

SE OU 8 Sites		
AEDB-R Site ID	**BRAC Phase**	**Site Name**
N/A*	I	Parcels 8**, 9**, 10, 11**, and 13**
LEAD-001	V	Building 57 Site
LEAD-002	VII	Building 37 Site
LEAD-008	V	Building T-228 Battery Acid Disposal Pit
LEAD-011	III	Backwash Discharge Area from the Water Treatment Plant
LEAD-027	I	Parcel 12
LEAD-055	V	Former Transfer Area Near Building 98

SE OU 8 Sites		
AEDB-R Site ID	**BRAC Phase**	**Site Name**
LEAD-060	V V	Lot 29 Ingot Storage Area Lot 48 Ingot Storage Area
LEAD-073	V	Southeast Drainageway Sediment Pile Areas
LEAD-092	V	Buildings 16 and 17 Area
LEAD-114	I I III	Parcels 1 and 2 Parcel 24** Former Vehicle Storage Area North of the Test Track
LEAD-114	III	Former Vehicle Storage Area North of the Test Track
LEAD-115	IV	Tank Farm Storage Area
LEAD-116	II	Radioactive Materials Storage at Building 441
LEAD-118	III V V V V V	Building 400 Series Fire Training Area Building 422 North Building 433 West Building 433 Defueling Point Former Storage Area West of Building 446 Aboveground Storage Tanks (ASTs) at Golf Course Storage Buildings
LEAD-119	I	Railroad Parcels (Parcels 22 and 31)**
LEAD-125	II	Former PCB Transformer Sites
LEAD-126	V V II	Building 425 Underground Storage Tank (UST) Removal Site Building 437 UST Removal Site Gate 1 Guardhouse**
LEAD-127	V	IWWS System (SE OU 8 only)
LEAD-130	V	Former Storage Shed Near Building S38-1/S-38-2

*SE OU 8 was still being defined while these parcels/sites were investigated; therefore, they do not have AEDB-R numbers.
**Soil LUCs for this site were lifted by the Phase I and II ESD (WESTON, 2012a).

RI/RAs have been conducted for the sites in SE OU 8 from 1998 to the present. The final RI/RA reports are listed in **Table 1** in Section 2 and are available for review in the LEAD Administrative Record. Findings of Suitability to Lease (FOSLs) have been signed for the following SE areas area buildings: Buildings 6, 9, 19, 412, 416, 500, 522, 2291, 7, 8, and 42. Two FOSLs were also signed that covered the remainder of the BRAC buildings in the SE area (Phase II FOSL, February 2000 [WESTON, 2000c LKD.RT-168] and 2002 FOSL, October 2002 [WESTON, 2002e LKD.RT-226]). Property transfers under BRAC are being performed in phases. The following is a summary of the status of property transfers within the SE OU 8 area:

- Phase I — Properties within the SE portion included Parcels 1 through 13, Parcels 16 through 28, and Parcel 31. Parcels within the SE Area that were investigated under CERCLA included Parcels 1 and 2, 8 through 13, 24, and the Railroad Parcels (Parcels 22 and 31). A ROD for the Phase I parcels was signed in September 1998 (WESTON, 1998a LKD.RT-143). A Finding of Suitability to Transfer (FOST) was signed in October 1998 (WESTON, 1998b LKD.RT-148). The Phase I BRAC property transfer was completed in November 1998. The ROD for Phase I

documented selection of LUCs for all of the Phase I Parcels to prevent contact with contaminated groundwater and for administrative purposes to ensure that the land use remains C/I. Soil LUCs for all the Phase I Parcels in the SE Area, except Parcels 1, 2, 10, and 12, were lifted by the Phase I and II ESD (WESTON, 2012b). The SE OU 10 ESD lifted the groundwater use restrictions for the majority of parcels in the SE Area; however, Parcels 10 and 12 retained their groundwater use restrictions (WESTON, 2009d).

- Phase II — Properties within the SE portion included Parcels 2-35 through 2-77 (with the exception of Parcel 2-73), which include structures and property above the seasonal high groundwater table. The road parcels 2R-80 through 2R-85 were also included in the SE portion of the Phase II transfer. A ROD for the Phase II parcels was signed in July 2001 (WESTON, 2001b LKD.RT-190). A FOST for the Phase II Parcels was finalized in November 2001 (WESTON, 2001c LKD.RT-200) and documented LUCs for the remainder of the Phase II Parcels for administrative purposes to ensure that the land use remains C/I. The Phase II BRAC property transfer was completed in May 2002. The ROD for Phase II documented selection of LUCs to prevent contact with contaminated groundwater and to ensure that the land use for certain areas remains C/I. Soil LUCs for the Gate 1 Guardhouse, Building 511 Area (part of Parcel 2R-80) were lifted by the Phase I and II ESD (WESTON, 2012a). The SE OU 10 ESD lifted the groundwater use restrictions for the majority of parcels in the SE Area; however, Parcels 2-65, 2-66, and 2R-82 retained their groundwater use restrictions (WESTON, 2009d).

- Phase III — Phase III parcels are located within an area referred to as the SMSR. A No Action ROD for the Phase III parcels was signed in August 2003 (WESTON, 2003e LKD.RT-239). A FOST for the Phase III parcels was signed in August 2003 (WESTON, 2003f LKD.RT-238). The Phase III BRAC Property Transfer was completed in January 2004. Properties within the SE portion of Phase III include the following:

  - Parcels 3-89, 3-90, and 3-91 — These parcels are located in both SE and PDO areas.

  - Parcels 2-53L, 2-54L, 2-70L, 2R-80L-3, 2R-84L-3, and 2R-86L-3 — These parcels represent the subsurface property deeper than 8 ft of a subset of the respective Phase II parcels (2-53, 2-54, 2-70, and portions of 2R-80, 2R-84, and 2R-86), all of which are located within the SMSR. During the Phase II Property Transfer completed in May 2002, only the upper 8 ft of the properties were transferred. These parcels are entirely located in the SE area.

  - Parcels 24, 27, and 28 — These Phase I Parcels located within the SMSR were included in the Phase III BRAC transfer so that groundwater restrictions could be lifted.

- Phase IV — Phase IV comprises approximately 60 acres (parcels 4-92 and 4-93). A Proposed Plan was issued for public review in May 2005 (WESTON, 2005b). The

Phase IV Parcels ROD (WESTON, 2006b) and FOST (WESTON, 2006c) were signed in June 2006. Note that parcels 4-94, and 4-95 are discussed in the Phase IV documents; however, these parcels will now be retained by the Army, as discussed below. The ROD specified that no further remedial action is necessary for soil (SE OU 8) and groundwater (SE OU 3B) to protect human health and the environment. The Phase IV BRAC Property Transfer was completed in August 2010.

- Phase V — There are 16 BRAC waste sites in SE OU 8 that are included in the Phase V BRAC property transfer along with SE OU 7, the TOSA/WOS site. Remedial alternatives were evaluated for the Phase V BRAC Sites in an FS, which was finalized for the Phase V BRAC Parcels in August 2009 (WESTON, 2009a). A PRAP was completed for the Phase V BRAC Sites in May 2010 (WESTON, 2010d) and the ROD was completed and signed in June 2012 (WESTON, 2012b LKD.RT-364). The Selected Remedy for the Phase V BRAC Sites was LUCs to restrict the sites to C/I. The Phase V FOST is currently in progress. The 16 SE OU 8 BRAC waste sites will be included in the Phase V BRAC property transfer, which will take place following the completion of the FOST for the Phase V BRAC Sites.

The BRAC boundary was revised in 2007 as a result of an agreement between Letterkenny Industrial Development Authority (LIDA) and LEAD, as sanctioned by the deputy assistant Secretary of the Army, to allow the Depot to retain 225 acres of land adjoining the facility. As a result of the revised BRAC boundary, some of the sites that were administered under SE OU 8 are now administered under a new OU, SE OU 14, because they will be retained by the Army.

The No Action RODs remain in place for Phases III and IV; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of Phases III or IV in the remainder of this document.

There are two remaining phases of BRAC property transfer planned for LEAD: Phase VI and VII. Each BRAC property transfer phase will be completed after a group of areas is deemed suitable for transfer after the CERCLA process is completed for the sites, which includes an RI/RA, FS, or Decision Document (as appropriate), Proposed Plan, and ROD. In addition, a FOST will be prepared in accordance with the U.S. Army requirements. A ROD has not been completed for Phases VI or VII; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of Phases VI or VII in the remainder of this document.

The VIP was evaluated in accordance with the *Interim-Final EPA Vapor Intrusion Framework* (EPA, 2009b) at Buildings 37 and 47 in July 2008 and April 2009. An RI/RA was finalized for Buildings 37 and 47 in February 2011 and the results indicated that risks due to the VIP are currently acceptable based on the current and future intended use of the property (i.e., C/I, WESTON, 2011c). The RI/RA concluded that there are no unacceptable risks to workers in Buildings 37 or 47 based on current conditions and the current and future intended C/I use. Future potential risks associated with this exposure pathway are being addressed in a FFS for Buildings 37 and 47. The PRAP and ROD for Buildings 37 and 47 will be completed following finalization of the FFS. The parcels associated with Building 37 and 47 will become part of the CVBP following the Phase VII BRAC transfer.

1.2.10 SE OU 9—Landfill J

SE OU 9 consists of a landfill (Landfill J) located west of Building 320. Landfill J was discovered in 1995 while trenching for utilities. Based on historical information, Landfill J was used from 1947 through 1953 and received solid waste material from on-post operations. The waste was buried in a series of long shallow trenches as a means of disposal. The extent of the landfill was determined using geophysical techniques and trenching. A variety of waste materials is buried at Landfill J, including construction debris, trash, and discarded vehicle and equipment parts. Oily material was observed at a number of locations, and bright, yellow-colored material resembling paint pigment was observed at one location. The characteristics of the soils and groundwater were evaluated through several sampling efforts. A hot spot removal action was conducted in June 2001 and a final Removal Action Summary Report, which included the RI/RA data, was completed in December 2005 (Shaw, 2005c LKD.RT-261).

Additional characterization activities were conducted at SE OU 9 between 2008 and 2009 to further delineate the nature and extent of the groundwater impacts at the site and to evaluate the potential for vapor intrusion into Building 320 from the site groundwater. These investigations included:

- Evaluation of the VIP for Building 320 — The evaluation of the VIP at Building 320 consisted of installation and sampling of 5 sub-slab vapor sampling implants, which were placed both in enclosed offices and open areas throughout the building. Two rounds of sampling were completed in March and July 2008. Risk assessment results will be presented in the FS for SE OU 9, which is currently in progress.

- Installation and sampling of a groundwater monitoring well in the footprint of the 'hot spot' removal area within Landfill J — In February 2009, a new shale bedrock groundwater monitoring well (09-320-1) was installed in the footprint of the 'hotspot' removal area (WT4). The follow-up groundwater sample from this new well was non-detect for VOCs, indicating a lack of source material remaining in this area.

- Rehabilitation and sampling of downgradient monitoring well 94-320-1, located east of Building 320 — In March 2009, existing well 94-320-1 was rehabilitated to allow for sampling pump access. This well has historically been non-detect for VOCs, indicating a lack of groundwater impacts south and southeast of Building 320.

- Installation and sampling of 3 groundwater monitoring wells upgradient and downgradient of the primary area of groundwater impact (i.e., in the vicinity of wells 96-320-5 and 96-320-4) — In November 2009, two additional limestone bedrock monitoring wells (09-320-2 and 09-320-3) were installed. The follow-up groundwater samples collected from these 2 new wells in December 2009 showed low levels of TCE, 1,2-DCE and vinyl chloride (VC) were present. It was determined that residual, soluble VOCs may exist in subsurface soils/bedrock beneath Building 320. In May 2011, another monitoring well was installed (11-320-1) to further characterize groundwater just east of Building 320. This well contained both a shallow (150 ft) and a deep (300 ft) zone.

At least 2 rounds of additional groundwater sampling will be conducted at SE OU 9; the data will be included in an FS to evaluate remedial alternatives for SE OU 9, which is currently in progress.

A ROD has not been completed for SE OU 9; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 9 in the remainder of this document.

1.2.11 SE OU 10—SSIA VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)

SE OU 10 consists of contaminated groundwater south of Gate 6. SE OU 10 was created when SE OU 3 was divided at the groundwater/surface water divide near Gate 6. The sources of the groundwater contamination for SE OU 10 were the formerly broken and leaking IWWS lines (prior to 1996) in the vicinity of Building 37 (VOC-contaminants) and a release from a diesel tank fuel line, which was discovered in 1992 in the vicinity of Building 37. Extensive work has been completed in the Building 37 area to design technically sound and cost-effective techniques to mitigate the contaminated on-site groundwater. An extended pilot study for enhanced bioremediation techniques to treat the groundwater is currently underway at Building 37. The FFS Final Report was issued in September 2003 (WESTON, 2003g LKD.RT-237).

A final Proposed Plan was completed in February 2005 (WESTON, 2005c LKD.RT-264), and a ROD was completed in March 2006 (WESTON, 2006d LKD.RT-274). The selected remedy for SE OU 10 was Enhanced Biodegradation with Monitored Natural Attenuation (MNA) and LUCs (to prevent contact with contaminated groundwater until the time the groundwater is safe for use). A final Remedial Action Work Plan was completed in April 2007 (WESTON, 2007c LKD.RT-294). The final sodium lactate injection for the selected remedy was completed at SE OU 10 in June 2007. A long-term groundwater monitoring program has been implemented for SE OU 10 and the most recent sampling event was conducted in December 2011. Groundwater is currently monitored on an annual basis during low groundwater (i.e., worst case) conditions.

Additional characterization activities were conducted at SE OU 10 between 2008 and 2009 to evaluate the potential for vapor intrusion from the site groundwater into Buildings 37 and 47. The evaluation consisted of installation and sampling of 6 total sub-slab vapor sampling implants, which were placed both in enclosed offices and open areas throughout the buildings. Two rounds of sampling were completed in July 2008 and April 2009. Risk assessment results were presented in the RI/RA Report for Buildings 37 and 47 (WESTON, 2011c LKD.RT-353). The RI/RA concluded that there are no unacceptable risks to workers in Buildings 37 or 47 based on current conditions and the current and future intended C/I use. Future potential risks associated with this exposure pathway are being addressed in a FFS for Buildings 37 and 47. The PRAP and ROD for Buildings 37 and 47 will be completed following finalization of the FFS. The parcels associated with Building 37 and 47 will become part of the CVBP following the Phase VII BRAC transfer. SE OU 11—NSIA VOC-Contaminated Groundwater North of Gate 6

SE OU 11 is located in the ER,A (i.e., Army-retained) portion of LEAD and consists of the VOC-contaminated groundwater associated with the IWTP lagoons and IWWS gravity lines.

Prior to the installation of the IWWS lines in 1965 in the SE Area at LEAD, chlorinated solvents were disposed in unlined lagoons. In addition to the contamination caused by this method of disposal, VOCs were released to soil from past leaks in the IWWS lines after 1965. The groundwater discharges off-post (see SE OU 6). A pilot study was initiated in September 2001 to evaluate the feasibility of treating dense, non-aqueous phase liquid (DNAPL) sources and reducing off-site contaminant migration concentrations at the property line. This study was completed in January 2003. Additional investigations to verify the vertical extent of groundwater contamination, as requested by EPA, were conducted from 2005 to 2006. The results of the additional investigations were presented in the final FFS for SE OUs 3A, 11, and 6 (WESTON, 2010a).

A vapor intrusion pilot study was conducted from July 2004 to January 2006, and a draft report was submitted to EPA and PADEP in May 2006 (WESTON, 2006a). In order to address residual groundwater contamination associated with SE OUs 6 and 11 at LEAD, a final Work Plan for the Evaluation of the VIP at SE OUs 6 and 11 was submitted in June 2007 (WESTON, 2007a). Vapor intrusion sampling was conducted in winter 2007 and in spring/early summer 2008 on-post at SE OU 11 and off-post (SE OU 6) in the Rowe Run Valley. The results were presented in the final FFS for SE OUs 3A, 11, and 6 (WESTON, 2010a).

The PRAP for SE OUs 3A, 11, and 6 is in progress and recommends an ARS under a front-end TI Waiver of ISCO to destroy the contaminant mass at the source areas in SE OUs 3A and 11 (see also Subsection 1.2.3), thereby reducing the concentrations of VOCs in the dissolved-phase plume in SE OUs 3A, 11, and 6, with LUCs and long-term groundwater monitoring as a component of the CERCLA five-year review process. The PRAP also recommends LUCs and long-term monitoring as a component of the CERCLA five-year review process to address the VIP at current and future buildings in the SE OU 11 area.

A ROD has not been completed for SE OU 11; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 11 in the remainder of this document.

1.2.12 SE OU 12—Landfill G

The LEAD Installation Assessment (IA) identified this area as active from 1964 through 1978, when it was leveled to match the existing terrain. The area was used to dispose of residue from nearby trash revetments and IWTP sludge. Visibly contaminated leachate (metals) was reported to emanate from this site into a nearby drainage ditch. A 1991 SI identified several magnetic anomalies, which were cross trenched in 1993. All of the anomalies were related to buried metallic objects. This area contained empty buried drums that formerly contained caustics. Sampling indicated that these buried drums had caused no environmental problems. Another anomaly showed a large number of solvent containers, which were drummed and disposed of in this area. The 1995 SI follow-on identified this site as requiring an RI. A Work Plan for the RI was finalized in June 2006 (Shaw, 2006b LKD.RT-277).

The RI field work was conducted from July 2006 to August 2008 and included test trenching and sampling of soil, groundwater, and surface water. The test trenching conducted during the first

round of the RI showed that primarily municipal-type waste is present in the landfill. The analytical results for the RI indicated that additional test trenching, soil sampling, and analysis needed to be conducted to further assess elevated levels of PCBs. The additional site investigation work was conducted in July 2007. Containers of black tar-like substance, thought to be discarded adhesive material, were encountered during the second round of the RI. The material had a petroleum-like odor. The size of the area where the containers were found is approximately 10 ft by 15 ft and 6 ft deep. The containers were encountered at about 4 ft below ground surface and the depth of the affected area did not extend beyond 6 ft deep. The preliminary analytical results showed that contaminants of potential concern included benzene, lead, zinc, and 2-methylphenol. A removal action, performed in January 2008, consisted of the removal of containers and associated waste along with affected soils. The *Landfill G, Remedial Investigation Field Report* was completed by Shaw Environmental, Inc. and was finalized in March 2008 (Shaw, 2008 LKD.RT-310).

The *Feasibility Study (FS) Report for the TNT Washout Plant (AEDB-R Site LEAD-050), Drainageways Downstream from Open Burning Ground No. 2 (AEDB-R Site LEAD-053), and the Landfill 5 Area G Security Landfill (Landfill G), Southeastern Area Operable Unit 12 (AEDB-R Site LEAD-039)* was completed to address the contaminated media present at Landfill G (WESTON, 2011f LKD.RT-359). The FS also includes the TNT Washout Plant (TNTWO) and Drainageways Downstream of Open Burning Ground No. 2 (DDOB2), which are both located in the Ammunition Area (AA) at LEAD. The recommended alternative for these three Sites is LUCs with Engineering Controls (ECs) at Landfill G (WESTON, 2011f).

Currently the land use for the TNTWO, DDOB2, and Landfill G sites is industrial and the LEAD Master Plan was updated in January 2009 to ensure that land use restrictions limit the use of LEAD properties to industrial use, thus preventing exposure to contaminated media under less restrictive uses (e.g., residential/daycare). All three sites will be retained by the Army and the Army has no plans to develop these sites. The LUCs alternative would be implemented to ensure that the future use of these sites is restricted to C/I and that intrusive activities at Landfill G are conducted in accordance with ARARs related to residual waste. ECs would be implemented at Landfill G to ensure that the landfill cover is of adequate thickness and is maintained in compliance with the appropriate ARARs.

A ROD has not been completed for SE OU 12; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 12 in the remainder of this document.

1.2.13 SE OU 13—Southern Martinsburg Shale Region Groundwater

SE OU 13 encompasses BRAC property. The SMSR is a region at LEAD that contains an area of shale bedrock surrounded by downgradient limestone bedrock. This shale bedrock is generally more resistant to weathering than the surrounding limestone formations and therefore forms the “highland” or elevated ridge areas in the area of the Phase III parcels. Several groundwater/surface water divides along this ridge in the SMSR cause groundwater to flow radially away from the SMSR.

The SMSR was originally included as part of SE OU 10 and SE OU 11. Based on its geologic and topographic setting and past industrial use of the area, however, it was thought that there were likely no sources of groundwater contamination in the SMSR, and the area would likely be unaffected by known and potential VOC sources located downgradient of the SMSR because groundwater flows from the SMSR into the lower lying valley areas underlain by limestone. To facilitate property transfer, a groundwater investigation was initiated in 1999 to establish that the SMSR was not impacted by any previous industrial activities at LEAD. The results of four rounds of groundwater sampling, conducted in late 1999 through 2000 and in 2002, showed no VOC groundwater contamination in the SMSR. Based on this finding, the SMSR was redefined as SE OU 13 and was included in the No Further Action ROD for the Phase III Parcels in August 2003 (WESTON, 2003e). SE OU 13 was part of the Phase III BRAC property transfer completed in January 2004.

The No Action ROD remains in place for the Phase III Parcels, which includes SE OU 13; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 13 in the remainder of this document.

1.2.14 SE OU 14—Former Test Track Area

SE OU 14 was created in 2007 to track sites on Army-retained land that were formerly administered under the BRAC program and are now in the IRP program as a result of the revised BRAC boundary. SE OU 14 consists of the Former Test Track in the Disposal Area and Areas E and F (AEDB-R Sites LEAD-114, 033, and 049), and the Building 349 Soil Staging Area (AEDBR Site LEAD-114).

The location of Areas E and F was initially thought to be adjacent to the Former Test Track in an open area north of the groundwater treatment plant (GWTP) at LEAD and west of East Patrol Road. However, during a TCRA completed during May and June 1997 for SE OU 2, strong evidence of Areas E and F was found in an area west of the GWTP (Building 365), as reported in Appendix Q of the RI report for SE OU 2 (Fluor Daniel and ESE, 1998 LKD.RT-220). Since this excavation, it has been the Army's position that the location of Areas E and F is not, in fact, adjacent to the Former Test Track. The background information pertaining to the historical use of Areas E and F is as follows: Area E was identified in previous investigations as a former oil burn pit. In the 1970s, activities at this location included disposal of waste oil, lubricants, and cleaning and stripping solvents. Area F was identified in previous investigations as a localized area where sludge from the LEAD IWTP was disposed. Sludge from the IWTP was removed in 1976 and buried or spread near East Patrol Road. The RI/RA for the Former Test Track and Areas E and F was finalized in 2004 (WESTON, 2004a LKD.RT-251); this RI/RA showed that risks are within acceptable levels for C/I use. An FS is currently being prepared for the Former Test Track.

A ROD has not been completed for SE OU 14; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of SE OU 14 in the remainder of this document.

1.3 DESCRIPTION AND BACKGROUND OF LEAD PDO AREA OUs

The locations of the OUs in the PDO Area are shown in **Figures 3** and **4**. At the time the last PDO five-year review was completed in 2007, there were seven PDO OUs as follows:

- PDO OU 1—Source Area Soils
- PDO OU 2—PDO Area Groundwater and Surface Water
- PDO OU 3—Mercury Detections in Rocky Spring Lake
- PDO OU 4—Soil, Sediment and Groundwater Associated with the Oil Burn Pit
- PDO OU 5—Rocky Spring Drainage System Area
- PDO OU 6—BRAC Waste Sites
- PDO OU 7—Southern Martinsburg Shale Region (SMSR)
- PDO OU 8—Waste Sites Retained by Army

Based on the results of RI/RAs conducted since the last five-year review, changing land use plans, and to support the OU restructuring, the boundary between PDO OU 2 (the Lower PDO Area) and PDO OU 4 (the Upper PDO Area) has been established at Vehicle Road (see **Figure 4** and further discussions in Subsections 1.3.2 and 1.3.4).

In addition, LEAD created a new OU in 2011 to administratively distinguish between former BRAC waste sites that will now be retained by the Army (PDO OU 8) and BRAC waste sites that will still be transferred for public reuse (PDO OU 6). The locations of the PDO BRAC waste sites are presented in **Figure 5**.

Finally, the TNTWO and the DDOB2 in the AA at LEAD have been incorporated into this five-year review and included in subsections that discuss the PDO Area. The locations of the 2 AA sites are shown in **Figure 7**.

The AEDB-R sites and corresponding ID numbers for the PDO Area OUs are presented in **Attachment 1**.

1.3.1 PDO OU 1—Source Area Soils (DRMO)

Two locations were identified as sources of soil contamination within PDO OU 1: The DRMO Drum Storage Revetments (DSR) and the Oil Burn Pit (OBP). As discussed above, the OBP is now addressed under PDO OU 4. Aerial photographs indicate that the DRMO Scrapyard became active between 1949 and 1957 (WESTON, 1999 LKD.RT-158). The DRMO used the DSR for storing drummed wastes until the early 1980s.

An Initial IA of LEAD was performed in 1978, and the discovery phase was initiated in January 1979. The assessment documented the two DRMO revetments that were used for the storage of drums containing oil and other organic substances. The revetments were designed with special valves that could be closed in the event of a spill. The assessment noted that the soil in the revetments was oil soaked.

An RI conducted in the 1980s concluded that the OBP and the DRMO DSR were the major sources of the VOC groundwater contamination, but the soils were no longer an active source of contamination (ESE, 1987 LKD.RT-015). Based on the findings of the RI a No Action ROD for the OBP and the DRMO DSR was signed in 1991. The ROD stated that the OBP and the DRMO DSR were the major sources that caused the VOC groundwater contamination in the PDO Area. The ROD also stated that the VOCs had migrated from the soils into the underlying bedrock. Therefore no soil remediation was necessary at the OBP and the DRMO DSR.

The final No Action ROD still applies to the DRMO DSR; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 1 – DRMO Source Area Soils in the remainder of this document. Contaminated groundwater in the DRMO DSR area is addressed under PDO OU 2, as discussed in Section 1.3.2. The OBP is addressed under PDO OU 4, as discussed in Section 1.3.4.

1.3.2 PDO OU 2—PDO Area Groundwater and Surface Water

PDO OU 2 consists of VOC-contaminated groundwater (on- and off-post) and surface water in the Lower PDO Area (i.e., south of Vehicle Road). The PDO groundwater becomes surface water at Rocky Spring. The primary sources of the VOC-contaminated groundwater are past releases of chlorinated solvents from the DRMO DSR and halogenated VOCs from the Pad 5 Landfill.

Groundwater sampling has been conducted in the PDO Area (on- and off-post) from 1998 to 2009. Results from the sampling were used to evaluate risk to human health and identify contaminants of concern (COCs) to provide the basis to develop the conceptual site model for the PDO OU 2 and PDO OU 4 Areas. Following is a list of reports associated with the findings:

- RI and Baseline Human Health Risk Assessment (BHHRA) Report for the Pad 5 Landfill Site, PDO OU 6, (WESTON, 2010b LKD.RT-338).
- RI/RA Report for Upper PDO Area Drainageways and Plunge Pool Site, OU 5, (WESTON, 2010c LKD.RT-334).
- RI/RA Report for the Chambersburg Area School District (CASD) Parcel, PDO OU 5 and OU 6 (WESTON, 2010f LKD.RT-340).
- RI/RA Report for the PDO OBP, OU 4, (WESTON, 2010e LKD.RT-342).
- Groundwater and Surface Water Monitoring Report for the PDO Area (Shaw, 2009).

Results of continued groundwater monitoring in PDO OU 4 initially indicated that some contamination from the OBP was migrating into PDO OU 2. Further characterization indicated that VOC concentrations in groundwater associated with the OBP (topographically the most upgradient point within the PDO Area) rapidly dilute upon crossing from shale to karst limestone at the Pinola Fault. VOC concentrations are below maximum contaminant levels (MCLs) by the time the groundwater reaches Vehicle Road (entering into PDO OU 2 Area), supporting the findings that VOC contamination in groundwater associated with the OBP does not contribute to

the VOC contamination in PDO OU 2 groundwater. As a result, the RI/RA conducted for the OBP (WESTON, 2010e) concluded that VOC-contaminated groundwater associated with the OBP would be tracked under OU 4 (Upper PDO Area) and would include the Upper PDO Area (i.e., north of Vehicle Road), which includes the drainage divide, while VOC-impacted groundwater associated with the DRMO and Pad 5 Landfill, would be tracked under OU 2 and would include the Lower PDO Area (i.e., south of Vehicle Road).

Concurrently, an RI/RA was conducted for the CASD Parcel (WESTON, 2010f) which analyzed the results of groundwater monitoring in PDO OU 2 and concluded that TCE concentrations in PDO OU 2 groundwater exceed the MCL of 5 micrograms per liter (µg/L). The CASD RI/RA and the Remedial Investigation/Baseline Human Health Risk Assessment (RI/BHHRA) for Pad 5 Landfill confirmed the presence of VOCs in the soils and groundwater associated with Pad 5 Landfill. The VOCs in the soils at Pad 5 Landfill are discussed with the PDO OU 6 sites in Subsection 1.3.6. Based on the presence of TCE at concentrations exceeding the MCL in Lower PDO Area groundwater, remedial alternatives were evaluated for PDO OU 2 groundwater in the final *Feasibility Study (FS) For The Lower Property Disposal Office (PDO) Area, Operable Unit (OU) 2 (AEDB-R Sites LEAD-024, -029, -069, -077, -097), OU 5 (AEDB-R Sites LEAD-098, -106, -107), And OU 6 (AEDB-R Sites LEAD-026, -037, -066, -093, -111, -113, -117, -129)* (WESTON, 2011b LKD.RT-356). MNA with LUCs was identified as the preferred remedial alternative for groundwater.

Because of the presence of VOCs in soils at the Pad 5 Landfill and in groundwater in the Lower PDO Area, the VIP was evaluated as part of the RI/RAs to evaluate potential risk. The area identified as presenting a potential unacceptable risk to human health was based on a TCE plume where concentrations exceed the MCL (5 µg/L) and all areas within a 100-ft buffer zone of the plume. With the exception of one building located on the edge of the TCE plume (Building 645), the VIP is considered incomplete in the Lower PDO Area because there are no buildings located within 100 ft of the TCE plume. Results of sub-slab sampling at Building 645 indicate that current risks to human health associated with the VIP at Building 645 are acceptable. A future potential risk exists in the Lower PDO Area as long as TCE concentrations within the 100-ft buffer exceed the MCL; therefore, LUCs were identified as the preferred remedial alternative for VIP in the Final FS for the Lower PDO Area (WESTON, 2011b).

The Army expects to complete the PRAP and ROD documents for PDO OU 2 during the next five-year review period. Long-term groundwater monitoring in the PDO Area is ongoing to support MNA. Because a ROD has not been completed for PDO OU 2, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 2 in the remainder of this document.

1.3.3 PDO OU 3—Mercury Detections in Rocky Spring Lake

PDO OU 3 addressed the sporadic detections of mercury in the Rocky Spring Lake. Suspected sources for the mercury were the deactivation furnace and the storage area behind Building 1467. During two sampling events in 1991, mercury was detected in the lake. However, follow-on studies in 1992-94 did not detect mercury above regional background in the lake.

The RI for PDO OU 3 was finalized in August 1996. The RI concluded that the 1991 mercury detections were due to drought conditions, causing enhanced bioaccumulation of mercury and subsequent release during algal die-off. This caused a short-term release of mercury into the lake.

A No Further Action Decision Document was finalized in February 2000 and that decision is still applicable; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 3 in the remainder of this document.

1.3.4 PDO OU 4—Soil, Sediment, and Groundwater Associated with the Oil Burn Pit

PDO OU 4 consists of the VOC-contaminated groundwater, sediments, and soils associated with the OBP. The OBP was a bare soil pit used for fire training exercises in the 1970s and 1980s. Oils and chlorinated solvents were dumped into the OBP and then set on fire as part of fire training exercises by the Letterkenny Fire Department. The IA documented that waste oil and organic compounds from the Building 350 chemical laboratory were taken to the OBP for disposal.

The OBP and associated soils were initially determined not to be a continuing source of groundwater contamination; therefore, a No Action ROD for PDO OU 1 was signed in 1991, which included the OBP. A subsequent investigation to further define the area of impacted groundwater in the area of the OBP was initiated in 1994. Results of the groundwater investigation pointed to the OBP as the source of groundwater contamination, with 1,1,1-TCA as the primary contaminant discovered in the groundwater.

In 1995 LEAD was backfilling the OBP when black sludge-like material was noted oozing from beneath the fill material. The sludge was sampled and discovered to contain high levels of VOCs. Later that year, 3 soil borings were completed within the OBP. The results showed the soil to be contaminated with 1,1,1–TCA, 1,4-dioxane, 1,1-dichloroethane, tetrachloroethene (PCE), TCE, and benzene, toluene, ethylbenzene, xylene (BTEX) along with other VOCs. These results showed that the OBP was still an active source of groundwater contamination.

As a result of the discovered soil contamination, LEAD created a new OU (PDO OU 4) to administratively manage the soil, sediment, and groundwater contamination associated with the OBP. An interim soil removal was initiated in 1997. The interim removal consisted of ISCO treatment of the soils. A second phase of in-situ treatment was in completed in 1998 and 1999.

Additional monitoring wells were installed in 1999 to determine whether groundwater contamination was migrating south from the OBP or east over the groundwater divide and into the SE Area. The results of that effort indicated that VOC contamination was present in monitoring wells immediately south of the OBP; however, contaminants were not detected in monitoring wells east of the groundwater divide in the SE Area.

Groundwater and soil gas investigations were conducted between 2002 and 2006 to delineate the extent of the plume south of the OBP. In addition, groundwater sampling and dye studies conducted between 2006 and 2007 determined that the contaminant plume becomes diluted in

the karst limestone groundwater a short distance downgradient of the Pinola Fault (where the shale and limestone meet).

An FS for the Upper PDO Area is being prepared based on the results of the RI/RAs for the Upper PDO Area. The Draft-Final FS recommends an ARS under a front-end TI Waiver of electrical resistance heating (ERH) to destroy the contaminant mass at the OBP, thereby reducing the dissolved-phase plume, with LUCs and groundwater monitoring as a component of the CERCLA five-year review process.

The Army expects to complete the FS, PRAP, and ROD documents for PDO OU 4 during the next five-year review period. Because a ROD has not been completed for PDO OU 4, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 4 in the remainder of this document.

1.3.5 PDO OU 5—Rocky Spring Drainage System Area

PDO OU 5 includes the sediments and surface water in the Rocky Spring Drainage Area; contaminants include PCBs and pesticides. In 1995 it was discovered that the sediments contained elevated levels of PCBs during a maintenance removal of sediments from the Rocky Spring Springhouse. Based on these findings, sediment traps were installed in the Springhouse to assess the sediments that continued to accumulate at Rocky Spring and subsequently discharge to Rocky Spring Lake. The results of the sediment trap sampling showed that PCB-containing sediments were continuing to discharge from Rocky Spring and flow into Rocky Spring Lake. Following this discovery, Rocky Spring Lake sediments and whole-body and fillet samples of fish were collected from the lake and co-located fish nursery and analyzed for PCBs. The results from the edible portion and whole body fish sampling indicated possible risk to human health from ingestion. The LEAD Commander issued a fishing ban at Rocky Spring Lake in 1995.

Based on the PCB sediment results, the Army conducted investigations in 1995 and 1997 to determine the source of PCB contamination. It was discovered that the DRMO Scrapyard, located within the upper PDO Drainage System upstream of Rocky Spring, had an active capacitor crushing operation ongoing at several concrete pads, which had historically been used for storage and handling of PCB-containing materials. An RI/RA was initiated in 1998 to determine whether additional significant sources of PCBs existed within the Rocky Spring System, to define the extent of contamination, and to define the migration pathway(s) and mechanisms of transport of PCBs through the system. The RI confirmed that the DRMO Scrapyard was the source of PCBs discharging from Rocky Spring as well as downgradient sediments associated with past releases from the DRMO.

Based on the results of the RI, the Army performed a TCRA to remove the source of the PCBs to the Rocky Spring System. The TCRA was completed in summer 1999. A total of 10,661 tons of concrete and soil were excavated from the DRMO Scrapyard.

Following the TCRA, additional soil samples were collected within the stormwater drainageway that drains the DRMO Scrapyard. The results revealed elevated levels of PCBs within an area referred to as the “plunge pool.” The plunge pool area receives the majority of the surface water

runoff from the DRMO Scrapyard and directs the flow to the Upper Rocky Spring Branch. Based on the sampling results, the Army performed a removal action at the plunge pool in fall 2002. A total of 42 tons of PCB-contaminated sediment were excavated from the plunge pool and disposed off-site in September 2002.

Results of the RI/RA for PDO OU 5 have determined that while PCB-contaminated sediments remain in the Rocky Spring Drainage System (such as in underground voids in the bedrock and some low levels in drainage ditches), the major sources have been removed as described above and no additional sources remain that will provide for significant migration or present an unacceptable risk, other than those low levels present in the lake sediments (WESTON, 2009b LKD.RT-323). Consequently, PCB concentrations are expected to decline in the lake over time as new, less contaminated sediments are deposited on top of existing sediments. In addition, based on groundwater and surface water monitoring done as part of the Remedial investigation, and as documented in the *Final Feasibility Study Report for the Lower PDO Area*, PCBs have not been detected in groundwater or surface water and it is unlikely that PCBs attached to the sediments will dissolve into groundwater (WESTON, 2011b). The Final FS for the Lower PDO Area establishes Monitored Natural Recovery (MNR) with LUCs as the recommended alternative to address PCB contamination in drainage sediment/soil and surface water in the Rocky Spring Drainage System (WESTON, 2011b). Groundwater for this area of LEAD is addressed under PDO OU 2, which is discussed in Subsection 1.3.2.

The Army expects to complete the FS, PRAP, and ROD documents for PDO OU 5 during the next five-year review period. Because a ROD has not been completed for PDO OU 5, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 5 in the remainder of this document.

1.3.6 PDO OU 6—BRAC Waste Sites

The PDO OU 6 area is composed of potential waste sites identified in the to-be-excessed/BRAC portion of the PDO Area. PDO OU 6 is being investigated under the BRAC investigation program. The locations of the PDO OU 6 BRAC sites are shown in **Figure 5**. Administratively, nine AEDB-R sites are addressed under PDO OU 6; these sites are listed in the table below.

PDO OU 6 Sites		
AEDB-R Site ID	**BRAC Phase**	**Site Name**
Upper PDO Area		
LEAD-110	I VII	Parcel 29* Vehicle/Equipment Storage Area West of the Test Track
Lower PDO Area		
LEAD-037	VI	Pad 5 Landfill
LEAD-113	VI	Buildings 651 and 652
LEAD-117	VI	Vehicle Wash Area and Roof Tar Storage Area Road Maintenance Area Aboveground Storage Tank

PDO OU 6 Sites		
AEDB-R Site ID	**BRAC Phase**	**Site Name**
		Building 683
LEAD-129	VI	Storage Areas 675, 676, and 696
LEAD-111	VI	Fagan's Quarry
LEAD-093	VI	Former PDO Scrapyard Quarters 2323
LEAD-066	VI	Buried Drum Site Two
LEAD-026	VI	Former (2325) and New (2329) Pesticide Buildings

*Soil LUCs for this site were lifted by the Phase I and II ESD (WESTON, 2012a).

RI/RAs were conducted for the sites in PDO OU 6 between 1998 and 2010. The final RI/RAs are listed in **Table 2** in Section 2 and are available for review in the LEAD Administrative Record.

The Phases of BRAC property transfer at LEAD are shown in **Figure 6**. The following is a summary of the status of property transfers within the PDO OU 6 area:

- Phase I — The following areas comprise the PDO portions of Phase I: Parcels 28, 29, 33, and 34. The only Phase I Parcel investigated under CERCLA in the PDO Area was Parcel 29. The Phase I ROD was signed in September 1998. A FOST was signed in October 1998. The Phase I transfer was completed in November 1998. The ROD for Phase I documented selection of LUCs for all of the Phase I Parcels to prevent contact with contaminated groundwater and for administrative purposes to ensure that the land use remains C/I (WESTON, 1998a). Soil LUCs for all the Phase I Parcels in the PDO Area were lifted by the Phase I and II ESD (WESTON, 2012a). Parcels 29, 33, and 34 currently have groundwater use restrictions.

- Phase II — The Phase II Parcels ROD was signed in July 2001. The Phase II FOST was signed in February 2002. The Phase II transfer was completed in May 2002. The following areas comprise the PDO portions of Phase II: Parcels 2-71, 2-72, 2-74A, 2-74B, and 2-76. There were no BRAC waste sites in the PDO portion of the Phase II BRAC property transfer. However, for administrative purposes soil LUCs were placed on all of the Phase II Parcels in both the SE and PDO Areas in the Phase II FOST to restrict these areas to C/I and agricultural use (WESTON, 2002c). In addition, Parcels 2-71, 2-72, and 2-76 currently have groundwater use restrictions.

- Phase III — The Phase III Parcels ROD was signed in August 2003. The Phase III FOST was signed in September 2003. The Phase III transfer was completed in January 2004. The following areas comprise the PDO portions of Phase III: Parcels 3-89 and 3-90. There was one BRAC waste site in the PDO portion of the Phase III BRAC property transfer: the Open Vehicle Storage Area (OVSA) site, a portion of which is also in SE OU 8.

From a leasing standpoint, a FOSL was signed that covered the remainder of the BRAC buildings in the PDO area (Phase II FOSL, February 2000). The 2002 FOSL was signed on March 24, 2003 after the review process extended the approval into calendar year 2003.

An FS has been finalized for the Lower PDO Area, which includes portions of the Phase VI BRAC property transfer (WESTON, 2011b). The recommended alternative for sites in the Lower PDO Area (see table above for list of sites) is LUCs with engineering controls (ECs) at the Pad 5 Landfill and Fagan's Quarry, and no further action for the remaining PDO OU 6 sites. The Army tentatively plans to transfer the remaining PDO OU 6 sites under the remaining Phase VI and VII BRAC property transfers.

1.3.7 PDO OU 7—Southern Martinsburg Shale Region (SMSR)

The SMSR is a region at LEAD that contains an area of shale bedrock surrounded by downgradient limestone bedrock. This shale bedrock is generally more resistant to weathering than the surrounding limestone formations, which form the "highland" or elevated ridge areas in the area of the Phase III parcels.

The SMSR was originally considered to be part of VOC-contaminated groundwater in the SE Area of LEAD (see Subsection 1.2.14). Based on its geologic and topographic setting and past industrial use of the area, it was thought that there were no sources of groundwater contamination in the SMSR, and that the area would likely be unaffected by the known and potential VOC sources located downgradient from the SMSR because groundwater flows from the SMSR into the lower lying valley areas underlain by limestone. To facilitate property transfer, a groundwater investigation was initiated in 1999 to establish that the SMSR was not impacted by any previous industrial activities at LEAD. The results of four rounds of groundwater sampling, conducted from late 1999 through 2000 and in 2002, showed no VOC groundwater contamination in the SMSR. Based on this finding, this portion of the SMSR was redefined as PDO OU 7 and was included in the No Further Action ROD for the Phase III Parcels in August 2003 (WESTON, 2003e). PDO OU 7 was part of the Phase III BRAC property transfer completed in January 2004.

The No Further Action ROD remains in place for the Phase III Parcels, which includes PDO OU 7; therefore, a five-year review is not required in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 7 in the remainder of this document.

1.3.8 PDO OU 8 – Upper PDO Waste Sites

The PDO OU 8 area is composed of waste sites previously identified as BRAC Waste Sites in the to-be-excessed portion of the PDO Area; however, these sites will now be retained for Army use only. PDO OU 8 sites were investigated under the BRAC investigation program. Administratively, 5 sites are addressed under PDO OU 8:

PDO OU 8 Sites	
AEDB-R Site ID	**Site Name**
Upper PDO Area	
LEAD-040	Open Landfill Adjacent to Transfer/Burning Revetments (Open Trench Landfill)
LEAD-044	Revetted Area North of Oil Burn Pit
LEAD-048	Transfer/Burning Revetments Wood Pile Storage Area Paint Can Shredding Area
LEAD-110	Former Vehicle Storage Area North of the Test Track
LEAD-112	Ammo Drum Storage Pad Areas (including the Ammo Drum Storage Pad Former Building Foundations near Ammo Are Drum Storage Pad, and Storage Area Southeast of Ammo Area Parking Lot)

RI/RAs were conducted for the sites in PDO OU 8 between 1998 and 2010. The final RI/RAs are listed on **Table 2** in Section 2 and are available for review in the LEAD Administrative Record. The locations of the PDO OU 8 sites are shown in **Figure 3**. PDO OU 8 sites are included in the FS for the Upper PDO Area. The recommended alternative for the PDO OU 8 sites is LUCs with ECs at Open Trench Landfill. The Army expects to complete the FS, PRAP, and ROD documents for PDO OU 8 during the next five-year review period. Because a ROD has not been completed for PDO OU 8, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of PDO OU 8 in the remainder of this document. Groundwater underlying PDO OU 8 is addressed under PDO OU 4, which is discussed in Subsection 1.3.4.

1.3.9 Ammunition Area—TNT Washout Plant and Drainageways Downstream of Open Burning Ground No. 2

Two sites in the Ammunition Area (AA) are being included in this introduction section of the five-year review along with the PDO and SE Areas because the sites were identified as Solid Waste Management Units (SWMUs) regulated under RCRA and are subject to the requirements in the 1989 Federal Facilities Agreement (FFA). However, a ROD has not been completed for the TNTWO or DDOB2; therefore, a five-year review is not required at this time in accordance with CERCLA. Consequently, there will be no further evaluation of these AA sites in the remainder of this document.

On 3 February 1989, the FFA was reached for LEAD under CERCLA Section 120 among the U.S. Army, EPA, and PADEP (EPA, Army, PADEP, 1989c LKD.RT-026). The 1989 FFA established the framework for the CERCLA response actions at LEAD. The two sites in the AA at LEAD addressed in this five-year review are:

Ammunition Area Sites	
AEDB-R Site ID	**Site Name**
LEAD-050	TNT Washout Plant (TNTWO)
LEAD-053	Drainageways Downstream of Open Burning Ground No. 2 (DDOB2)

The TNTWO site is located in the southeast portion of the AA at LEAD along the northwest border of the PDO area (see **Figure 7**). This site was used beginning in 1948 to wash TNT projectiles and reclaim the TNT. The original plant, located at the site from 1948 to 1962, consisted of a closed system that filtered the process water through sawdust and wood shavings. The filtered rinse water was then stored on-site for reuse. Although the plant was considered a closed system, some filtered wastewater was released to a nearby intermittent stream via overflow valves on the storage tank.

The current TNT facility operated from 1969 to 1975 and also used a closed system that filtered rinse water through sawdust, fiberglass, and activated charcoal. Operations ceased at the TNTWO site in 1975.

It is likely that the TNTWO will be demolished after the equipment has been removed. As documented in the Master Plan (R&K, 2009), the Army intends to retain the land for future C/I use.

The active OB2 site and the associated DDOB2 site are located in the AA, adjacent to Demolition Ground No. 2 (see **Figure 7**). The active OB2 site is approximately 3.3 acres and consists of mainly graveled land that slopes gently to the northwest. Burn pans and rocket motor static firing tubes are located at the OB2 site. Thermal Battery Activation is also conducted at the OB2 site. The site reportedly became operational in 1945.

Since approximately 1985, the southern portion of the site, the pan area, has been used to burn propellant in pans. Residue in the pans is drummed, characterized, and properly disposed. The northern portion of the site, the rail area, has not been used to burn projectiles for 10 or more years.

The DDOB2 site is approximately 5.7 acres in size and lies immediately downstream from the active OB2 site. Surface soil and groundwater samples were collected at the active OB2 site to support the development of the *RCRA Part B Permit Application for Open Burning/Open Detonation Areas at Letterkenny Army* (Application) (WESTON, 2006e). Because of the presence of explosives in surface water samples collected at DDOB2, the site is currently protected from runoff from OB2 by erosion and sedimentation (E&S) controls installed in June 2008 as required by subsection D-8(i)(2) of the RCRA Part B Permit Application (WESTON, 2006e).

The DDOB2 site is not currently used by the Army for purposes other than a drainage area, although burning activities continue at the OB2, and as documented in the Master Plan (R&K, 2009), the Army intends to retain the DDOB2 land for future C/I use.

RI/RAs were completed for the TNTWO and DDOB2 sites in October and December 2010, respectively (WESTON, 2010g LKD.RT-346; WESTON 2010h LKD.RT-348). An FS is

currently being prepared to address contamination associated with drainage soils/sediments and surface water at DDOB2, and surface and subsurface soils, sediment, surface water, and groundwater at TNTWO. The FS also includes SE OU 12 (Landfill G), which is discussed in Section 1.2.13.

2. SITE CHRONOLOGY

Tables 1 and 2 list the chronology of events for the SE Area and PDO Area NPL sites, respectively.

Table 1
Chronology of Site Events for the SE Area NPL Site

Event	Date	Document Reference*
Initial Discovery	1978	N/A
Pre-NPL Responses	1984 (LEAD RI/FS Completed)	WESTON, 1984 - LKD.RT-006
NPL Listing	22 July 1987	N/A
Federal Interagency Agreement	3 February 1989	Army, EPA, PADEP - LKD.RT-026
RI/FSs Complete	June 1993 (SE OU 1 RI, and SE OU 3 RI, AEDB-R Sites LEAD-052, -081, -094)	ESE, 1993a – LKD.RT-086
	November 1993 (SE OU 1 FS and SE OU 3 RI, FS, AEDB-R Sites LEAD-052, -081, -094)	ESE, 1993b – LKD.RT-095
	July 1994 (SE OU 1 RA and SE OU 3 RI, FS, AEDB-R Sites LEAD-052, -081, -094)	ESE, 1994 – LKD.RT-096
	September 1998 (SE OU 2 RI, AEDB-R Sites LEAD-074, -083)	Fluor Daniel and ESE – LKD.RT-220
	October 2000 (Phase II BRAC, portions of SE OU 8, former PCB Sites, AEDB-R Site LEAD-125)	WESTON, 2000a – LKD.RT-175
	June 2002 (SE OU 2 RA, AEDB-R Site LEAD-074)	IT, 2002 – LKD.RT-246
	2003 (Phase III BRAC, which consists of SE OU 13 and portions of SE OU 8, AEDB-R Sites LEAD-110, -114)	WESTON, 2003d – LKD.RT-232
	September 2003 (SE OU 4, Removal Action Completion Report, RI/RA, AEDB-R Site LEAD-072)	Shaw, 2003 – LKD.RT-241
	November 2004 (SE OU 2 FS, AEDB-R Sites LEAD-074, -083)	IT, 2004 – LKD.RT-258
	November 2004 (SE OU 6 RI, AEDB-R Sites LEAD-068, 071, -078, -084, -086, -087, -088, -096, -104)	Shaw, 2004d – LKD.RT-296
	May 2005 (Phase IV BRAC, SE OU 3B SI and SE OU 8 FVSA, AEDB-R Sites LEAD-016, -110, -114, -115) (latest dates shown)	WESTON, 2005j – LKD.RT-265/WESTON, 2002d – LKD.RT-269
	May 2005 (SE OU 10 FFS, AEDB-R Sites LEAD-090, -091, -095, -100, -101, -128)	WESTON, 2005k – LKD.RT-266a
	July 2006 (SE OU 6 RA, AEDB-R Sites LEAD-068, 071, -078, -084, -086, -087, -088, -096, -104)	Shaw, 2006c – LKD.RT-298

Table 1
Chronology of Site Events for the SE Area NPL Site (Continued)

Event	Date	Document Reference*
RI/FSs Complete (Continued)	2003 (SE OU 8, Building 437 UST, AEDB-R Site LEAD-126)	WESTON, 2003c – LKD.RT-229
	2004 (SE OU 8, Former Transformer Area Near Bldg 98, AEDB-R Site LEAD-055)	WESTON, 2004b – LKD.RT-248
	2004 (SE OU 8, Sediment Storage Pile Areas, AEDB-R Site LEAD-073)	WESTON, 2004c – LKD.RT-252
	2004 (SE OU 8, Building 16 and 17 Area, AEDB-R Site LEAD-092)	WESTON, 2004d – LKD.RT-253
	2005 (SE OU 8, Building T-228, AEDB-R Site LEAD-008)	WESTON, 2005i – LKD.RT-272
	2006 (SE OU 8, S38-1 FSA, AEDB-R Site LEAD-130)	WESTON, 2006m – LKD.RT-276
	2006 (SE OU 8, Bldg 425 UST, AEDB-R Site LEAD-126)	WESTON, 2006l – LKD.RT-278
	2006 (SE OU 8, Golf Course Storage Buildings, AEDB-R Site LEAD-118)	WESTON, 2006k – LKD.RT-280
	2006 (SE OU 8, Bldg 433 West, AEDB-R Site LEAD-118)	WESTON, 2006j – LKD.RT-282
	2006 (SE OU 8, Bldg 422 North, AEDB-R Site LEAD-118)	WESTON, 2006i – LKD.RT-283
	2006 (SE OU 8, Lot 29 Ingot Storage Area, AEDB-R Site LEAD-060)	WESTON, 2006f – LKD.RT-286
	2006 (SE OU 8, Lot 48 Ingot Storage Area, AEDB-R Site LEAD-060)	WESTON, 2006g – LKD.RT-287
	2008 (SE OU 8, Building 57, AEDB-R Site LEAD-001)	WESTON, 2008a – LKD.RT-313
	2008 (SE OU 8, IWWS, AEDB-R Site LEAD-127)	WESTON, 2008b – LKD.RT-316
	2009 (SE OU 7 BRAC Summary, AEDB-R Site LEAD-126)	WESTON, 2009c – LKD.RT-325
	2010 (SE OU 8, IWWS, AEDB-R Site LEAD-127)	WESTON, 2010j – LKD.RT-350
	2011 (SE OU 8, Building 37, AEDB-R Site LEAD-002, and Building 47)	WESTON, 2011c – LKD.RT-353
	2011 (RI/RA, SE OU 12 [Landfill G], AEDB-R Site LEAD-039)	WESTON, 2011d – LKD.RT-354
	2011 (FS, SE OU 12 [Landfill G], AEDB-R Site LEAD-039)	WESTON, 2011h – LKD.RT-359

Table 1
Chronology of Site Events for the SE Area NPL Site (Continued)

Event	Date	Document Reference*
ROD Signature	August 1991 (K-Areas, SE OU 1, AEDB-R Sites LEAD-044, -048, -052, -055, -056, -057, -058, -059, -060, -062, -071)	LEAD, 1991 – LKD.RT-061
	April 1998 (Phase I BRAC, AOC Decision Documents, part of SE OU 8, Parcel 29, Parcels 1 and 2, Railroad Parcels, Parcel 24, Parcels 8 through 13, Buildings 6 and 9)	WESTON, 1998e – LKD.RT-147
	September 1998 (Phase I BRAC, BRAC waste sites, part of SE OU 8)	WESTON, 1998 – LKD.RT-143
	July 2001 (Phase II BRAC, BRAC Waste Sites, part of SE OU 8)	WESTON, 2001b – LKD.RT-190
	August 2003 (Phase III BRAC, SMSR groundwater, SE OU 13, and BRAC Waste Sites, part of SE OU 8 – No Action ROD, AEDB-R Sites LEAD-110, -114, -126, and -118)	WESTON, 2003e – LKD.RT-239
	August 2005 (SE OU 4, Stormwater Sewer Lines and Associated Drainageways – No Further Action ROD, AEDB-R Site LEAD-072)	Shaw, 2005b – LKD.RT-270
	July 2006 (Phase IV BRAC, BRAC Waste Sites, part of SE OU 8 soils and SE OU 3B, Area Upgradient of VOC-Contamination Source in SE OU 3A Groundwater – No Action ROD, AEDB-R Sites LEAD-016, -114, -115)	WESTON, 2006b – LKD.RT-275
	March 2006 (cover date), August 2006 (signed Army), September 2006 (signed EPA), (SE OU 10 SSIA VOC-Contaminated Groundwater South of Gate 6, Conococheague Drainage System, AEDB-R Sites LEAD-090, -091, -095, -100, -101, -128)	WESTON, 2006d – LKD.RT-274
	August 2006 (finalized) and September 2006 (signed) (SE OU 2 Industrial Wastewater Sewer System, AEDB-R Site LEAD-083)	Shaw, 2006a – LKD.RT-284
	June 2012 (Phase V BRAC, BRAC Waste Sites, SE OU 7, TOSA/WOS and part of SE OU 8 soils, AEDB-R Sites LEAD-080, -082, -001, -008, -055, -060, -073, -092, -118, -126, -127, -130)	WESTON, 2012b – LKD.RT-364
Explanation of Significant Differences (ESD)	August 1991 (K-Areas, SE OU 1, AEDB-R Sites LEAD-044, -048, -052, -055, -056, -057, -058, -059, -060, -062, -071)	LEAD, 1991 – LKD.RT-061
	April 2004 (K-Areas, SE OU 1, for LUCs, AEDB-R Sites LEAD-044, -048, -052, -055, -056, -057, -058, -059, -060, -062, -071)	LEAD, 2004 – LKD.RT-245
	September 2009 (SE OU 10, AEDB-R Sites LEAD-090, -091, -095, -100, -101, -128)	WESTON, 2009d – LKD.RT-330
	May 2012 (SE OU 8, Phases I and II)	WESTON, 2012a – LKD.RT-363

Table 1
Chronology of Site Events for the SE Area NPL Site (Continued)

Event	Date	Document Reference*
Remedial Design Start	September 1991 (K-Areas, SE OU 1 soil) September 1998 (Phase I BRAC, part of SE OU 8 soil) July 2001 (Phase II BRAC, part of SE OU 8 soil) September 2006 (SE OU 10 groundwater) September 2006 (SE OU 2 soil) *Note: No Action RODs for SE OU 3B and portions of SE OU 8 (Phase III and IV BRAC). No Further Action RODs for SE OU 4 and 13.*	N/A
Remedial Design Complete	June 1993 (K-Areas, SE OU 1)	N/A
	August 2002 (Phases I and II BRAC, Land Use Control Action Plan Memorandum of Agreement (LUCAP MOA), signed by BRAC Cleanup Team, BRAC Waste Sites, part of SE OU 8)	N/A
	January 2004 (K-Areas, SE OU 1, Cap Maintenance Plan)	N/A
	April 2007 (SE OU 10 groundwater, Final RAWP for SE OU 10, including LUC RD, AEDB-R Sites LEAD-090, -091, -095, -100, -101, -128)	WESTON, 2007c – LKD.RT-294
	March 2010 (SE OU 2 soil, AEDB-R Site LEAD-083)	Shaw, 2010 – LKD.RT-336
Remedial Action Start	August 1993 (K-Areas, SE OU 1)	N/A
	November 1998 (Phase I BRAC Property Transfer and Implementation of Post-Land Transfer LUCs, BRAC waste sites, part of SE OU 8)	
	May 2002 (Phase II BRAC Property Transfer and Implementation of Post-Land Transfer LUCs, BRAC waste sites, part of SE OU 8)	
	Fall 2004 (Industrial Wastewater Sewers, abandon sewers, part of SE OU 2 remedy)	
	April 2007 (SE OU 10 groundwater, nutrient injections begin)	

Table 1
Chronology of Site Events for the SE Area NPL Site (Continued)

Event	Date	Document Reference*
Remedial Action Complete	September 1995 (K-Areas, SE OU 1)	McLaren/Hart, Inc., 1997
	Spring 2006 (Industrial Wastewater Sewers, complete abandonment of sewers, part of SE OU 2 remedy)	N/A
	June 2007 (SE OU 10 groundwater, final injection for active treatment phase of remedy. Remedy currently in the ongoing LUCs/long-term monitoring phase)	WESTON, 2009g – LKD.RT-319
Removal Actions	1994 (Contaminated soil removal, SE OU 1)	McLaren/Hart, 1997 LKD.RT-131
	1994, 1995 (IWWS Emergency Repairs, SE OU 2)	N/A
	1997 (IWWS Contaminated Soils, SE OU 2)	Shaw, 2006a LKD.RT-284
	1997 (Contaminated sediments, SE OU 4)	Shaw, 2003 – LKD.RT-241
	1997 (Soil at Spill Area A, SE OU 5)	Shaw, 2004b LKD.RT-259
	1997 (Septic Tank Abandoned, SE OU 7)	FD GTI and QST, 1997 – LKD.RT-132
	2000 (OVSA Soils, SE OU 8)	IT, 2001a – LKD.RT-227
	2000-2001 (TOSA, SE OU 7, AEDB-R Site LEAD-080)	AmDyne, 2001 – LKD.RT-212
	2001 (Buried Waste Material, SE OU 9 and SE OU 12)	Shaw, 2005c – LKD.RT-261
	2001 – 2002 (Lot 48, SE OU 8, AEDB-R Site LEAD-060)	AmDyne, 2003 – LKD.RT-230

*Documents with LKD.RT numbers can be located in the Letterkenny Admin Record (www.leadenv.com/leadenv/, username: guest, password: guest)

AEDB-R = Army Environmental Database- Restoration
BRAC = Base Realignment and Closure
FS = feasibility study
FVSA = Former Vehicle Storage Area
IWWS = Industrial Wastewater Sewers
LUCAP = Land Use Control Action Plan
LUCs = land use controls
MOA = Memorandum of Agreement
NPL = National Priorities List
OU = operable unit
OVSA = Open Vehicle Storage Area
PDO = Property Disposal Office
RA = Risk Assessment
RI = Remedial Investigation
ROD = Record of Decision
SE = Southeastern
SMSR = Southern Martinsburg Shale Region
SSIA = Southern Southeast Industrial Area
TCRA = time-critical removal action
TOSA/WOS = Truck Open Storage Area/Waste Oil Sump
VOC = volatile organic compound

Table 2
Chronology of Site Events for the PDO Area NPL Site

Event	Date	Document Reference*
Initial Discovery	1978	
Pre-NPL Responses	January 1980 (Preliminary Assessment)	USATHAMA, 1980 – LKD.RT-011
	September 1987 (Remedial Investigation)	ESE, 1987 – LKD.RT-015
NPL Listing	22 March 1989	N/A
Federal Interagency Agreement	3 February 1989	N/A
RI/FS Complete	July 2003 (PDO OU 6 and PDO OU 7, Phase III)	WESTON, 2003d – LKD.RT-232
	March 2008 (RI/RA, PDO OU 6, AEDB-R Sites LEAD-113 and -117)	WESTON, 2008d – LKD.RT-304
	April 2009 (RI, PDO OU 5)	WESTON, 2009b – LKD.RT-323
	September 2009 (RI/RA, PDO OU 6, AEDB-R Site LEAD-117)	WESTON, 2009e – LKD.RT-329
	January 2010 (RI/RA, PDO OU 5, AEDB-R Site LEAD-107)	WESTON, 2010c – LKD.RT-334
	April 2010 (RI, PDO OU 6, AEDB-R Site LEAD-037)	WESTON, 2010b – LKD.RT-338
	May 2010 (RI/RA, PDO OU 5, AEDB-R Sites LEAD-098 and -107)	WESTON, 2010l – LKD.RT-341
	May 2010 (RI/RA, PDO OU 5, AEDB-R Sites LEAD-098 and -107, PDO OU 6, AEDB-R SITES LEAD-026, -066, -093, and -111)	WESTON, 2010f – LKD.RT-340
	July 2010 (RI/RA, PDO OU 4, AEDB-R Site LEAD-010)	WESTON, 2010e – LKD.RT-342
	October 2010 (RI/RA, TNTWO, AEDB-R Site LEAD-050)	WESTON, 2010g – LKD.RT-346
	December 2010 (RI/RA, DDOB2, AEDB-R Site LEAD-053)	WESTON, 2010h – LKD.RT-348
	December 2010 (RI/RA, PDO OU 6, AEDB-R Site LEAD-129)	WESTON, 2010k – LKD.RT-352
	August 2011 (FS, PDO OU 2, AEDB-R Sites LEAD-024, -029, -069, -077, -097, PDO OU 5, AEDB-R Sites LEAD-098, -106, -107, and PDO OU 6, AEDB-R Sites LEAD-026, -037, -066, -093, -111, -113, -117, -129)	WESTON, 2011b – LKD.RT-356

Table 2
Chronology of Site Events for the PDO Area NPL Site (Continued)

Event	Date	Document Reference*
Record of Decision (ROD) Signature	June 1991 (PDO OU 1 - No Action ROD, AEDB-R Sites LEAD-044, -048, -052, -055, -056, -057, -058, -059, -060, -062, -071)	LEAD, 1991 – LKD.RT-061
	February 2000 (PDO OU 3 - No Further Action ROD, AEDB-R Sites LEAD-070 and -067)	IT, 2000 – LKD.RT-167
	September 1998 (Phase I BRAC, BRAC waste sites, part of PDO OU 6)	WESTON, 1998 – LKD.RT-147
	July 2001 (Phase II BRAC, BRAC waste sites, part of PDO OU 6)	WESTON, 2001b – LKD.RT-190
	August 2003 (Phase III BRAC, SMSR groundwater, PDO OU 7, and BRAC waste sites, part of PDO OU 6 – No Further Action ROD)	WESTON, 2003e – LKD.RT-239
Remedial Action Start	September 1998 (Phase I Parcels)	N/A
	July 2001 (Phase II Parcels)	
Remedial Action Complete	Ongoing (LUCs)	N/A
Removal Actions	1997, 1999 (OBP Soils, PDO OU 4)	WESTON, 2006n – LKD.RT-288
	2000, 2002 (DRMO PCB Sediments, PDO OU 5)	IT, 2001b – LKD.RT-188
	2002 (Building 651/652 Tannin Resin, PDO OU 6)	Cape, 2002 – LKD.RT-224
	2000 (OVSA Soils, PDO OU 6)	IT, 2001a – LKD.RT-227
	2004, 2005 (Old PDO Scrapyard Soils, PDO OU 6)	Cape, 2008 – LKD.RT-326
	2004 (Quarters 2323 Lead)	SAIC, 2005
	2005, 2006 (Pad 5 Landfill Soils, PDO OU 6)	WESTON, 2010b – LKD.RT-338
	2007 (Transfer/Burning Revetments Soils, PDO OU 4, AEDB-R Site LEAD-048)	WESTON, 2009f – LKD.RT-322

*Documents with LKD.RT numbers can be located in the Letterkenny Admin Record (www.leadenv.com/leadenv/, username: guest, password: guest)

DDOB2 = Drainageways Downstream of Open Burning Ground No. 2
OBP = Oil Burn Pit
PCB = polychlorinated biphenyl
TNTWO = TNT Washout Plant

3. PHYSICAL CHARACTERISTICS AND CONTAMINATION ASSESSMENT

3.1 LEAD PHYSICAL CHARACTERISTICS

3.1.1 Climatology

The climate at LEAD is moderate, with an average annual temperature of 11.2 ºC (Celsius) (52 ºF [Fahrenheit]). Summers average 22.3 ºC (72 ºF) and winters average 0 ºC (32 ºF). Rainfall averages 98.2 centimeters (cm) (38.7 inches) per year. The moderate climate results in an average of 15 days above 32 ºC (90 ºF) per year and mild winters with temperatures below 0 ºC (32 ºF) occurring less than 100 days per year. Winds are generally from the southwest, with an average velocity of 10 miles per hour (mph). During the period from July to mid-September, the area experiences warm periods lasting 4 to 5 days, with high relative humidity and only slight wind movement (EA, 1991 LKD.RT-060).

3.1.2 Site Topography and Surface Drainage

LEAD is located in the Great Valley section of the Valley Ridge Province of the eastern United States, and referred to locally as the Cumberland Valley. The Cumberland Valley trends northeast to southwest through central Pennsylvania and is bordered to the west by the Appalachian Mountain Province. The South Mountain section of the Blue Ridge Province is situated east of Chambersburg and marks the eastern edge of the Cumberland Valley.

The Cumberland Valley is characterized by southwest-trending sandstone and shale ridges and limestone valleys. The valley floors are filled with carbonate rocks of the St. Paul and Chambersburg Formations. Weathering of the folded and faulted underlying geologic formations imparts a gently rolling aspect to the local topography. The majority of LEAD is underlain by clastic rocks of the Martinsburg Shale Formation, except for bands of carbonate rocks along the eastern and western edges of LEAD. The PDO Area and the SIA of LEAD are underlain primarily by limestone. Surface elevations throughout LEAD range from approximately 600 to 750 ft above mean sea level (msl), except for the northwest portion of LEAD, where the elevation increases abruptly to more than 2,300 ft above msl in the vicinity of Broad Mountain (EA, 1991).

Streams cutting through the limestone terrain flow through broad, open valleys and are usually intermittent. In contrast to this, streams cutting through the upper shale units of the Martinsburg Formation usually meander in small, steep-walled valleys and are perennial. Surface drainage at LEAD is divided into two watersheds, the Susquehanna River to the northeast and the Potomac River to the southwest. Both the Susquehanna and Potomac Rivers eventually drain into the Chesapeake Bay. **Figure 2** shows the drainage divides at LEAD.

Two major stormwater drain systems serve the SE portion of LEAD and contribute to local surface drainage. One system serves the area north of Coffey Avenue and discharges near the IWTP into the IWTP outfall (located north of the IWTP), which discharges to Rowe Run. The other system serves the southeast warehouse area. Water drains into the storm drain system via sheet flow or drainage ditches, is discharged through the storm drain outfall, and joins other surface runoff flowing southward to Conococheague Creek (USATHAMA, 1980).

Surface water drainage in the PDO Area of LEAD is divided into three storm water drainage areas primarily consisting of sheet flow and drainage ditches, with some underground storm sewer lines. The topographic high ridge line for the PDO Area is near Georgia Avenue, near the Megan Mackenzie Run (MMR)/PDO drainage divide that marks the surface water and groundwater divide between MMR to the north, the SE area to the southeast, and the PDO/Rocky Spring Drainage System to the southwest (see **Figure 2**). Two of the stormwater drainage areas eventually flow to Rocky Spring Lake and the third flows to MMR.

3.1.3 Soils

Surface soils present at LEAD are predominantly shaley to very shaley silt loams that developed through weathering of the Martinsburg Shale and the interbedded siltstones and sandstones. According to the Soils Survey Bulletin of Franklin County, these soils have been classified as part of the Weikert-Berks-Bedington Association (see **Figure 8**). Soils on the eastern edge of LEAD associated with the limestone have been identified as part of the Hagerstown-Duffield Association. These soils are deep, level or sloping, somewhat poorly drained, and mostly rocky, silty, clay loams. Along the western side of LEAD, outside the BRAC area, soils of both the Laidig-very stony Land-Buchanan Association (formed from sandstone) and the Morrill-Laidig Association (formed on the foot of mountain slopes) are present (USATHAMA, 1980).

3.1.4 Geology

LEAD straddles two major structural features: the South Mountain anticlinorium to the east and the Massanutten synclinorium to the west. The eastern portion of the Depot (underlain by carbonate rocks) is part of the anticlinorium, whereas the western portion of the Depot (underlain by shale) is part of the synclinorium. These structures resulted from folding that occurred during the close of the Paleozoic era. High-angle reverse faulting accompanied the folding of rocks in the eastern portion of LEAD. Several major faults that strike north to northeast and dip to the southeast at fairly steep angles cross the PDO Area (WESTON, 1984 LKD.RT-006).

In the vicinity of LEAD, the Great Valley is floored by Ordovician age carbonate rock, as well as Ordovician age shale and greywacke of the Martinsburg Formation. The five formations occurring at LEAD are the shales of the Martinsburg Formation, the limestones of the Chambersburg Formation and the St. Paul Group, the limestones and dolomites of the Rockdale Run Formation, and the dolomites of the Pinesburg Station Formation. These geologic formations are fractured and deformed to varying degrees from past geologic activity (ESE, 1993). **Figure 9** shows the geologic units of the eastern part of LEAD.

Several faults extend through LEAD, including the Pinola and Letterkenny Faults. Although an east-to-west cross fault was identified between these two faults, both the position and surface trace are open to question (Becher and Taylor, 1982). Northeast of LEAD, the Pinola Fault truncates the Letterkenny Fault, indicating that the latter fault is older.

The Letterkenny Fault is one of the few faults in the region that parallels the tectonic grain, yet is an early-formed, westward-dipping thrust that moved material from within the syncline to the west up onto the anticline to the east (EA, 1991).

The Pinola Fault, located to the west of the Letterkenny Fault, is considered to be an east-dipping, high-angle thrust fault (based on the fact that older beds are to the east of the fault). Because it is almost impossible to trace faults through the Martinsburg terrain, the fault trace is projected through the Martinsburg Formation on the basis of a ridge-forming unit that extends through it (Becher and Taylor, 1982).

3.1.5 Hydrogeology

The regional surface water flow system of Franklin County controls the general groundwater flow patterns within LEAD. The surface water drainage divide, discussed previously, also divides the groundwater flow system into two basins. Groundwater elevation contours within LEAD generally reflect surface topography. The water table is located at moderate depth in areas of topographic highs and is shallow near stream valleys and other topographic lows (ERM, 1995).

The shale and carbonate rock that underlie LEAD have been folded and faulted during deformational events that ultimately formed the Great Valley. The two major faults located within the confines of LEAD (the Pinola Fault and the Letterkenny Fault) influence groundwater flow. Where faulting is present and dissimilar rocks have been brought into contact, the fault tends to act as a barrier to groundwater movement, occasionally forcing water within the formation to discharge as a fault spring (i.e., Rocky Spring). The groundwater movement may be only minimally affected where similar rocks, such as two limestone units, are in contact along a fault (ERM, 1995).

Fracture systems within the Martinsburg Formation are small and well connected, thus allowing groundwater to generally follow a regional flow path. Groundwater flow within the limestone of the Chambersburg Formation and St. Paul Group is more complex because it occurs predominantly through individual fractures and solution cavities typical of karst terrain. Fractures in the limestones are mainly aligned with the regional northeast tectonic grain and are much more irregular and widely spaced than those in the adjacent shales. Where solution cavities are present in the limestone, groundwater flow more closely resembles open channel flow rather than the fracture flow described above. The quantity and density of fractures within the limestone units increase with proximity to the bedrock surface. During seasonal periods when the water table is at its highest (early spring, late autumn), water levels commonly rise above the bedrock/surface material contact. Leaching or resuspension of any materials or potential contaminants buried in the surficial sediments may be enhanced during high water table conditions. **Table 3** presents a description of the water-bearing characteristics of the geologic units present at LEAD (ERM, 1995).

Table 3
Descriptions and Water Bearing Characteristics of the Geologic Units at LEAD

System	Geologic Unit	Thickness (ft)	Character of Rocks	Water-Bearing Characteristics
Quaternary	Colluvium	0 to 250	Mixture of clay, silt, sand, pebbles, cobbles, and boulders overlying a thick residual clay layer.	Yields domestic supplies commonly at the contact with bedrock. Provides extra storage for underlying limestone. Maximum reported yield is 30 gallons per minute (gpm) from sand and gravel. Calculated maximum sustained yield is 110 gpm.
Ordovician	Martinsburg Formation	1,500 to 3,000	Thin basal unit of platy limestone; thick medial unit of graywacke; bulk of formation is black carbonaceous and fissile shale. Formation is thinner to west.	Good aquifer. Maximum reported yields are 150 gpm from shale and 50 gpm from graywacke. Calculated maximum sustained yield is 100 gpm for shale and graywacke. No data are available for basal limestone. Only 3% of wells need standby storage to supply minimum domestic needs.
	Chambersburg Formation	300 to 750	Dark-gray, thin-bedded limestone that characteristically weathers into cobblestone shapes. Thinner to west. Abundantly fossiliferous.	Fair Aquifer. Maximum reported yield is 225 gpm. Calculated maximum sustained yield is 160 gpm. Approximately 30% of wells require standby storage to supply minimum domestic needs.
	St. Paul Group	800 to 1,000	Light-gray limestone; minor interbeds of dolomite containing black chert. Thinner to west. Abundantly fossiliferous.	Fair aquifer. Maximum reported yield is 225 gpm. Calculated maximum sustained yield is 160 gpm. Approximately 30% of wells require standby storage to supply minimum domestic needs.
	Pinesburg Station Formation	250 to 800	Medium-gray dolomite; some interbeds of limestone. Black chert and white quartz.	Fair aquifer. Maximum reported yield is 30 gpm. Calculated maximum sustained yield is 150 gpm. About 25% of wells require standby storage for minimum domestic supply.

Source: Becher, A.E. and L.E. Taylor. 1982. *Groundwater Resources in the Cumberland and Contiguous Valleys of Franklin County, Pennsylvania.* Pennsylvania Geological Survey Water Resources Report 53. Harrisburg, PA.

Groundwater recharge occurs primarily through precipitation. Recharge areas occur throughout the central part of LEAD, wherever sandstone, siltstone, or joints are close to the surface. Actual points of recharge for the limestone aquifers have not been determined; however, the many faults, joints, and sinkholes present at LEAD are the most likely routes (ERM, 1995).

Groundwater underlying LEAD generally occurs under unconfined conditions, with local areas of artesian conditions. These artesian conditions occur along a moderately steep slope located near the northwest edge of LEAD in the AA.

A groundwater study completed for the USACE Baltimore District in the 1950s concluded that a viable source of groundwater was not available within LEAD boundaries to supply the depot's industrial mission (Acker, 1955). The only use of groundwater in the area is outside LEAD, where some individual homes depend on groundwater for their domestic supply. Any homes in SE Area using well water that were determined to be impacted by the groundwater contamination at LEAD (exceedances of MCLs for VOCs) were initially supplied with bottled water, but are now connected to public water. Off-post VOC-contaminated groundwater is used to water livestock and produce.

No VOCs were detected above MCLs in drinking water samples from homes downgradient of the PDO Area. All homes off-post of the PDO OU 2 Area use groundwater as the drinking water source.

3.2 CONTAMINATION ASSESSMENT FOR SE AREA

Note that the contamination assessment is presented only for those OUs with final RODs that specify a remedial action (i.e., OUs with no further action RODs and those still going through the pre-ROD CERCLA process are not included).

3.2.1 SE OU 1—K-Areas

The K-Areas are located in the DA at LEAD and consist of Areas K-1, K-2, and K-3. The K-1 lagoon, which was closed in the 1970s, was used to dispose of waste industrial solvents. The Remedial Action, which consisted of removal of VOC-contaminated soil, was completed at the site in 1995. Contaminants in the soils in this area were at concentrations of up to 5.5% total VOCs. The most common VOCs were:

- trans-1,2-DCE
- Methylene chloride
- 1,1,1-TCA
- TCE

The groundwater in the SE Area is contaminated with the same VOCs as those detected in soils at the K-Area, with historical data indicating concentrations in groundwater were detected at up to 20,000 micrograms per liter (µg/L). In soils, lead was detected at concentrations up to 1.5%. Metals contamination of the groundwater is not an issue because of the binding properties of the

clay soil. Response is complete at this site. VOC-contaminated groundwater associated with the DA is addressed under SE OU 3A.

3.2.2 SE OU 2—Industrial Wastewater Sewer System

The IWWS collection system malfunctioned soon after it was installed in the mid 1950s. The malfunction allowed VOC-contaminated wastewater to infiltrate directly into the soils and bedrock, causing VOC groundwater contamination. RI Field Work in 1992 and 1993 led to emergency repairs in 1994 and 1995. An emergency removal of IWWS VOC-contaminated soils was conducted in 1997.

Soils surrounding the IWWS were contaminated with VOCs, which contributed to on-post and off-post VOC groundwater contamination. Although the emergency repairs to the IWWS eliminated the primary source of chemical release, the affected underlying soils were a source of chemical release to receiving media such as groundwater, surface water/sediment, and ambient air.

The following chemicals were identified as contaminants of potential concern (COPCs):

SE OU 2—IWWS Sewers
Contaminants of Potential Concern in Soil

Chemical	Max. Conc. (mg/kg)	PADEP Standard[a] (mg/kg)	Federal (ORNL) Standard[b] (mg/kg)
VOCs			
Trichloroethene	1,700	1,300	2.0 n
SVOCs			
Benzo (a) pyrene	0.5	11	0.21 c
Metals			
Antimony	3.5	1,100	41 n
Barium	1,050	190,000	19,000 n
Beryllium	4.6	5,600	200 n
Chromium	226	8,400	150,000 n
Lead	2,090	1,000	800
Nickel	83	56,000	2,000 n
Thallium	18	200	1.0 n

Note: Standards are for industrial use.

[a] Non-Residential Medium-Specific Concentrations (MSCs) for Soil (PA Bulletin, 8 January 2011).

[b] Industrial Soil Screening Levels were obtained from ORNL Regional Screening Levels for Chemical Contaminants at Superfund Sites Table (November 2011).
c = Cancer effects at a target risk of 1.0E-06 for soil.
n = Noncancer effects, at a target hazard quotient of 0.1 for soil.

3.2.3 SE OU 7—Truck Open Storage Area/Waste Oil Sump

A former open storage area, with an abandoned septic tank and leaching field, was used to dispose of “boiler slops” and septage. The initial COCs identified were SVOCs and PCBs in the

sludge in the septic tank. A removal action for the septic tank was completed in spring 1997. In 1999, polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (dioxins/furans) were discovered at low concentrations at the site in a limited area of shallow (0 to 1 foot) soils. A TCRA for the dioxin-contaminated soils was performed in December 2000.

In order to evaluate the current conditions of SE OU 7 and to document the nature and extent of any risk related to the transfer of the TOSA/WOS Site, the *Summary of BRAC Investigations at the TOSA/WOS Site, SE OU 7* was completed in August 2009 (WESTON, 2009c LKD.RT-325). Results of the screening level risk assessment (SLRA) indicated that human health risk at the TOSA/WOS Site was driven by TCE via the groundwater ingestion pathway (maximum concentration 7.9 µg/L) and arsenic via the direct contact/soil ingestion pathway (maximum concentration 5.2 milligrams per kilogram [mg/kg]). Results of the screening level ecological risk assessment (SLERA) indicated ecological risk was driven by Aroclor 1260, 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalent (TCDD TEQ) for mammals of 1.63E-05, and 2,3,7,8-TCDD TEQ for birds (maximum concentrations were 1.33E-02 micrograms per kilogram [µg/kg] and 1.68E-02 µg/kg, respectively). The report concluded that human health and ecological risks are within acceptable levels based on the intended future C/I use of the property.

3.2.4 SE OU 8—BRAC Waste Sites

The SE OU 8 area is composed of the to-be-excessed (BRAC) portion of the SE Area. The COPCs for the areas within SE OU 8 that have been investigated to date include:

- VOCs
- SVOCs, including polycyclic aromatic hydrocarbons (PAHs)
- Metals
- Dioxins/furans

The sites within SE OU 8 for which there are final remedies in place are listed in the following table:

SE OU 8 Sites

AEDB-R Site ID	Site Name
Cleared for UU/UE and intended C/I use	
N/A*	Parcels 8, 9, 10, 11, and 13** (Phase I BRAC)
LEAD-011	Backwash Discharge Area from the Water Treatment Plant
LEAD-027	Parcel 12** (Phase I BRAC)
LEAD-110 and 114	Open Vehicle Storage Area Parcel 24** (Phase I BRAC) Former Vehicle Storage Area North of the Test Track
LEAD-115	Tank Farm Storage Area
LEAD-118	Building 400 Series Fire Training Area
LEAD-119	Railroad Parcels** (Phase I BRAC)
LEAD-125	Former PCB Transformer Sites (Phase II BRAC)
LEAD-126	Gate 1 Guardhouse** (Phase II BRAC)

AEDB-R Site ID	Site Name
LEAD-127	IWWS System (SE OU 8 only)***
Cleared for intended C/I use only	
LEAD-001	Building 57 Site
LEAD-008	Building T-228 Battery Acid Disposal Pit
LEAD-114	Parcels 1 and 2 (Phase I BRAC)
LEAD-055	Former Transfer Area Near Building 98
LEAD-060	Lot 29 Ingot Storage Area Lot 48 Ingot Storage Area
LEAD-073	Southeast Drainageway Sediment Pile Areas
LEAD-092	Buildings 16 and 17 Area
LEAD-016	Test Track Area
LEAD-118	Building 422 North Building 433 West Building 433 Defueling Point Former Storage Area West of Building 446 ASTs at Golf Course Storage Buildings
LEAD-126	Building 425 UST Removal Site Building 437 UST Removal Site
LEAD-127	IWWS System (SE OU 8 only)
LEAD-130	Former Storage Shed Near Building S38-1/S-38-2

*SE OU 8 was still being defined while these parcels/sites were investigated; therefore, they do not have AEDB-R numbers.
**Soil LUCs for this site were lifted by the Phase I and II ESD (WESTON, 2012b).
***Cleared for UU/UE where the IWWS System overlaps Parcels 5, 6, 7, 2-47, 2-65, and 2-66 (WESTON, 2012a).

An FS, PRAP, and ROD were completed for the sites listed above that were cleared for C/I use only (WESTON, 2009a [FS], 2010d [PRAP], and 2011a [ROD]).

A non-time critical removal action was performed at the Open Vehicle Storage Area as reported in the Property Disposal Office Area Operable Unit 6 Southeast Area, Operable Unit 8 – Removal Action Completion Report PAH-Contaminated Soils at the Open Vehicle Storage Area (OVSA), Letterkenny Army Depot (IT, 2001).

In addition, the VIP was evaluated at the Building 57 Site based on its location relative to the SE OU 10 groundwater plume. One sub-slab soil gas sample was collected in Building 57 in August 2008 and analyzed for VOCs. Results indicated the presence of 1,1,1-TCA, carbon tetrachloride, chloroform, PCE, and TCE. The RI/RA for Building 57 concluded that there are no unacceptable risks to current occupants of Building 57 associated with vapor intrusion based on C/I use (WESTON, 2008a LKD.RT-313).

3.2.5 SE OU 10—Southern Southeast Industrial Area VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)

The COCs in SE OU 10 groundwater include VOCs (TCE, TCA, and associated breakdown products) and SVOCs. The source of the VOCs is the Building 37 IWWS gravity lines, while the presence of SVOCs is related to a diesel fuel release at Building 37. RI field work in 1992 and 1993 led to emergency repairs in 1994 and 1995. The selected remedy documented in the ROD for SE OU 10 was Enhanced Biodegradation with MNA and LUCs (WESTON, 2006d). A final Remedial Action Work Plan was completed in April 2007 and the final sodium lactate injection for the Enhanced Biodegradation occurred in June 2007. Monitoring of the natural attenuation processes and LUCs will remain in place until chemical concentrations in groundwater are protective of human health and the environment. In December 2010, groundwater sampling frequency changed from tri-annual during low, base, and high groundwater conditions to annual during low groundwater conditions. The most recent groundwater sampling events in SE OU 10 were conducted in December 2010 and December 2011. Validated analytical results from April 2008 to December 2011 are presented in Table G-1 in Appendix G. Based on the maximum detected concentrations during 2010 (*Note: The most recent annual groundwater sampling event for SE OU 10 was completed in December 2011.Low groundwater conditions are targeted for annual sampling at SE OU 10 to evaluate groundwater during a worst-case scenario (i.e., maximum contaminant concentrations due to less dilution within the aquifer). However, the December 2011 sampling event occurred during unseasonably high groundwater conditions; therefore, the data is likely not representative of the maximum concentrations for 2011)*, the following COCs remain above their respective federal and state drinking water standards in wells located on-post.

SE OU 10
Contaminants of Concern in Groundwater as of December 2010

Chemical	Maximum Concentration in Groundwater (µg/L)	Federal/State Standard (µg/L)
VOCs Related to Former Leaking IWWS Lines		
Trichloroethene	11	5
Vinyl chloride	3.5	2
VOCs Related to Diesel Release		
Benzene	50	5
1,2,4-Trimethylbenzene	220	15
1,3,5-Trimethylbenzene	56	13
Naphthalene	200	100

The VIP was evaluated at Buildings 37 and 47 in July 2008 and April 2009. Both buildings are located above the SE OU 10 groundwater contaminant plume. VOCs were detected in sub-slab vapors beneath Buildings 37 and 47 that are congruous to those detected in SE OU 10

groundwater. The following COCs were detected above their respective Oak Ridge National Laboratory (ORNL) regional screening levels (RSLs) for industrial air in sub-slab and indoor air samples.

SE OU 10
VIP Contaminants of Concern – Sub-Slab

Chemical	Maximum Concentration in Sub-Slab (µg/m^3)	ORNL Industrial Air RSL (AF = 0.1) (µg/m^3)
Building 37		
Chloroform	16	5.3 c
cis-1,2-Dichloroethene	1,600	260 n
Tetrachloroethene	3,300	177 n
Trichloroethene	5,900	8.8 n
Building 47		
Chloroform	6.8	5.3 c
cis-1,2-Dichloroethene	1.7	260 n
Tetrachloroethene	640	177 n
Trichloroethene	380	8.8 n

[a] Industrial Soil Screening Levels were obtained from ORNL Regional Screening Levels for Chemical Contaminants at Superfund Sites Table (November 2011).
c = Cancer effects at a target risk of 1.0E-06.
n = Noncancer effects, at a target hazard quotient of 0.1.

SE OU 10
VIP Contaminants of Concern – Indoor Air

Chemical	Maximum Concentration in Indoor Air (µg/m^3)	ORNL Industrial RSL[a] (µg/m^3)
Building 37		
Chloroform	3.1	0.53 c
1,2,4-Trimethylbenzene	14	3.1 n
1,3,5-Trimethylbenzene	4.9	2.2 n
Tetrachloroethene	2.6	17.7 n
Building 47		
1,2,4-Trimethylbenzene	7.4	3.1 n
Tetrachloroethene	12	17.7 n

[a]Industrial Soil Screening Levels were obtained from ORNL Regional Screening Levels for Chemical Contaminants at Superfund Sites Table (November 2011).
[b]1,2,3-Trimethylbenzene was used as a surrogate for 1,3,5-trimethylbenzene.
c = Cancer effects at a target risk of 1.0E-06.
n = Noncancer effects, at a target hazard quotient of 0.1.

3.3 CONTAMINATION ASSESSMENT FOR PDO AREA

Note that the contamination assessment is presented only for those OUs with final RODs that specify a remedial action (i.e., OUs with no further action RODs and those still going through the pre-ROD CERCLA process are not included).

3.3.1 PDO OU 6—BRAC Waste Sites

The PDO OU 6 area is composed of the to-be-excessed (BRAC) portion of the PDO Area. There are no sites within the Phase II BRAC property transfer portion of PDO OU 6 that were investigated under CERCLA.

Parcel 29 was the only Phase I Parcel within PDO OU 6 that was investigated under CERCLA. Only arsenic and beryllium were detected in samples collected at Parcel 29 at concentrations that exceeded the EPA Region III risk-based concentrations (RBCs). Prior to the signing of the Phase I ROD, EPA, PADEP, and the Army agreed that these concentrations did not warrant further remedial action for continued industrial use (WESTON, 1998a). However, because the Phase I Parcels were all transferred with LUCs, Parcel 29 was reevaluated in the ESD for Phases I and II. The evaluation of Parcel 29 in the ESD concluded that Parcel 29 is suitable for UU/UE and the LUCs were lifted (WESTON, 2012b). Therefore, there are no remedial actions for soil currently implemented for OUs in the PDO Area. The interim groundwater remedy still applies to the Phase I and II Parcels in PDO OU 6 (i.e., Parcels 29, 33, 34, 2-71, 2-72, and 2-76) per the Phase I and II RODs.

4. REMEDIAL ACTIONS FOR THE SE AREA

4.1 SE OU 1—K-AREAS

4.1.1 Remedy Selection

The ROD for SE OU 1: K-Areas was signed on 2 August 1991. The remedial action objective (RAO) was to minimize the deterioration of groundwater by providing source control of the contaminated soils. The remedial actions at SE OU 1 included:

- Excavation of 8,000 cubic yards (yd^3) of contaminated soils in the K-Area.
- Thermal treatment of contaminated soils at a temperature not greater than 450 °F.
- Destruction of volatilized contaminants by adsorption of volatilized contaminants onto activated carbon.
- Analysis of representative samples of treated soils and comparison with treatment criteria.
- Return of treated soils to original excavation.

An ESD for the SE Area OU 1: K-Areas was included in the SE OU 1 ROD and was completed in August 1991 (LEAD, 1991). The ESD clarifies that the appropriate ARARs for any metals found in soils during the remediation at the SE Area are the RCRA, 42 U.S.C. § 6901 et seq., Land Disposal Restrictions (LDRs) promulgated at 40 CFR Part 268, and that the Pennsylvania proposed regulations on residual waste management are "To Be Considered" (TBC) in implementing the proposed remedy.

A second ESD was issued in 2004 (LEAD, 2004). This ESD provided for LUCs (see **Figure 3**) to limit future use of the capped areas and a Cap Inspection Plan for annual inspections to protect and monitor the integrity of the caps.

4.1.2 Remedy Implementation

The remedial design for the site was started in September 1991 and completed in June 1993. The plans called for the Army to excavate all soils in the K-Areas that contained 225 parts per billion (ppb) of TCE or greater. The soils were to be thermally treated, as discussed in Subsection 4.1.2.1. Excavation to bedrock (the limits of mechanical excavation) yielded approximately 14,100 yd^3 of soil from Areas K-1, K-2, and K-3 to be treated. Mobilization began in August 1993. LUCs, although already informally in place at the site after remediation was complete, were formally implemented immediately following completion of the 2004 ESD, via the LEAD Master Plan.

4.1.2.1 Low Temperature Thermal Treatment (LT^3)

The LT^3 system was required to remove TCE from the impacted soils down to a residual concentration level of 50 ppb as well as remove other target organic contaminants to the residual LDR concentration limits specified in 40 CFR 268.41. In addition, the LT^3 system was required to comply with all applicable air emissions standards to include a particulate matter concentration of less than 0.08 grains per dry standard cubic foot (dscf) and a 99% removal efficiency of target organic compounds. LT^3 technology was previously used to successfully treat impacted soil at LEAD's IWTP lagoons.

The following performance requirements were required:

- Trichloroethene 50 ppb
- Acetone 160,000 ppb
- Benzene 3,700 ppb
- Carbon tetrachloride 5,600 ppb
- Chlorobenzene 5,700 ppb
- O-Dichlorobenzene 6,200 ppb
- 1,1,1-Trichloroethane 5,600 ppb
- 1,1,2-Trichloroethane 7,600 ppb
- Tetrachloroethene 5,600 ppb
- Ethyl benzene 6,000 ppb
- Toluene 28,000 ppb
- Xylene (total) 28,000 ppb

4.1.2.2 Stabilization

Following LT^3, approximately 4,000 yd^3 of soil that exceeded TCLP standards for lead were treated (fixated) to meet the TCLP regulatory requirements of 5 parts per million (ppm).

4.1.2.3 Backfilling

LT^3 treated and stabilized soil was returned to the area from which it was excavated. These soils were placed into all of the excavations in 8-inch lifts and compacted. The K-Areas were returned to their pre-remediation contours or, where necessary, modified to promote surface water drainage and prevent ponding or collection of surface water. Slopes associated with final grading were constructed and maintained to ensure permanent stability, control erosion, and to allow for the placement of the soil and vegetative cover.

4.1.2.4 Construction of Class III Residual Waste Landfill

The cover system placed on the K-Areas was required to meet all final cover requirements of the PADEP Title 25 Residual Waste Management Regulations, Chapter 288, pertaining to Class III residual waste landfills.

A minimum of 12 inches of the intermediate cover layer was installed in no greater than 8-inch lifts. A 40-mil geomembrane was installed onto the completed intermediate layer. The drainage layer consisted of a Geotextile over a Geonet layer. Cover soil was placed on the drainage layer in a manner that prevented damage to and wrinkling of the Geotextile and Geonet. Topsoil was installed over the cover soil. The topsoil layer was then seeded and mulched.

4.1.2.5 Project Schedule

The following project schedule was implemented:

- August 1993—Began Mobilization and Excavation Shoring activities
- September 1993—Completed Mobilization activities
- November 1993—Received PADEP Exemption Approval for LT^3 system
- November 1993—Continued Excavation/Treatment/Backfill activities
- January 1994—Suspension of Work pending regulatory approval of the Solidification/ Stabilization Treatability report
- April 1994—Resumed Excavation/Treatment/Backfill activities
- October 1994—Completed Excavation/Treatment/Backfill activities
- November 1994—Began Final Cap/Site Restoration activities
- September 1995—Completed Capping and Site Demobilization activities

4.1.2.6 Cost

The remedial action costs were as follows:

- The total cost of the remedial action was $4,295,578.
- The contract cost of the remedial action was $3,905,256.
- Excavation costs were $24.77 per yd^3.
- LT^3 treatment costs were $74.70 per yd^3.
- TCLP soils stabilization costs were $17.13 per yd^3.

4.1.3 Operation and Maintenance

The operation and maintenance (O&M) plan and schedule for the capped areas in the K-Area was documented in the SE OU 1 (K-Areas) *Vegetative Cover Preventative Maintenance and Corrective Action Standard Operating Procedure* (USACE, 2004). The document states that inspections of the capped areas should be conducted on a quarterly basis. Currently, the capped areas are inspected on an annual basis. This was listed in this Five-Year Review as an issue, and the Vegetative Cover SOP will be updated to require annual inspection instead of quarterly inspection.

4.1.4 Current Status

LUCs for SE OU 1 are maintained and enforced through the LEAD Master Plan. In addition, the Army has conducted annual visual inspections of the capped areas. The most current inspection

was conducted in September 2011 and indicated that the landfill cover, the under drainage system, and the liner are intact. The K-Areas were also mowed in November 2011 in accordance with the Cap Maintenance Plan.

4.2 SE OU 2—INDUSTRIAL WASTEWATER SEWER SYSTEM

4.2.1 Remedy Selection

The selected remedy for SE OU 2 is cleaning and abandonment of the sewer lines in the parcels transferred to the public. Also, because the RA showed that there are acceptable risks only for C/I use (and not UU/UE), the remedy includes LUCs to prevent residential use of the property. The RAOs for SE OU 2 include the following:

- Prevent potential future releases from the sewers.
- Prevent residential land use exposure.

As discussed in the ROD for SE OU 2, this remedial action alternative protects human health and the environment, is cost effective, technically and administratively feasible, and its implementation will not present any risks to site workers, the surrounding community, or the environment. The following documents support the selection of the remedy for SE OU 2:

- *SE OU 2, Industrial Wastewater Sewers, Risk Assessment Report, Final* (IT, 2002 LKD.RT-246).
- *Summary Report on the Emergency Removal of Contaminated Soils from the Industrial Wastewater Sewer System at the Letterkenny Army Depot, Chambersburg, PA* (WESTON, 1998c).
- *Data Validation Plan for Historical Analytical Data* (WESTON and MSTI, 1999).
- *Engineering Evaluation/Cost Analysis (EE/CA) for the Industrial Wastewater Sewer System Contaminated Soils for Southeastern Area Operable Unit 2, Letterkenny Army Depot, Chambersburg, PA, Final Report* (Fluor Daniel and ESE, 1996 LKD.RT-119).
- *Remedial Investigation for Southeastern Area Operable Unit 2 Industrial Wastewater Sewer Lines and Associated Contaminated Soils at Letterkenny Army Depot, Draft* (Fluor Daniel and ESE, 1998).
- *SE OU 2 Industrial Wastewater Sewers Feasibility Study Report Final* (Shaw, 2004e LKD.RT-258).
- *Proposed Plan for Southeastern Area Operable Unit 2* (Shaw, 2005a).
- *Record of Decision for Southeastern Area Operable Unit 2* (Shaw, 2006a).

4.2.2 Remedy Implementation

The selected remedy for SE OU 2 includes the following elements:

- Abandonment of the sewer lines in the BRAC parcel, which was completed and reported as part of the SE OU 8 investigations.
- Implementation of LUCs (see **Figure 3**) to restrict land use to C/I.

The Land Use Controls Remedial Design (LUC RD) for SE OU 2 was completed by Shaw and finalized in March 2010 (Shaw, 2010 LKD.RT-336).

4.2.2.1 Sewer Lines

The selected remedy for SE OU 2 consisted of the cleaning and abandonment of the IWWS force main, and gravity drain lines servicing Buildings 37 and 57 to prevent future use of the existing sewers. The IWWS gravity lines in the Army-retained portion of the installation will remain in use. The sewer abandonment activities that were associated with the parcels transferred or to be transferred to the public are shown in **Figures 10** through **16**. The sewer abandonment portion of the SE OU 2 remedy was implemented as part of the RI activities for the IWWS under SE OU 8 and is reported in the RI/RA report for the IWWS System (WESTON, 2008b LKD.RT-316).

The IWWS system flushing/cleaning, testing and abandonment activities were conducted from fall 2004 through spring 2006. Work conducted since 2006 includes abandonment of the industrial wastewater force main that extended from Building 57 to Manhole 140 A, and making reconnections for the sanitary sewer as discussed below.

The IWWS force main extends from the Building 57 to Building 360 (the IWTP). The IWWS force main was abandoned from Building 57 to Manhole 140A. The Building 57 gravity line and parts of the Building 37 gravity line, wet wells, and lift stations remain in use. This section of the force main is approximately 5,000 ft long and varies in diameter from 4 inches at Building 57 to 6 inches at Lift Station No. 2 to Manhole 140A. **Figures 10** through **13** show the IWWS force main associated with Buildings 57, 37, 227 and 228, and 12, respectively, the points at which the line was plugged, and the abandonment of all listening posts, cleanouts, air release manifolds (ARMs), and manholes.

Three sections of the IWWS force main near Buildings 37 and 57 were tested and abandoned as shown in **Figures 14, 15,** and **16**. The remaining unused portion of the IWWS system force main in this area was abandoned. The Army installed a replacement force main (in the vicinity of the abandoned force main) in October 2010 to direct flow from both buildings to the IWTP. Currently, the wastewater from Buildings 37 and 57 is discharged to the IWTP at LEAD.

4.2.2.2 LUCs

The selected remedy for SE OU 2 also includes LUCs to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds. Implementation of this remedy will maintain the industrial use of the property by

the development and enforcement of environmental deed restrictions. These restrictions will become a permanent part of the real estate documentation and will be required to be included in any subsequent sales, transfers, and/or lease agreements. According to the description of the selected remedy in the ROD, "within 90 days after the last signature on this ROD, the Army will prepare and submit to EPA for review and approval a LUC RD as the land use component of the Remedial Design; this LUC RD shall contain LUC implementation and maintenance actions, including periodic inspections." The LUC RD for SE OU 2 was finalized in March 2010 (Shaw, 2010). The LUCs will be maintained until the concentrations of hazardous substances in the soil are at levels that allow for UU/UE. The remedy for SE OU 2 was implemented as discussed below.

LUCs for property that has been transferred to the public, which are located in the Phase I and Phase II parcels (**Figure 6**), were implemented through deed restrictions at the time of property conveyance. The LUCs also include zoning restrictions and enforcement provisions as summarized below. Deed restrictions were included upon transfer of the property to LIDA and include a covenant to use the area solely for non-residential purposes. The deed restrictions do not preclude additional remediation to residential standards; however, the restrictions require USEPA and PADEP approval prior to any residential use of the property. Residential use as defined in the deed restriction includes, but is not limited to, housing, daycare facilities, schools (excluding educational and training programs for persons over 18 years of age), assisted living facilities, and outdoor recreational activities (excluding recreational activities by employees and their families incidental to authorized C/I uses on the property). A Land Use Control Assurance Plan Memorandum of Agreement (LUCAP MOA) was developed and signed by the BRAC Cleanup Team in August 2002. The LUCAP MOA documents the LUCs and mechanisms, the enforcement and the annual reporting requirements, and ensures that the land use restrictions for the Phase I and Phase II BRAC property transfer remain in-place. The LUCAP MOA and its land use control provisions last until August 2012, by which time it will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers, which is currently in progress. The completion of the LUC RD also addresses an issue from the last five-year review: EPA requires that a LUC RD be completed to provide documentation of the remedy for Phases I, II, and V under CERCLA.

For parcels related to SE OU 2 currently retained for military use at LEAD, the LEAD Master Plan describes land use on-post as C/I by specifying various military uses (LEAD Master Plan, Chapter 5). The LEAD Master Plan was amended in January 2010 to explicitly restrict land use for SE OU 2 to C/I. A statement that prohibits residential use at SE OU 2, including residential housing, elementary and secondary schools, child care facilities, and playgrounds was included in the LEAD Master Plan, along with the figure showing the locations of the sewer lines. Some of the parcels associated with SE OU 2 are in the process of transfer to LIDA as part of the Phase V BRAC property transfer; the LUCs for these parcels will be implemented through deed restrictions, analogous to the implementation process for the Phase I and II BRAC parcels, as was previously described. The details for land use restrictions for the sewers were specified in the LUC RD for SE OU 2, which was completed in March 2010 (Shaw, 2010). Currently, land use in SE OU 2 is restricted to C/I through the requirement for health and safety and dig permits to perform work at the site. Security patrols are also being utilized to prevent unauthorized activity at the site.

In addition, the removal of contaminants from groundwater through enhanced bioremediation was conducted for SE OU 2 as part of the SE OU 10 remedial action (see Subsection 4.5).

4.2.3 Operation and Maintenance

The LUCs portion of the SE OU 2 remedy requires O&M to prevent future residential use of the property. Portions of SE OU 2 are located in Army retained land, and portions are located within BRAC Parcels, which will ultimately be transferred to LIDA. As stated in the SE OU 2 ROD, the long-term effectiveness of the LUCs will be contingent upon enforcement of use restrictions initially by the Army through the LEAD Master Plan, and, after transfer, through enforcement of zoning restrictions and environmental deed restrictions.

The LUCAP MOA and the SE OU 2 LUC RD ensure that the LUCs for the Phase I and Phase II BRAC property transfers remain in place. The monitoring and enforcement provisions of the LUCAP MOA include ongoing inspections by the Army as part of day-to-day activities at LEAD. The Army will provide written notification to PADEP and EPA within 3 working days after observing or being informed of LUCs violations. Annual requirements stated in the LUCAP MOA include: annual inspection of the Cumberland Valley Business Park (CVBP); annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual status report of LUCs to PADEP and EPA. Other LUCs mechanisms are deed restrictions; zoning restrictions; and the CVBP Declaration of Covenants, Conditions, and Restrictions (CCRs). LIDA's Health and Safety Plan and the CVBP Declaration of CCRs ensure that the land is used solely for C/I purposes. Additionally, all of the Phase I and Phase II BRAC parcels are located in the portion of Greene Township that has zoning restrictions prohibiting residential use of the land.

The LUCAP MOA documents the mechanisms for, enforcement of, and the annual reporting requirements for the LUCs. LEAD has submitted annual inspection reports to EPA and PADEP for calendar years 1999 through 2011. One requirement under the LUCAP MOA is the development by the BRAC Cleanup Team (BCT) of a notification letter for LIDA. The notification letter was finalized by the BCT in May 2006, signed by the BRAC Environmental Coordinator on June 16, 2006 and delivered to LIDA. LIDA has distributed this notification letter on an annual basis to the CVBP landowners and tenants. Copies of the 2010 and 2011 notification letters are provided in Appendix H. The LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers, which is currently in progress. The LUC RD will specify O&M procedures for the LUCs in SE OU 2.

The sewer abandonment portion of the SE OU 2 remedy does not specifically necessitate O&M because the specified abandonment activities associated with Building 37 and 57 have been completed. The Army has plans to continue using Buildings 37 and 57 under a lease agreement after the property is transferred to LIDA. The Army also plans to use portions of the IWWS lines at Buildings 37 and 57. Therefore, the Army installed a new force main in 2010 in the vicinity of the abandoned force main to direct flow from both buildings to the IWTP.

4.3 SE OU 7—TRUCK OPEN STORAGE AREA/WASTE OIL SUMP (TOSA/WOS)

Note: Groundwater beneath SE OU 8 for sites where a remedial action was implemented, for BRAC Phases I, II and V, is addressed under SE OU 10 (see Subsection 4.5).

4.3.1 Remedy Selection

SE OU 7 is included in the Phase V BRAC property transfer. The PRAP (WESTON, 2010d) was approved and a ROD (WESTON, 2011a) was signed in June 2012 for the Phase V BRAC Sites. The ROD specified LUCs (see **Figure 6**) as the final remedy for soils to restrict SE OU 7 and the other Phase V BRAC Sites in SE OU 8 to C/I use.

The following document related to SE OU 7 was completed and approved to support the ROD for the Phase V BRAC Sites: *Summary of BRAC Investigations at the TOSA/WOS Site (AEDB-R Sites LEAD-080 and -082), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot* (WESTON, 2009c).

The following are RAOs for the Phase V Parcels in SE OU 7:

- Protect human health and the environment.
- Comply with all applicable or relevant and appropriate federal and state environmental laws and regulations (ARARs).
- Prevent direct contact and ingestion of soil under uses less restrictive than C/I (i.e., residential) exposure scenarios.

The following are remedial actions for the Phase V Parcels in SE OU 7:

- Restrict use of the Phase V BRAC Sites to C/I use and prohibit residential development or use.
- Prohibit the construction of any subsurface structure for human occupation, without the prior approval of the Army, EPA, and PADEP.
- Amend LEAD's Master Plan for the Phase V Parcels to reflect the LUCs until the date of transfer.
- Implement the restrictions through the appropriate deed restrictions at the time of transfer.

4.3.2 Remedy Implementation

The LUCs for Phase V will be maintained and enforced through the Environmental Constraints (Chapter 5) of the LEAD Master Plan, which currently restricts the entire Industrial Complex (which includes the Phase V BRAC sites and SE OU 7) to a commercial/industrial use (except where remedial investigations/risk assessments, which have been approved by EPA and PADEP, have cleared the land for unrestricted use). These restrictions remain in place while the Phase V

BRAC Sites remain under Army control and while the Phase I, II, and V LUC RD is being prepared and implemented. When the Phase V BRAC Sites are transferred to LIDA, LUCs will be implemented through deed restrictions or environmental covenants in accordance with the LUC RD. Additionally, existing Greene Township zoning ordinances restrict the property in this area of LEAD to non-residential use. The LUC RD for the Phase I, II, and V BRAC property transfers is currently in progress.

The Army will be responsible for implementing, maintaining, reporting on, and enforcing the LUCs while the Phase V BRAC property is under Army control. After the Phase V BRAC property is transferred to LIDA, the Army may transfer these procedural responsibilities to LIDA or another party by contract or other means. However, the Army shall retain ultimate responsibility for remedy integrity.

4.3.3 Operation and Maintenance

Operation and Maintenance of the Remedy for SE OU 7 is the same as for SE OU 8 Phase V BRAC sites, and is described in Subsection 4.4.3.

4.4 SE OU 8—BRAC WASTE SITES

Note: Groundwater beneath SE OU 8 for sites where a remedial action was implemented, for BRAC Phases I, II and V, is addressed under SE OU 10 (see Subsection 4.5). Groundwater beneath the SE OU 8 sites where no further action was selected was addressed under SE OU 3B and SE OU 14.

4.4.1 Remedy Selection

A Proposed Plan (WESTON, 1998d LKD.RT-133) was approved and a ROD (WESTON, 1998a) was signed in September 1998 for the Phase I Parcels. The ROD specified LUCs (see **Figure 6**) as the final remedy for soils and the interim remedy for groundwater. The following areas comprise the SE portions of Phase I: Parcels 1 and 2, Parcels 3 and 4, Parcel 5, Parcel 6, Parcel 7, Parcel 8, Parcel 9, Parcels 10 through 13, Parcels 16 through 21, Parcels 22 and 31, Parcel 23, Parcel 24, Parcel 25, Parcel 26, and Parcel 27. The locations of these parcels in the SE Area are shown in **Figure 6**.

Decision documents were completed and approved to support the ROD for the Phase I Parcels in the SE Area (*Note: these documents were combined into a single report in the LEAD Administrative Record under LKD.RT-147*):

- *Decision Document for BRAC Parcels 1 and 2, Letterkenny Army Depot* (WESTON, 1998e LKD.RT-147).
- *Decision Document for BRAC Parcels 8 through 13, Letterkenny Army Depot* (WESTON, 1998e).
- *Decision Document for BRAC Parcel 24, Letterkenny Army Depot* (WESTON, 1998e).

- *Decision Document for BRAC Railroad Parcels, Letterkenny Army Depot* (WESTON, 1998e).

The following are the RAOs for the Phase I Parcels in SE OU 8:

- Prevent direct contact and ingestion of soil under residential and other nonindustrial exposure scenario.
- Prevent direct contact and ingestion of groundwater under any scenario.
- Prevent exposure levels of contaminants that produce unacceptable risk.

The following are remedial actions for the Phase I Parcels in SE OU 8:

- Restrict the property for C/I use only.
- Not permit soil excavation activities below a depth of 3 ft above the water table without prior approval of the Army, EPA, and PADEP.
- Not permit the construction of any subsurface structure for human occupation, without prior approval of the Army, EPA, and PADEP.
- Restrict access or use of the groundwater underlying the property without the prior written approval of the Army, EPA, and PADEP.
- Institute an amendment to LEAD's Master Plan for the Phase I Parcels to reflect the LUCs until the date of transfer.
- Implement the restrictions through the appropriate deed restrictions at the time of transfer.
- Establish periodic inspection procedures to ensure adherence to the LUCs.

As stated in the ROD, the long-term effectiveness of the LUCs will be contingent upon enforcement of use restrictions initially by the Army through the LEAD Master Plan, and after transfer, through enforcement of the environmental deed restrictions. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain the LUCs as long as the Army will remain ultimately responsible for the effectiveness of the LUCs.

Implementation of this remedy maintained the industrial use of the property and reduced the future risk of exposure to groundwater by the development and enforcement of environmental deed restrictions. These restrictions became a permanent part of the real estate documentation and are required to be included in any subsequent sales, transfers, and/or lease agreements.

A PRAP (WESTON, 2001a LKD.RT-181) was approved and a ROD (WESTON, 2001b) was signed in July 2001 for the Phase II Parcels. The ROD specified LUCs (see **Figure 6**) as the final remedy for soils and the interim remedy for groundwater. The following areas comprise the SE

Portions of Phase II: Parcels 2-35 through 2-77 (with the exception of Parcel 2-73). The locations of these parcels in the SE Area are shown in **Figure 6**.

Because the groundwater beneath the Phase II parcels was known to be or potentially was contaminated with VOCs, the Army and LIDA defined the Phase II parcels to exclude the groundwater. To expedite transfer, the Phase II parcels were defined to include only the surface structures and soil to a depth of 8 ft below ground surface, which is above the seasonal high groundwater table.

The following documents were completed and approved to support the ROD for the Phase II Parcels in the SE Area:

- *Final Decision Document, Former PCB Transformer Sites in Southeastern (SE) Area, Operable Unit (OU) 8, (Defense Site Environmental Restoration Tracking System [DSERTS] Site LEAD-125)* (WESTON, 2000a LKD.RT-175).
- *Final Termination Survey Report for Building 441 at Letterkenny Army Depot* (WESTON, 2000b LKD.RT-169.).
- *Remedial Investigation and Risk Assessment Report for the Gate 1 Guardhouse, Building 511, Southeastern Area (SE) Operable Unit (OU) 8, Letterkenny Army Depot,* Final Report (WESTON, 2001d LKD.RT-183).
- *Groundwater Vapor Intrusion Risk Assessment, Letterkenny Army Depot,* Final Report (WESTON, 2001e LKD.RT-182).
- *Feasibility Study Report for the Gate 1 Guardhouse, Building 511, Southeastern Area (SE) Operable Unit (OU) 8, Letterkenny Army Depot,* Final Report (WESTON, 2001f LKD.RT-180).
- *Seasonally High Groundwater Determination for the Phase 2 BRAC Parcels, Letterkenny Army Depot,* Final Report (EPSYS, 2001).

The following are RAOs for the Phase II Parcels in SE OU 8:

- Prevent direct contact and ingestion of soil under residential and other nonindustrial exposure scenario.
- Prevent direct contact and ingestion of groundwater under any scenario.
- Prevent exposure to levels of contaminants that produce unacceptable risk.

The following are remedial actions for the Phase II Parcels in SE OU 8:

<u>Restrictions Related to Soil:</u>

- Restrict the Gate 1 Guardhouse (Building 511 Area) to C/I use.

Note: Although there were no soil-related LUCs specified in the Phase II ROD for SE OU 8 sites (other than for restricting the Gate 1 Guardhouse site to C/I use), for administrative

purposes all of the SE OU 8 Phase II parcels were transferred with restrictions for C/I and agricultural use only per the Phase II FOST (WESTON, 2002c).

Restrictions Related to Groundwater:

- Prohibit soil excavation activities below a depth of 3 ft above the water table without prior approval of the Army.
- Prohibit the construction of any subsurface structure for human occupation, without the prior approval of the Army, EPA, and PADEP.
- Prohibit access to or use of the groundwater underlying the Phase II Parcels without the prior written approval of the Army, EPA, and PADEP.
- Amend LEAD's Master Plan for the Phase II Parcels to reflect the LUCs until the date of transfer.
- Implement the restrictions through the appropriate deed restrictions at the time of transfer.

In addition, upon transfer of the property, the Army, in consultation with EPA and PADEP, established periodic inspection procedures as described in the LUC Assurance Plan and the LUC Implementation Plan to ensure adherence to the LUCs. By means of the LUC Assurance Plan (LUCAP), which is a Memorandum of Agreement (MOA) with EPA and PADEP, LEAD, on behalf of the Department of the Army, agreed to implement Depot-wide certain periodic site inspection, condition certification, and agency notification procedures designed to ensure the maintenance by Army personnel (or other approved designee) of any site-specific LUCs deemed necessary for future protection of human health and the environment. The LUCAP MOA will be replaced by the LUC RD for the Phases I, II, and V BRAC property transfers. The LUC RD is currently in progress and will be completed in 2012.

An ESD was completed in May 2012 for the Phase I and II Parcels (WESTON, 2012a). The purpose of the ESD was to document a significant change to a component of the soil remedy (LUCs) described in the RODs for the Phase I and II Parcels and the FOST for Phase II. The ESD documented that the soil-related LUCs for all Phase I Parcels (except for Parcels 1, 2, 10, and 12) and for part of the Phase II Parcel 2R-80 associated with the Gate 1 Guardhouse, Building 511 Area were lifted as those parcels were deemed suitable for UU/UE (WESTON, 2012a). Soil LUCs were retained for Phase I Parcels 1, 2, 10, and 12. Since the ESD was only recently completed, the review of the remedy and LUCs for the Phase II Parcel associated with the Gate 1 Guardhouse, Building 511 Area was included in this five-year review.

Groundwater underlying SE OU 8 sites where a remedy was implemented is addressed under SE OU 10 (see Subsection 4.5). A ROD was signed for SE OU 10 in 2006. In addition, an ESD was completed for SE OU 10 groundwater in September 2009. The ESD documented the lifting of groundwater use restrictions from each of the Phase I and II Parcels (except Parcels 10, 12, 2-65, 2-66, and 2R-82) that are outside the current SE OU 10 VOC groundwater contaminant plume.

A PRAP (WESTON, 2010d) was approved and a ROD (WESTON, 2011a) was signed in June 2012 for the Phase V BRAC Sites. The ROD specified LUCs (see **Figure 6**) as the final remedy

for soils to restrict the Phase V BRAC Sites to C/I use (WESTON, 2012b). The following areas comprise the SE Portions of Phase V: Parcels 5-100 through 5-107, 5-109, 5-110, 5-114 through 5-116, 5-121, and the IWWS System Lines Site. The locations of these parcels in the SE Area are shown in **Figure 6**.

It was determined that portions of the IWWS System Lines Site are suitable for UU/UE. Therefore, the remedy for portions of the IWWS System Lines Site (areas overlapping Phase I and II Parcels 5, 6, 7, 2-47, 2-63, and 2-64) was changed from restricting the property to C/I with LUCs, as described in the Phase V PRAP, to No Further Action, as documented in the Phase V ROD (WESTON, 2012b).

This change allowed the LUCs to be lifted from Phase I Parcels 5, 6, and 7, which was documented in the ESD for the Phase I and II Parcels (WESTON, 2012a). The remaining portions of the IWWS in SE OU 8 will be transferred with LUCs to restrict these areas to C/I use.

The following documents related to SE OU 8 were completed and approved to support the ROD for the Phase V BRAC Sites:

- *RI/RA Report for the Building 57 Site (AEDB-R Site LEAD-001), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2008a).*
- *RI/RA for the Building T-228 Battery Acid Disposal Pit Site (AEDB-R Site LEAD-008), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2005i LKD.RT-272).*
- *RI/RA for the Former Transformer Area Near Building 98 Site (AEDB-R Site LEAD-055/125), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2004b LKD.RT-248).*
- *RI/RA for the Lot 29 Ingot Storage Area Site (AEDB-R Site LEAD-060), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006f, LKD.RT-286).*
- *RI/RA Report for the Lot 48 Ingot Storage Area (AEDB-R Site LEAD-060), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006g, LKD.RT-287).*
- *RI/RA for the SE Sediment Pile Areas Site (AEDB-R Site LEAD-073), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2004c, LKD.RT-252).*
- *RI/RA for the Building 16 and 17 Area Site (AEDB-R Site LEAD-092), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2004d, LKD.RT-253).*

- *RI/RA for the Building 433 LDP Site (AEDB-R Site LEAD-118), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2004e LKD.RT-249).*

- *RI/RA Report for the Former Storage Area West of Building 446 (AEDB-R Site LEAD-118), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006h LKD.RT-281).*

- *RI/RA and RCRA Closure Report for the Building 422 North Site (AEDB-R Site LEAD-118), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006i LKD.RT-283).*

- *RI/RA and RCRA Closure Report for the Building 433 West Site (AEDB-R Site LEAD-118), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006j LKD.RT-282).*

- *RI/RA for the ASTs at the Golf Course Storage Buildings Site (AEDB-R Site LEAD-118), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006k LKD.RT-280).*

- *RI/RA for the Building 437 UST Site (AEDB-R Site LEAD-126), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2003c LKD.RT-229).*

- *RI/RA for the Building 425 UST Site (AEDB-R Site LEAD-126), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006l LKD.RT-278).*

- *RI/RA Report for the Industrial Wastewater Sewer (IWWS) System (AEDB-R Site LEAD-127), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2010i LKD.RT-316).*

- *Addendum to the RI/RA Report for the Industrial Wastewater Sewer (IWWS) System (AEDB-R Site LEAD-127), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2010j LKD.RT-350).*

- *RI/RA for the Former Storage Area Near Buildings S38-1 and S38-2 Site (AEDB-R Site LEAD-130), Southeastern (SE) Area Operable Unit (OU) 8, Letterkenny Army Depot (WESTON, 2006m LKD.RT-276).*

The following are RAOs for the Phase V Parcels in SE OU 8:

- Protect human health and the environment.

- Comply with all applicable or relevant and appropriate federal and state environmental laws and regulations (ARARs).

- Prevent direct contact and ingestion of soil under uses less restrictive than C/I (i.e., residential) exposure scenarios.

The following are remedial actions for the Phase V Parcels in SE OU 8:

- Restrict use of the Phase V BRAC Sites, except for the portions of the IWWS System Site that were cleared for UU/UE (as discussed in Section 13 of the Phase V ROD), to C/I use and prohibit residential development or use.
- Prohibit the construction of any subsurface structure for human occupation, without the prior approval of the Army, EPA, and PADEP.
- Amend LEAD's Master Plan for the Phase V Parcels to reflect the LUCs until the date of transfer.
- Implement the restrictions through the appropriate deed restrictions at the time of transfer.

4.4.2 Remedy Implementation

LUCs were adopted by the LIDA in October 1998 at the time of the Phase I Properties transfer. The LUCs mechanisms consist of: permanent deed restrictions placed on the property, Greene Township zoning restrictions, and the CVBP Declaration of CCRs. The LUCs consist of the following: restricting the use of the property to C/I; prohibiting the excavation of soil deeper than 3 ft above the water table without the prior approval of the Army; prohibiting access to groundwater underlying the property without the prior written approval of the Army, PADEP, and EPA; and prohibiting construction of subsurface structures without the prior approval of the Army. The same approach was adopted at the time of property transfer of the Phase II Parcels in May 2002.

The LUCs for Phase V will be implemented, maintained and enforced through the Environmental Constraints (Chapter 5) of the LEAD Master Plan, which currently restricts the entire Industrial Complex (including the Phase V BRAC sites and SE OU 7) to a commercial/industrial use (except where remedial investigations/risk assessments, which have been approved by EPA and PADEP, have cleared the land for unrestricted use). These restrictions remain in place while the Phase V BRAC property remains under Army control and while the LUC RD for Phase I, II, and V is being prepared and implemented. When the Phase V BRAC property is transferred to LIDA, LUCs will be implemented through deed restrictions or environmental covenants. Additionally, existing Greene Township zoning ordinances restrict the property in this area of LEAD to non-residential use.

4.4.3 Operation and Maintenance

As stated previously in Section 4, the LUCAP MOA for the LEAD BRAC parcels was signed by the Army, EPA, and PADEP in July and August of 2002 to ensure that the soil and groundwater use restrictions for the Phase I and Phase II BRAC property transfer remain in place. The LUCAP MOA documents the LUCs and mechanisms, the enforcement, and the annual reporting requirements. Annual requirements stated in the LUCAP MOA include annual inspection of the

CVBP; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual status report of LUCs to PADEP and EPA. Other institutional control mechanisms are deed restrictions, zoning restrictions, and the CVBP Declaration of CCRs. The LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers, which is currently in progress. The LUC RD will specify O&M procedures for the LUCs at LEAD.

The Phase I and II parcels are located in the CVBP where a potable water supply/distribution system is already in-place (that does not use groundwater from the LEAD Site). LIDA's Health and Safety Plan and the CVBP Declaration of CCRs ensure that the land is used solely for C/I purposes and that the users of the site are protected from exposure to VOC-contaminated groundwater. Additionally, all of the Phase I and Phase II BRAC parcels are located in the portion of Greene Township that has zoning restrictions prohibiting residential use of the land.

The Army will be responsible for implementing, maintaining, reporting on, and enforcing the LUCs while the Phase V BRAC property is under Army control. After the Phase V BRAC property is transferred to LIDA, the Army may transfer these procedural responsibilities to LIDA or another party by contract or other means. However, the Army will retain ultimate responsibility for remedy integrity.

LEAD has submitted annual LUCs inspection reports to the EPA and PADEP for calendar years 1999 through 2010. The 2011 inspection report is in progress and will be submitted in early 2012. One requirement under the LUCAP MOA is the development by the BCT of a notification letter for the LIDA. The notification letter was finalized by the BCT in May 2006, signed by the BRAC Environmental Coordinator on June 16, 2006 and delivered to LIDA. LIDA has and will continue to distribute this notification letter on an annual basis to the CVBP landowners and tenants.

4.5 SE OU 10— SOUTHERN SOUTHEAST INDUSTRIAL AREA VOC-CONTAMINATED GROUNDWATER SOUTH OF GATE 6 (CONOCOCHEAGUE DRAINAGE SYSTEM)

4.5.1 Remedy Selection

SE OU 10 addresses the groundwater in the SIA of LEAD, which underlies SE OU 7 and SE OU 8 sites in BRAC Phases I, II and V. A final PRAP was completed in February 2005, and a ROD was completed in March 2006 (signed by the Army in August 2006 and by EPA in September 2006). The selected remedy for SE OU 10 included enhanced biodegradation, monitored natural attenuation of contaminants in groundwater, and implementation of LUCs (see **Figure 17**) to restrict site use. The timeline for the selected remedy is presented in Subsections 4.5.2.1 through 4.5.2.3.

The following RAOs were identified for lands associated with SE OU 10:

- Protect human health and the environment.
- Restore the aquifer to federal and state drinking water standards within a reasonable timeframe.
- Comply with all federal and state environmental laws and ARARs.
- Reduce or eliminate further contamination of groundwater.
- Reduce or eliminate the migration of VOC-contaminated groundwater off-post and the discharge of VOC-contaminated groundwater to surface waters at off-post springs.
- Provide a suitable remedial alternative so that land can be transferred for beneficial use with minimal limitations.
- Prevent human exposure to contaminants associated with VOC-contaminated groundwater and springs at concentration in excess of the remediation levels.

The remediation levels defined in the ROD for SE OU 10 were as follows:

- In groundwater throughout SE OU 10, attain the EPA MCLs and PADEP MSCs for Organic Regulated Substances in Groundwater in groundwater throughout SE OU 10.
- Reduce concentrations of volatile organic chemicals, which are known or suspected carcinogens, in groundwater throughout SE OU 10 to acceptable exposure levels, which, as defined by the NCP in 40 CFR 300.430 (e)(2)(i), are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}.
- Reduce concentrations of VOCs in groundwater throughout SE OU 10 to levels to which the human population may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety.
- In surface water at Hawbaker spring, attain the Pennsylvania Water Quality Criteria (WQC) for Toxic Substances.

At the time of the ROD for SE OU 10, RAOs were not included for vapor intrusion pathway because it was determined that the vapor intrusion pathway for off- site areas was not a pathway of concern, and the vapor intrusion pathway for on-site areas was still in the process of being fully understood due to changes in progress of scientific approach for this pathway. For on-site areas, the vapor intrusion pathway is being evaluated under SE OU 8 as part of the CERCLA process for Building 37 and 47 sites. A remedy has not yet been selected for these sites, and the status is discussed in Section 1.2.9.

4.5.2 Remedy Implementation

As stated above, the selected remedy for SE OU 10 included enhanced biodegradation, monitored natural attenuation of contaminants in groundwater, and implementation of LUCs to restrict site use. The following subsections provide details on each of these remedial actions.

An ESD was completed in 2009 to document a significant change to the SE OU 10 remedy: the lifting of groundwater use restrictions from some of the on-post areas of SE OU 10 (WESTON, 2009d). At the time of the signing of the ROD, there were multiple areas within the LUCs

boundaries of SE OU 10 where groundwater contamination did not exceed MCLs or risk-based levels. Some areas were upgradient or outside of the contaminant plume. In addition, the groundwater plume had been reduced in size as a result of an extended pilot study conducted prior to the date of the SE OU 10 ROD. The ESD documented the lifting of the following groundwater use restrictions from each of the Phase I, II, and V BRAC Parcels (except Parcels 10, 12, 2-65, 2-66, and 2R-82) because these areas are outside the current SE OU 10 VOC groundwater contaminant plume:

- Restrict soil excavation, digging, drilling, or other disturbance of soil activities below the water table without the prior approval of the Army.
- Restrict access to or use of the groundwater underlying the property without the prior approval of the Army, PADEP, and EPA.
- Restrict construction of any subsurface structure for human occupation without the prior approval of the Army, PADEP, and EPA.

In addition to lifting groundwater use restrictions, the Army continued monitoring groundwater outside the extent of the SE OU 10 groundwater plume. In accordance with the CVBP's Declaration of CCRs, one of the prohibited uses of the property is drilling for water. Installation and pumping of any new wells upgradient or downgradient of the SE OU 10 groundwater plume could potentially result in migration of the plume; the CVBP's Declaration of CCRs prohibit installation of any new groundwater wells upgradient of the SE OU 10 groundwater plume.

4.5.2.1 Enhanced Biodegradation

Enhanced biodegradation technology was shown to be effective at the site based on the results of bench-scale and full-scale field pilot tests and was selected for SE OU 10 based on the nine CERCLA evaluation criteria. The selected remedial alternative was subsequently incorporated into the final PRAP for the site (WESTON, 2005c).

Continuation of the enhanced biodegradation program on a full-scale basis was implemented in November 2000 and concluded in June 2007. Preliminary indications suggest that the enhanced bioremediation program was an effective remedial strategy for reducing the mass and toxicity of the VOCs in the site groundwater.

4.5.2.2 Monitored Natural Attenuation

Since implementation of the remedial action in November 2000, a long-term groundwater and surface water sampling was implemented at SE OU 10. Sampling was conducted on a tri-annual basis (April, August, and December) until 2010 at four locations to track the monitored natural attenuation of the BTEX portion of the plume. As of August 2010, the sampling program at SE OU 10 is conducted annually, and seven total monitoring wells are sampled. The rationale for each of the seven sampling locations is discussed in detail in the Remedial Action Work Plan for SE OU 10 (WESTON, 2007c). Samples are analyzed for VOCs in accordance with EPA's CLP requirements. All data packages are subject to independent, third party data validation. Annual reports summarizing the results of the MNA program and the status of the LUCs have been and will continue to be submitted to the agencies by the end of the first quarter of each year.

4.5.2.3 LUCs

The LUCs for the Army-retained (i.e., not yet transferred) portions of SE OU 10 are maintained and enforced by the LEAD Master Plan. LUCs for land within the boundaries of SE OU 10 that has been transferred to LIDA are described in the LUCAP MOA. The LUCAP MOA expires in 2012, and will be replaced by the LUC RD for Phase I, II, and V. The LUC RD will ensure the ongoing effectiveness of LUCs in SE OU 10.

An ESD for SE OU 10 was completed in 2009, and groundwater LUCs for the majority of the Phase I, II, and V Parcels within SE OU 10 were lifted; however, groundwater use restrictions have been retained for Phase I Parcels 10 and 12 and Phase II Parcels 2-65, 2-66, and 2R-82 (WESTON, 2009d). The objectives of the groundwater use restrictions for SE OU 10 are as follows:

- Reduce risks to human health by preventing the use of VOC-contaminated groundwater for bathing, showering, and drinking throughout SE OU 10; prohibiting people from digging into, drilling into, or otherwise disturbing soil below the water table in on-post areas (Army-retained and BRAC property); and prohibiting people from building subsurface structures designed for human occupation in on-post areas (Army-retained and BRAC property).
- Maintain the integrity of any current or future remedial or monitoring system associated with SE OU 10 remedial actions, such as monitoring wells.

4.5.3 Operation and Maintenance

No O&M for the enhanced biodegradation program is currently necessary; the program was concluded in June 2007, which is when the final nutrient injection occurred. Sampling for MNA parameters is ongoing.

The continued need for LUCs within SE OU 10 is evaluated as part of the CERCLA five-year review process for the SE Area of LEAD. Assessment of the need for LUCs at SE OU 10 is included in Section 7. In accordance with the SE OU 10 ESD, LUCs are only necessary and in place in a focused area where contamination remains above MCLs and health-based levels. The LUCs are maintained by continued inspections ensuring that groundwater use restrictions remain in place and that there is no unauthorized use of groundwater in the areas where restrictions remain (WESTON, 2009d).

When a part of the property in SE OU 10 is transferred, the LUCs will be implemented through appropriate use restrictions in the deed, which will be recorded at the time of transfer. In addition, upon transfer of the property, the Army, in consultation with EPA and PADEP, will make arrangements to maintain the LUCs. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain the LUCs as long as the Army will remain ultimately responsible for the effectiveness of the LUCs. In addition, the Greene Township Code (*Code of the Township of Greene Pennsylvania, Part II General Legislation, V3 Updated through 12-15-2002, Chapter 85, Subdivision and Land Development, and Chapter 101, Water)* also applies to SE OU 10, which is located entirely within Greene Township (Greene Township,

2011). The Greene Township Code requires connection to public water supply for specified areas and situations as defined in Chapters 85 and 101 of the 2005 Code of the Township of Greene. Chapter 85 states that if any part of a proposed subdivision, mobile home park, or land development is located within 500 ft of an existing or planned public water system, it shall be connected to said water system and shall serve every lot, dwelling unit, or other occupancy within the proposed subdivision. Chapter 101 of Greene Township Code requires connection to public water supply for existing structures located within 150 ft of a public water system where the existing individual or semipublic water supply becomes nonfunctional or inadequate, as defined by the code. On-post water is supplied by the FCGA from the Letterkenny Reservoir located in Roxbury, PA.

While the groundwater in the off-post portion of SE OU 10 contained VOCs above MCLs, the Army hooked residences into the public water supply; however, VOCs have not exceeded MCLs in the off-post portion of SE OU 10 since 2002. Also, as described above, existing codes are in place and implemented by Greene Township that require connection to public water supply for specified areas and situations as defined in Chapters 85 and 101 of the 2005 Code of the Township of Greene. In addition, the Greene Township Code Chapter 101 contains a provision for requiring additional analysis of a water supply if the township has reason to suspect that harmful substances are present in amounts that are significantly adverse to human health and safety. The Army will be responsible for providing off-post sampling results to Greene Township and the public through annual reporting until ARARs are met and maintained throughout SE OU 10; however, there are no restrictions to excavation depths and no construction prohibitions off-post. The Army will work with Greene Township to ensure that property owners are provided access to all pertinent information regarding groundwater contamination and remediation progress so that the Township can evaluate the current codes and ordinances that apply.

5. REMEDIAL ACTIONS FOR THE PDO AREA

5.1 PDO OU 6— BRAC WASTE SITES

5.1.1 Remedy Selection

A PRAP (WESTON, 1998d) was approved and a ROD (WESTON, 1998a) was signed in September 1998 for the Phase I Parcels. The ROD specified LUCs as the final remedy for soils and the interim remedy for groundwater (see **Figure 6**). The following areas comprise the PDO portions of Phase I: Parcel 28, Parcel 29, and Parcels 33 and 34. The locations of these parcels in the PDO Area are shown in **Figure 6**.

The following documents were completed and approved to support the ROD for the Phase I Parcels in the PDO Area:

- *Decision Document for BRAC Parcel 29, Letterkenny Army Depot* (WESTON, 1998i LKD.RT-174-3).
- *Decision Document for BRAC Railroad Parcels, Letterkenny Army Depot* (WESTON, 1998h).

The following are RAOs for the Phase I Parcels in PDO OU 6:

- Prevent direct contact and ingestion of soil under residential and other nonindustrial exposure scenario.
- Prevent direct contact and ingestion of groundwater under any scenario.
- Prevent exposure levels of contaminants that produce unacceptable risk.

The following are remedial actions for the Phase I Parcels in PDO OU 6:

- Restrict the property for C/I use only.
- Not permit soil excavation activities below a depth of 3 ft within the water table without prior approval of the Army.
- Not permit the construction of any subsurface structure for human occupation, without prior approval of the Army, EPA, and PADEP.
- Restrict access or use of the groundwater underlying the property without the prior written approval of the Army, EPA, and PADEP.
- Institute an amendment to LEAD's Master Plan for the Phase I Parcels to reflect the institutional controls until the date of transfer.

- Implement the restrictions through the appropriate deed restrictions at the time of transfer.
- Establish periodic inspection procedures to ensure adherence to the institutional controls.

As stated in the ROD, the long-term effectiveness of the institutional controls will be contingent upon enforcement of use restrictions initially by the Army through the LEAD Master Plan, and, after transfer, through enforcement of the environmental deed restrictions. The enforcement of these restrictions will be the responsibility of LIDA, the Army, EPA, and PADEP.

Implementation of this remedy will maintain the industrial use of the property and reduce the future risk of exposure to groundwater by the development and enforcement of environmental deed restrictions. These restrictions will become a permanent part of the real estate documentation and will be required to be included in any subsequent sales, transfers, and/or lease agreements.

A Proposed Plan (WESTON, 2001a) was approved and a ROD (WESTON, 2001b) was signed in July 2001 for the Phase II Parcels. The ROD specified institutional controls as the final remedy for soils and the interim remedy for groundwater (see **Figure 6**). The following areas comprise the PDO Portions of Phase II: Parcels 2-71, 2-72, 2-74, 2-76, 2R-86, 2R-87, and 2R-88. The locations of these parcels in the PDO Area are shown in **Figure 6**.

Because the groundwater beneath the Phase II parcels is known to be or potentially is contaminated with VOC's, the Army and LIDA have defined the Phase II parcels to exclude the groundwater. To expedite transfer, the Phase II parcels are defined to include only the surface structures and soil to a depth of 8 ft below ground surface which is above the seasonal high groundwater table.

The following documents were completed and approved to support the ROD for the Phase II Parcels in the PDO Area:

- *Groundwater Vapor Intrusion Risk Assessment, Letterkenny Army Depot.* Final Report (WESTON, 2001e).
- *Seasonally High Groundwater Determination for the Phase 2 BRAC Parcels, Letterkenny Army Depot.* Final Report (EPSYS, 2001).

The following are RAOs for the Phase II Parcels in PDO OU 6:

- Prevent direct contact and ingestion of soil under residential and other nonindustrial exposure scenario.
- Prevent direct contact and ingestion of groundwater under any scenario.
- Prevent exposure to levels of contaminants that produce unacceptable risk.

The following are remedial actions for the Phase II Parcels in PDO OU 6:

- Although no soil-related LUCs were specified in the Phase II ROD (other than for restricting the SE area Gate 1 site to C/I use), all of the PDO Phase II parcels were transferred with restrictions for C/I and agricultural use only (except for Parcels 2-74 A and B) per the Phase II FOST. The Phase II FOST allows for UU/UE use for Parcels 2-74A and 2-74B. The Phase II FOST further defined residential use in Enclosure 7, *Environmental Protection Provisions*, Section 3 Land Use Restrictions, Paragraph A (WESTON, 2002c).

- As discussed below, the following LUCs were implemented for the PDO OU 6 Phase II BRAC sites as per the ROD

  Groundwater Related restrictions:

  - Prohibit soil excavation activities below a depth of 3 ft above the water table without prior approval of the Army.

  - Prohibit the construction of any subsurface structure for human occupation, without the prior approval of the Army, EPA, and PADEP.

  - Restrict access or use of the groundwater underlying the property without the prior written approval of the Army, EPA, and PADEP.

  - Institute an amendment to LEAD's Master Plan for the Phase II Parcels to reflect the institutional controls until the date of transfer.

  - Implement the restrictions through the appropriate deed restrictions at the time of transfer.

In addition, upon transfer of the property, the Army, in consultation with EPA and PADEP, established periodic inspection procedures as described in the LUCAP MOA and the LUC Implementation Plan to ensure adherence to the institutional controls. By means of the LUCAP MOA, LEAD, on behalf of the Department of the Army, agreed to implement Depot-wide, certain periodic site inspection, condition certification, and agency notification procedures designed to ensure the maintenance by Army personnel (or other approved designee) of any site-specific LUCs deemed necessary for future protection of human health and the environment. The LUCAP MOA will be replaced by the LUC RD for the Phases I, II, and V BRAC property transfers. The LUC RD is currently in progress and will be completed in 2012.

An ESD was completed in May 2012 for the Phase I and II Parcels (WESTON, 2012b). The purpose of the ESD was to document a significant change to a component of the remedy described in the RODs for the Phase I and II Parcels and the Phase II FOST: removal of soil-related LUCs from particular Phase I and II BRAC Parcels for which the LUCs are not necessary. Phase I Parcels in the PDO Area of LEAD (Parcels 28, 29, 33, 34) were deemed suitable for UU/UE and the respective soil-related LUCs were lifted (WESTON, 2012a).

Groundwater LUCs related to groundwater use and contact will remain in place in PDO OU 6, including:

- Prohibit soil excavation activities below a depth of 3 ft above the water table without prior approval of the Army.
- Prohibit the construction of any subsurface structure for human occupation, without the prior approval of the Army, EPA, and PADEP.
- Restrict access or use of the groundwater underlying the property without the prior written approval of the Army, EPA, and PADEP.

5.1.2 Remedy Implementation

LUCs were adopted by the LIDA in October 1998 at the time of the Phase I Properties transfer. The LUCs mechanisms consist of permanent deed restrictions placed on the property, Greene Township zoning restrictions, and the CVBP Declaration of CCRs. The LUCs consist of the following: restricting the use of the property to C/I; prohibiting the excavation of soil deeper than 3 ft above the water table without the prior approval of the Army; prohibiting access to groundwater underlying the property without the prior written approval of the Army, PADEP, and EPA; and prohibiting construction of subsurface structures without the prior approval of the Army. The same approach was adopted at the time of property transfer of the Phase II Parcels in May 2002.

5.1.3 Operation and Maintenance

As stated previously in Section 4, the LUCAP MOA for the LEAD BRAC parcels was signed by the Army, EPA, and PADEP in July and August of 2002 to ensure that the soil and groundwater use restrictions for the Phase I and Phase II BRAC property transfer remain in-place. The LUCAP MOA documents the LUCs and mechanisms, the enforcement, and the annual reporting requirements. Annual requirements stated in the LUCAP MOA include annual inspection of the CVBP; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual status report of LUCs to PADEP and EPA. Other institutional control mechanisms are deed restrictions, zoning restrictions, and the CVBP Declaration of CCRs. The LUCAP MOA expires in August 2012 and will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers, which is currently in progress. The LUC RD will specify operations and maintenance procedures for the LUCs at LEAD. After the expiration date of the LUCAP MOA, operations and maintenance for LUCs related to groundwater use and contact will be specified and administered under the ROD and remedial design for PDO OU 2 and PDO OU 4.

LEAD has submitted annual LUCs inspection reports to EPA and PADEP for calendar years 1999 through 2010. The 2011 inspection report is in progress for early 2012 submittal. One requirement under the LUCAP MOA is the development by the BCT of a notification letter for LIDA. The notification letter was finalized by the BCT in May 2006, signed by the BRAC Environmental Coordinator on June 16, 2006 and delivered to LIDA. LIDA distributes this notification letter on an annual basis to the CVBP landowners and tenants.

6. FIVE-YEAR REVIEW PROCESS

The following tasks were conducted as part of the five-year review process: document review, interviews, site inspection, ARARs review, and data review. There were no significant changes in the ARARs or site contaminants for OUs with final RODs; therefore, site risks were not recalculated.

6.1 FIVE-YEAR REVIEW TEAM

The five-year review was led by Bryan Hoke, Installation Restoration Program Manager and BRAC Environmental Coordinator, LEAD. The following team members assisted in the analysis and/or review:

- Ruth Bishop, PADEP Regional Project Manager.
- Susanne Haug, Bruce Beach, and Jerry Hoover, Project Managers, EPA Region III.

The five-year review was originally presented to the community at a RAB meeting in March 2011. The presentation provided the following information:

- The site name and location;
- The lead agency conducting the review;
- A brief description of the two NPL sites, the operable units and selected remedies;
- A summary of contamination addressed by the selected remedy;
- How the community can contribute during the review process;
- A contact name and telephone number for further information; and
- The scheduled completion date of the five-year review.

A copy of the presentation is available in the Letterkenny Administrative Record (http://www.leadenv.com/leadenv; username: guest, password: guest). The community was informed again of the five-year review in October 2011 through an email to Restoration Advisory Board (RAB) members from Bryan Hoke. The purpose and requirement of a CERCLA five-year review was presented at the October 2011 RAB meeting and it was determined that the SE and PDO five-year reviews would be combined into a single five-year review.

6.2 INTERVIEWS

The Army used a community questionnaire in lieu of using phone interviews for all of the feedback (phone interviews were the approved method used for previous five-year review) for the following reasons: the Army has kept the community involved on a regular basis throughout the CERCLA process including, but not limited to, quarterly RAB meetings, newspaper notices, public meetings, and past interviews; feedback from the community involvement, including throughout the past two five-year review processes, which indicates that the community is satisfied with the progress of cleanup at LEAD and does not have major concerns. Feedback from the previous phone interviews suggested that sufficient feedback could be obtained through

mailed questionnaires while also providing an enhanced level of comfort for the interviewee. Questions were customized for certain recipients. For example, the cleanup contractor was asked questions focused on the progress of the remedial action.

Community feedback was provided via interviews or community questionnaires, obtained from the following:

- Adjacent resident with past interest in activities
- LIDA official
- Two Business park tenants with past interest in activities
- Army restoration program managers
- Army cleanup contractor for SE OU 10 progress
- PADEP
- Greene township Supervisor

The interview summaries are presented in **Appendix A** of this document. *Note: Not all interviews that were sent to the specified parties were returned to the Army; Appendix A contains those interviews that were completed and returned.*

6.3 SITE INSPECTION

Inspections are conducted throughout the calendar year during construction events. Note that as of the date of this document, there are no active remediation activities taking place that need inspection other than LUCs and groundwater monitoring. Site inspections include ensuring LUCs are still in place and protective, cap inspections in SE OU 1, and inspection of wells in SE OU 10 to ensure sampling for MNA parameters continues. These inspections are included in the annual letter that is submitted to EPA and PADEP that documents the status of the LUCs. The annual inspection letters can be found on the Letterkenny Army Depot Environmental Website, Administrative Records, Regulatory Correspondence, at http://209.235.100.233/padep/testrunsearch2.htm. In addition, backup information for inspections since 1999 can be found in the Constructions Inspection yearly office files. Final site inspections for all the sites addressed in the five-year review were conducted on 19 April 2012. A table summarizing the inspections and the final site inspection checklists are presented in **Appendix B**. The table includes inspection location, date of inspection, reason for inspection, inspector(s), inspection activities, results and findings, and inspection report/data location.

In addition, the following documents and data were reviewed for the five-year review report:

- *Proposed Plan for Phase I Parcels, Letterkenny Army Depot* (WESTON, 1998d).
- *Record of Decision for Phase I Parcels, Letterkenny Army Depot* (WESTON, 1998a).
- *Area of Concern Decision Documents, Phase I Parcels, Letterkenny Army Depot* (WESTON, 1998e).
- *Finding of Suitability to Transfer (FOST) for Phase I Parcels, Letterkenny Army Depot* (WESTON, 1998b).

- *Proposed Plan for Phase II BRAC Parcels, Letterkenny Army Depot* (WESTON, 2001a).
- *Record of Decision for Phase II BRAC Parcels, Letterkenny Army Depot* (WESTON, 2001b).
- *Finding of Suitability to Transfer (FOST) for the Phase II BRAC Parcels, Letterkenny Army Depot* (WESTON, 2002c LKD.RT-200).
- *Proposed Plan for Phase III Parcels, Letterkenny Army Depot* (WESTON, 2003a LKD.RT-234).
- *Record of Decision for the Phase III BRAC Parcels* (WESTON, 2003e).
- *Finding of Suitability to Transfer (FOST) for the Phase III BRAC Parcels* (WESTON, 2003f).
- *Land Use Controls Assurance Plan Memorandum of Agreement, BRAC Phase I and II Parcels, Letterkenny Army Depot* (LEAD, 2002 LKD.RT-257).
- *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Explanation of Significant Differences (ESD) Two: Letterkenny Army Depot National Priorities List Southeastern Area EPA ID number PA 6213820503 Operable Unit One K-Areas* (LEAD, 2004).
- *Proposed Plan for SE OU 2, Industrial Wastewater Sewers (IWWS) and Contaminated Soils* (Shaw, 2005a).
- *Record of Decision for SE OU 2, Industrial Wastewater Sewers and Associated Contaminated Soils* (Shaw, 2006a).
- *Proposed Plan for SE OU 4, Stormwater Sewers and Associated Sediments* (Shaw, 2004a).
- *Record of Decision for SE OU 4, Stormwater Sewer Lines and Contaminated Sediments* (Shaw, 2005b).
- *SE OU 1 (K-Areas) Vegetative Cover Preventive Maintenance and Corrective Action Standard Operating Procedure* (USACE, 2004).
- *Record of Decision for Conococheague Drainage System, Southern Southeast Industrial Area (SSIA) SE OU 10* (WESTON, 2006d).
- *Explanation of Significant Differences, SE OU 10* (WESTON, 2009d).
- *Proposed Remedial Action Plan for the Phase V BRAC Sites* (WESTON, 2010d).
- *LUC RD for SE OU 2, Industrial Wastewater Sewers (IWWS) and Contaminated Soils* (Shaw, 2010).

- *Explanation of Significant Differences for the Phase I and II BRAC Parcels* (WESTON, 2011e).
- *Record of Decision for the Phase V BRAC Sites* (WESTON, 2011a).

Bryan Hoke reviewed the most recent property deeds for the Phase I and II BRAC Parcels that retained their LUCs. The deeds are located in the Chambersburg Court House files and were reviewed on 31 August 2011 to verify that the land use restrictions specified in the ROD were recorded with the respective parcels at the time of property transfer. Letters documenting the review of the most current deeds and leases, as well as copies of typical deed and lease language, are provided in **Appendix C**.

Annual land use control letter reports and construction inspection office files from 1999 to 2011 were also reviewed as part of the five-year review. Additionally, the Greene Township Codes were reviewed on the Internet to verify that water use restrictions that are part of the LUCs remedy for SE OU 10 groundwater are still in place and are being adhered to (Greene Township, 2011).

Select leases from LIDA were reviewed on 11 July 2012 and confirmed that the leases reference the corresponding Phase I or Phase II deed. It was verified with LIDA representative Kip Feldman that all LIDA leases follow the same format and, therefore, reference the corresponding Phase I and II deeds.

6.4 COMMUNITY INVOLVEMENT

The community's concerns were reviewed based on the minutes of the ongoing RAB meetings and interviews and questionnaires conducted as part of this five-year review. The purpose and requirements of the five-year review process were presented at the October 2011 RAB meeting and discussed in an email to the RAB members in October 2011. The findings of the five-year review will be presented at a future RAB meeting. When the five-year review is completed, the community will be notified through a published notice. A draft community notice is included in **Appendix D**.

7. ASSESSMENT – SE AREAS

7.1 SE OU 1—K-AREAS

7.1.1 Question A: Is the remedy functioning as intended by the Decision Documents?

7.1.1.1 Remedial Action Performance

The LT^3 was effective in meeting the RAOs, which are to prevent direct contact and ingestion of soil, and reduce exposure levels of contaminants that produce unacceptable risk (i.e., 1,1-dichloroethylene and TCE). The 1991 ROD for SE OU 1 (K-Areas) specified that the soil contaminant concentration at SE OU 1 be reduced to levels below the cleanup criteria of 225 μg/kg, and that the thermal treatment unit be operated at or above 99.95% efficiency. The cleanup criteria were based on the TCE MCL, which is the more stringent MCL (i.e., lower than the MCL for 1,1-DCE). Based on a review of the remedial action data and the information presented in **Appendix E**, it was determined that the performance requirements of the selected remedy (Alternative 4A) were met.

The remedy selected for SE OU 1 remains protective of human health and the environment based on continued industrial use. This determination is supported by the conclusions presented in this section.

7.1.1.2 System Operations/O&M

An inspection of the cap was conducted in September 2011 and indicated that the vegetative cover, drainage system, and liner are intact. The Cap Inspection Plan recommends yearly inspections of the K-Area caps. Continued inspections of the liner (and repairs if needed) are necessary to maintain protectiveness of human health and the environment. The “Please Keep Off” signs, which were posted by the Army in early September 2007 as part of cap maintenance, are still present and legible. The capped areas (K-1, K-2, and K-3) are included in the Depot's mowing and landscape plan. Mowing at a minimum frequency of once per year is needed to prevent the growth of woody plants that could possibly compromise the integrity of the cover. The K-Areas were mowed in fall 2011 to meet this requirement. The Cap Inspection Report for September 2011 is provided as **Appendix F**.

7.1.1.3 Opportunities for Optimization

Not applicable (project is complete).

7.1.1.4 Early Indicators of Potential Remedy Problems

There have been no early indicators of potential remedy problems as documented by the findings of the yearly cap inspections, other than infrequent mowing at K-3. Mowing will be performed at

a minimum frequency of once per year to prevent the growth of woody plants that could possibly compromise the integrity of the cover.

7.1.1.5 Implementation of LUCs and Other Measures

An issue was identified during the first five-year review, which was completed in October 2001 (USACE, 2001 LKD.RT-198). Neither the 1991 ROD nor the first ESD identified the necessary LUCs needed to limit future use of the capped areas and to maintain the long-term integrity of the capped areas. To address this issue, significant additions to the remedy selected in the 1991 ROD were incorporated into the second ESD (LEAD, 2004), including LUCs to limit the future use of the three capped areas K-1, K-2, and K-3, and a Cap Maintenance Plan to maintain the long-term integrity through yearly inspections (the most recent cap inspection occurred in September 2011) of the three capped areas K-1, K-2, and K-3 (USACE, 2004). The implementation of LUCs was carried out through amendments to the LEAD Master Plan. The following was added to the Environmental Constraints section of the Letterkenny 2010 Master Plan: "Two areas of the installation contain remediated soils covered with synthetic caps. They include the industrial waste treatment plant lagoons (IWTP) (See SE OU 11) and the K-Areas west of the ore piles. Intrusive activities are prohibited in these areas." The cap boundaries at the K-Areas are shown in **Appendix F**.

An issue was also identified during the second five-year review, which was completed in June 2008 (WESTON, 2008c LKD.RT-309). The capped areas (K-1, K-2, and K-3) are included in the Depot's mowing and landscape plan. It was noted in the last five-year review that the mowing of the K-Areas should occur annually at a minimum. Therefore, the K-Areas have been mowed at a minimum frequency of once per year to prevent the growth of woody plants that could possibly compromise the integrity of the cover.

<u>ANSWER A SE OU 1:</u> Yes – The remedy is functioning as intended by the 1991 ROD for SE OU 1 (K-Areas).

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

7.1.2.1 Changes in Standards and TBCs

At the time of the ROD for SE OU 1, there were no ARARs for soil. The following could be considered to be ARARs at this point in time:

- PADEP Act 2 Medium-specific concentrations (MSCs), Residential, Soil Direct Contact and Soil to Groundwater Used Aquifer, Total Dissolved Solids (TDS) <2,500 (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program).
- PADEP Residential MSCs for Groundwater Used Aquifer, TDS <2,500 (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program).

The aforementioned ARARs have recently been revised (January/February/March 2011). Prior to this revision, the PADEP Chapter 250, Appendix A, Act 2 MSCs were from 2001, revised as follows:

> "The provisions of this Appendix A amended November 23, 2001, effective November 24, 2001, 31 Pa.B. 6395; amended January 7, 2011, effective January 8, 2011, 41 Pa.B. 230; corrected February 11, 2011, effective January 8, 2011, 41 Pa.B. 840; corrected March 19, 2011, effective March 5, 2011, 41 Pa.B. 1458."

Although there has been ongoing research and controversy regarding the EPA TCE toxicity values (as discussed in Section 7.1.2.3), the ARARs for TCE and 1,1-DCE remained unchanged since the last five-year review.

Comparison of the data that were used for the risk assessment in support of the ROD (ESE, 1988 LKD.RT-024) to the 2011 PADEP criteria indicates that the detected concentrations of COCs in soil are below the current PADEP direct contact MSCs. The COCs for SE OU 1 specified in the ROD were TCE and 1,1-DCE. These COCs were identified because of contamination that had migrated to offpost groundwater (see SE OU 6) and to prevent further migration of contaminants from soil to groundwater in the future. The risk assessment for SE OU 1 showed that the risks to onpost workers were within acceptable levels for the pathways evaluated. Therefore, the cleanup goal for the SE OU 1 (TCE) stated in the ROD was a site-specific goal developed for protection of the soil-to-groundwater pathway and was calculated for TCE only because the groundwater ARAR (MCL) for TCE is lower than that for 1,1-DCE. The cleanup goal was 225 ppb (equivalent to 225 µg/kg).

The following tables provide a list of COCs at SE OU 1 along with the original cleanup goals and risk-based criteria, and the current applicable standards:

Groundwater COCs	EPA MCL and PADEP MSC - ARAR Used to Derive Soil Cleanup Goal	Current EPA MCLs/PADEP MSC
TCE	5 µg/L	5 µg/L
1,1-DCE	7 µg/L	7 µg/L

Soil COC	Exposure Pathway	Original Benchmarks PADEP MSCs (PADEP, 1991)	Current Benchmarks PADEP MSCs (PADEP, 2011a)
TCE	Soil Cleanup Goal	225 µg/kg	--
TCE	Residential Soil	190,000 µg/kg	260,000 µg/kg
TCE	Non-Residential Soil	970,000 µg/kg	1,300,000 µg/kg
TCE	Soil-to-Groundwater Residential, Generic Value, TDS <2500	170 µg/kg	170 µg/kg

Note that although the PADEP soil-to-groundwater MSC is lower than the soil cleanup goal, this value has not changed within the time period of the review cycle. In addition, the PADEP number is a statewide generic number under Act 2, and Act 2 allows calculation of a site-specific number. The evaluation provided in **Appendix E** supports the conclusion that the site-specific number is protective and also supports the overall conclusion for the site, i.e., that the federal and state standards for the COCs have not changed in a manner that affects the protectiveness of the remedy. For example, **Appendix E** states that, as a conservative measure, the removal areas in the K-Areas were cleaned up to below 50 µg/kg, which was the target treatment level, lower than the remediation goal of 225 µg/kg (McLaren Hart, 1997).

7.1.2.2 Changes in Exposure Pathways

There have been no changes in exposure pathways for SE OU 1 since the previous five-year review. No new contaminants have been detected, and no new sources of the existing underlying groundwater have been found.

7.1.2.3 Changes in Toxicity and Other Contaminant Characteristics

There are no significant changes in toxicity and other contaminant characteristics except TCE. The PADEP MSCs for TCE are derived from the federal MCL, which became effective in 1989 (EPA, 2009a), and use the equations in 25 Pennsylvania Code Chapter 250.307 and 250.308 (PADEP, 2011b). The Safe Drinking Water Act requires EPA to periodically review the national primary drinking water regulation for each contaminant and revise the regulation, if appropriate. EPA reviewed TCE as part of the second EPA Six-Year Review and determined that it is appropriate to revise the regulation based on changes in analytical feasibility (EPA, 2009a).

TCE toxicity is a complicated issue involving many uncertainties and has been the subject of considerable controversy over the past two decades. In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011. The revised soil residential and industrial RSLs are 440 and 2,000 µg/kg, respectively. As of November 2011, the ORNL risk-based soil to groundwater SSL is 0.16 µg/kg (assuming a cancer risk of 1E-06), which is based on a residential use scenario. The toxicity values used in these ORNL risk-based SSLs range from 2 – 8 times more restrictive. The MCL-based soil to groundwater SSL is 1.8 µg/kg which is protective of the general public and the PADEP soil to groundwater MSC remains 170 µg/kg. The PADEP MSCs are established and passed by state law and the MSC for TCE (i.e., 170 µg/kg) has not been revised at the time of this five-year review. Future revisions to PADEP MSCs, including revisions passed by the State based on revised toxicity values, will be evaluated during future five-year reviews.

The soil in SE OU 1 was cleaned up to below 50 µg/kg, which was done as a conservative measure (the site-specific soil cleanup goal was calculated to be 225 µg/kg [McLaren Hart, 1997]). Although there are levels of TCE in soil in SE OU 1 that likely exceed the MCL-based soil-to-groundwater SSL of 1.8 µg/kg, the K-Areas are capped, which inhibits contaminant migration from soil to groundwater. Therefore, it was concluded that the updated TCE toxicity data does not affect protectiveness of the remedy for SE OU 1.

7.1.2.4 Changes in Risk Assessment Methods

There are no changes in risk assessment methods that affect the protectiveness of the remedy. However, it is important to note, there have been changes in the risk assessment methodology for TCE. IRIS suggests that the kidney risk be assessed using the mutagenic equations and the liver and non-Hodgkin lymphoma risks be addressed using the standard cancer equations. In order to generate cancer-based RSLs for land uses involving multiple age receptors using the RSL calculator, multiple steps need to be performed (EPA, 2012). The current industrial use RSLs are accurate as discussed in this section as they do not include multiple age receptors (e.g., child and adult resident).

Additionally, there have been some minor changes in risk assessment procedures recommended by EPA since 1991, such as methods for calculation of exposure point concentrations (EPA, 2004); however, these do not affect the overall protectiveness of the remedy (see discussion in **Appendix E**).

7.1.2.5 Expected Progress Toward Meeting RAOs

The RAOs, specified in the ROD for SE OU 1 have been completed as follows:

- Excavation of approximately 8,000 yd^3 of contaminated soil.
- Thermal treatment of the contaminated soils at a temperature not to exceed 450 ºF.
- Destruction of the volatilized contaminants by a secondary high-temperature combustor or collection on a carbon filter.
- Chemical analyses of representative samples of the treated soils to ensure cleanup criteria are met.
- Proper management of treated soils.

<u>ANSWER B SE OU 1:</u> YES – The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid.

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

7.1.3.1 Newly Identified Ecological Risks

There are no newly identified ecological risks.

7.1.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters.

7.1.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy

There has been no other information that could affect the protectiveness of the remedy.

ANSWER C SE OU 1: NO – There has not been any new information that calls into question the protectiveness of the remedy.

7.1.4 Summary of the Technical Assessment for SE OU 1

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the two ESDs issued for SE OU 1. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been changes in the toxicity factors for the contaminants of concern (i.e., TCE); however, these changes do not affect the protectiveness of the remedy. Furthermore, there have also been changes in the risk assessment methodology for TCE when estimating age-specific cancer risks (e.g., child and adult resident). However this does not affect the remedy for SE OU 1 as it remains protective based on continued industrial use (i.e., adult receptors only). There is no other information that calls into question the protectiveness of the remedy.

7.2 SE OU 2—INDUSTRIAL WASTEWATER SEWER SYSTEM

7.2.1 Question A: Is the remedy functioning as intended by the Decision Documents?

7.2.1.1 Remedial Action Performance

A ROD was signed in September 2006. The selected remedy for SE OU 2 consists of cleaning and abandonment of sewers and drain lines at Buildings 37 and 57 and the implementation of LUCs to prevent future residential use of the existing sewers.

From fall 2004 through spring 2006, the IWWS system was cleaned and tested for leaks, a portion of the IWWS system that serviced Buildings 37 and 57 was rerouted to the sanitary sewer at LEAD to support a new mission, and the remaining unused portion of the IWWS system force main was abandoned. Currently, a new force main transports wastewater from Buildings 37 and 57 to the IWTP at LEAD. This part of the remedy is complete and is performing as expected.

LUCs will be effective in preventing the use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds, as specified in the ROD for SE OU 2 (Shaw, 2006a). The LUCs are to be implemented and maintained as described in the LUC RD.

It was determined during the five-year review that the LUC RD document had not yet been prepared, and this issue has been addressed. The LUC RD for SE OU 2 was completed in March 2010 (Shaw, 2010). The remedy is being implemented and has been functioning properly to date because none of the lands where the sewers are located has been or is being used for residential-type purposes.

LUCs for property that has been transferred to the public, which are located in the Phase I and Phase II Parcels (**Figure 6**), were implemented through deed restrictions at the time of property conveyance. The remedy is performing as expected for these parcels. In accordance with the LUC RD for SE OU 2, the 2002 LUCAP MOA ensures that the land use restrictions for the Phase I and Phase II BRAC property transfer remain in-place. The LUCAP MOA and its LUC provisions last until 2012. The LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfer. The LUC RD is currently in progress and is expected to be completed in 2012. In addition, the existing Greene Township zoning ordinances restricts the property to non-residential use. Bryan Hoke, BRAC Environmental Coordinator and Installation Restoration Program Manager for LEAD, reviewed the deeds in the Chambersburg Court House in August 2011 and verified that the land use restrictions specified in the ROD were recorded with the respective Phase I and II parcels at the time of property transfer. In addition, it was determined that there have been no new leases or land sales since January 2012.

For parcels related to SE OU 2 currently retained for military use at LEAD, the LEAD Master Plan describes land use on-post as C/I by specifying various military uses (LEAD Master Plan, Chapter 5) and was amended in 2010 to explicitly restrict land use for SE OU 2 to C/I. A statement was added to the Master Plan that prohibits residential use at SE OU 2, including residential housing, elementary and secondary schools, child care facilities, and playgrounds, along with the figure showing the locations of the sewer lines. Some of the parcels associated with SE OU 2 are associated with the Phase V BRAC property transfer; the LUCs for these Parcels will be implemented through deed restrictions, analogous to what was done for the Phase I and II BRAC Parcels, as was previously described. The details for land use restrictions for the Phase V BRAC Sites will be specified in the LUC RD for Phase I, II, and V, which is expected to be completed in 2012. In the interim, land use in SE OU 2 and for the Phase V BRAC Sites is restricted to C/I through the LEAD Master Plan and any other attempted use will be vetted through the requirement for health and safety and dig permits to perform work at the site. Security patrols are also being used to prevent unauthorized activity at the site.

7.2.1.2 System Operations/O&M

The abandonment of sewers and drain lines at Buildings 37 and 57 has been completed and O&M is not necessary.

The LUCs portion of the SE OU 2 remedy requires O&M to prevent future residential use of the property. Portions of the sewers associated with SE OU 2 are located in Army-retained land and portions are located within a BRAC parcel, which has been or ultimately will be transferred to LIDA.

The O&M requirements for the BRAC property that has been transferred, the Phase I and Phase II Parcels, are documented in the LUC RD for SE OU 2, which incorporates by reference the

LUCAP MOA that was developed and signed by the BRAC Cleanup Team in August 2002 (LEAD, 2002). The LUCAP MOA documents the LUCs and mechanisms for the enforcement and annual reporting requirements of the LUCs.

Annual requirements for LUCs stated in the MOA include annual inspection to ensure that the LUCs for each site are effective; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual submission of a status report of LUCs to PADEP and EPA. Inspections of the LUCs were conducted for calendar years 1999 through 2011 for the Phase I and II Parcels. An annual report summarizing the findings was submitted to EPA and PADEP for calendar years 1999 through 2011. The most recent LUC Compliance/Inspection Report was submitted to EPA and PADEP in January 2012. To date, no LUC violations have been reported. Land use at CVBP has followed the C/I use restrictions. As stated previously, the LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfer. The LUC RD will ensure that regular inspections of the LUCs continue.

For the portions of SE OU 2 located in Army-retained property, the property has not been used for purposes other than C/I to date. Restrictions that have been placed in the LEAD Master Plan will ensure this use for the future. For sewer parcels that will be transferred in the future (Phase V BRAC), the LUC O&M will be maintained as specified in the Phase I, II, and V LUC RD document.

The estimated cost for O&M for the selected remedy as presented in the SE OU 2 ROD was $107,800. These costs represented the net present worth of five-rear reviews for 30 years assuming a 7% discount rate. The cost data were reviewed and it was determined that the total costs are for the SE OU 2 remedy to date are approximately $221,900. The extra costs are associated with annual notifications and LUC inspections, neither of which was considered in the cost estimate presented in the ROD.

7.2.1.3 Opportunities for Optimization

There have been no opportunities for optimization.

7.2.1.4 Early Indicators of Potential Remedy Problems

The LUCAP MOA expires in August 2012 and is being replaced by the LUC RD for the Phase I, II, and V BRAC property transfers to document the LUCs at LEAD as required under CERCLA. There could be potential remedy problems for SE OU 2 if the LUC RD is not completed by August 2012 and there is a lapse in the enforcement of LUCs. The LUC RD is currently in progress and is expected to be completed in spring 2012.

7.2.1.5 Implementation of LUCs and Other Measures

LUCs were implemented as specified in Section 7.2.1.1 and 7.2.1.2 at SE OU 2 as part of the selected remedy. The LUCs are effective in preventing the use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds, as specified in

the ROD for SE OU 2 (Shaw, 2006a), and they will be maintained until the concentrations of hazardous substances in the soil are at levels that allow UU/UE.

ANSWER A SE OU 2: YES – The remedy of abandonment of specified sewers is functioning as intended. The remedy of LUCs is functioning as intended and is preventing use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

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

7.2.2.1 Changes in Standards and TBCs

The site was evaluated for C/I use only (most likely future use), and the post-removal risks were found to be within acceptable levels; therefore, there are no COCs based on likely future use of the site. Screening criteria that were used to support the Decision Document, which could potentially be considered to be ARARs at this point in time, included:

- PADEP MSCs, Residential, Soil Direct Contact and Soil to Groundwater Used Aquifer, TDS <2,500 (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program).
- PADEP Residential MSCs for Organics and Inorganics in Groundwater, Used Aquifer, TDS <2,500 (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program).

As previously discussed, the PADEP ARARs have been updated (January and February/March, 2011). The following table provides a list of ARARs and TBCs for the site for the COC (identified prior to the removal action at SE OU 2) along with the original benchmarks and the current applicable standards.

Pre-Removal COCs	Exposure Pathway	Original Benchmarks (PADEP MSCs) (PADEP, 2001)	Current Benchmarks PADEP MSCs (PADEP, 2011)
TCE	Residential Soil	190,000 µg/kg	260,000 µg/kg
TCE	Non-Residential Soil	970,000 µg/kg	1,300,000 µg/kg
TCE	Soil-to-Groundwater Residential, Generic Value, TDS <2500	170 µg/kg	170 µg/kg

Overall, ARARs and TBCs for TCE have not changed in a manner that affects the protectiveness of the remedy. However, the soil data at Building 37 for TCE exceeds the MCL-based soil to groundwater SSL (1.8 µg/kg) (EPA, 2011). Therefore, the protectiveness of the remedy was

reevaluated based on the updated information available for TCE. The results of the evaluation are presented below.

Data from 1994 and 2001 were used to evaluate the current protectiveness of the remedy. Based on the results from 1994 and 2001, TCE concentrations in soil are decreasing over time. The 2001 sampling event was a hot spot investigation conducted in the most contaminated areas where the 1994 TCE results were above the preliminary remediation goal (PRG) of 170 µg/kg (Fluor Daniel, 1998). As shown in Figure 3 of the FS, TCE concentrations greater than 1,000 µg/kg were detected at various soil boring locations during the 1994 RI (Shaw, 2004e); however, for each of the corresponding samples collected in 2001, TCE concentrations were less than 50 µg/kg. Where this was observed, the 2001 data replaced the 1994 data for the purposes of this reevaluation. In 2001, TCE was detected above its reporting limit in 11 of 49 samples, none of which exceeded the 2011 PADEP soil to groundwater MSC (170 µg/kg). However, TCE exceeded the MCL-based soil to groundwater SSL (1.8 µg/kg) in all 11 samples. It is important to note, that all but four of the reporting limits also exceeded this MCL-based soil to groundwater SSL.

Comparison of Building 37 TCE data with Protection of Groundwater MSCs and SSLs				
COC	**Site Mean**	**Site Maximum**	**PADEP MSCs (2001/2011)**	**Region III EPA RBC/ORNL MCL-Based SSL (DAF = 1) (1999/2011)**
TCE	24.8	50	170	77/1.8

NOTE: All units in µg/kg.
Mean and maximum based on Sample Data in Appendix I, which was taken from Figure 3 of the FS (Shaw, 2004e) as described above.

The values that are above the ORNL risk-based value do not represent a significant source of contamination that could adversely affect groundwater quality in the future because the exceedances are isolated locations surrounded by 'clean' soil (i.e., TCE not detected or below the ORNL SSL). In addition, the west side of Building 37, where these 49 samples were collected, is paved, which inhibits contaminant migration from soil to groundwater. Since the current and future intended use of the site is C/I, the MCL-based soil to groundwater SSL, which protects public health, is amply conservative. In addition, a dilution attenuation factor of 1 was used for the evaluation which is very conservative for the site conditions. If a DAF of 20 were to be used, the SSL would be 36 µg/kg, and TCE would exceed the SSL in only 2 of 49 samples. As stated above, the most recent data collected at the site indicates that TCE did not exceed the PADEP MSC for groundwater protection.

In conclusion, TCE values exceeded the MCL-based soil to groundwater SSLs; however, TCE levels in soil have been shown to be declining naturally over time, and there is an asphalt cap (i.e., the entire west side of Building 37 is paved) to help prevent contaminant migration from soil to groundwater. In addition, the groundwater in this area of LEAD is addressed under SE OU 10, for which the remedy is in the MNA phase and TCE concentrations in groundwater have been shown to be declining, as discussed in Section 7.5, indicating that the localized elevated levels of TCE are not contributing to groundwater contamination. Therefore, the remedy for SE OU 2 remains protective of human health.

7.2.2.2 Changes in Exposure Pathways

Exposure pathways evaluated at SE OU 2 were direct contact with soil, incidental ingestion of dust, soil-to-groundwater, and vapor inhalation. The VIP is of potential concern within SE OU 2 because the sewers are located in areas where underlying groundwater is contaminated with VOCs. However, this pathway poses no new threat to human health and the environment at SE OU 2 because the OU addresses only the industrial sewers which are underground, primarily below roadways. It is very unlikely that habitable buildings would be constructed on top of the road/sewers; therefore, the VIP is not considered a pathway of concern at this time for SE OU 2. No new contaminants have been detected, and no new sources of the existing underlying groundwater have been found. The VIP is being addressed for current and future buildings in this area of LEAD under SE OU 8 and SE OU 11 (see Subsections 1.2.9 and 1.2.12).

7.2.2.3 Changes in Toxicity and Other Contaminant Characteristics

There have been no changes in toxicity or other contaminant characteristics that affect the protectiveness of the remedy. As discussed in Section 7.1.2.3, the PADEP MSCs for TCE are derived from the Federal MCL, (EPA, 2009a), and use the equations in 25 Pennsylvania Code Chapter 250.307 and 250.308 (PADEP, 2011b). TCE toxicity is a complicated issue involving many uncertainties and has been the subject of considerable controversy over the past two decades. In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011. The revised soil residential and industrial RSLs are 440 and 2,000 µg/kg, respectively. As of November 2011, the ORNL risk-based soil to groundwater SSL is 0.16 µg/kg (assuming a cancer risk of 1E-06), which is based on a residential use scenario and the MCL-based soil to groundwater SSL is 1.8 µg/kg which is established to protect public health. The toxicity values used in the November 2011 SSLs range from 2 – 8 times more restrictive than the June 2011 values; however the PADEP soil to groundwater MSC remains 170 µg/kg. The PADEP MSCs are established and passed by state law and the MSC for TCE has not been revised at the time of this five-year review. Future revisions to PADEP MSCs, including revisions passed by the State based on revised toxicity values, will be evaluated during future five-year reviews. Based on the evaluation and discussion presented in Subsection 7.2.2.1, it is concluded that the most recent TCE toxicity data do not adversely affect the protectiveness of the remedy for SE OU 2.

7.2.2.4 Changes in Risk Assessment Methods

There have been no changes in risk assessment methods that affect the protectiveness of the remedy. However, it is important to note, there have been changes in the risk assessment methodology for TCE. IRIS suggests that the kidney risk be assessed using the mutagenic equations and the liver and non-Hodgkin lymphoma be addressed using the standard cancer equations. In order to generate cancer-based RSLs for land uses involving multiple age receptors using the RSL calculator, multiple steps need to be performed (EPA, 2012). The current industrial use RSLs are accurate as discussed in this section as they do not include multiple age receptors (i.e., child and adult resident).

Additionally, there have been some minor changes in risk assessment procedures recommended by EPA since 1991, such as methods for calculation of exposure point concentrations (EPA, 2004); however, these do not affect the overall protectiveness of the remedy.

7.2.2.5 Expected Progress Toward Meeting RAOs

The following RAOs were established in the SE OU 2 ROD (Shaw, 2006a):

- Prevent potential future releases from the sewers.
- Prevent residential land use exposure.

The possibility of future releases from the sewers has been prevented by abandoning the sewers and drain lines as outlined in the ROD. LUCs will be implemented at SE OU 2 to prohibit the future use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds. LUCs were implemented as specified in Sections 7.2.1.1 and 7.2.1.2.

<u>ANSWER B SE OU 2:</u> YES – The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid.

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

7.2.3.1 Newly Identified Ecological Risks

There are no newly identified ecological risks.

7.2.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters.

7.2.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy

No new information has come to light that would affect the selected remedy.

ANSWER C SE OU 2: NO – There has not been any new information that calls into question the protectiveness of the remedy.

7.2.4 Summary of the Technical Assessment for SE OU 2

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been changes in the toxicity factors for the contaminants of concern

(i.e., TCE); however, these changes do not affect the protectiveness of the remedy. Furthermore, there have also been changes in the risk assessment methodology for TCE when estimating age-specific cancer risks (i.e., child and adult resident). However this does not affect the remedy for SE OU 2 as it remains protective based on continued industrial use (i.e., adult receptors only). There is no other information that calls into question the protectiveness of the remedy.

7.3 SE OU 7—TOSA/WOS

7.3.1 Question A: Is the remedy functioning as intended by the Decision Documents?

7.3.1.1 Remedial Action Performance

The remedy for the Phase V BRAC Sites, LUCs, was selected in the Phase V ROD (WESTON, 2012b). The remedy is performing as expected for these parcels. The LUC RD for Phase V will be completed in 2012 and will ensure that the LUCs for the Phase V BRAC property transfer will be established and remain in place. The LUCs are effective in meeting the RAOs for the SE OU 7 Phase V Transfer Parcel by preventing direct contact and ingestion of soil under residential and other nonindustrial exposure scenarios, preventing direct contact and ingestion of groundwater under any scenario, and reducing exposure levels of contaminants that produce unacceptable risk. In addition, the existing Greene Township zoning ordinances restrict the property to non-residential use. Bryan Hoke reviewed the most recent leases in 2011; the SE OU 7 property is still owned by the Army and property transfer is anticipated in 2012. In the interim, land use in SE OU 7 is restricted to C/I through the LEAD Master Plan, and any other attempted use will be vetted through the requirement for health and safety and dig permits to perform work at the site. Security patrols are also being used to prevent unauthorized activity at the site.

7.3.1.2 System Operations/O&M

The O&M requirements for the SE OU 7 LUCs are documented in the Phase I, II, and V LUC RD developed and signed by the BRAC Cleanup Team. The Phase I, II, and V LUC RD documents the LUCs and the mechanisms for the enforcement and annual reporting requirements of the LUCs.

Annual requirements for LUCs stated in the LUC RD include annual inspection of the CVBP; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual submission of a status report of LUCs to PADEP and EPA. Inspections of the LUCs for SE OU 7 will begin in 2012. To date, no LUC violations have been reported. Land use at the CVBP has followed the C/I use restrictions. In addition, to date, no new tenants or lessees have excavated into any contaminated soil or underlying groundwater.

The estimated cost for O&M for the selected remedy as presented in the ROD for the Phase V BRAC Sites was $52,000. These costs represented the net present worth of five-year reviews for 30 years and annual LUC inspections. The ROD for the Phase V BRAC Sites was signed in June 2012; therefore, a LUC inspection report has not yet been completed. To date, the only cost

associated with O&M of the remedy for SE OU 7 is the partial cost of preparing this five-year review.

7.3.1.3 Opportunities for Optimization

There are currently no opportunities for optimization for the SE OU 7 Phase V Transfer Parcel. LUCs for SE OU 7 are combined with those for SE OU 8 through the Phase I, II, and V LUC RD to optimize the implementation and the effectiveness of the remedy.

7.3.1.4 Early Indicators of Potential Remedy Problems

There are no early indicators of potential remedy problems.

7.3.1.5 Implementation of LUCs and Other Measures

LUCs have been implemented successfully at the Phase V BRAC Transfer Parcels. An ESD was completed for SE OU 10 groundwater in September 2009 and groundwater restrictions were lifted for all of the Phase V Parcels. LUCs remain in place at SE OU 7 and the rest of the Phase V BRAC Sites in SE OU 8 to restrict land use to C/I.

ANSWER A SE OU 7: YES – The remedy of LUCs is functioning as intended and is preventing human exposure to the underlying groundwater and preventing use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

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

7.3.2.1 Changes in Standards and TBCs

As previously discussed, the PADEP ARARs have been updated (January and February/March, 2011). The ARARs and TBCs for soil as identified for SE OU 7 sites associated with the Phase V ROD are the following:

- PADEP Act 2 MSCs, Appendix A, Direct Contact Numeric Values, Table 3A and 4A, Nonresidential Surface Soil 0-2 feet and Subsurface Soil 2-15 feet; and Table 3B and 4B, Used Aquifers, TDS <2,500, Nonresidential, Soil to Groundwater Generic Value (PADEP, 2011a).

- Title 40 CFR Part 265—Interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, Subpart G – Closure and post-closure, 1 July 2002.

- Title 25 Pennsylvania Code, Environmental Protection, Chapter 265a—Interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, Subchapter G – Closure and post closure, 1 May 1999.

Dioxin/furans (expressed as 2,3,7,8-TCDD) was the only COC identified prior to the removal action at SE OU 7. The following table provides the original and current applicable standards for 2,3,7,8-TCDD:

COCs	Region III EPA RBC/ORNL RSL (1999/2011)	PA Act 2 MSCs (1999/2011)	
	Soil Ingestion - Industrial (mg/kg)	Residential (mg/kg)	Nonresidential (mg/kg)
2,3,7,8-TCDD	3.8E-05/ 1.8E-05	1.2E-04/ 1.4E-04	5.3E-04/ 6.1E-04

Following the removal action, confirmatory sampling was conducted on 21 December 2000 by AmDyne. Four samples were collected and analyzed for dioxins/furans using EPA SW 846 Method 8290. As documented in the Summary of BRAC Investigations Report for SE OU 7, the results of confirmatory sampling indicated post-removal concentrations of dioxins/furans ranged from 4.9 to 13 ng/kg (total EPA TEQ) of 2,3,7,8-TCDD (WESTON, 2009c). These concentrations were less than the original EPA RBC for industrial soil and the residential and nonresidential PADEP MSCs. As shown in the table above, the ARARs or TBCs for 2,3,7,8-TCDD have not changed in a manner that affects the protectiveness of the remedy.

Additionally, under the future intended C/I use scenario, no other compounds were determined to be COCs. The LUCs and deed provisions for the Phase V BRAC Sites are protective of human health and the environment.

7.3.2.2 Changes in Exposure Pathways

There have been no changes in exposure pathways at SE OU 7 that would affect the protectiveness of the remedy.

7.3.2.3 Changes in Toxicity and Other Contaminant Characteristics

In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011. TCE has not been detected in soil at SE OU 7; risks associated with groundwater beneath this OU are addressed under SE OU 10 and are discussed in Subsection 7.5.1.1. Therefore, there have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy for SE OU 7.

7.3.2.4 Changes in Risk Assessment Methods

There have been no changes in risk assessment methodology that would affect the protectiveness of the remedy. As previously discussed in Section 7.2.2.4, risk assessment methodology for TCE has changed but it does not affect the protectiveness of the remedy for SE OU 7.

7.3.2.5 Expected Progress Toward Meeting RAOs

The remedy for the SE OU 7 continues to achieve the RAOs.

ANSWER B SE OU 7: The exposure assumptions, toxicity data, cleanup levels, and RAOs used in preparing the Phase V ROD are still valid.

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

7.3.3.1 Newly Identified Ecological Risks

There have been no newly identified ecological risks.

7.3.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters.

7.3.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy

There has been no new information that could affect the protectiveness of the remedy.

ANSWER C SE OU 7: NO – There has not been any new information that calls into question the protectiveness of the Phase V LUCs remedy.

7.3.4 Summary of the Technical Assessment for SE OU 7

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been changes in the toxicity factors for the contaminants of concern (i.e., 2,3,7,8-TCDD) that were used in the baseline risk assessment; however, these changes do not affect the protectiveness of the remedy. There have been no changes to the standardized risk

assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

7.4 SE OU 8—BRAC WASTE SITES

7.4.1 Question A: Is the remedy functioning as intended by the Decision Documents?

7.4.1.1 Remedial Action Performance

As of January 2012, remedies have been selected for the Phase I, Phase II, and Phase V BRAC Parcel portions of SE OU 8. The remedy is performing as expected for these parcels. The 2002 LUCAP MOA ensures that the LUCs for the Phase I and Phase II BRAC property transfer will remain in place. In addition, the LEAD Master Plan currently restricts the active BRAC sites at LEAD to C/I until they are transferred. The LUCs are effective in meeting the RAOs for the SE OU 8 Phase I, Phase II, and Phase V Transfer Parcels by preventing direct contact and ingestion of soil under residential and other nonindustrial exposure scenarios, preventing direct contact and ingestion of groundwater under any scenario, and reducing exposure levels of contaminants that produce unacceptable risk. In addition, the existing Greene Township zoning ordinances restrict the property to non-residential use. As documented by the recent ESD for the Phase I and II BRAC Parcels, only Phase I Parcels 1 and 2 have retained their LUCs (WESTON, 2012b). Therefore the review of leases was targeted towards parcels with LUCs remaining. Bryan Hoke reviewed the most recent deeds and leases for Phase I: Parcels 1 and 2 in the Chambersburg Court House in August 2011.

The Phase II Parcels no longer require LUCs to restrict these parcels to C/I, as documented in an ESD (WESTON, 2012b). The Phase V BRAC property transfer is expected to take place in 2012. In the interim, land use in SE OU 8 is restricted to C/I through the LEAD Master Plan, and any other attempted use will be vetted through the requirement for health and safety and dig permits to perform work at the site. Security patrols are also being used to prevent unauthorized activity at the site.

7.4.1.2 System Operations/O&M

The O&M requirements for the Phase I and II of this OU are documented in the LUCAP MOA that was developed and signed by the BRAC Cleanup Team in August 2002 (LEAD, 2002). The LUCAP MOA documents the LUCs and the mechanisms for the enforcement and annual reporting requirements of the LUCs. The LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers. Preparation of the LUC RD is currently in progress and will be completed in 2012. In accordance with the Phase I and II ESD, currently only Phase I Parcels 1, 2, 10, and 12 are subject to soil LUCs. For the Phase II Parcels, soil LUCs were only lifted for the Gate 1 Guardhouse, Building 511 Area (part of Parcel 2R-80) (WESTON, 2012a).

Annual requirements for LUCs stated in the MOA include annual inspection of to ensure that the LUCs for each site are effective; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual submission of a status report of LUCs to PADEP

and EPA. Inspections of the LUCs were conducted for calendar years 1999 through 2011 for the Phase I and II Parcels. An annual report summarizing the findings was submitted to EPA and PADEP for calendar years 1999 through 2010. The 2011 report will be submitted in 1st or 2nd quarter 2012. Inspections of the LUCs for the Phase V BRAC Sites in SE OU 8 will begin in 2012. To date, no LUC violations have been reported in SE OU 8. Land use at the CVBP has followed the C/I use restrictions. To date, no tenants or lessees have excavated into areas that would contact underlying groundwater, and there have been no violations of restricting parcel use to C/I.

The estimated cost for O&M for the selected remedies as presented in the RODs for Phase I, Phase II, and Phase V were as follows:

- Phase I - $25,000 for each CERCLA five-year review and $1,000 annually for LUC inspection.
- Phase II - $221,900, which includes maintenance of and reporting on LUCs, and CERCLA five-year reviews.
- Phase V - $52,000, which includes CERCLA five-year reviews for 30 years and annual LUC inspections.

The ROD for the Phase V BRAC Sites was signed in June 2012; therefore, a LUC inspection report has not yet been completed. To date, the only cost associated with O&M of the remedy for SE OU 7 is the partial cost of preparing this five-year review. The cost data for Phases I and II were reviewed and are consistent with the costs presented in the RODs for Phase I and II.

7.4.1.3 Opportunities for Optimization

The remedy for SE OU 8 will be optimized by replacing the LUCAP MOA with the LUC RD for Phase I, II, and V. In addition to combining BRAC Phases, SE OU 7 will be included in the Phase V property transfer.

7.4.1.4 Early Indicators of Potential Remedy Problems

There are no early indicators of potential remedy problems.

7.4.1.5 Implementation of LUCs and Other Measures

LUCs have been implemented successfully at the Phase I, II, and V BRAC Parcels. An ESD was completed for SE OU 10 groundwater in September 2009 and groundwater restrictions were lifted for the majority of the Phase I and II Parcels and all of the Phase V Parcels (WESTON, 2009d). The LUCs that remain prevent contact with contaminated groundwater and ensure land use remains C/I, where applicable. In addition, an ESD was completed to lift soil LUCs from the Phase I and II Parcels. Only Parcels 1 and 2 retained their soil LUCs; LUCs were lifted for the remaining Phase I Parcels and all of the Phase II Parcels (WESTON, 2009d).

The annual LUC inspection letters can be found on the LEAD Administrative Record website at http://www.leadenv.com/leadenv/ under the correspondence tab. To find the specific letter for each year, go to the bottom left-hand corner and click on the year for the subject letter. Page down to the corresponding date of the letter. Dates for each annual inspection letter follow:

- Inspection Year 1999 December 22, 1999.
- Inspection Year 2000 January 12, 2001.
- Inspection Year 2001 February 4, 2002.
- Inspection Year 2002 January 24, 2003.
- Inspection Year 2003 January 27, 2004.
- Inspection Year 2004 January 31, 2005.
- Inspection Year 2005 January 25, 2006.
- Inspection Year 2006 January 29, 2007.
- Inspection Year 2007 January 29, 2008.
- Inspection Year 2008 February 5, 2009.
- Inspection Year 2009 January 12, 2010.
- Inspection Year 2010 January 24, 2011.
- Inspection Year 2011 February 10, 2012.

ANSWER A SE OU 8: YES – The remedy of LUCs is functioning as intended and is preventing human exposure to the underlying groundwater and preventing use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

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

7.4.2.1 Changes in Standards and TBCs

As previously discussed, the PADEP ARARs have been updated (January and February/March, 2011). The ARARs and TBCs for soil as identified for SE OU 8 sites associated with the Phase I and II RODs are the following:

- PADEP MSCs, Non-Residential, Soil Direct Contact and Soil to Groundwater Used Aquifer, TDS <2,500 (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program) (PADEP, 2011a).

- EPA, Title 40 CFR, Part 761, Disposal of PCBs, Final Rule under TSCA, Section 761.61(a)(4)(i)(A), Cleanup Levels for Bulk PCB Remediation Waste, High Occupancy Areas: action is required for concentrations greater than 1 ppm (equivalent to mg/kg for soil or solid materials). Source: Federal Register, Volume 63, Number 124, 29 June 1998, pp 35383-35474).

The PADEP and EPA ARARs for PCBs as described above have not changed in a manner that affects protectiveness of the remedy.

Several Phase I and II Parcels were reevaluated in the Phase I and II ESD to demonstrate that they are suitable for UU/UE and to remove their soil LUCs. The COCs for Phase I Parcels identified in the respective Area of Concern Decision Documents (WESTON, 1998e to 1998i) are shown in the following tables. There were no COCs identified for Parcels 8 to 13 (Open Shed Storage Area) and Buildings 6 and 9 (former storage). The COCs for other parcels were as follows: Parcels 1 and 2 (Industrial area) – arsenic and beryllium; Parcel 24 (former vehicle storage) – arsenic; and Railroad parcels – arsenic and beryllium.

The only chemicals detected above any of the screening criteria were arsenic and beryllium, which were consistently detected at concentrations above the ORNL residential RSLs. As of spring 2008, Region III relied for its RBC Table updates on the ORNL RSLs under an interagency agreement with EPA. These results were discussed by the Army, EPA, and PADEP, and the concentrations were deemed as not requiring additional remedial action (based on continued C/I use of the parcel) for the following reasons:

- Arsenic and beryllium are naturally occurring compounds and are not known to be related to any past or current operations at LEAD.
- The results are within published regional (PA) values for these two metals.

In the Phase I and II ESD, no compounds were determined to be COCs, except at the Gate 1 Guardhouse, which is discussed below. It was determined that Parcel 24 and the Railroad Parcels, which are in the SE Area at LEAD, are suitable for UU/UE and Parcels 1 and 2 remain suitable under the future intended C/I use scenario.

The changes in standards for arsenic and beryllium are as follows: these standards have not changed in a manner that would affect the protectiveness of the remedy. The standards for beryllium have remained the same or increased (are less restrictive). Although some standards for arsenic have decreased, levels of arsenic are still considered within naturally occurring levels.

	Region III EPA RBC/ORNL RSL (1997/2011)	**PA Act 2 (1997/2011)**	
COCs	**Soil Ingestion - Industrial (mg/kg)**	**Nonresidential Ingestion (mg/kg)**	**Soil to Groundwater Pathway (mg/kg)**
Arsenic	3.8 c /1.6 c	53/53	150/29
Beryllium	1.3 n/200 n	18/5,600	320/320

Note: EPA RBCs and ORNL RSLs presented at a target risk (TR) of 1E-06 for carcinogens (c) and a target hazard quotient (THQ) of 0.1 for non-carcinogens (n).

The Gate 1 Guardhouse was the only Phase II site with COCs; however, the COCs were determined using a future resident scenario. Under the future intended C/I use scenario there were no compounds determined to be COCs. The following table provides a list of COCs under the future resident scenario and the respective MSCs.

COCs	Original (2000) PADEP MSCs Residential Soil (mg/kg)	Current (2011) PADEP MSCs Residential Soil (mg/kg)	Original (2000) EPA RBCs Residential Soil (mg/kg)	Current (2011) ORNL RSLs Residential Soil (mg/kg)
Aluminum	190,000	190,000	7,821 n	7,700 n
Arsenic	12	12	0.43 c	0.39 c
Barium	15,000	44,000	548 n	1,500 n
Chromium	1,100 (VI)	660 (VI)	23 n (VI)	0.29 c (VI)
Cobalt	13,000	66	469 n	2.3 n
Iron	66,000	150,000	2,346 n	5,500 n
Lead	500	500	400*	400*
Manganese	10,000	10,000	156 n	180 n
Nickel	4,400	4,400	156 n	150 n
Selenium	1,100	1,100	39 n	39 n
Thallium	18	15	0.55 n	0.078 n
Vanadium	13	1,500	55 n	39 n
Zinc	66,000	66,000	2,346 n	2,300 n
Acetone	10,000	10,000	782 n	6,100 n
Benzene	38	57	12 c	1.1 c
Naphthalene	8,800	4,400	156 n	3.6 c
Acenaphthene	13,000	13,000	469 n	340 n
Benzo[a]anthracene	25	5.7	0.87 c	0.15 c
Benzo[a]pyrene	2.5	0.57	0.087 c	0.015 c
Benzo[b]fluoranthene	25	5.7	0.87 c	0.15 c
Dibenz[a,h]anthracene	2.5	0.57	0.087 c	0.015 c
Indeno[1,2,3-cd]pyrene	25	5.7	0.87 c	0.15 c
Fluorene	8,800	8,800	313 n	230 n

*There is no RBC for lead; the value listed is the CERCLA guideline number.

Note: EPA RBCs and ORNL RSLs presented at a target risk (TR) of 1E-06 for carcinogens (c) and a target hazard quotient (THQ) of 0.1 for non-carcinogens (n).

The LUCs and deed provisions for the Phase I, II, and V Parcels are protective of human health and the environment. Any action planned for the remaining areas of this OU in the future will meet ARARs and be protective of human health and the environment.

7.4.2.2 Changes in Exposure Pathways

The VIP was evaluated based on the location of the Building 57 Site (Phase V) with respect to the SE OU 10 groundwater plume. One sub-slab soil gas sample was collected in August 2008 and analyzed for VOCs. Results indicated the presence of 1,1,1-TCA, carbon tetrachloride, chloroform, PCE, and TCE. Concentrations of chloroform and TCE were 32 micrograms per cubic meter ($\mu g/m^3$) and 2.5 $\mu g/m^3$, respectively. The RI/RA for Building 57 concluded that there are no unacceptable risks to current and potential future occupants of Building 57 associated with vapor intrusion based on C/I use (WESTON, 2008a). In addition, the Phase V ROD concluded that the VIP is not a pathway of concern for the Phase V BRAC Sites (WESTON, 2012b). No new contaminants have been detected, and no new sources of the existing underlying groundwater have been found.

The VIP was also evaluated at Buildings 37 and 47, as discussed in Subsection 1.2.9, and will be addressed under SE OU 8. There is no signed ROD yet for the Building 37 Site and Building 47.

The parcels associated with Buildings 37 and 47 will become part of the CVBP following the Phase VII BRAC transfer.

7.4.2.3 Changes in Toxicity and Other Contaminant Characteristics

In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011 TCE is not a COC in soil at sites within SE OU 8 with remedies in place. Risks associated with groundwater beneath this OU are addressed under SE OU 10 and are discussed in Subsection 7.5.1.1. There have been no changes in toxicity and other contaminant characteristics at the SE OU 8 Phase I, Phase II, or Phase V Transfer Parcels that would affect the protectiveness of the remedies.

7.4.2.4 Changes in Risk Assessment Methods

There have been no changes in risk assessment methodology that would affect the protectiveness of the remedy. As previously discussed in Section 7.2.2.4, risk assessment methodology for TCE has changed but it does not affect the protectiveness of the remedy for SE OU 8.

7.4.2.5 Expected Progress Toward Meeting RAOs

The remedy for the SE OU 8 Phase I, Phase II, and Phase V Transfer Parcels continues to achieve the RAOs.

<u>ANSWER B SE OU 8:</u> The exposure assumptions, toxicity data, cleanup levels, and RAOs used in preparing the Phase I, Phase II, and Phase V RODs are still valid.

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

7.4.3.1 Newly Identified Ecological Risks

There have been no newly identified ecological risks.

7.4.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters.

7.4.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy

There has been no new information that could affect the protectiveness of the remedy.

<u>ANSWER C SE OU 8:</u> NO – There has not been any new information that calls into question the protectiveness of the Phase I, II, and V remedies consisting of LUCs. However, the soil LUCs were lifted for portions of the SE OU 8 Phase I BRAC property in accordance with the Phase I and II ESD (WESTON, 2012a). Groundwater LUCs remain in place for a small portion of SE OU 8 to prevent human contact with contaminated groundwater.

7.4.4 Summary of the Technical Assessment for SE OU 8

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the RODs issued for the Phase I and Phase II RODs, as modified by the Phase I and II ESD, and Phase V Parcels in SE OU 8. There have been no changes in the physical conditions of the sites that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment; however, these changes do not affect the protectiveness of the remedy. Although there have been changes to the standardized risk assessment methodology for some COCs at SE OU 8, as noted above where appropriate, none of the changes affect the protectiveness of the remedy y. There is no other information that calls into question the protectiveness of the remedy.

7.5 SE OU 10—SOUTHERN SOUTHEAST INDUSTRIAL AREA VOC-CONTAMINATED GROUNDWATER SOUTH OF GATE 6 (CONOCOCHEAGUE DRAINAGE SYSTEM)

7.5.1 Question A: Is the remedy functioning as intended by the Decision Documents?

7.5.1.1 Remedial Action Performance

A final Proposed Plan was completed in February 2005 (WESTON, 2005c), and a ROD was completed in March 2006 (WESTON, 2006d). The selected remedy for SE OU 10 was enhanced biodegradation with monitored natural attenuation and LUCs.

In late 2000, the Army established procedures to continue the enhanced bioremediation pilot study (EBPS) in SE OU 10 as a full-scale treatment operation (WESTON, 2001h, LKD.RT-185). Due to the effectiveness of the EBPS, the FFS concluded that enhanced biodegradation with institutional controls was the preferred remedial alternative for the chlorinated volatile organic compounds (CVOC) groundwater contamination within SE OU 10. The findings and scope of the initial EBPS served as the basis for the design of the continued field pilot EBPS at a level equal to that designed for a full-scale operation, as detailed in the Final Technical Plan for the EBPS (WESTON, 2001h) and the Remedial Action Work Plan for SE OU 10 (WESTON, 2007c).

A pair of nutrient delivery systems were set up in October 2000 as gravity feed systems (in accordance with the pilot study). Introduction of sodium lactate nutrient solution began on November 2, 2000 following completion of monitor well and epikarst dye injection point (EDIP) installations and baseline sampling of the groundwater in October 2000. To track and document the distribution of the nutrient solution throughout the groundwater regime from each EDIP, fluorescein dye and Rhodamine WT dye were mixed with the water/sodium lactate solution introduced into the EDIPs. Nine 4-week long nutrient introductions (at rates and concentrations designed for full-scale implementation) were performed between November 2000 and May 2007 according to the following schedule:

- 2 November to 1 December 2000.
- 17 May to 15 June, 2001.
- 13 November to 24 December 2001.
- 21 May to 18 June 2002.
- 23 October to 21 November 2002.
- 9 July to 6 August 2003.
- 27 August to 24 September 2004.
- 27 May to 22 July 2005 (Injection suspended briefly in June because of failure/replacement of pump).
- 9 April to 7 May 2007.

The FFS Addendum concluded that bi-annual applications of the nutrient solution has enhanced the microbial activity and stimulated the reductive dechlorination processes in SE OU 10 groundwater. Decreased concentrations of the primary parent compounds (TCE and 1,1,1-TCA) to below MCLs, decreased concentrations of degradation compounds, and increased production of dissolved gases (i.e., methane, ethane, and ethene) in the treatment area indicate that complete dechlorination through VC is occurring at most locations. Racer dye studies confirmed effective distribution of nutrients.

The declining concentrations of primary CVOC and lighter molecular weight daughter products in off-post wells and Hawbaker Spring indicates that the mass of on-post contaminants, trapped in the epikarst and bedrock matrix, has been significantly reduced since the start of the continued EBPS program was implemented at a full-scale magnitude. Since 2002, there have been no exceedances of either federal MCLs or state water quality standards in off-post sampling locations for site-related VOCs.

The following are the SE OU 10 RAOs:

- Protect human health and the environment.
- Restore the aquifer to federal and state drinking water standards within a reasonable timeframe.
- Comply with all federal and state environmental laws and ARARs.
- Reduce or eliminate further contamination of groundwater.

- Reduce or eliminate the migration of VOC-contaminated groundwater off-post and the discharge of VOC-contaminated groundwater to surface waters at off-post springs.
- Provide a suitable remedial alternative so that land can be transferred for beneficial use with minimal limitations.
- Prevent human exposure to contaminants associated with VOC-contaminated groundwater and springs at concentrations in excess of the remediation goals.

In accordance with the Remedial Action Work Plan, the final chemical injection for the selected remedy was completed at SE OU 10 in June 2007. A long-term groundwater monitoring program has been implemented for SE OU 10 and the most recent sampling event (for which validated analytical results are available) was conducted in December 2010. Figures G-1 through G-6 in Appendix G present trends analyses, showing the change in concentrations of TCE and vinyl chloride from 1996 to the present for six monitoring wells where these contaminants have been most persistent. ***Note:*** *The annual groundwater sampling event for SE OU 10 was completed in December 2011. Low groundwater conditions are targeted for annual sampling at SE OU 10 to evaluate groundwater during a worst-case scenario (i.e., maximum contaminant concentrations due to less dilution within the aquifer). However, the December 2011 sampling event occurred during unseasonably high groundwater conditions; therefore, the data is likely not representative of the maximum concentrations for 2011.* Information to date has indicated that the RAOs are being met with the exception of compliance with all federal and state ARARs for groundwater in all wells. Based on data from 2010, and as shown in Appendix G (Table G-1 and Figure G-7), TCE remains slightly above its MCL of 5 µg/L in only two wells (97-37-24 and 97-37-23 ranging from 6 to 11 µg/L); VC remains slightly above its MCL of 2 µg/L in only two wells (96-37-6 and 97-37-23 ranging from 2.2 to 3.5 µg/L); and four compounds related to the historical diesel release (benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and naphthalene) remain above their MCLs only in well UST-3. Although the final chemical injection was in 2007, a review of the monitoring data indicates that the remedial action is still in the MNA stage; therefore, additional rounds of post-treatment monitoring data are needed to determine final compliance with ARARs and risk-based levels in groundwater.

Groundwater risks that were calculated and presented in the SE OU 10 ROD (WESTON, 2006d) were used as a comparison to the current groundwater risks presented in Appendix G. The same input parameters were used for the three selected receptors: child resident, adult resident, and C/I worker. Toxicity values were updated when necessary to adhere to the most current values in IRIS and the ORNL RSL November 2011 table. TCE and 1,4-dioxane values were among the toxicity changes.

The groundwater risks presented in the ROD (WESTON, 2006d) were calculated using results from only 4 wells on-post (wells: 96-37-6, 96-37-11, 97-37-23, and 97-37-24). In the current risk calculations (Appendix G), the results from 7 wells were used (wells: 96-37-6, 96-37-11, 96-37-12, 97-37-23, 97-37-24, 98-37-27, and UST-3), including all sampling rounds from 2008 to 2010. Chemicals such as benzene, naphthalene, and other BTEX components are most frequently detected in UST-3. As a result, the current risks are more conservative and comprehensive.

The following table is a summary of the ROD risks versus current risks (See Appendix G for complete tables):

Receptor	SE OU 10 ROD ILCR	Current ILCR	SE OU 10 ROD HI	Current HI
Child Resident	7.5E-04	N/C	3.3	2.7
Adult Resident	3.5E-04	N/C	1.5	0.88
Age-Adjusted Resident	N/C	1.4E-04	N/C	N/C
Commercial/Industrial Worker	1.9E-04	3.8E-05	0.64	0.31

ILCR = Incremental lifetime cancer risk
HI = Hazard index
N/C = Not calculated.

In summary, all current ILCR and HIs have decreased since the SE OU 10 ROD. Table G-20 presents the age-adjusted resident risks, which accounted for chemicals that act with a mutagenic mode of action for carcinogenesis (e.g., TCE and vinyl chloride) (EPA, 2012; 2005). The ILCR for the age-adjusted resident is slightly above the EPA risk management range of 1E-04 to 1E-06 and although the HI for the child resident was greater than 1, no individual COC or target organ was greater than unity. The ILCR for the commercial/industrial worker is within the EPA management risk range of 1E-04 to 1E-06 and the HI is less than 1 (noncancer point of departure). Furthermore, considering the inclusion of all wells in the vicinity and updating of toxicity values, the current risks are conservative, trending downward over time, and the remedy is still protective and moving towards cleanup.

The SE OU 10 LUCs objectives are as follows:

- Reduce risks to human health by preventing bathing with, showering with, and drinking VOC-contaminated groundwater throughout SE OU 10; prohibiting people from digging into or drilling into or otherwise disturbing soil below the water table in on-post areas (Army-retained and BRAC property); and prohibiting people from building subsurface structures designed for human occupation in on-post areas (Army-retained and BRAC property).
- Maintain the integrity of any current or future remedial or monitoring system associated with SE OU 10 remedial actions, such as monitoring wells.

The Army has transferred portions of the SE OU 10 site to LIDA and will be transferring other portions of the OU. In addition, the SE OU 10 site includes off-post groundwater. As a result of the anticipated property transfer and off-post groundwater contamination, the SE OU 10 remedy includes pre-transfer LUCs, post-transfer LUCs, and off-post LUCs, as described in the SE OU 10 ROD (WESTON, 2006d) and Remedial Action Work Plan (WESTON, 2007c), as modified by the 2009 ESD.

7.5.1.2 System Operations/O&M

No O&M is required for the biodegradation stage of the remedy. The last nutrient injection occurred in 2007. The remedy is currently in the MNA and LUCs phase. As part of the MNA

O&M, three wells and one spring are sampled to track the natural attenuation of the BTEX portion of the plume near Building 37. In addition, the LUCs have been effective in preventing exposure to groundwater with concentrations greater than MCLs, PADEP MSCs, and carcinogen and systemic toxicant remediation levels, as specified in the ROD for SE OU 10 (WESTON, 2006d) and the Remedial Action Work Plan for SE OU 10 (WESTON, 2007c). Regular inspections have been conducted to ensure their ongoing effectiveness. LUCs for on-post property already transferred to the public are discussed in Section 6 for SE OU 8 and are maintained through the LUCAP MOA and the CVBP codes, which are still in force. The LEAD Master Plan was amended as follows to include groundwater use restrictions for Army property, to be implemented until risks to exposure to groundwater are within acceptable levels:

> **"Groundwater LUCs**
>
> The groundwater underlying the Industrial Area, the Administrative Area, and the BRAC Excess Area is contaminated with solvents. Source areas include the (IWTP) lagoons, the K Areas west of the ore piles, the Building 37 leaking industrial gravity sewer lines, the DRMO revetments, and the Oil Burn Pit. As stated on Page 10 Letterkenny receives its drinking water from the Letterkenny Reservoir, therefore the Letterkenny employees are not drinking the underlying contaminated groundwater.
>
> All depot personnel are prohibited from coming in contact with the groundwater. Installation of drinking water wells is absolutely forbidden. Installation of monitoring wells is prohibited without prior approval from BRAC Environmental Coordinator or the Letterkenny Remedial Project Manager. All excavations must follow the Letterkenny Army Depot National Environmental Policy Act Handbook as documented in Section VI, p 16, *NEPA Procedure at LEAD*, dated June 30, 1995.
>
> The LUCs pertaining to the BRAC Excess Area will only remain in effect as long as the Army owns the property. Once the property is transferred to the Letterkenny Industrial Development Authority the environmental LUCs will be incorporated into the property transfer deed."

LUCs for on-post property associated with SE OU 10 that will be transferred to the public will be maintained as specified in the Remedial Action Work Plan for SE OU 10 (WESTON, 2007c).

An ESD was submitted in 2009 to document a significant change to the SE OU 10 remedy: the lifting of groundwater use restrictions from some of the on-post areas of SE OU 10. At the time of the signing of the ROD, there were multiple areas within the LUCs boundaries of SE OU 10 where groundwater contamination did not exceed MCLs or risk-based levels. Some areas were upgradient or outside of the contaminant plume. In addition, the groundwater plume had been reduced in size as a result of an extended pilot study conducted prior to the date of the SE OU 10 ROD. The ESD documented the lifting of the following groundwater use restrictions from each of the Phase I, II, and V BRAC Parcels (except Parcels 10, 12, 2-65, 2-66, and 2R-82) because these areas are outside the current SE OU 10 VOC groundwater contaminant plume:

- Restrict soil excavation, digging, drilling, or other disturbance of soil activities below the water table without the prior approval of the Army.

- Restrict access to or use of the groundwater underlying the property without the prior approval of the Army, PADEP, and EPA.
- Restrict construction of any subsurface structure for human occupation without the prior approval of the Army, PADEP, and EPA.

In addition to lifting groundwater use restrictions, the Army continued monitoring groundwater outside the extent of the SE OU 10 groundwater plume. In accordance with the CVBP Declaration of CCRs, one of the prohibited uses of the property is drilling for water. Installation and pumping of any new wells upgradient or downgradient of the SE OU 10 groundwater plume could potentially result in migration of the plume; the CVBP CCRs prohibit installation of any new groundwater wells upgradient or downgradient of the SE OU 10 groundwater plume.

Groundwater use in off-post property, which includes all of SE OU 10 outside the LEAD boundary, is managed through local ordinances of Greene Township. The Greene Township Code (*Code of the Township of Greene Pennsylvania, Part II General Legislation, V4 Updated through 07-15-2005, Chapter 85, Subdivision and Land Development, and Chapter 101, Water)* applies to SE OU 10, which is located entirely within Greene Township. It was verified that, as of September 2011, these ordinances are still in place (Greene Township, 2011).

The estimated cost for O&M for the selected remedy as presented in the ROD for SE OU 10 was $82,400. These costs represented the net present worth of a five year treatment program (nutrient injections), five-year reviews for 30 years, maintenance of and reporting on LUCs. The cost data were reviewed and it was determined that the estimated costs are consistent with the actual cost of the remedy for SE OU 10.

7.5.1.3 Opportunities for Optimization

There have not been any opportunities for optimization for the SE OU 10 selected remedy.

7.5.1.4 Early Indicators of Potential Remedy Problems

It was originally anticipated in the SE OU 10 Remedial Action Work Plan that benzene concentrations in the site groundwater would be compliant with ARARs by 2010. However, benzene concentrations still exceed ARARs in monitoring wells in the immediate vicinity of Building 37. The MNA phase of the remedy continues to track the natural attenuation of BTEX compounds in site groundwater.

7.5.1.5 Implementation of LUCs and Other Measures

See Subsection 7.5.1.2.

<u>ANSWER A SE OU 10:</u> YES – The remedy of enhanced biodegradation and LUCs is functioning as intended by lowering VOC concentrations and preventing human exposure to the underlying groundwater.

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

7.5.2.1 Changes in Standards and TBCs

COCs, original target cleanup goals, and current applicable standards are provided in the following table:

Chemical	EPA MCL micrograms per liter (µg/L) (2003/2009)	PADEP MSC (µg/L) Residential (2001/2011)	PADEP WQC: Lower of fish and aquatic life or human health criteria (µg/L) (2001/2009)
Benzene	5/5	5/5	1.2 C/1.2 C
Chloroethane	NA	230/230	NA
1,1-Dichlorothane (1,1-DCA)*	NA	27 /31	NA
1,1-Dichloroethene (1,1-DCE)*	7/7	7/7	0.057 C (Regulation allows for achievable detection limit of 0.13)/33 H
Cis-1,2-dichloroethene (cis-1,2-DCE)*	70/70	70/70	NA
Trans-1,2-dichloroethene (trans-1,2-DCE)*	100/100	100/100	700 H/140 H
Naphthalene	NA	NA/100	NA
Trichloroethene (TCE)	5/5	5/5	2.7 C/2.5 C
1,2,4-trimethylbenzene	NA	NA/15	NA
1,3,5-trimethylbenzene	NA	NA/13	NA
Vinyl chloride	2/2	2/2	2 C/0.025 C

*Breakdown products of TCE.
C- Human health, cancer risk level at 1 x 10^{-6}.
H - Threshold effect human health criterion.

As shown in the table above, the applicable standards for the COCs have not changed in a manner that would affect the protectiveness of the remedy for SE OU 10 groundwater.

7.5.2.2 Changes in Exposure Pathways

The exposure pathway evaluated for SE OU 10 was groundwater consumption and contact, and vapor intrusion. It was noted in the second five-year review that the VIP needed to be re-evaluated at many LEAD sites within the SE Area because of changes in methods and new information that has been developed regarding the toxicity of TCE. At the time of the ROD, the VIP was determined to be an incomplete pathway based on an evaluation using methods that are now considered inaccurate for preferential pathways situations.

The VIP was evaluated at Buildings 37 and 47, as discussed in Subsection 1.2.9, and will be addressed under SE OU 8. The parcels associated with Buildings 37 and 47 will become part of the CVBP following the Phase VII BRAC transfer.

The current remedy for SE OU 10 potentially could reduce the contamination to levels that are acceptable based on risk calculations for C/I use. The EPA continues to evaluate the current remedy at SE OU 10 until a determination can be made regarding its effectiveness in reducing the mass of the VOCs in the site groundwater.

No new contaminants have been discovered and no new sources of the existing underlying groundwater have been discovered.

7.5.2.3 Changes in Toxicity and Other Contaminant Characteristics

There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the selected remedy. TCE toxicity is a complicated issue involving many uncertainties and has been the subject of considerable controversy over the past two decades. The PADEP MSCs for TCE are derived from the federal MCL, which became effective in 1989 (EPA, 2009a), and use the equations in 25 Pennsylvania Code Chapter 250.307 and 250.308 (PADEP, 2011b). The Safe Drinking Water Act requires EPA to periodically review the national primary drinking water regulation for each contaminant and revise the regulation, if appropriate. EPA reviewed trichloroethylene as part of the second six-year review and determined that it is appropriate to revise the regulation based on changes in analytical feasibility. As previously stated, the PADEP MSCs are established and passed by state law and the MSC for TCE has not been revised at the time of this five-year review. Future revisions to PADEP MSCs, including revisions passed by the State based on revised toxicity values, will be evaluated during future five-year reviews. In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011. Groundwater risks for SE OU 10 were reevaluated using the updated TCE toxicity values and the results are discussed in Subsection 7.5.1.1. It was determined that the risks are within the risk management range (i.e., 1E-04 to 1E-06) based on the current and future intended C/I use of the site. The age-adjusted resident risk was slightly above 1E-04, however this does not affect the C/I use of the site and protectiveness of the remedy and the groundwater risks continue to show a downward trend over time.

Therefore, it was concluded that there have been no changes in toxicity or other contaminant characteristics that affect the protectiveness of the remedy.

7.5.2.4 Changes in Risk Assessment Methods

There have been changes in the risk assessment methodology for TCE and vinyl chloride. IRIS suggests that the kidney risk be assessed using the mutagenic equations and the liver and non-Hodgkin lymphoma risks be addressed using the standard cancer equations. In order to generate cancer-based RSLs and risks for land uses involving multiple age receptors using the RSL calculator, multiple steps need to be performed (EPA, 2012). Additionally, vinyl chloride is a carcinogen that acts via a mutagenic mode of action. Appendix G was revised to include the inclusion of the age-adjusted resident risk for groundwater at SE OU 10. The risks calculated for the age-adjusted resident for TCE and vinyl chloride were done so using the age-dependent adjustment factors (ADAFs) and EPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (EPA, 2012; 2005).

The current industrial use RSLs and risks are accurate as discussed in this section as they do not include multiple age receptors (i.e., child and adult resident). Other than TCE and vinyl chloride, there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the C/I remedy. In addition, there have been changes in risk assessment methods for the VIP that were addressed and discussed under SE OU 8.

7.5.2.5 Expected Progress Toward Meeting RAOs

As stated in Subsection 7.5.1.1, the SE OU 10 RAOs are as follows:

- Protect human health and the environment.
- Restore the aquifer to federal and state drinking water standards within a reasonable timeframe.
- Comply with all federal and state environmental laws and ARARs.
- Reduce or eliminate further contamination of groundwater.
- Reduce or eliminate the migration of VOC-contaminated groundwater off-post and the discharge of VOC-contaminated groundwater to surface waters at off-post springs.
- Provide a suitable remedial alternative so that land can be transferred for beneficial use with minimal limitations.
- Prevent human exposure to contaminants associated with VOC-contaminated groundwater and springs at concentration in excess of the remediation goals.

The SE OU 10 remedy has been successful in meeting most of the RAOs; however, there are still some contaminants that continue to exceed ARARs in the vicinity of Building 37. Therefore, the MNA and long-term monitoring of groundwater will continue to track the natural attenuation of the BTEX component of the groundwater plume. The LUCs remain in place for portions of SE OU 10 to prevent human contact with groundwater.

<u>ANSWER B SE OU 10:</u> YES – The exposure assumptions, toxicity data, cleanup levels, and RAOs used in preparing the SE OU 10 ROD are still valid, with the exception of Vapor Intrusion Pathway which continues to be evaluated.

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

7.5.3.1 Newly Identified Ecological Risks

There have been no newly identified ecological risks.

7.5.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters. LUCs will prevent exposure to contaminated groundwater in the event of any natural disaster.

7.5.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy

No new information has come to light that affects the protectiveness of the selected remedy.

ANSWER C SE OU 10: NO – There has not been any new information that calls into question the protectiveness of the SE OU 10 remedy.

7.5.4 Summary of the Technical Assessment for SE OU 10

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the SE OU 10 ESD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. ARARs for groundwater contamination cited in the ROD have been met in most of the monitor wells in SE OU 10. There have been changes in the toxicity factors for the contaminants of concern (i.e., TCE) that were used in the baseline risk assessment; however, these changes do not affect the protectiveness of the remedy. Furthermore, there have also been changes in the risk assessment methodology for TCE and vinyl chloride when estimating age-specific cancer risks (i.e., child and adult resident). However this does not affect the remedy for SE OU 10 as it remains protective based on continued industrial use (i.e., adult receptors only). There is no other information that calls into question the protectiveness of the remedy.

8. ASSESSMENT – PDO AREAS

8.1 PDO OU 6—BRAC WASTE SITES

8.1.1 Question A: Is the remedy functioning as intended by the decision documents?

8.1.1.1 Remedial Action Performance

The LUCs were effective in meeting the RAOs, which are to prevent direct contact and ingestion of soil under residential and other nonindustrial exposure scenarios; prevent direct contact and ingestion of groundwater under any scenario; and prevent exposure levels of contaminants that produce unacceptable risk for the PDO OU 6 Phase I and Phase II Parcels. In accordance with the ESD for the Phase I and II Parcels (WESTON, 2012a), all soil LUCs for the PDO portions of the Phase I BRAC properties were lifted. Groundwater restrictions will remain in place in PDO OU 6.

8.1.1.2 System Operations/O&M

The O&M requirements for the Phase I and Phase II parcels of this OU are documented in the LUCAP that was developed and signed by the BCT in August 2002. The LUCAP documents the LUCs and mechanisms, the enforcement, and the annual reporting requirements. The LUCAP MOA will be replaced by the LUC RD for the Phase I, II, and V BRAC property transfers. The LUC RD is currently in progress and is expected to be completed in 2012.

Annual requirements for LUCs stated in the MOA include annual inspection to ensure that the LUCs for each site are effective; annual notification of LUCs to LIDA, Greene Township, Letterkenny Township, and CVBP; and annual status report of LUCs to PADEP and EPA. Inspections of the LUCs were conducted for calendar years 1999 through 2011 for the Phase I and II Parcels. An annual report summarizing the findings was submitted to EPA and PADEP for calendar years 1999 through 2010. The 2011 report is in progress. To date no LUC violations have been discovered. Land use at the CVBP has followed the C/I use restrictions. To date no new tenants or lessees have excavated into any contaminated soil or underlying groundwater.

8.1.1.3 Opportunities for Optimization

Other than the lifting of soil LUCs for the PDO OU 6 Phase I and Phase II Transfer Parcels recommended in the ESD, there are no opportunities for optimization.

8.1.1.4 Early Indicators of Potential Issues

The remedy for the PDO OU 6 Phase I and Phase II Transfer Parcels achieved the RAOs until the soil LUCs were lifted. There have been no exposures to contaminated groundwater and no exposures to soil as a result of land use less restrictive than C/I. Groundwater restrictions will

remain in place in PDO OU 6.

8.1.1.5 Implementation of LUCs and Other Measures

LUCs have been implemented successfully at the Phase I and II BRAC Parcels. All soil LUCs in PDO OU 6 have been lifted. Groundwater LUCs that remain prevent contact with contaminated groundwater.

The annual LUC inspection letters can be found on LEAD's Administrative Record website at http://www.leadenv.com/leadenv/. To find the specific letter for each year, go to the bottom left-hand corner and click on the year for the subject letter. Page down until you find the corresponding date of the letter. Dates for each annual inspection letter follow:

- Inspection Year 1999 December 22, 1999
- Inspection Year 2000 January 12, 2001
- Inspection Year 2001 February 4, 2002
- Inspection Year 2002 January 24, 2003
- Inspection Year 2003 January 27, 2004
- Inspection Year 2004 January 31, 2005
- Inspection Year 2005 January 25, 2006
- Inspection Year 2006 January 29, 2007
- Inspection Year 2007 January 29, 2008
- Inspection Year 2008 February 5, 2009
- Inspection Year 2009 January 12, 2010
- Inspection Year 2010 January 24, 2011
- Inspection Year 2011 February 10, 2012

ANSWER A PDO OU 6: YES – The remedy of LUCs functioned as intended by preventing human exposure to the underlying groundwater and preventing use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds. The soil LUCs for the PDO OU 6 portions of the Phase I and II Parcels were lifted and these areas are suitable for UU/UE. Groundwater LUCs remain in place in PDO OU 6 to prevent human contact with contaminated groundwater.

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

8.1.2.1 Changes in Standards and TBCs

The remedies selected for portions of PDO OU 6 as of the date of this five-year review (Phases I and II BRAC Parcels) meet ARARs. Overall, the federal and state standards for the contaminants of concern have not changed in a manner that affects the protectiveness of the selected remedies. The selected final remedy for the remaining portions of the OU with regard to soils will be in full compliance with all ARARs.

The remedy selected for the Phase I and Phase II Parcels in PDO OU 6, as stated in the Phase I and Phase II RODs (WESTON, 1998a and 2001b), was LUCs and deed provisions, which are protective of human health and the environment. Deeds recorded at the Franklin County Courthouse contain the restrictions for C/I use, excavation depth above the water table, subsurface structures for human occupation, and prohibiting access to the underlying VOC-contaminated groundwater.

At the time of the Phase I BRAC Parcels ROD, there were no ARARs identified for soils at the subject parcels. The ARARs discussed below for the Phase II ROD could also be considered ARARs at this point in time for the Phase I Parcels. The ARARs for soil as identified in the Phase II Parcels ROD are the following:

- PADEP MSCs, Non-Residential, Soil Direct Contact (Title 25 PA Code, Chapter 250, Administration of Land Recycling Program) (PADEP, 2011a).

- EPA, Title 40 CFR, Part 761, Disposal of PCBs, Final Rule under the Toxic Substances Control Act (TSCA), Section 761.61(a)(4)(i)(A), Cleanup Levels for Bulk PCB Remediation Waste, High Occupancy Areas: action is required for concentrations greater than 1 ppm (equivalent to milligrams per kilogram for soil or solid materials). Source: Federal Register, Volume 63, Number 124, 29 June 1998, pp 35383-35474). Verified: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=2ed854863aa31cabce205759212d4ad3&rgn=div8&view=text&node=40:31.0.1.1.18.4.1.3&idno=40 (24 August 2011).

The aforementioned ARARs have recently been revised (January/February/March, 2011). Prior to this revision, the PADEP Chapter 250, Appendix A, Act 2 MSCs were from 2001, revised as follows:

> *"The provisions of this Appendix A amended November 23, 2001, effective November 24, 2001, 31 Pa.B. 6395; amended January 7, 2011, effective January 8, 2011, 41 Pa.B. 230; corrected February 11, 2011, effective January 8, 2011, 41 Pa.B. 840; corrected March 19, 2011, effective March 5, 2011, 41 Pa.B. 1458."*

The ARARs for soil are met because there were no hazardous substances found or tested for in soils in the Phase I and Phase II Parcels. Phase I Parcel 29, which is in the PDO Area of LEAD, was reevaluated in the Phase I and II ESD due to detections of arsenic and beryllium. The updated risk assessment in the ESD confirmed that this parcel is suitable for UU/UE (WESTON, 2012a). Therefore, there are no soil LUCs remaining for the PDO OU 6 portion of the Phase I BRAC property.

The remedy regarding groundwater in the RODs for the Phase I and Phase II BRAC Parcels is an interim measure. The LUCs and deed provisions for PDO OU 6, which are the components of the interim groundwater remedy for PDO OU 2 groundwater, are protective of human health and the environment. Because the groundwater remedy is an interim measure, final ARARs were not identified in the RODs. Groundwater ARARs, including providing a detailed list of current ARARs, will be addressed in the ROD for PDO OU 2.

8.1.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways. Exposure pathways evaluated at PDO OU 6 were direct contact with soil, incidental ingestion of dust, soil-to-groundwater, and vapor inhalation. The VIP is of potential concern at PDO OU 2 because there are areas where underlying groundwater is contaminated with VOCs. However, this pathway poses no new threat to human health and the environment at PDO OU 6 sites and parcels with final remedies because the Phase I and II Parcels, with some exceptions noted below, are outside of the VOC-contaminated groundwater plume; therefore, the VIP is not considered a pathway of concern. Two of the Phase II road parcels (2R-87 and 2R-88) cross areas within the VIP area of concern for PDO OU 2 contaminated groundwater. However, there are no habitable buildings on these roads and none are expected in the future because there are no changes planned for roadway network. In addition, a portion of the southwest corner of Parcel 29 lies in an area of potential VIP concern based on the estimated extent of the VOC-contamination plume in PDO OU 2, which starts at the Pad 5 Landfill source and connects with the past source at the former DRMO revetments area. However, this pathway is not complete because there are no habitable buildings in this area of the parcel and no construction activities are planned for this area. Restrictions related to VIP for these areas will be addressed under PDO OU 2. Therefore, the remedy is still protective for the VIP.

The land use within the Phase I and II Parcels was C/I until the Phase I and II ESD cleared these parcels for UU/UE. The parcels are part of the CVBP. No new contaminants have been discovered and no new sources of the existing underlying groundwater have been discovered.

8.1.2.3 Changes in Toxicity and Other Contaminant Characteristics

In September 2011, the IRIS released new toxicity values for TCE which resulted in revised ORNL RSLs issued in November 2011. TCE is not a COC in soil at sites within PDO OU 6 with remedies in place (Parcel 29). Risks associated with groundwater beneath this OU are addressed under PDO OU 2, for which a remedy has not been selected. There have been no changes in toxicity and other contaminant characteristics at the PDO OU 6 Phase I or II Transfer Parcels that would affect the protectiveness of the remedies. There have been no changes in toxicity and other contaminant characteristics regarding the underlying VOC-contaminated groundwater that would affect the protectiveness of the remedy.

The recent changes in toxicity of TCE will be incorporated into the PDO OU 2 PRAP and ROD process.

8.1.2.4 Changes in Risk Assessment Methods

There have been no changes in risk assessment methodology that would affect the protectiveness of the remedy.

8.1.2.5 Expected Progress Toward Meeting RAOs

The remedy for the PDO OU 6 Phase I and II Parcels continues to achieve the RAOs.

ANSWER B PDO OU 6: Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used in preparing the Phase I and Phase II RODs are still valid.

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

8.1.3.1 Newly Identified Ecological Risks

There have been no newly identified ecological risks.

8.1.3.2 Impacts from Natural Disasters

There have been no impacts from natural disasters.

8.1.3.3 Any Other New Information that Could Affect the Protectiveness of the Remedy?

There has been no new information that could affect the protectiveness of the remedy.

ANSWER C PDO OU 6: NO – There has not been any new information that calls into question the protectiveness of the Phase I and II remedies consisting of LUCs. However, the soil LUCs were lifted for the PDO OU 6 portions of the Phase I BRAC property in accordance with the Phase I and II ESD (WESTON, 2012a). Groundwater LUCs remain in place in PDO OU 6 to prevent human contact with contaminated groundwater.

8.1.4 Summary of the Technical Assessment for PDO OU 6

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the RODs issued for the Phase I and Phase II RODs, as modified by the Phase I and II ESD. There have been no changes in the physical conditions of the sites that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been changes in the toxicity factors for the contaminants of concern (i.e., TCE) that were used in the baseline risk assessment; however, these changes do not affect the protectiveness of the remedy. There have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

9. PROGRESS SINCE LAST REVIEW AND CURRENT ISSUES

The issues identified during the five-year review are noted in the table below. These issues are not considered by the Army to be sufficient to warrant a finding that the remedy is not protective as long as corrective actions are implemented in a timely manner with respect to each issue. The tables also include issues that were identified during the first five-year review for the PDO Area NPL Site and the second five-year review for the SE Area NPL Site to indicate implementation progress.

Past Issues (from Second SE Five-Year Review and First PDO Five-Year Review)	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. SE OU 1: Cap Integrity – NOW RESOLVED		
SE OU 1: There was some accidental vehicle traffic noted in August 2007 across K-3, which did not damage the cover. The Army posted "Please Keep Off" signs in early September 2007 as part of cap maintenance. The capped areas (K-1, K-2, and K-3) are included in the Depot's mowing and landscape plan. It was noted in the second five-year review that the mowing of the K-Areas should occur annually at a minimum. Therefore, the K-Areas have been mowed at a minimum frequency of once per year to prevent the growth of woody plants that could possibly compromise the integrity of the cover.	N	Y
2. SE OU 2: LUCs Design and Implementation – NOW RESOLVED		
At the time of the second five-year review, the LUC RD had not been prepared. In addition, for parcels related to SE OU 2 that were retained for military use at LEAD, the LEAD Master Plan described land use on-post as C/I by specifying various military uses (LEAD Master Plan, Chapter 5); however, it did not explicitly restrict land use for SE OU 2 to C/I. To address this issue, the SE OU 2 RD was submitted and finalized in March 2010 (Shaw, 2010) and the LEAD Master Plan was amended to restrict SE OU 2 to C/I use by adding a statement that prohibits residential use at SE OU 2, including residential housing, elementary and secondary schools, child care facilities, and playgrounds, along with a figure showing the locations of the sewer lines.	N	Y

Past Issues (from Second SE Five-Year Review and First PDO Five-Year Review)	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
3A. SE OU 8 and PDO OU 6: LUCs – NOW RESOLVED		
Deeds for Road Parcels 2R-80, 2R-81, 2R-84, 2R-85, 2R-86, and 2R-87 do not include or reference the Land Use Restrictions required by the Phase II ROD. Because the Land Use Restrictions recorded in the May 3, 2002 Phase II deed "run with the land," they are enforceable. However, because the restrictions are not explicitly stated in the deeds, more research would be required for potential future owners to know about them. This issue was noted during the first PDO Area five-year review and discussions have been initiated with LIDA and Greene Township. Preparation of a deed of correction was implemented during the five-year review to provide additional legal certainty that the Land Use Restrictions are being fully implemented. The deed of correction was completed and recorded in the Franklin County Courthouse in Chambersburg on April 15, 2008. The LUCs for these parcels were lifted as part of the Phase I and II ESD, which was submitted and finalized in May 2012 (WESTON, 2012a).	N	N
3B. SE OU 8 and PDO OU 6: LUCs – NOW RESOLVED		
The LUCAP MOA requires the LEAD Commander to sign the annual LUC inspection reports. However, it has been the practice at LEAD for the BEC to sign the inspection reports. The Army, PADEP, and EPA agree that requiring the LEAD Commander to sign the inspection reports is overly burdensome, and that it would be more appropriate for the BEC to sign the reports. Therefore, it was noted in the second SE Area five-year review that the LUCAP MOA should be revised to allow the BEC to sign the annual reports. The LUC RD will replace the LUCAP MOA and will specify that the BEC will sign the reports.	N	N
3C. SE OU 8 and PDO OU 6: LUCs – NOW RESOLVED		
Two issues were noted in the second SE Area five-year review as a result of the inspection of Phase I/II deeds and leases: 1. Copies of deeds/leases were not being sent to the required parties as stated in the deed/lease as follows: "CERCLA Remediation Section, Paragraph C.2. Deed/Lease: Within 14 days after the effective date of the transaction, GRANTEE, its successors and assigns, will provide to the GRANTOR, EPA, and PADEP, copies of the deed, lease, or other conveying instrument evidencing such transaction." 2. A lease from a CVBP tenant was reviewed and discovered not to reference the corresponding Phase I Deed, thus confirming that not all leases reference the corresponding Phase I or II deed. The Army has worked with LIDA and CVBP tenants to determine an effective method to make sure that the deeds/leases are sent to the specified parties. In addition, the Army has completed the review of leases and has determined that all applicable soil and groundwater LUCs (for the parcels discussed in the following paragraphs) are referenced in the deed. The SE OU 10 ESD lifted groundwater restrictions for the majority of the Phase I and II Parcels in the SE Area (i.e., within the boundaries of SE OU 10) at LEAD. The parcels that retained their groundwater use restrictions were Parcels	N	N

Past Issues (from Second SE Five-Year Review and First PDO Five-Year Review)	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
10, 12, 2-65, 2-66, and 2R-82 (WESTON, 2009d). In addition, Phase I Parcels 29, 33, and 34 and Phase II Parcels 2-71, 2-72, and 2-76 in the PDO Area currently have groundwater restrictions. The Phase I and II ESD lifted the soil LUCs for the majority of the Phase I and II Parcels in both the SE and PDO Areas at LEAD (WESTON, 2012b). The only parcels that retained their LUCs were Parcels 1 and 2.		
4. Interim C/I Land Use, PDO and SE– NOW RESOLVED		
The remedies for SE OUs 3A, 5, 6, 9, 11, 12, 14, and for the remaining portions (BRAC Phase VII Parcels) of SE OU 8 have not yet been selected. The remedies for PDO OUs 1, 2, 3, 4, 5, and 8 have also not yet been selected. To be protective of human health and the environment, the interim land use of these areas must be restricted to C/I use. It was noted in the first five-year review for the PDO Area NPL Site and in the second five-year review for the SE Area NPL Site that the LEAD Master Plan did not explicitly restrict land use at these OUs (listed above) to C/I use only. The LEAD Master Plan (Chapter 5, Section L) was amended in January 2010 to address this issue.	N	Y

Issues Identified at 2012 Five-Year Review	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. SE OU 1: Cap Inspection Frequency		
The Vegetative Cover SOP for SE OU 1 states that the caps should be inspected quarterly (USACE, 2000). Currently, the caps are inspected annually. The SOP will be revised to allow for yearly inspections of the capped areas.		
2. SE OUs 2, 7, and 8 and PDO OU 6: LUCs	N	Y
The LUCAP MOA expires in August 2012 and is being replaced by the LUC RD for the Phase I, II, and V BRAC Parcels to document the LUCs at LEAD as required under CERCLA. This is not an issue at this time but could be if the LUC RD is not completed by August 2012 and there is a lapse in the enforcement of LUCs. The LUC RD is currently in progress and will be completed in 2012. Also, for PDO OU 6, groundwater restrictions for the interim remedy for Phase I and II exist in the LUCAP MOA and will ultimately be addressed by the RODs and RDs for PDO OUs 2 and 4. These are no issues at this time but could be if the RODs and RDs for PDO OUs 2 and 4 are not completed by August 2012 and there is a lapse in the enforcement of LUCs.		

[1]The following paragraphs were added to the *Environmental Constraints* section of the Letterkenny 2010 Installation Master Plan:

"Two areas of the installation contain remediated soils covered with synthetic caps. They include the industrial waste treatment plant lagoons (IWTP) and the K areas west of the ore piles. Intrusive activities are prohibited in these areas."

"**Groundwater LUCs**: The groundwater underlying the Industrial Area, the Administrative Area, and the BRAC Excess Area is contaminated with solvents. Source areas include the (IWTP) lagoons, the K Areas west of the ore piles, the Building 37 leaking industrial gravity sewer lines, the DRMO revetments, and the Oil Burn Pit. As stated on Page 10 Letterkenny receives its drinking water from the Letterkenny Reservoir, therefore the Letterkenny employees are not drinking the underlying contaminated groundwater.

All depot personnel are prohibited from coming in contact with the groundwater. Installation of drinking water wells is absolutely forbidden. Installation of monitoring wells is prohibited without prior approval from BEC or the Letterkenny Remedial Project Manager. All excavations must follow the Letterkenny Army Depot National Environmental Policy Act Handbook as documented in Section VI, p 16, NEPA Procedure at LEAD, dated June 30, 1995."

10. RECOMMENDATIONS AND REQUIRED FOLLOW-UP ACTIONS

Recommendations and required follow-up actions for SE Area and PDO Area OUs are summarized in the table below.

Issue No. and OU	Recommendations/ Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1. SE OU 1	Perform activities specified in maintenance plan: inspect sign integrity and mow cap at least once per year. Animal burrows have been observed during the past two cap inspections. Traps have been effective at removing burrowing animals and will continue to be used. Existing holes will be filled in to determine if new holes are being created. Revise Vegetative Cover SOP to require annual cap inspection instead of quarterly inspection.	Army, Restoration Program Manager	EPA	Cap inspection completed in September 2011. Mowing to be completed in Fall 2011. Revision of SOP to be completed by September 2012.	**N**	**Y**
2. SE OU 2	Ensure completion of annual LUC inspection reports.	Army, BEC	EPA	Annually	**N**	**Y**
3. SE OU 2	Include SE OU 2 LUCs in the LUC RD for Phases I, II, and V.	Army, BEC	EPA	1st or 2nd Quarter 2012	**N**	**Y**
4. SE OU 7	Include SE OU 7 LUCs in the LUC RD for Phases I, II, and V.	Army, BEC	EPA	1st or 2nd Quarter 2012	**N**	**Y**
5. SE OUs 2, 7, 8, and PDO OU 6	Complete LUC RD for Phases I, II, and V before the LUCAP MOA expires in August 2012.	Army, BEC	EPA	1st or 2nd Quarter 2012	**N**	**Y**
6. SE OU 10	Continued monitoring of site conditions.*	Army, BEC	EPA	Annually	**N**	**Y**
7. PDO OU 6	Ensure groundwater restrictions at PDO OU 6 sites are incorporated into the RODs and RDs for PDO OUs 2 and 4; ensure RDs are completed before the LUCAP MOA expires in August 2012.	Army, BEC	EPA	1st or 2nd Quarter 2012	**N**	**Y**

*The VIP is being addressed under SE OU 8 for Buildings 37 and 47 (Phase VII BRAC), as discussed in Subsection 1.2.9.

11. PROTECTIVENESS STATEMENT

11.1 SE AREA

Remedies have been selected for SE OU 1, SE OU 2, SE OU 3B, SE OU 4, SE OU 7, portions of SE OU 8, SE OU 10, and SE OU 13. Based on the results of the five-year review, these remedies are protective of human health and the environment Note that the selected remedies for SE OU 3B, SE OU 4, and two phases (Phases III and IV) of SE OU 8 were no action or no further action.. The remedies for SE OU 3A, SE OU 5, SE OU 6, SE OU 9, SE OU 11, SE OU 12, SE OU 14, and for the remaining portions of SE OU 8 (BRAC Phase VI and VII Parcels) have not yet been selected.

11.1.1 SE OU 1—K-Areas

The 1991 ROD for SE OU 1 specified that TCE concentrations at the K-Areas be reduced to levels below the cleanup criteria of 225 μg/kg. This cleanup criterion has been met through thermal treatment of soil. The remedy at SE OU 1 is protective of human health and the environment under current industrial land use. The remedial action is expected to be protective in the long term now that LUCs are specified in the LEAD Master Plan and a Cap Maintenance Plan is in place.

11.1.2 SE OU 2—Industrial Wastewater Sewer System

A ROD was completed (August 2006) and signed for SE OU 2 in September 2006 (Shaw, 2006a). The selected remedy for SE OU 2 was cleaning followed by abandonment of the sewers and drain lines at Building 37 and 57 to prevent future use of the existing sewers. Also, because the RA showed that there are acceptable risks only for C/I use (and not UU/UE), the remedy includes LUCs to prevent residential use of the property. The remedial action for sewer abandonment was completed in spring 2006.

The remedy at OU 2 currently protects human health and the environment. To ensure that the remedy is protective, the required LUC inspections must be documented annually. For parcels related to SE OU 2 currently retained for military use at LEAD, the LEAD Master Plan restricts land use for SE OU 2 to C/I. The details for land use restrictions for the sewers were specified in the LUC RD document, which was finalized in March 2010 (Shaw, 2010). The LUC RD includes a requirement for health and safety and dig permits to perform work at the site. Security patrols are also being utilized to prevent unauthorized activity at the site.

11.1.3 SE OU 7—TOSA/WOS

The ROD for the Phase V BRAC Sites was signed in June 2012. It is anticipated that the LUCs for the Phase V BRAC Sites will be protective by preventing direct contact and ingestion of soil under residential and other non-industrial exposure scenarios, preventing direct contact and

ingestion of groundwater under any scenario, and reducing exposure levels of contaminants that produce unacceptable risk. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain the LUCs as long as the Army will remain ultimately responsible for their effectiveness.

11.1.4 SE OU 8—BRAC Waste Sites

The RODs for Phase I (WESTON, 1998a) and II (WESTON, 2001b) documented selection of LUCs to prevent contact with contaminated groundwater and to ensure that the land use remains C/I. The remedy for the Phase I and Phase II Parcels portions of SE OU 8 is considered protective of human health and the environment.

During the second five-year review, the following minor issues were discovered that do not affect the protectiveness of the remedy and have been corrected as discussed below:

- The deeds transferring the road parcels (2R-80, 2R-81, 2R-84, 2R-85, 2R-86, and 2R-87) to Greene and Letterkenny Townships do not include or reference the LUCs required by the Phase II ROD. Because the Land Use Restrictions recorded in the May 3, 2002 Phase II deed "are binding on the GRANTEE, its successors and assigns; shall run with the land; and are forever enforceable," they are enforceable and the remedy is protective. However, because the restrictions are not explicitly stated in the deeds, the deeds should be modified to incorporate the Land Use Restrictions, providing additional legal certainty that the remedy is protective. *The deed of correction was completed during the second five-year review process and was recorded in the Franklin County Courthouse in Chambersburg on April 15, 2008.*

- The LUCAP MOA requires the LEAD Commander to sign the annual LUC inspection reports. However, it has been the practice at LEAD for the BEC to sign the inspection reports. This breach of protocol does not affect the protectiveness of the remedy. The Army has submitted the inspection reports to EPA and PADEP annually, as required by the LUCAP MOA. Furthermore, the LEAD Commander signs the five-year review reports that incorporate the findings of the annual inspections. In addition, the Army, PADEP, and EPA agree that requiring the LEAD Commander to sign the inspection reports is overly burdensome and that it would be more appropriate for the BEC to sign the annual reports. *It was determined during the second five-year review that the LUCAP MOA should be revised to allow the BEC to sign the annual reports; however, the LUC RD for Phases I, II, and V will replace the LUCAP MOA to document LUCs at LEAD as required under CERCLA. The LUC RD is currently in progress and will address this issue.*

During this five-year review, the following minor issues were discovered:

- The LUCAP MOA expires in August 2012 and is being replaced by the LUC RD for the Phase I, II, and V BRAC property transfers to document the LUCs at LEAD as required under CERCLA. This is not an issue at this time but could be if the LUC RD is not completed by August 2012 and there is a lapse in the enforcement of LUCs.

The LUC RD is currently in progress and is expected to be completed in spring 2012.

An ESD was completed to lift LUCs for a subset of the Phase I and II Parcels (WESTON, 2012a). Within Phase I, only Parcels 1, 2, 10, and 12 are still restricted to C/I. The Gate 1 Guardhouse, Building 511 Area (part of Parcel 2R-80) was the only Phase II Parcel to have its LUCs lifted in the ESD (WESTON, 2012a).

The ROD for the Phase V BRAC Sites was signed in June 2012. The ROD specified LUCs as the final remedy for soils. Before the signing of the Phase V ROD, it was determined that portions of the IWWS System lines Site are suitable for UU/UE. Therefore, the following changes were made to the selected remedy specifically for the IWWS System Lines:

- The remedy for portions of the IWWS System (areas overlapping Phase I and II Parcels 5, 6, 7, 2-47, 2-63, and 2-64) was changed from restricting the property to C/I with LUCs to No Further Action. These same portions of the IWWS Site were not transferred with LUCs.

This change in the remedy allowed the LUCs on Phase I Parcels 5, 6, and 7 to be lifted by means of a post-ROD ESD. The remaining portions of the IWWS in SE OU 8 will be transferred with LUCs to restrict these areas to C/I use (WESTON, 2012b).

It is anticipated that the LUCs for the Phase V BRAC Sites will be protective by preventing direct contact and ingestion of soil under residential and other non-industrial exposure scenarios, preventing direct contact and ingestion of groundwater under any scenario, and preventing exposure levels of contaminants that produce unacceptable risk. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain the LUCs as long as the Army will remain ultimately responsible for their effectiveness.

During the last five-year review, the protectiveness of the remedy for a portion of the SE OU 10 groundwater contamination plume was unable to be determined based on the necessity of re-evaluating the VIP. To address this, the VIP was evaluated at Buildings 37 and 47 in 2009 and is being addressed under SE OU 8. The current status of SE OU 8 is discussed in Subsection 1.2.9.

11.1.5 SE OU 10—Southern Southeast Industrial Area VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)

A final Proposed Plan (WESTON, 2005c) was completed in February 2005, and a ROD was completed in March 2006 (WESTON, 2006d). The selected remedy for SE OU 10 was Enhanced Biodegradation and LUCs. The Enhanced Biodegradation program has been completed (the last nutrient injection occurred from April to May 2007) and onpost and offpost LUCs have been effective in preventing exposure to groundwater with concentrations greater than MCLs, MSCs, and carcinogen and systemic toxicant remediation levels, as specified in the ROD. Regular inspections have been conducted to ensure their ongoing effectiveness.

An ESD was completed for SE OU 10 in 2009. The ESD documented the lifting of groundwater use restrictions from the majority of the Phase I and II Parcels and all of the Phase V Parcels because these areas are outside of the current VOC plume associated with SE OU 10

groundwater (WESTON, 2009d). Groundwater restrictions were retained on Phase I Parcels 10 and 12 and Phase II Parcels 2-65, 2-66, and 2R-82.

The remedy for SE OU 10 currently protects human health and the environment based on recent groundwater results, the evaluation of the VIP, and continued LUCs for protection of human health from groundwater use and contact. The effectiveness of the remedy will be reassessed by means of risk calculations and comparison of data to MCLs after sufficient groundwater data are obtained.

11.2 PDO AREA

11.2.1 PDO OU 6—BRAC Waste Sites

An ESD was completed by the Army and EPA in May 2012 to lift the LUCs for a subset of the Phase I and Phase II BRAC Parcels that no longer require LUCs to protect human health and the environment. LUCs were lifted from all of the Phase I BRAC Parcels associated with PDO OU 6. It was concluded in the ESD that the Phase I Parcels within PDO OU 6 are cleared for UU/UE and are protective of human health and the environment.

During this five-year review, the following minor issue was identified:

- Groundwater restrictions in PDO OU 6 for the interim remedy for Phase I and Phase II BRAC Parcels exist in the LUCAP MOA. These restrictions will ultimately be covered in the ROD and RD for PDO OU 2 and OU 4. These are no issues at this time but could be if the RODs and RDs for PDO OUs 2 and 4 are not completed by August 2012 and there is a lapse in the enforcement of LUCs.

12. NEXT FIVE-YEAR REVIEW

The SE and PDO Areas at LEAD are statutory sites that require ongoing five-year reviews. The initial trigger date for the first PDO five-year review was 11 August 1993. The first evaluation for the PDO Area NPL Site was signed by the Army on 1 March 2007 and EPA concurred on 12 March 2007. The first review for the SE Area NPL Site was completed on 25 October 2001 and EPA concurred on 6 November 2001. The second five-year review for the SE Area NPL Site was completed on 19 June 2008 and EPA concurred on 24 June 2008.

Until 1 August 2011, it was required that subsequent five-year reviews be completed 5 years from the date of EPA concurrence of the previous evaluation. Therefore, the trigger date for the second PDO five-year review was 12 March 2007. The third SE review has been integrated into this document. The EPA Memorandum, *Program Priorities for Federal Facility Five-Year Review*, issued August 1, 2011, has altered the requirement for due dates of subsequent five-year reviews. The Memorandum states the following in regards to due dates:

> *"In fiscal year (FY) 2011, [the Federal Facilities Restoration and Reuse Office] has made a [Comprehensive Environmental Response, Compensation, and Liability Information System] change such that the future date will be based on the planned completion date. What this means is that starting this fiscal year, if the date the five-year review report is concurred on by EPA is July 30, 2011, then the due dates of the subsequent five year reviews are July 30, 2016 and July 30, 2021. This will assure that the due dates do not change if the reports are late or early. These changes supercede section 1.3.3 of the 2001 Comprehensive Five-Year Review Guidance for federal facilities."*

Therefore, the next LEAD five-year review for the PDO and SE Area NPL Sites at LEAD will be completed no later than 5 years after the due date of this five-year review (12 March 2012), which will be on 12 March 2017.

13. REFERENCES

Note: The Administrative Record reference number for each document is included at the end of references that are included in the Letterkenny Army Depot Administrative Record (i.e., LKD.RT-xxx). These documents can be viewed by clicking the following link http://www.leadenv.com/leadenv/ and then clicking on "Public Library/Public Announcement". This link will direct your web browser to the LEAD Administrative Record.

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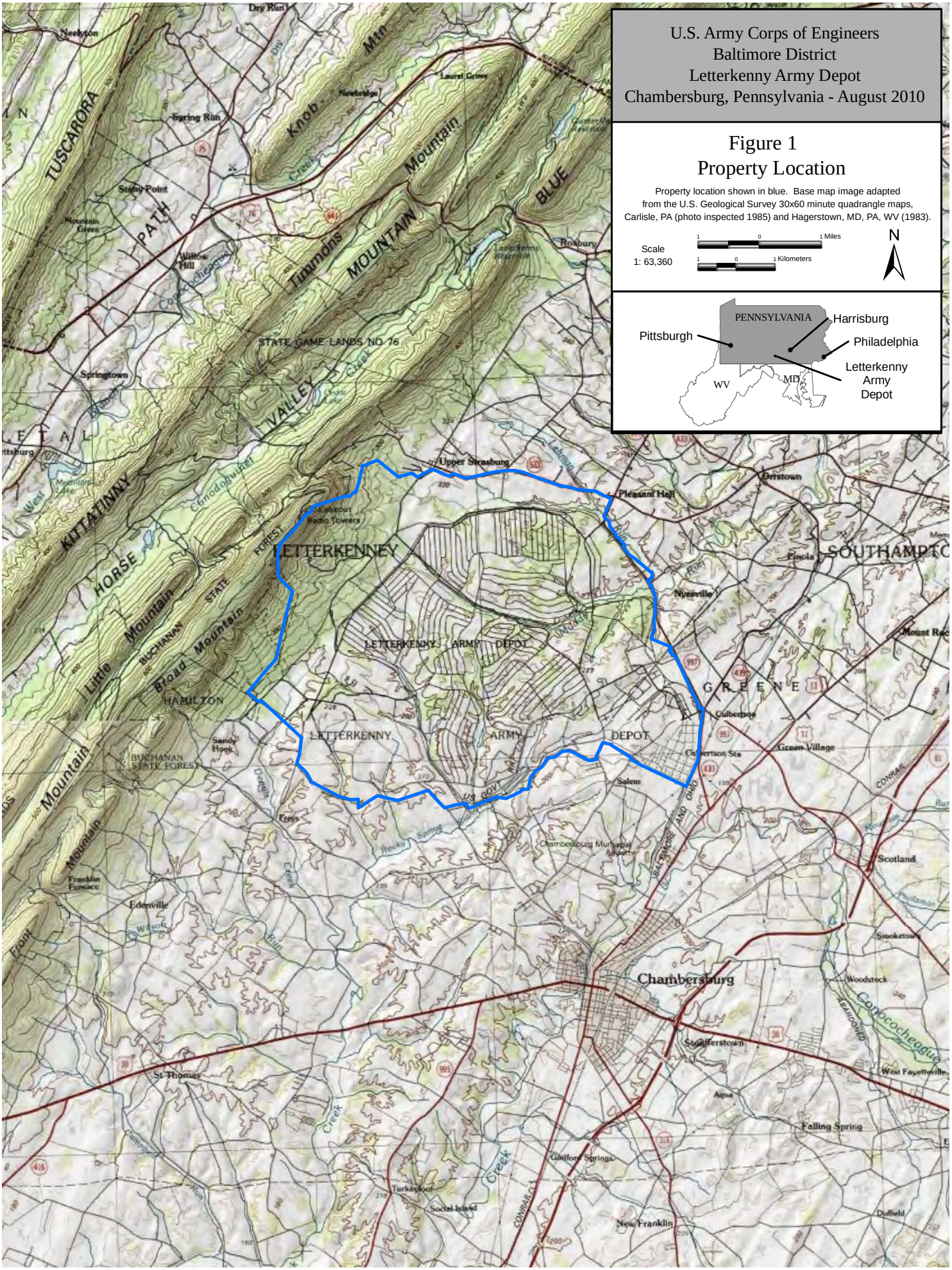
FIGURES



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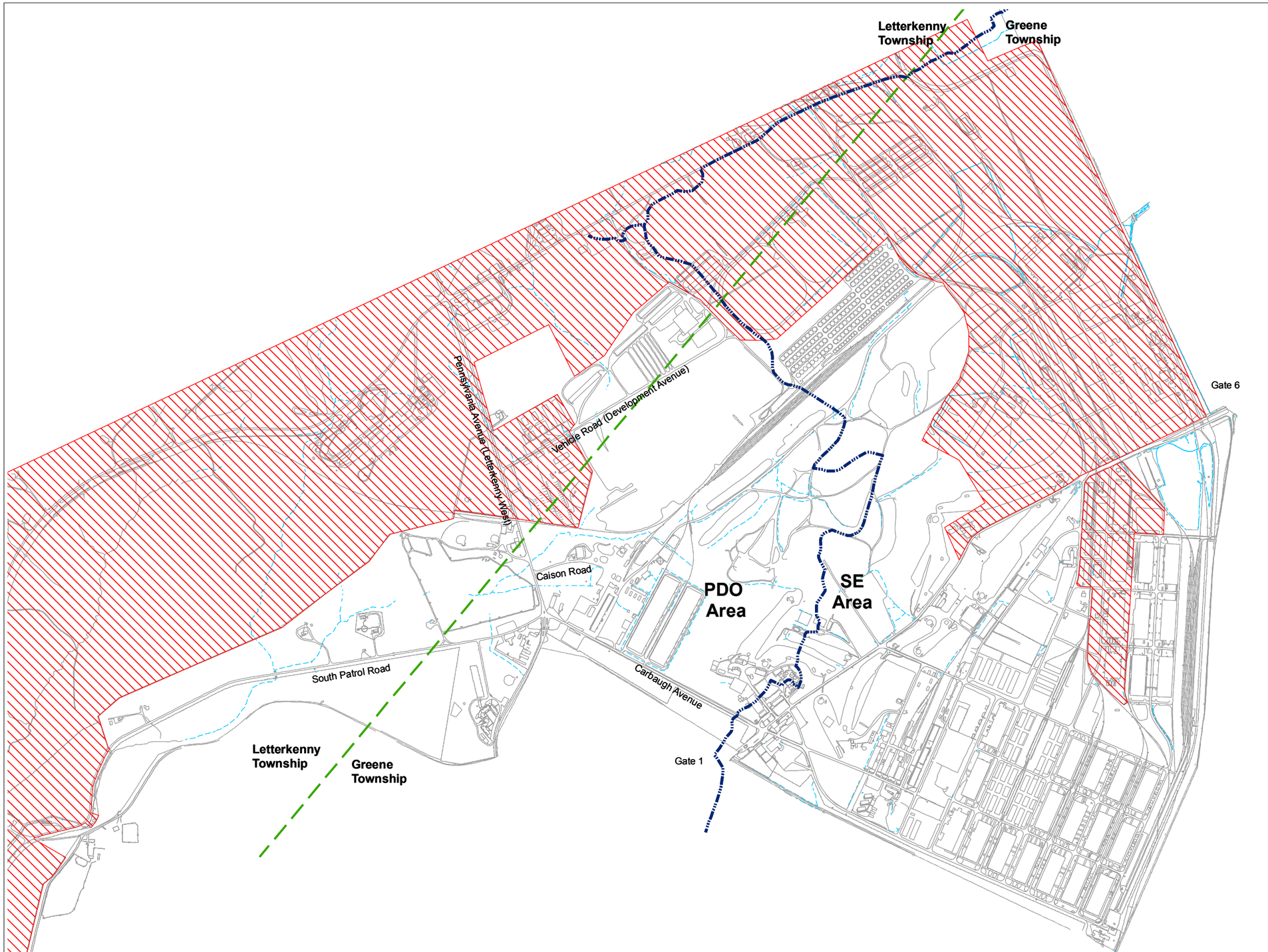

Legend

- Buildings
- Drainage
- Roads
- SE PDO Drainage Divide
- Township Line (Approximate)
- Army Retained Area

N
W E
S

1,250 625 0 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 2
Location of SE/PDO Divide and Army Retained Area
Letterkenny Army Depot

U.S. Army Corps of Engineers
Baltimore District

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11-09-2010

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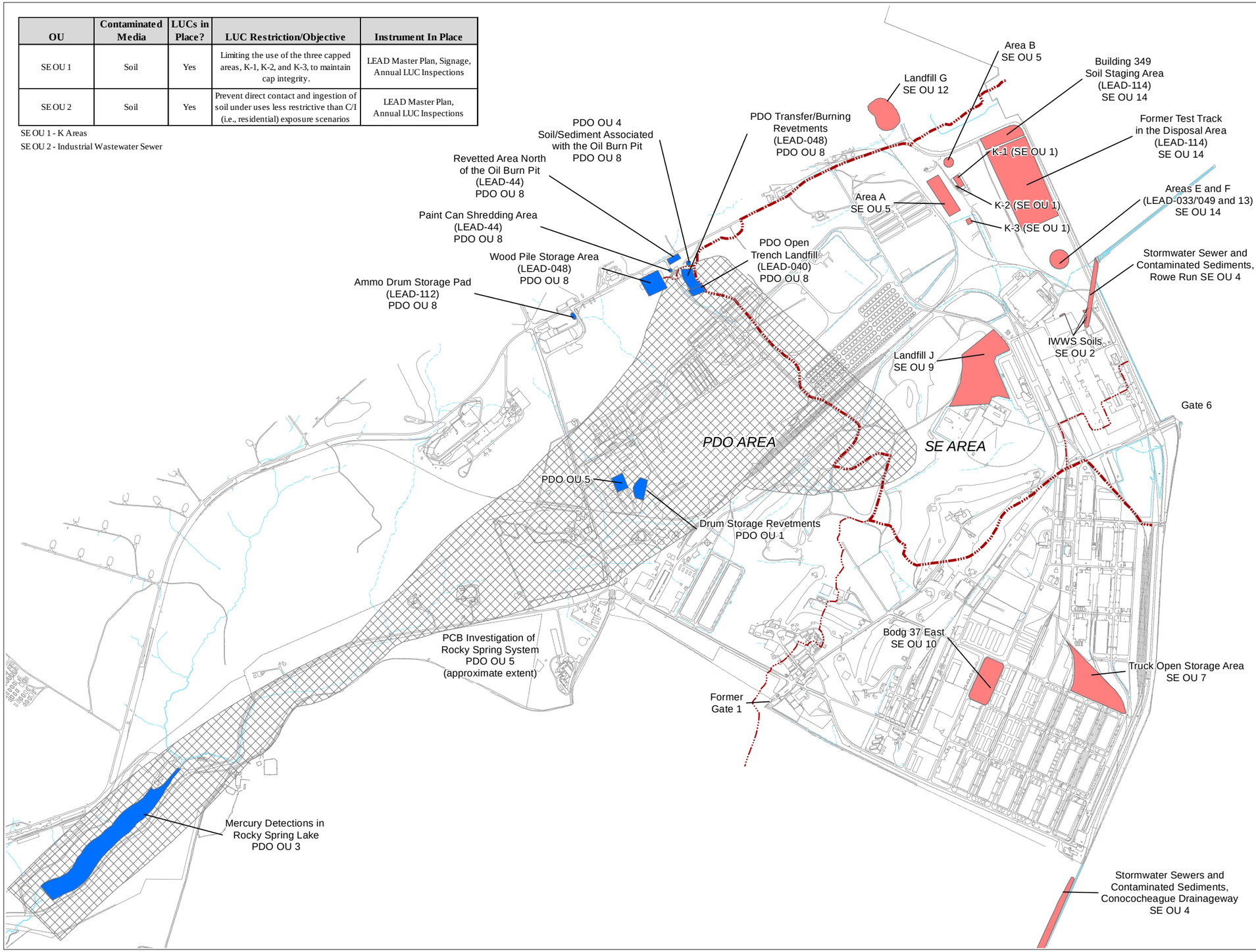
OU	Contaminated Media	LUCs in Place?	LUC Restriction/Objective	Instrument In Place
SE OU 1	Soil	Yes	Limiting the use of the three capped areas, K-1, K-2, and K-3, to maintain cap integrity.	LEAD Master Plan, Signage, Annual LUC Inspections
SE OU 2	Soil	Yes	Prevent direct contact and ingestion of soil under uses less restrictive than C/I (i.e., residential) exposure scenarios	LEAD Master Plan, Annual LUC Inspections

SE OU 1 - K Areas

SE OU 2 - Industrial Wastewater Sewer



Legend:

- Base Features
- Drainage
- Major Watershed Divide
- Subbasin Drainage Divide
- PDO Operable Unit Locations (approximate)
- PCB Investigation of Rocky Spring System
- SE Operable Unit Locations (approximate)

Notes:

1. Part of PDO OU 4 is located off-post and is not shown on this figure. PDO OBP Soils were formerly PDO OU 1 and are now being addressed under PDO O U 4.

2. SE OU 8 and PDO OU 6 BRAC waste sites are shown on Figure 5.

3. The areal extents of groundwater OUs at LEAD, including SE OUs 3A, 3B, 6, 10, 11, and 13 and PDO OUs 2, 4, and 7 are shown on Figure 4.

4. SE OU 2 IWWS lines are located throughout the Southeast Industrial Area and are not specifically identified on this figure.

N W E S

1,500 750 0 1,500 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 3
Locations of Operable Units in the SE and PDO Areas at LEAD
Letterkenny Army Depot

U.S. Army Corps of Engineers
Baltimore District

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10-17-11

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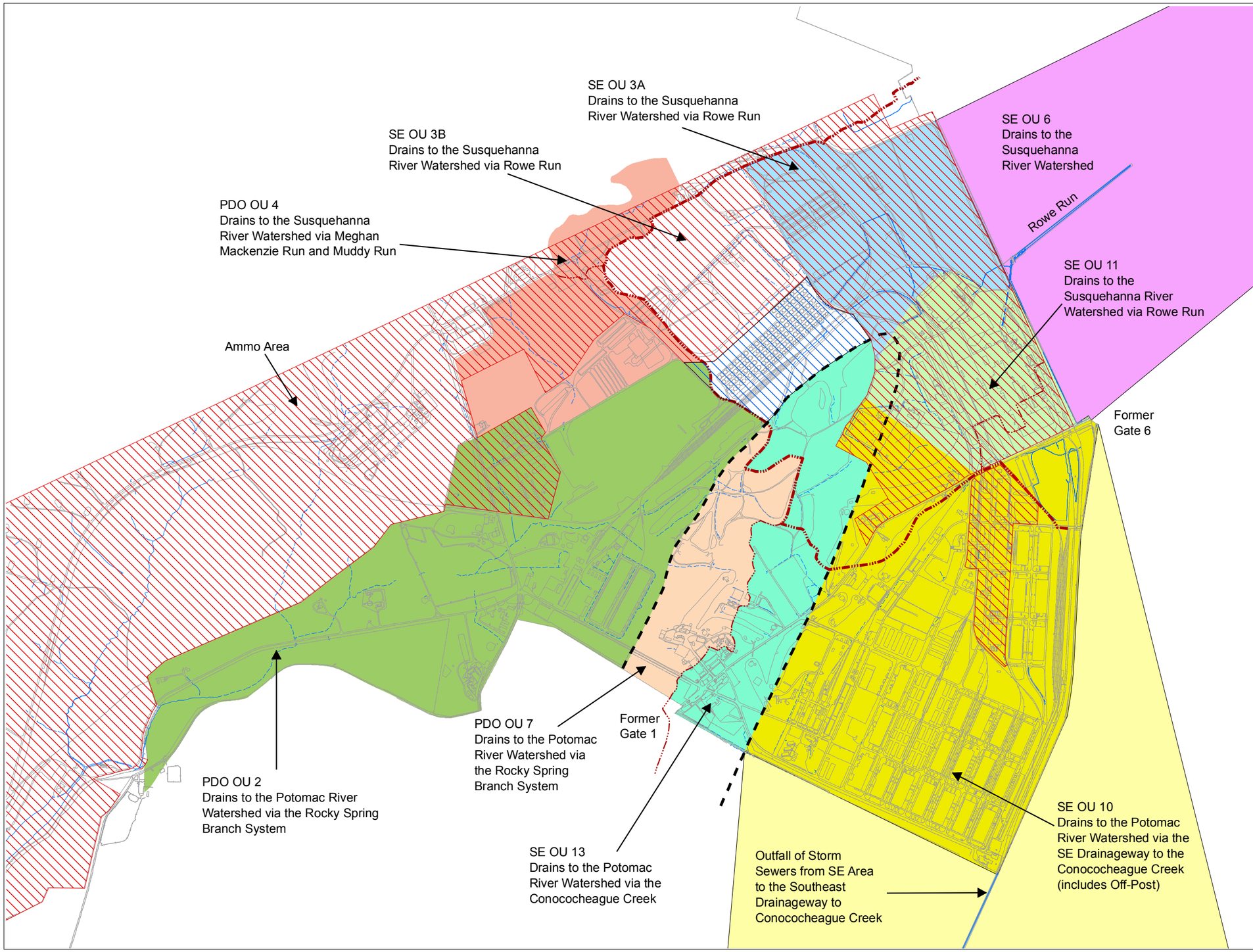

Legend:

- Base Features
- Drainage
- Major Watershed Divide
- Subbasin Drainage Divide
- Shale/Limestone Boundary
- Army Retained Area
- SE OU 3A: Disposal Area VOC-Contaminated Groundwater
- SE OU 3B: Area Upgradient of VOC Contamination Source in SE OU 3A
- SE OU 6: Off-Post VOC-Contaminated Groundwater North of Former Gate 6
- SE OU 10: Southern Southeast Industrial Area VOC-Contaminated Groundwater Primarily South of Former Gate 6 (Conococheague Drainage System)
- SE OU 10 (Off-Post)
- SE OU 11: Northern Southeast Industrial Area VOC-Contaminated Groundwater North of Former Gate 6
- PDO OU 2: PDO Area Groundwater and Surface Water
- PDO OU 4: Groundwater Associated with the PDO Oil Burn Pit
- PDO OU 7 / SE OU 13: Southern Martinsburg Shale Region (SMSR) Groundwater

Note: SE OU 6 (entire area not shown) is SE Area Off-Post VOC-Contaminated Groundwater (Downgradient of SE OU 3 and SE OU 11)

N W E S

1,400 700 0 1,400 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 4
Current Layout of LEAD Groundwater Operable Units (OUs)
Letterkenny Army Depot

U.S. Army Corps of Engineers
Baltimore District

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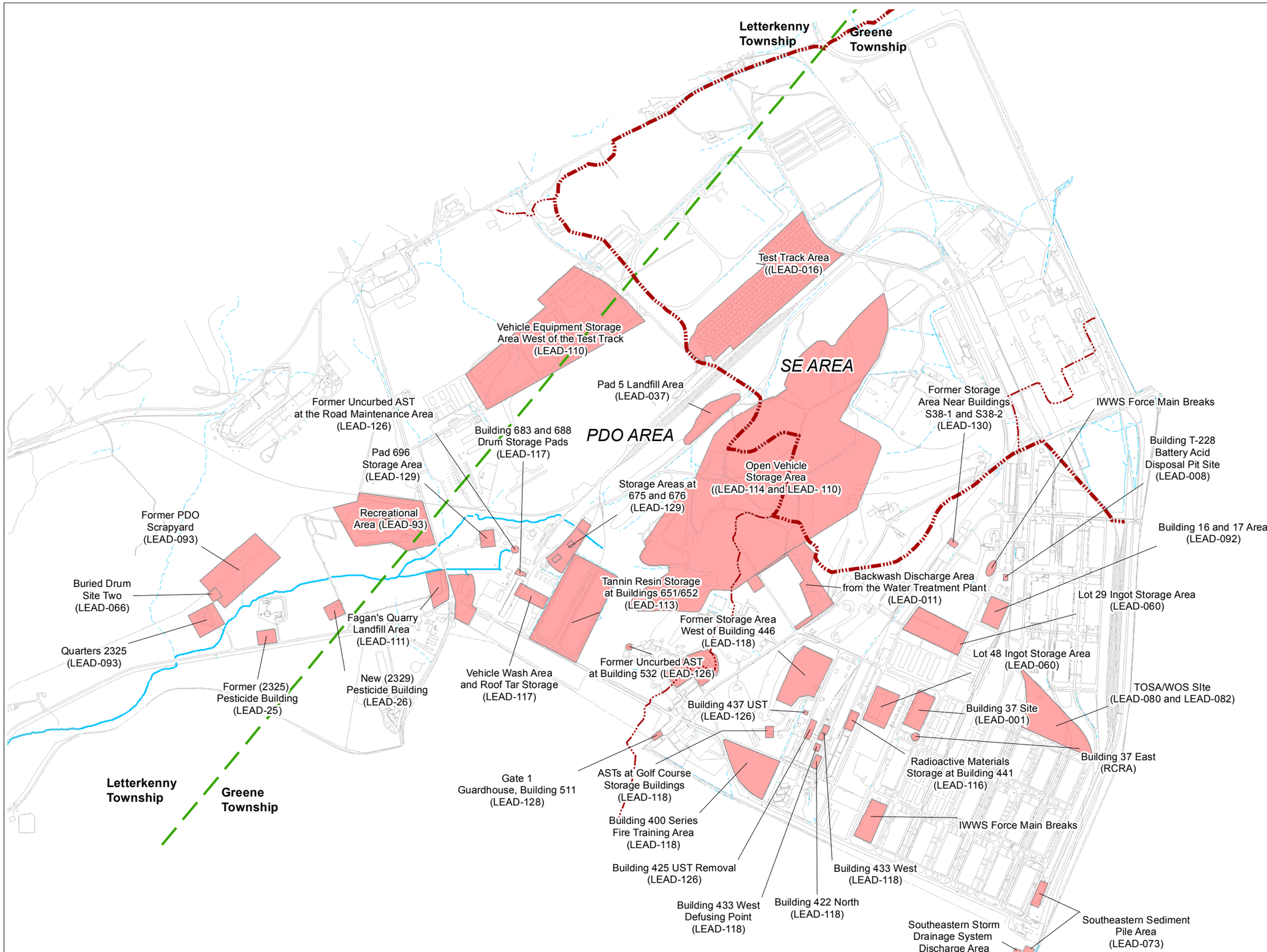

Legend:

- Base Features
- Drainage
- Major Watershed Divide
- Subbasin Drainage Divide
- Township Line (Approximate)
- Army Retained Area

Notes:
Former PCB Transformer Site not shown.

Site numbers in parentheses are Army Enviromental Database Restoration (AEDBR) numbers.

N
W E
S

1,250 625 0 1,250 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 5
SE OU 8 and PDO 6 BRAC
Waste Sites

U.S. Army Corps of Engineers
Baltimore District

Date:
09-14-11

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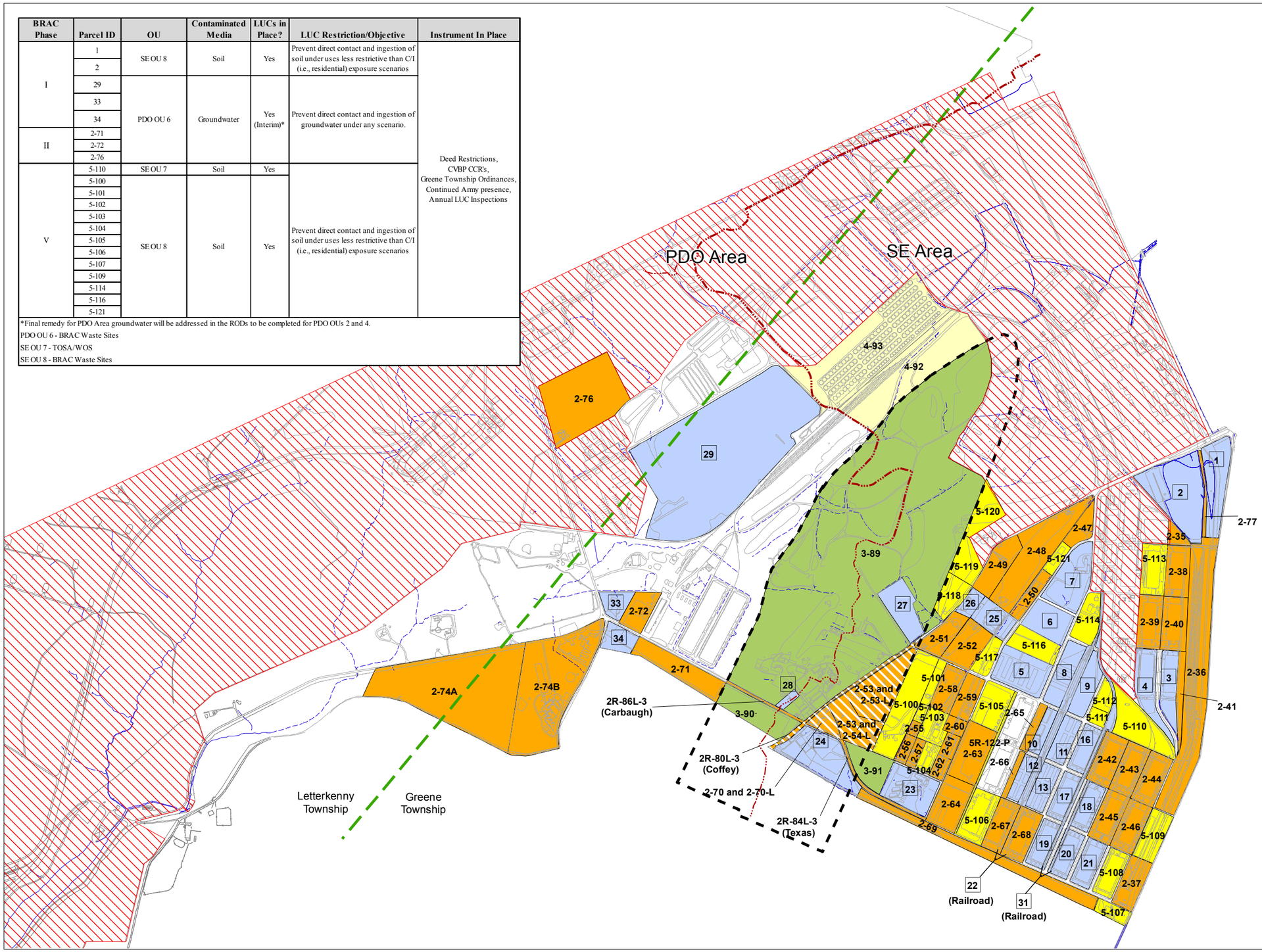
BRAC Phase	Parcel ID	OU	Contaminated Media	LUCs in Place?	LUC Restriction/Objective	Instrument In Place
I	1	SE OU 8	Soil	Yes	Prevent direct contact and ingestion of soil under uses less restrictive than C/I (i.e., residential) exposure scenarios	Deed Restrictions, CVBP CCR's, Greene Township Ordinances, Continued Army presence, Annual LUC Inspections
	2					
	29	PDO OU 6	Groundwater	Yes (Interim)*	Prevent direct contact and ingestion of groundwater under any scenario.	
	33					
	34					
II	2-71					
	2-72					
	2-76					
V	5-110	SE OU 7	Soil	Yes	Prevent direct contact and ingestion of soil under uses less restrictive than C/I (i.e., residential) exposure scenarios	
	5-100	SE OU 8	Soil	Yes		
	5-101					
	5-102					
	5-103					
	5-104					
	5-105					
	5-106					
	5-107					
	5-109					
	5-114					
	5-116					
	5-121					

*Final remedy for PDO Area groundwater will be addressed in the RODs to be completed for PDO OUs 2 and 4.
PDO OU 6 - BRAC Waste Sites
SE OU 7 - TOSA/WOS
SE OU 8 - BRAC Waste Sites



Legend:

- Buildings
- Army Retained
- Roads
- Drainage Divides
- Shale/Limestone Boundary
- Township Line
- 1 — Phase I Parcels
- 2-48 — Phase II Parcels (Does not show all roads)
- 2-70-L — Phase III Parcel that is Lower Portion of Phase II Parcel (8 ft. below ground surface to center of the earth)
- 3-90 — Phase III Parcels
- 4-92 — Phase IV Parcels
- 5-109 — Phase V Parcels

N W E S

1,250 625 0 1,250 Feet

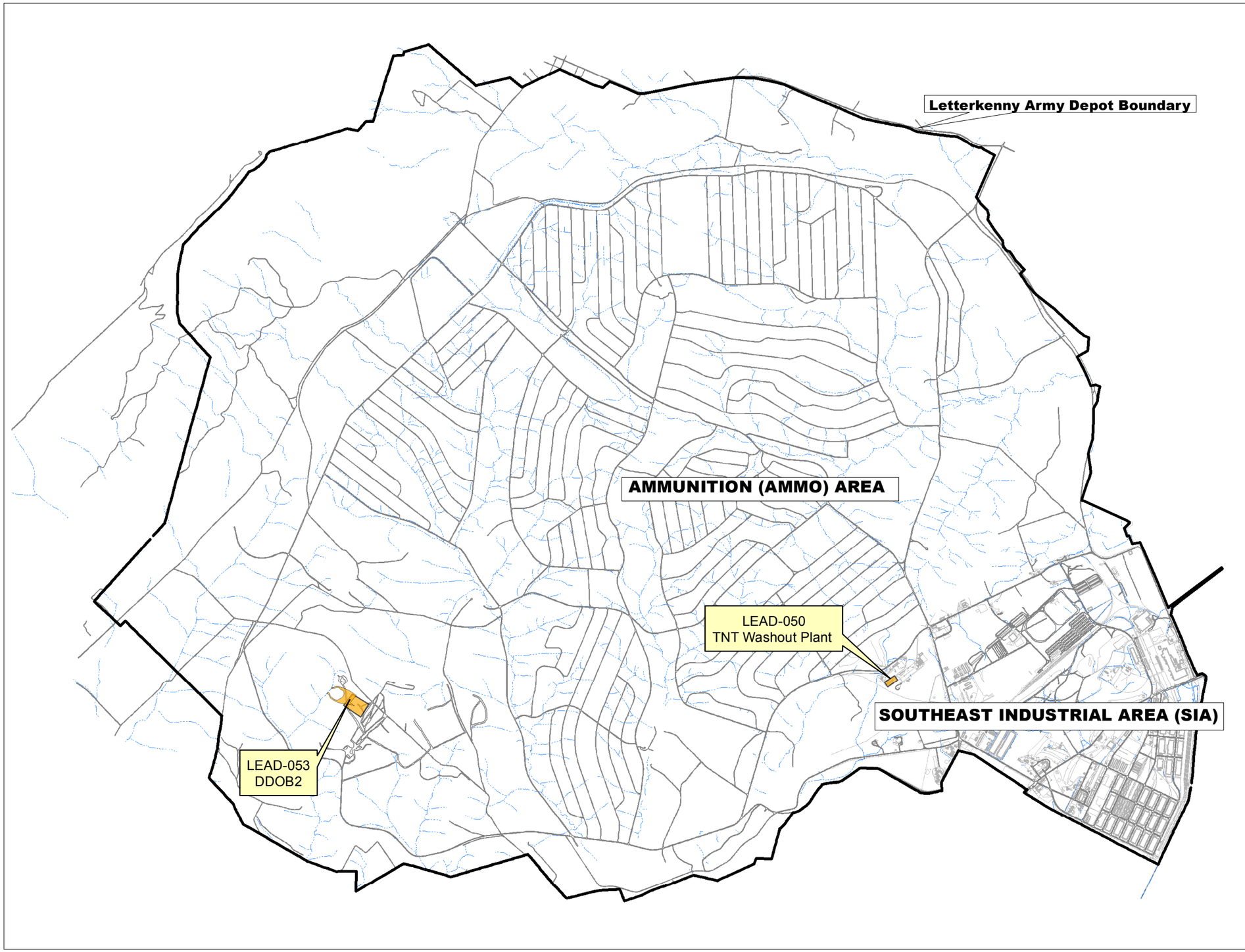
Letterkenny Army Depot
Chambersburg, PA

Figure 6
Phases of BRAC Property Transfers at LEAD

U.S. Army Corps of Engineers
Baltimore District

Date:
1/6/2012

File: Y:\LEAD\MXD\BRAC_phases_1_5.mxd, 1/6/2012 9:35:50 AM, ricksc



Legend:

- Buildings
- Roads
- Drainage
- AEDBR Site

N
W E
S

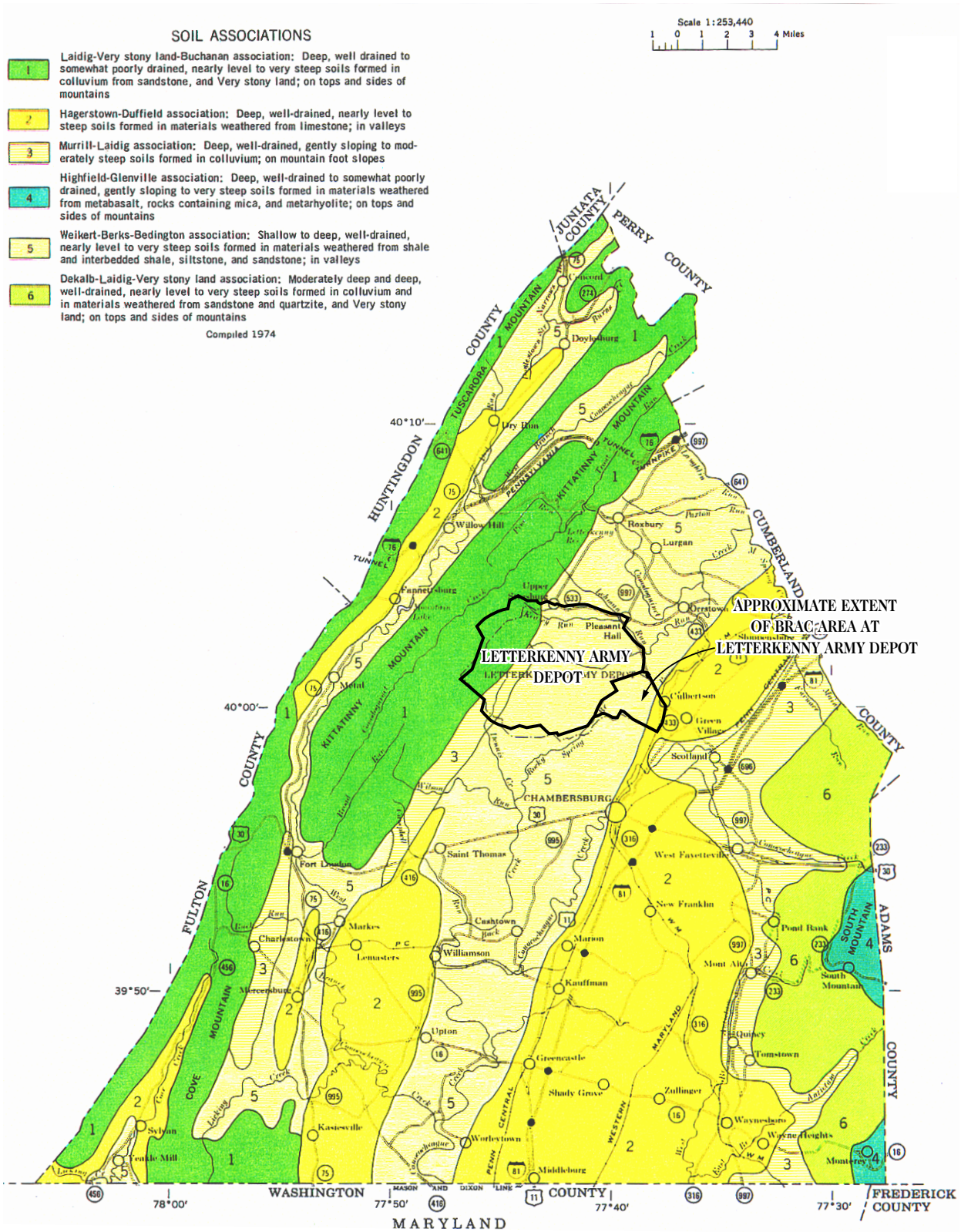
3,500 1,750 0 3,500 Feet

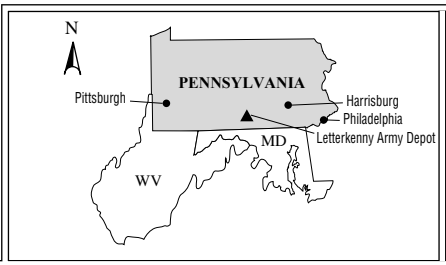
Figure 7
Ammo Area AEDBR Sites
LEAD-050 TNTWO
LEAD-053 DDOB2
Letterkenny Army Depot

Letterkenny Army Depot
Chambersburg, PA

Date:
09-15-11

File: Y:\LEAD\MXD\PBA\TNT_OB2_site_locations.mxd, 9/15/2011 12:01:09 PM, ricksc





U.S. Army Corps of Engineers,
Baltimore District

Letterkenny Army Depot

Chambersburg, Pennsylvania

FIGURE 8

GENERAL SOIL MAP: FRANKLIN COUNTY, PENNSYLVANIA

Source: USDA, 1974; ESE.

02P-1355

FIGURE 9
GEOLOGIC MAP OF THE PDO AND SE AREAS
LETTERKENNY ARMY DEPOT

Legend:

Om — Martinsburg Formation (Om)
Dark-gray to black fissile shale, and yellow-green to dark-gray sandstone and graywacke. Forms distinctive shale hills.

Oc — Chambersburg Formation (Oc)
Medium to dark-gray, thin to medium bedded argillaceous limestone. Fossiliferous in part. Occurs primarily on hill slopes.

Osp — St. Paul Group (Osp)
Medium to dark-gray, medium to thick bedded micritic limestone, granular limestone, striped limestone and sparse dolomite. Typically forms low-lying areas with little topographic relief.

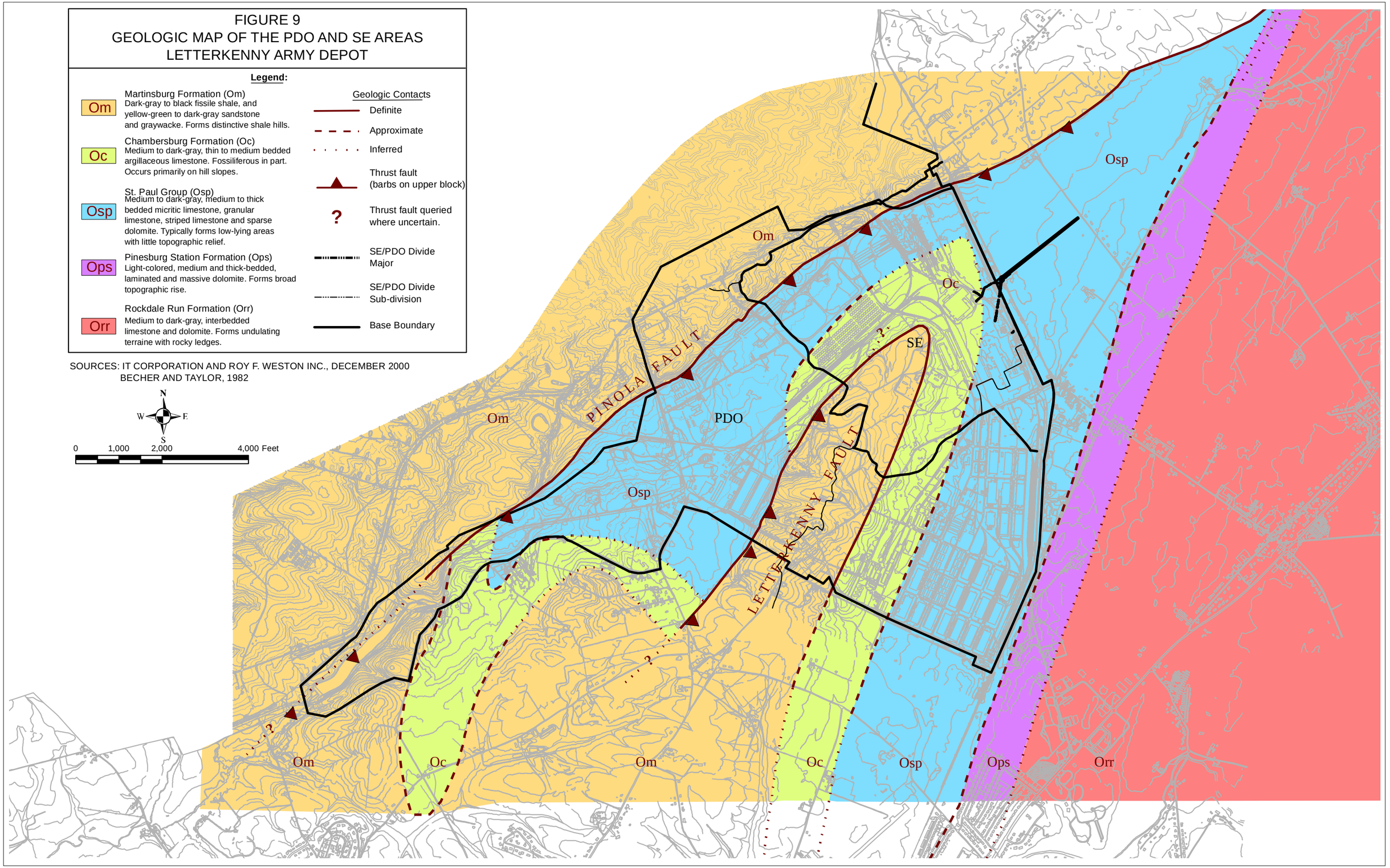
Ops — Pinesburg Station Formation (Ops)
Light-colored, medium and thick-bedded, laminated and massive dolomite. Forms broad topographic rise.

Orr — Rockdale Run Formation (Orr)
Medium to dark-gray, interbedded limestone and dolomite. Forms undulating terraine with rocky ledges.

Geologic Contacts

- Definite
- Approximate
- Inferred
- Thrust fault (barbs on upper block)
- ? Thrust fault queried where uncertain.
- SE/PDO Divide Major
- SE/PDO Divide Sub-division
- Base Boundary

SOURCES: IT CORPORATION AND ROY F. WESTON INC., DECEMBER 2000
BECHER AND TAYLOR, 1982



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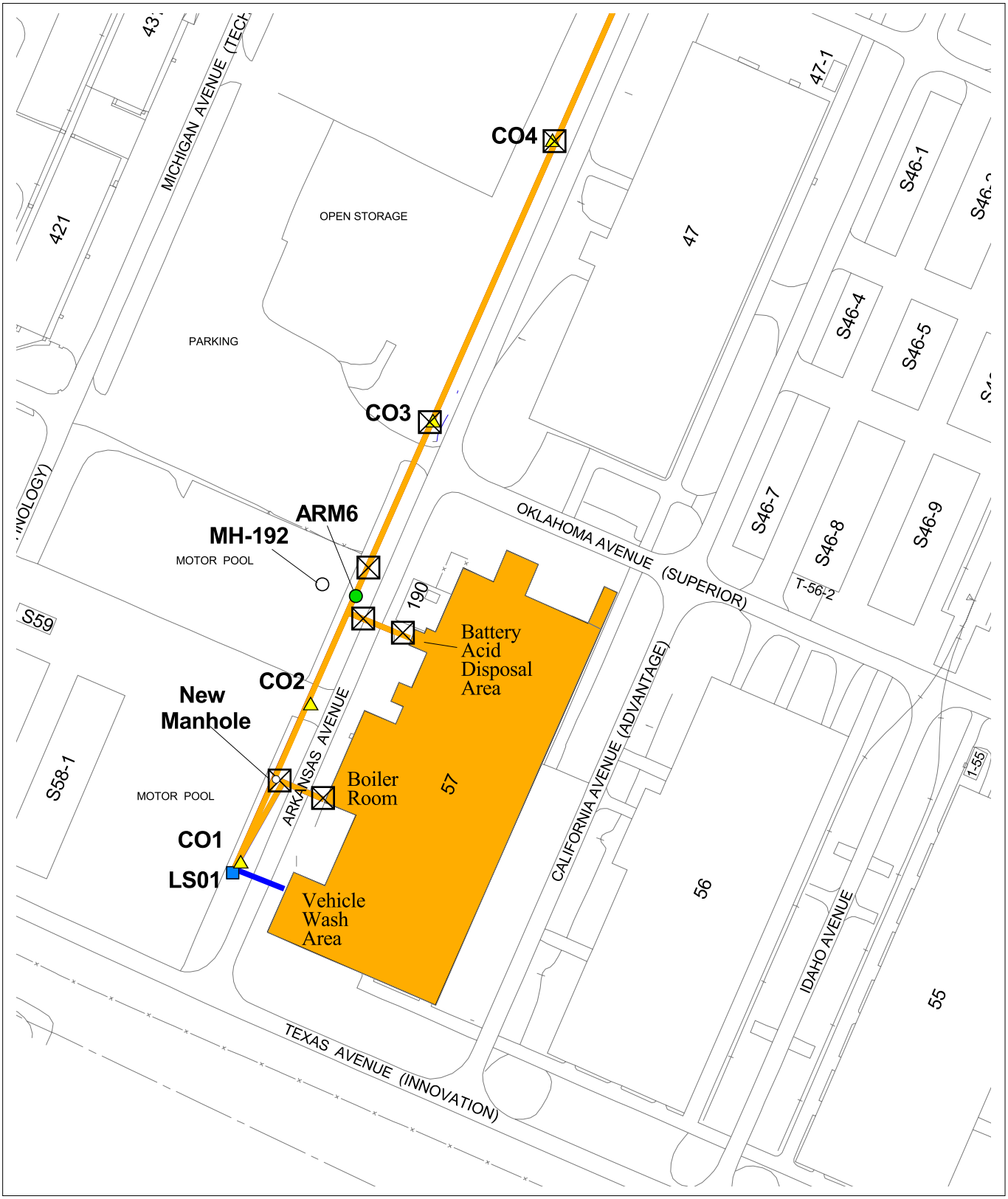

Legend:

- Building
- Roads
- Drainage
- Gravity Flow IWWS Pipeline
- Abandoned IWWS Pipeline
- Air Release Manhole
- Cleanout
- Lift Station
- Listening Post
- Manhole
- Abandonment Point

50 0 50 100 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 10
Abandonment Points
for IWWS Lines Associated
with Building 57

WESTON SOLUTIONS

Date:
09/05/2007

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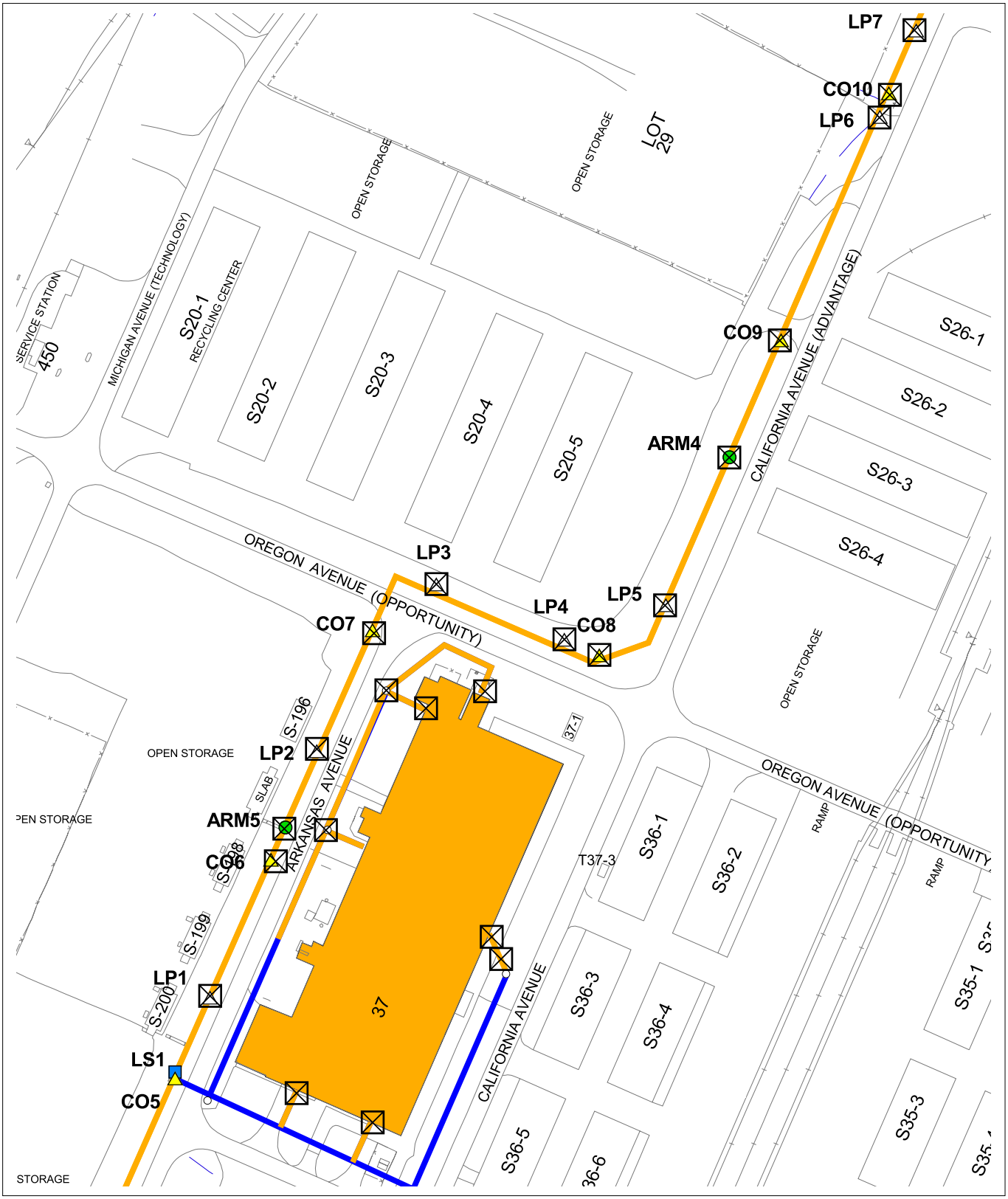


Legend:

- Building
- Roads
- Drainage
- Gravity Flow IWWS Pipeline
- Abandoned IWWS Pipeline
- Air Release Manhole
- Cleanout
- Lift Station
- Listening Post
- Manhole
- Abandonment Point

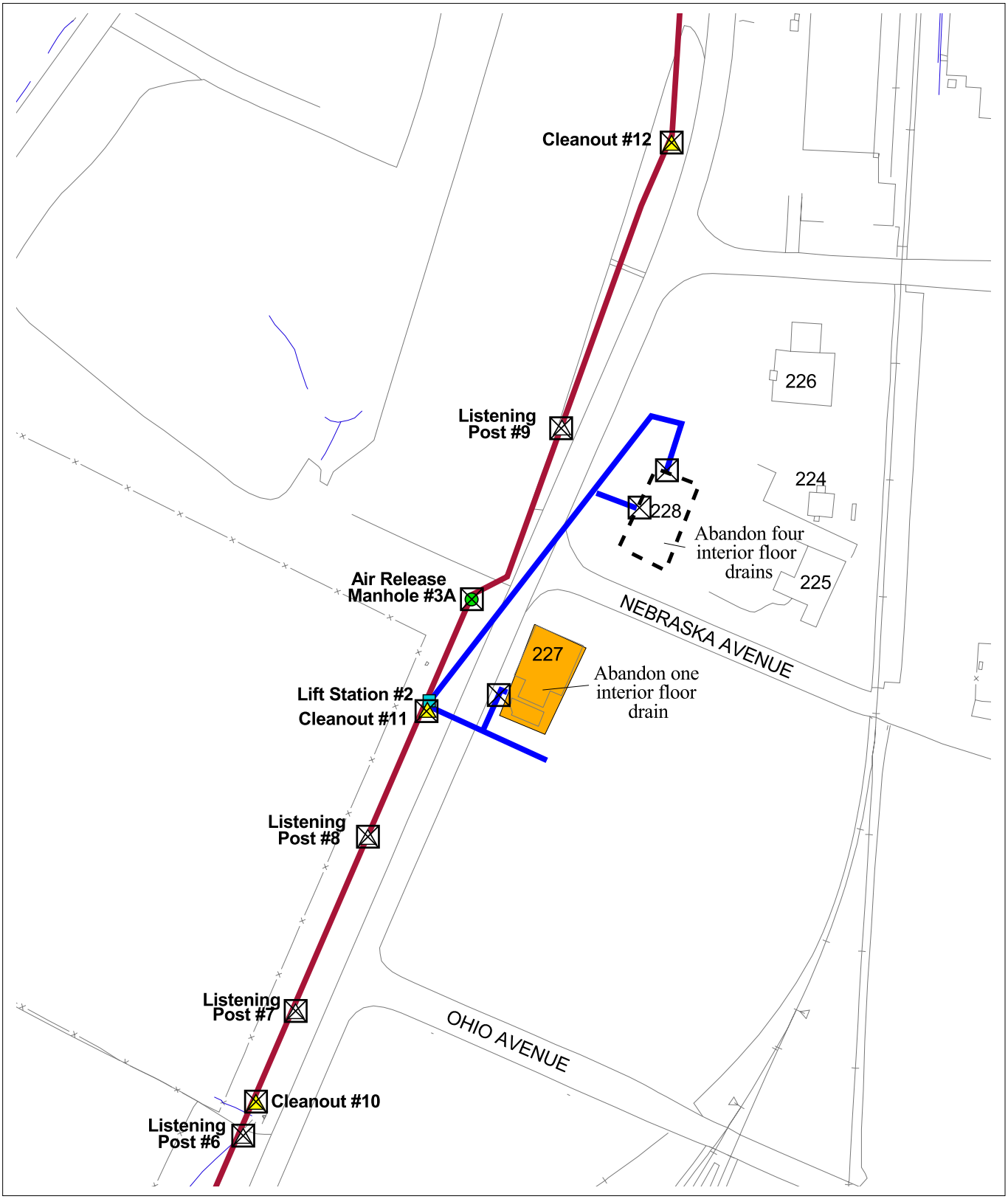
0 150 Feet

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 11
Abandonment Points
for IWWS Lines Associated
with Building 37

Date:
09/05/2007

| Y:\LEAD\aprs\iwtp.apr | Layout- Building 37 | y:\lead\pdfs\iwtp_bldg37.eps | 3:33 PM, 9/7/2007 |



Legend:

- Building
- Roads
- Drainage
- Gravity Flow IWWS Pipeline
- Pressurized IWWS Pipeline
- Air Release Manhole
- Cleanout
- Lift Station
- Listening Post
- Manhole
- Abandonment Point

50 0 50 100 Feet

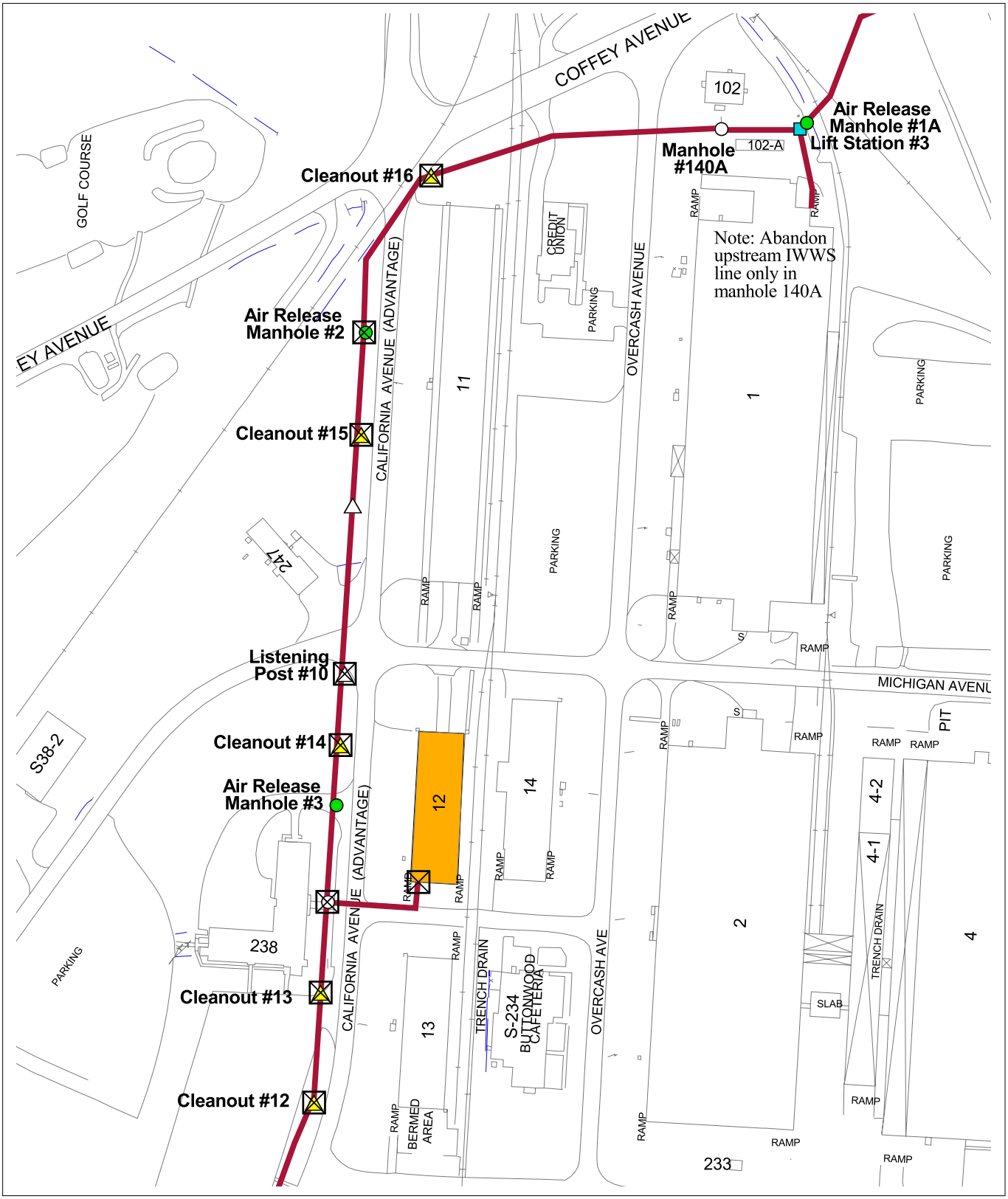
N W E S

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 12
Abandonment Points
for IWWS Lines Associated
with Buildings 227 and 228

Date:
09/05/2007

| Y:\LEAD\aprs\iwtp.apr | Layout- Building 227 | y:\lead\pdfs\iwtp_bldg227.eps | 3:34 PM, 9/7/2007 |



Legend:

- Building
- Roads
- Drainage
- Gravity Flow IWWS Pipeline
- Pressurized IWWS Pipeline
- Air Release Manhole
- Cleanout
- Lift Station
- Listening Post
- Manhole
- Abandonment Point

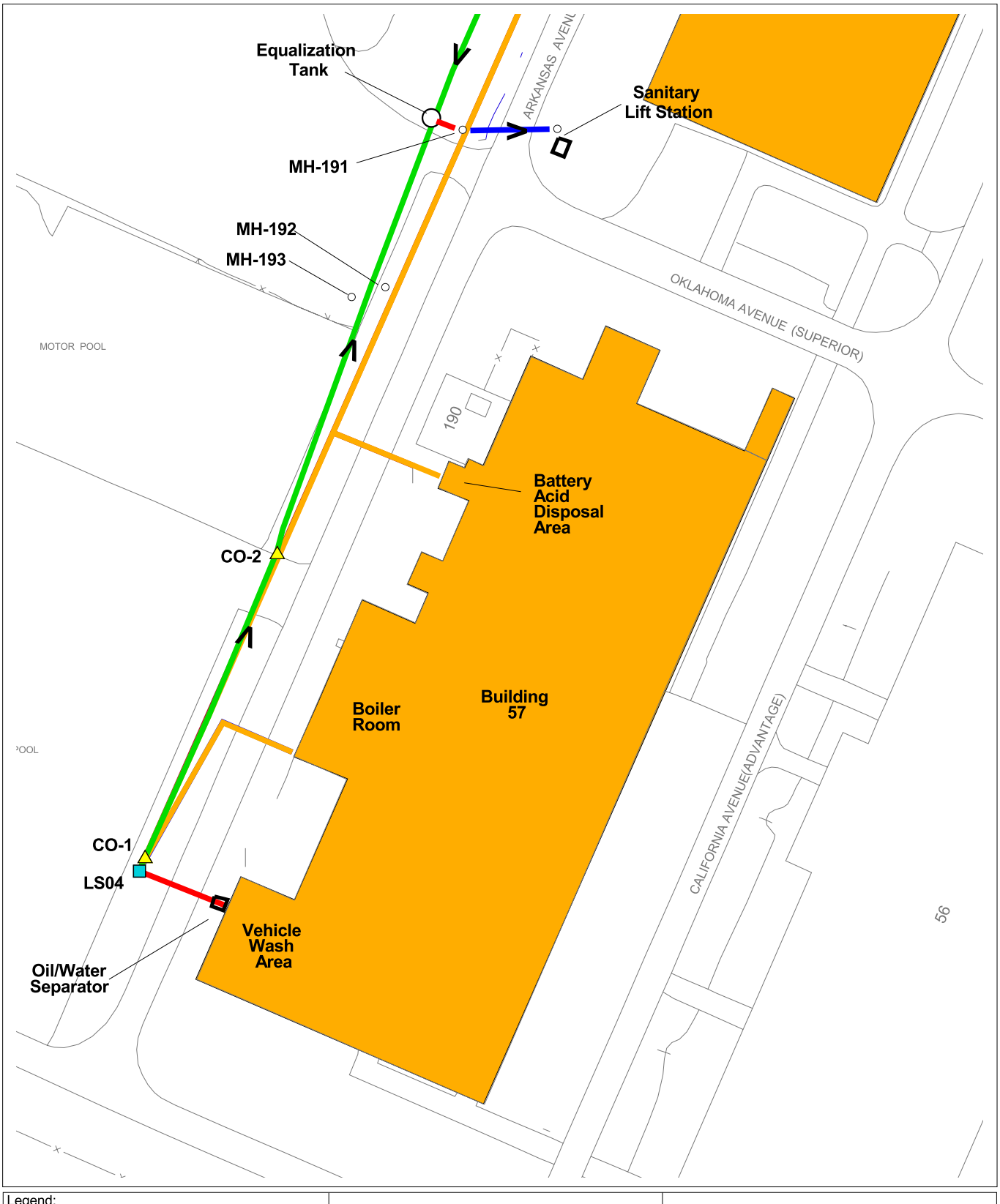
50 0 50 100 Feet

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 13
Abandonment Points
for IWWS Lines Associated
with Building 12

Date:
09/05/2007

| Y:\LEAD\aprs\iwtp.apr | Layout- Building 12 | y:\lead\pdfs\iwtp_bldg12.eps | 3:35 PM, 9/7/2007 |



Legend:

- Building
- Roads
- Drainage
- Lift Station
- Manhole
- Cleanout
- Gravity Lines Revised
- Abandoned Force Main Line
- Newly Installed Force Main Line

0 100 Feet

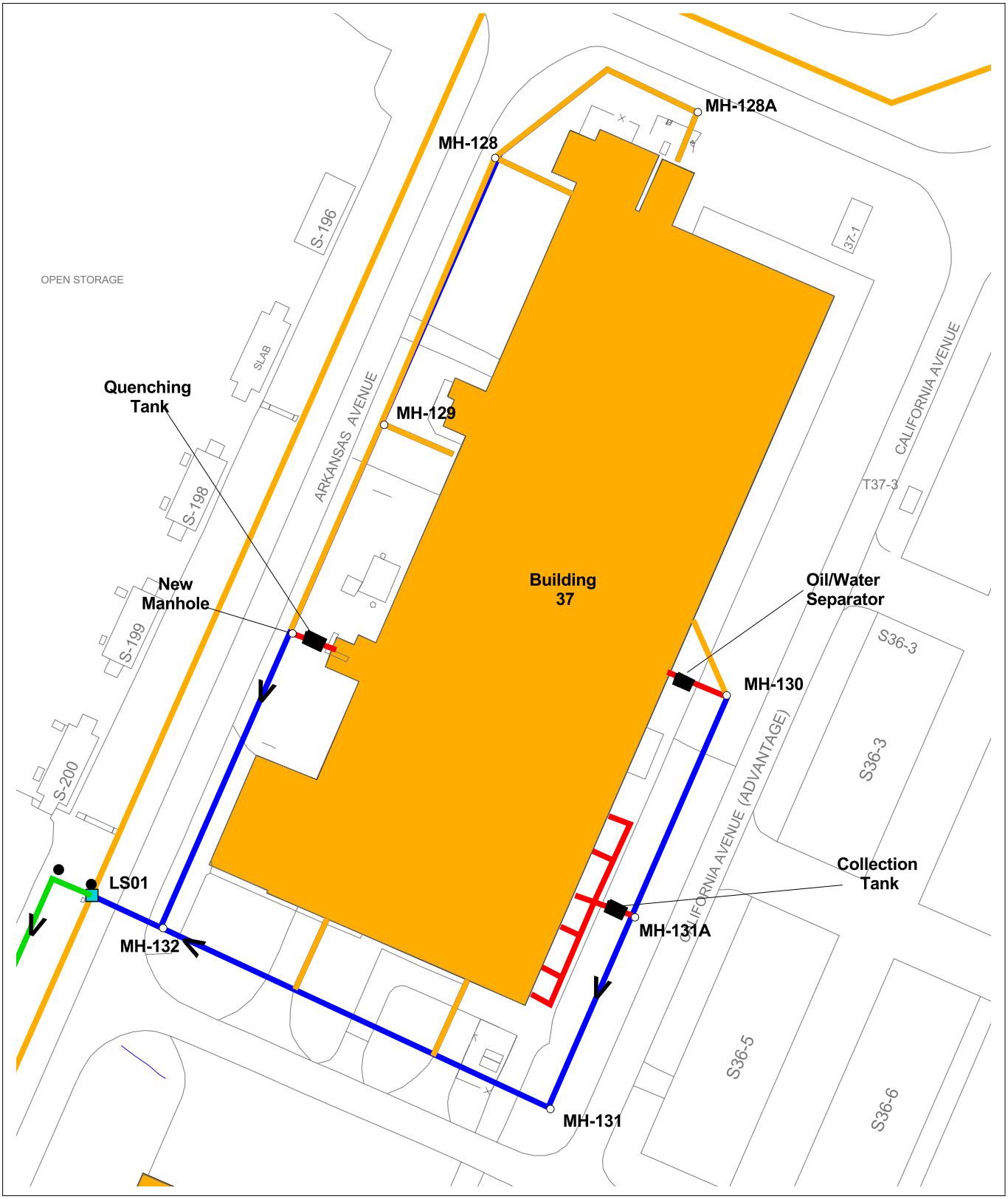
N W E S

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 14
Building 57 Reroute Work

Date:
09/05/2007

| Y:\LEAD\aprs\bldg57_fm_new.apr | Layout- Building 57 New Force | y:\lead\pdfs\bldg57_new_forcemain.eps | 3:40 PM, 9/7/2007 |



Legend:

- Building
- Roads
- Drainage
- Gravity Line Revised
- Abandoned Force Main Line
- Newly Installed Force Main Line
- New Gravity Line
- Lift Station

0 75 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

Figure 15
Building 37 Reroute Work

Date:
09/05/2007

| Y:\LEAD\aprs\bldg57_fm_new.apr | Layout- Building 37 Features | y:\lead\pdfs\bldg37_features.eps | 3:41 PM, 9/7/2007 |

Legend:

- Building
- Roads
- Drainage
- Gravity Line Revised
- Abandoned Force Main Line
- Newly Installed Force Main Line
- 1,000 gal Cement Tank
- Cleanout
- Lift Station
- Storm Sewer
- Manhole
- New Gravity Line

0 200 Feet

N W E S

Letterkenney Army Depot
Chambersburg, PA
U.S. Army Corps of Engineers
Baltimore District

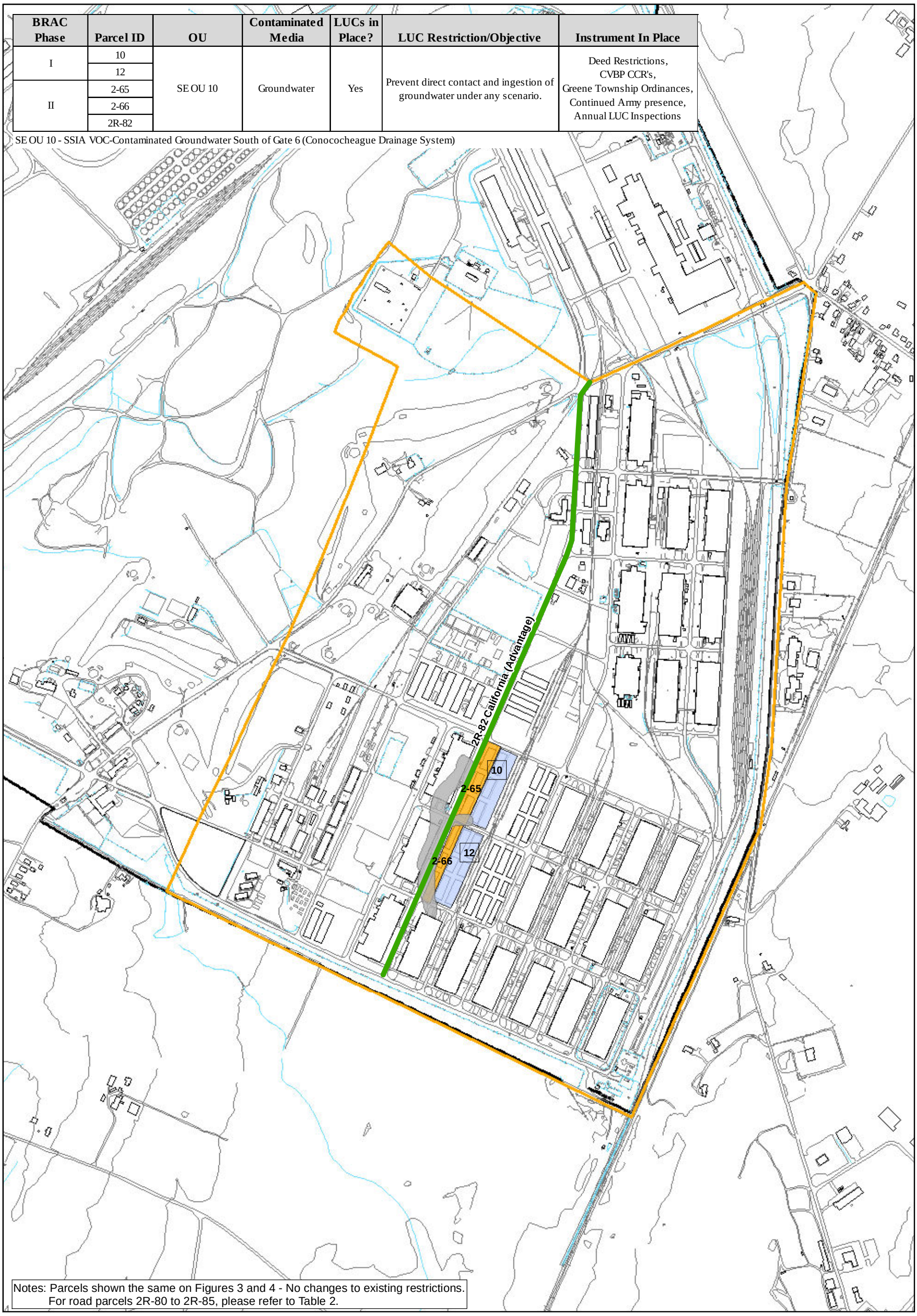
Figure 16
New IWWS
Force Main Section

Date:
09/05/2007

| Y:\LEAD\aprs\bldg57_fm_new.apr | Layout - Proposed Force Main | y:\lead\pdfs\bldg57_fm_new.eps | 3:43 PM, 9/7/2007 |

BRAC Phase	Parcel ID	OU	Contaminated Media	LUCs in Place?	LUC Restriction/Objective	Instrument In Place
I	10	SE OU 10	Groundwater	Yes	Prevent direct contact and ingestion of groundwater under any scenario.	Deed Restrictions, CVBP CCR's, Greene Township Ordinances, Continued Army presence, Annual LUC Inspections
	12					
II	2-65					
	2-66					
	2R-82					

SE OU 10 - SSIA VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)



Notes: Parcels shown the same on Figures 3 and 4 - No changes to existing restrictions.
For road parcels 2R-80 to 2R-85, please refer to Table 2.

Legend:

- Buildings
- Roads
- Contours
- Drainage
- Road Parcel with GW Restrictions
- Approximate Boundaries of SE OU 10
- 1 Phase I Parcels
- 2-65 Phase II Parcels
- Approximate TCE/VC Contaminant Plume Extent

0 375 750 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA

U.S. Army Corps of Engineers
Baltimore District

Figure 17
Existing LUCs in SE OU 10

Date:
10-17-11

File: Y:\LEAD\MXD\seou10_LUCs_future_update2.mxd, 10/17/2011 3:07:16 PM, >rickscc

ATTACHMENT 1

CROSS-REFERENCE LIST OF ARMY AEDB-R AND EPA OPERABLE UNIT TRACKING NUMBERS

Attachment 1A
Army and EPA
AEDB-R and OU Tracking Number Cross-Reference
Associated with Letterkenny Army Depot

AEDB-R SITE DATA SUMMARY REPORT

Installation: **LETTERKENNY ARMY DEPOT (SOUTHEASTERN AREA)**
FFID: **PA6213820503**
State: **PA**

Site (AEDB-R)	Alias (LEAD OU)	Description	Program	RIP/RC	BRAC PHASE	NFA	ROD	EPA OU
LEAD-001	SE OU 8	BUILDING 57	BRAC IV	201106	Phase V - Parcel 5-106		Phase V	OU27
LEAD-002	SE OU 8	BUILDING 37 CLEANING AREA	BRAC IV	201205	Phase VII		Phase VII	OU28
LEAD-003	LEAD-003	BUILDING 1	ER,A	199407		NFA		
LEAD-004	LEAD-004	BUILDING 350	ER,A	199407		NFA		
LEAD-005	LEAD-005	BUILDING 351	ER,A	199407		NFA		
LEAD-006	LEAD-006	BUILDING 370	ER,A	199407		NFA		
LEAD-008	SE OU 8	BUILDING T-228	BRAC IV	201106	Phase V Parcel 5-114		Phase V	OU24
LEAD-009	SE OU 5	CLAY LINED FTA (AREA B)	ER,A	201302			OU 5	OU05
LEAD-011	LEAD-011	BUILDING 554 WATER TREATMENT PLANT	BRAC IV	200209	Phase III Parcel 3-89		Phase III	0U14
LEAD-013	LEAD-013	IWTP LAGOONS/AREA D/BLDG 360	ER,A	199211		NFA		
LEAD-014	LEAD-014	BUILDING 3700 CHEMICAL LAB SS	ER,A	199105		NFA		
LEAD-015	LEAD-015	ACID BURNING PITS	ER,A	199105		NFA		
LEAD-016	SE OU 3B	COMBAT VEHICLE TEST TRACK	ER,A	200503			Phase IV	OU15
LEAD-017	LEAD-017	PROJECTILE RANGE	ER,A	198602		NFA		
LEAD-018	LEAD-018	CS TEST SITE	ER,A	198602		NFA		
LEAD-019	LEAD-019	WEAPONS STORAGE AREA, IGLOOS	ER,A	198602		NFA		
LEAD-020	LEAD-020	BUILDING 11 STORAGE OF RAD ITEM	ER,A	198609		NFA		
LEAD-021	LEAD-021	BUILDING 431 CAL LAB	BRAC IV	199407	Phase II Parcel 2-61		Phase II	
LEAD-022	LEAD-022	BUILDING 3223 RAD DISPOSAL STORAGE	ER,A	198609		NFA		
LEAD-023	SE OU 8	BUILDING 51 OLD RAD STORAGE AREA	BRAC IV	200409	Phase V Parcel 5-108	NFA	Phase V	
LEAD-024	PDO OU 1	TWO REVETMENTS IN PDO AREA	ER,A	199108		NFA		
LEAD-025	LEAD-025	PREVIOUS PESTICIDE AREA, BLDG G	ER,A	199212		NFA		
LEAD-027	LEAD-027	DOCK 45 SPILL OF MALATHION	BRAC IV	199807	Phase I Parcel 13		Phase I	
LEAD-028	LEAD-028	SMALL SEWAGE TREATMENT PLANT	ER,A	198602		NFA		
LEAD-030	LEAD-030	DIGESTED SLUDGE SPREAD ON GROUND	ER,A	199111		NFA		
LEAD-031	LEAD-031	BLDG 2357 LNDRY FOR ORDINANCE COMPOUNDS	ER,A	198609		NFA		
LEAD-032	SE OU 4	INDUSTRIAL WASTE DITCH (ROWE RUN)	ER,A	199611		NFA		
LEAD-033	SE OU 2	SEDIMENT BURIAL SITE (AREA F)	ER,A	200408		NFA		
LEAD-034	SE OU 4							
LEAD-035	LEAD-035	LANDFILL 1 (41-48) (AREAS H & I)	ER,A	199308		NFA		
LEAD-036	SE OU 9	LANDFILL 2 (48-52) (AREA J)	ER,A	201206			LF J	ou09
LEAD-038	LEAD-038	LANDFILL 4 (56-64) (AREA C)	ER,A	199407		NFA		
LEAD-039	SE OU 12	LANDFILL 5 (64-?) (AREA G), SECURITY	ER,A	201206			LF G RI	ou12

Attachment 1A
Army and EPA
AEDB-R and OU Tracking Number Cross-Reference
Associated with Letterkenny Army Depot

AEDB-R SITE DATA SUMMARY REPORT

Installation: **LETTERKENNY ARMY DEPOT (SOUTHEASTERN AREA)**
FFID: **PA6213820503**
State: **PA**

Site (AEDB-R)	Alias (LEAD OU)	Description	Program	RIP/RC	BRAC PHASE	NFA	ROD	EPA OU
LEAD-041	LEAD-041	BURIAL AREA FOR BERYLLIUM PHOS TUBES	ER,A	199407		NFA		
LEAD-042	LEAD-042	RESIDUE BURIAL SITE (SWMU 57)	ER,A	199504		NFA		
LEAD-043	LEAD-043	REVETTED AREA NORTH OF	ER,A	199105		NFA		
LEAD-045	LEAD-045	DEMO GROUND 1	ER,A	199105		NFA		
LEAD-046	AMMO	DEMO GROUND 2	ER,A	199501				
LEAD-047	LEAD-047	BURNING GROUND 1 (SWMU 56)	ER,A	199105		NFA		
LEAD-049	SE OU 2	OIL BURNING PIT USED IN 70'S (AREA E)	ER,A	200409		NFA		
LEAD-050	AMMO	TNT WASHOUT PLANT	ER,A	201006			TNTWO/OB2/LFG	OU 32
LEAD-051	LEAD-051	DEACTIVATION FURNACE	ER,A	199108		NFA		
LEAD-052	SE OU 1	DISPOSAL AREA TRENCHES (AREA K)	ER,A	199806			OU1	OU 01
LEAD-053	AMMO	BURNING GROUND 2 (SWMU 58)	ER,A	201006			TNTWO/OB2/LFG	OU 33
LEAD-054	LEAD-054	AMMUNITION BOX PILES	ER,A	199105		NFA		
LEAD-055	LEAD-055	TRANSFORMER PAD	BRAC IV	199501	Phase V Parcel 5-107		Phase V	OU 13
LEAD-056	LEAD-056	RESIDUE DRUM STORAGE, AMMUNITION AREA	ER,A	199007		NFA		
LEAD-057	LEAD-057	WASTE OIL UST - AUTO SHOP, BUILDING 3238	ER,A	199007		NFA		
LEAD-058	LEAD-058	CLASSIFIED PAPER INCINERATOR, BLDG 1	ER,A	199007		NFA		
LEAD-060	SE OU 8	INGOT STORAGE, LOT 48	BRAC IV	201103	Phase V Parcel 5-105		Phase V	OU 08, OU 29
LEAD-060	SE OU 8	INGOT STORAGE, LOT 29	BRAC IV	201103	Phase V Parcel 5-116		Phase V	OU 29
LEAD-061	LEAD-061	ORE PILE LOCATIONS (DA AREA)	ER,A	199407		NFA		
LEAD-062	LEAD-062	GUILFORD ALTERNATE WATER SYSTEM, OFFPOST	ER,A	199407		NFA		
LEAD-064	LEAD-064	STORAGE AREA-BLDG 1467	ER,A	200002		NFA		
LEAD-065	LEAD-065	BURIED DRUM SITE # 1	ER,A	199501		NFA		
LEAD-067	LEAD-067	ROCKY SPRING LAKE MERCURY	ER,A	200002		NFA		
LEAD-068	SE OU 6	ROWE SPRING	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-069	PDO OU 2	CARTY WELL	ER,A	200503		NFA		
LEAD-070	LEAD-070	ROCKY SPRING (MERCURY)	ER,A	200002		NFA		
LEAD-071	SE OU 6	ROWE RUN DRAINAGE FARM SAMPLING	ER,A	199605		NFA		
LEAD-072	SE OU 4	STORM WATER SEWERS	ER,A	200507		NFA		
LEAD-073	SE OU 8	STORM WATER SEWER SOLIDS	BRAC IV	200409	Phase V Parcel 5-109		Phase V	OU 22
LEAD-074	SE OU 2	INDUSTRIAL SEWERS - IR	ER,A	200509			SE OU 2	
LEAD-076	SE OU 6	SE OFFPOST GROUNDWATER - IR	ER,A	201206			Ous 3A, 6 and 11	OU 06
LEAD-079	SE 0U 5	WASTE DISPOSAL TRENCHES AREA A	ER,A	201302			SE OU 5	OU 5

Attachment 1A
Army and EPA
AEDB-R and OU Tracking Number Cross-Reference
Associated with Letterkenny Army Depot

AEDB-R SITE DATA SUMMARY REPORT

Installation: **LETTERKENNY ARMY DEPOT (SOUTHEASTERN AREA)**
FFID: **PA6213820503**
State: **PA**

Site (AEDB-R)	Alias (LEAD OU)	Description	Program	RIP/RC	BRAC PHASE	NFA	ROD	EPA OU
LEAD-080	LEAD-080	STORAGE AREA NEAR BUILDING 32/33	BRAC IV	200108	Phase V Parcel 5-110		Phase V	OU 07
LEAD-081	SE OU 3A	SE ONPOST GROUNDWATER - IR	ER,A	201206			Ous 3A, 6 and 11	OU 03
LEAD-082	LEAD-082	WASTE OIL SUMPS	BRAC IV	200108	Phase V Parcel 5-110		Phase V	OU 07
LEAD-083	SE OU 2	INDUSTRIAL WASTE SEWERS-SOILS IR	ER,A	200509			SE OU 2	OU 02
LEAD-084	SE OU 6	OFF SE RESIDENTIAL WELL STUDY (METALS)	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-086	SE OU 6	HELMAN SPRING	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-087	SE OU 6	HELMAN SPRING EAST	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-088	SE OU 6	WITMER SPRING	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-089	LEAD-089	PDO PLAYGROUND SOIL	BRAC IV	199506	Phase III Parcel 3-89		Phase III	
LEAD-090	LEAD-090	HAWBAKER SPRING	BRAC IV	200303			OU 10	OU 10
LEAD-091	LEAD-091	DOZENS SPRING	BRAC IV	200303			OU 10	OU 10
LEAD-092	SE OU 8	BUILDING 16	BRAC IV	200406	Phase V Parcel 5-115		Phase V	OU 25
LEAD-094	SE OU 11	BUILDING 349, SUMP	ER,A	200503			Ous 3A, 6 and 11	OU 11
LEAD-095	LEAD-095	CHAMBERS SPRING	BRAC IV	200303			OU 10	OU 10
LEAD-096	SE OU 6	NELSON SPRING	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-097	PDO OU 2	ALLEN WELL	ER,A	200503		NFA		
LEAD-098	PDO OU 2	ROCKY SPRING SPRINGHOUSE	ER,A	200503		NFA		
LEAD-100	LEAD-100	BUILDING 12	BRAC IV	200203			OU 10	OU 10
LEAD-101	SE OU 10	BUILDING 37 GROUNDWATER	BRAC IV	200409	Phase VII		OU 10	OU 10
LEAD-104	SE OU 6	NELSON SPRING EAST	ER,A	200409			Ous 3A, 6 and 11	OU 06
LEAD-105	SE OU 5	SPILL SITE WITHIN AREA A	ER,A	200503			SE OU 5	
LEAD-113	LEAD-113	BUILDINGS 651 & 652	BRAC IV	200206	Phase VI		Phase VI	
LEAD-114	SE OU 8&13	VEHICLE OPEN STORAGE AREA, SE AREA	BRAC IV	200303	Phase III Parcel 3-89		Phase III	23, OU 26
LEAD-115	SE OU 3B	TANK FARM	BRAC IV	200408	Phase IV Parcel Phase 4-93		Phase IV	OU 16
LEAD-116	LEAD-116	BUILDING 441, RAD STORAGE	BRAC IV	200003	Phase II Parcel 2-60		Phase II	
LEAD-118	SE OU 8	BUILDING 400 SERIES	BRAC IV	201106	Phase V Parcels 5-103 & 104		Phase V - also listed in OU 14 (Phase III)	OU 17, OU 18, OU 19, OU 31
LEAD-119	LEAD-119	RR TRACKS	BRAC IV	199806	Phase I Parcels 22 & 31		Phase I	
LEAD-123	LEAD-123	COMP RAD SOURCES ,TRITIUM	BRAC IV	200102	Mulitple BRAC Parcels		Multi	
LEAD-124	LEAD-124	COMP ASBESTOS	BRAC IV	200107	Mulitple BRAC Parcels		Multi	
LEAD-125	LEAD-125	COMP PCB	BRAC IV	200107	Mulitple BRAC Parcels		Phase V	OU 13

Attachment 1A
Army and EPA
AEDB-R and OU Tracking Number Cross-Reference
Associated with Letterkenny Army Depot

AEDB-R SITE DATA SUMMARY REPORT

Installation: **LETTERKENNY ARMY DEPOT (SOUTHEASTERN AREA)**
FFID: **PA6213820503**
State: **PA**

Site (AEDB-R)	Alias (LEAD OU)	Description	Program	RIP/RC	BRAC PHASE	NFA	ROD	EPA OU
LEAD-126	SE OU 8	COMP UST/AST	BRAC IV	201106	Phase V Parcel 5-103		Phase V - also listed in OU 14 (Phase III)	OU 30
LEAD-127	SE OU 8	INDUSTRIAL SEWER SOILS - BRAC	BRAC IV	201106	Parcels 5, 6, 7, 2-63, 2-64, 5-106		Phase V	
LEAD-128	SE OU 10	SE GROUNDWATER - BRAC	BRAC IV	200706	Mulitple Phase I & II Parcels		OU 10	OU 10
LEAD-130	SE OU 8	BUILDINGS S 38-1 & S 38-2	BRAC IV	201106	Phase V Parcel 5-121		Phase V	OU 21
LEAD-131	SE OU 11	IWTP LAGOON GROUNDWATER	ER,A	201206			Ous 3A, 6 and 11	OU 11
LEAD-132	SE OU 14	BUILDING 349	ER,A	199407		NFA	Bldg 349 / FTT	OU20
LEAD-PBA		PBA	ER,A	201206				

INDICATES CLOSED SITE

GLOSSARY:

Program:
BRAC I - BRAC I Base Realignment and Closure 1988
BRAC II - BRAC II Base Realignment and Closure 1991
BRAC III - BRAC III Base Realignment and Closure 1993
BRAC IV - BRAC IV Base Realignment and Closure 1995
BRAC V - BRAC V Base Realignment And Closure 2005
ER, A - Environmental Restoration, Army
PDO - Property Disposal Office
SE - Southeastern

Report Headings:
FFID - Federal Facility Identification Number
NFA - No Further Action
OU - operable unit
RIP/RC - Remedy in Place/ Response Complete
ROD - Record of Decision

ATTACHMENT 2

DOCUMENTATION OF REGULATORY AGENCY CONCURRENCE

Transmittal Chronology for the LEAD Five-Year Review
Letterkenny Army Depot, Chambersburg, Pennsylvania

Date	Transmittal
October 17, 2011	Army submits Draft-Final Five-Year Review to EPA and PADEP.
December 5, 2011	EPA submits comments on the Draft-Final Five-Year Review.
December 14, 2011	PADEP submits comments on the Draft-Final Five-Year Review
February 3, 2012	Army submits Revised Draft-Final Five-Year Review, including responses to EPA and PADEP comments.
March 8, 2012	EPA submits toxicological comments on the Five-Year Review.
March 9, 2012	EPA submits additional comments on the Five-Year Review.
March 27, 2012	Army submits responses to EPA comments.
July 17, 2012	Army submits Revised Draft-Final based on finalization of the Phase V ROD and ESD for Phases I and II.
August 30, 2012	Army submits Conditional Final Five-Year Review for EPA concurrence review.
September 4, 2012	EPA submits comments on the Conditional Final Five-Year Review.
September 25, 2012	PADEP approves Final Five-Year Review.
September 25, 2012	EPA approves Final Five-Year Review.

Locurcio, Daniel

From: Dan Locurcio [daniel.locurcio@westonsolutions.com]
Sent: Monday, October 17, 2011 4:35 PM
To: Bruce Beach; Ruth Bishop; Clapp, Matthew; Dermigny, Robin; Bryan Hoke; Gerald Hoover; Michael Kipp; Locurcio, Daniel; Young, Stacie Popp
Cc: Locurcio, Daniel
Subject: Deliverable - Draft Final

Here is a link to the Submittal:
https://westonproject.net/TL/LetterPBC.nsf/ID/EXTT-8MQRUK

Comments:
The Draft-Final LEAD Five-Year Review is available for review on TeamLink.
Yellow highlighting has been used in the document to call out unknown dates to be filled in at a later time.
Some interview questionnaires (Appendix A) have not yet been received. They will be added to the document online as they are received.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

December 5, 2011

Mr. Bryan Hoke
BRAC Environmental Coordinator, Letterkenny Army Depot
ATTN: DAIM-BO-N-LE, Building 14
1 Overcash Avenue
Chambersburg, PA 17201-4150

Re: Five-Year Review for Letterkenny SE and PDO Areas

Dear Mr. Hoke,

I am drafting this letter on behalf of myself and Mr. Bruce Beach, the EPA RPM for the Letterkenny SE Area. The purpose of this letter is to provide comments on the *Draft Five-Year Review for Letterkenny SE and PDO Areas* dated October 2011. In general, the Five-Year Review is consistent with the Five-Year Review Guidance. However, several comments have been prepared that identify deviations from the Five-Year Review Guidance as well as comments that promote clarity and consistency throughout the document.

The majority of EPA comments were submitted via the Weston TeamLink website on December 5, 2011. Those comments are in the form of comments and edits to the WORD sections of the document. The remaining general comments are provided as an attachment to this letter.

If you have any questions, please feel free to call me at (215) 814-2077 or Mr. Beach at (215) 814-3364.

Sincerely,

Gerald F. Hoover

Gerald F. Hoover, RPM
NPL/BRAC Federal Facilities Branch (3HS11)

cc: Ruth Bishop (PADEP, Harrisburg)
Matthew Clapp, Weston

Re: Five-Year Review for Letterkenny SE and PDO Areas

General comments:

1. Please provide the sampling data necessary to evaluate the performance of selected groundwater remedies. Evidence must be provided in the report that the selected groundwater remedy is still protective.

2. For groundwater remedies, please present sufficient sampling data over time, developing trend analysis for contaminants of concern and providing an evaluation of the success of the selected remedial technology.

3. The data used for selected remedies must be provided in the five-year review. It is EPA policy to cross-check the data provided in the five-year review against the original sources of the data for verification.

4. Appendix F, K Area Cap Inspections, this attachment needs to be reorganized to have the inspection photos immediately following the inspection write up, not in a follow on attachment. Similarly, the maps/drawings indicating the location of animal burrows should be appropriately co-located.

5. Appendix C, Relevant Portions of Deed and Lease Documents: The second paragraph of the draft letter report from Bryan Hoke, BRAC Environmental Coordinator, to EPA, dated September 1, 2011, states the following: "Attached is a table summarizing the review of the Phase I Parcel deeds. This list is based on the November 2010 notice from the Letterkenny Industrial Development Authority (LIDA) listing property owners. The table lists the Phase I Parcel, building, owner, whether the deed was reviewed and any comments applicable to the deed review." However, the summary table attached appears to include only those Phase I parcels (Parcels 1 and 2) at which LUCs were not lifted as part of the ESD in 2011. The letter report should clarify that only those Phase I parcels at which LUCs were not lifted are included in the summary table.

6. Appendix D, Community Notice: Five-Year Review, Letterkenny Army Depot: Under the selected remedies for various OUs section, BRAC Waste Sites (portions of SE OU 8 and PDO OU 6), the selected remedy described (LUCs) only identifies portions of SE OU 8 and does not mention portions of PDO OU 6. Please assure that the final Community Notice addresses the selected remedy for both SE OU 8 and PDO OU 6.

7. Appendix D, Community Notice: Five-Year Review, Letterkenny Army Depot: The Community Notice should also address the ESDs that were completed for the applicable OUs since they significantly altered the selected remedies for the sites. Please assure that the final Community Notice describes the ESDs completed for applicable OUs so a clearer picture of the remedies at the sites is presented to the public.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL CLEANUP AND
BROWNFIELDS REDEVELOPMENT PROGRAM

December 14, 2011

Mr. Bryan Hoke
Letterkenny Army Depot
DAIM-ODB-LE, Building 14
One Overcash Avenue
Chambersburg, PA 17201-4150

Re Letterkenny 5 Year Review
Letterkenny Army Depot
Greene Township, Franklin County

Dear Mr. Hoke:

The Pennsylvania Department of Environmental Protection (PADEP) has reviewed the Five-Year Review Report for the Letterkenny Southeast Area and the Property Disposal Area. The following are my comments on this document.

1. Page 1-17, Section 1.2.12 – In the sentence "Prior to the installation of the IWWS lines in 1965 in the SE Area at LEAD, chlorinated solvents were disposed in unlined lagoons and released from past leaks in IWWS lines" are the IWWS lines associated from with the leaks different that the ones installed in 1965? If not, this sentence appears to cover 2 topics, how the chlorinated solvents were disposed and the source of the groundwater contamination.

2. Table 2-1 – The RI/FS for SE OU 7 (2009) appears to be out of order in the table.

3. Page 4-2, Section 4.1.2.4 – "**PADER** Title 25 Residual Waste Management Regulations", is this misprint or because it was PADER at the time? Same comment, page 4-3 third bullet of Project Schedule.

4. Page 4-3 – "The K-Areas will be mowed in fall 2011 in accordance with the Cap Maintenance Plan." Was this done?

5. Page 7-1 – It states that "the K-Areas will be mowed in fall 2011 to meet this requirement". Again, if this has been done it should be stated here.

6. Page 7-17 – It states that "The PADEP and EPA ARARs for PCBs as described above have not changed". A number of the PADEP MSCs for the PCB Aroclors were changed in the latest update for Act 2.

7. Page 7-18 – A number of the MSCs in the Table are incorrect: Benzene (current) is 57 mg/kg, Benzo(a)anthracene (current) is 5.7 mg/kg, Benzo(a)pyrene (current) is 0.57 mg/kg, Benzo[b]fluoranthene (current) is 5.7 mg/kg, Dibenz[a,h]anthracene (current) is 0.57 mg/kg, Indeno[1,2,3-cd]pyrene (current) is 5.7 mg/kg.

If you have any questions on this matter, please contact me at 717.705.4833 or by email at rbishop@state.pa.us.

Sincerely,

Ruth Bishop

Ruth Bishop
Regional Project Manager
Hazardous Sites Cleanup Section
Environmental Cleanup Program

cc: Gerald Hoover, USEPA Region 3 (3HS11)
Bruce Beach, USEPA Region 3 (3HS11)
Matt Clapp, Weston Solutions, Inc.

Locurcio, Daniel

From: Locurcio, Daniel
Sent: Friday, February 03, 2012 1:38 PM
To: Bruce Beach; Ruth Bishop; Clapp, Matthew; Dermigny, Robin; Bryan Hoke; Gerald Hoover; Michael Kipp; Locurcio, Daniel; Young, Stacie Popp
Cc: Locurcio, Daniel
Subject: Deliverable - Draft Final

Here is a link to the Submittal:
https://westonproject.net/TL/LetterPBC.nsf/ID/EXTT-8MQRUK

Comments:
Bruce, Jerry, and Ruth,
The LEAD Five-Year Review is on the TeamLink site and ready for regulatory review. All text, tables, figures, Attachment 1, and all Appendices were uploaded. Note that Appendices G, H, and I were added to the document per EPA comments, and responses to EPA's comments are provided within the comment bubbles in the text files. A separate MS Word file (RTCs_PADEP_LEAD_PBA_5YR_D-F_Rev1.docx) was created for responses to the PADEP comment letter.

Army Responses to PADEP Comments (December 2011) on the Draft-Final Five-Year Review Report, Letterkenny Army Depot, Southeastern (SE) Area (Third Review) and Property Disposal Office (PDO) Area (Second Review), National Priorities List Sites, Chambersburg, Pennsylvania (October 2011)

Background: The Pennsylvania Department of Environmental Protection (PADEP) has reviewed the Five-Year Review Report for the Letterkenny Southeast Area and the Property Disposal Area. The following are my comments on this document.

1. Page 1-17, Section 1.2.12 – In the sentence "Prior to the installation of the IWWS lines in 1965 in the SE Area at LEAD, chlorinated solvents were disposed in unlined lagoons and released from past leaks in IWWS lines" are the IWWS lines associated with the leaks different than the ones installed in 1965? If not, this sentence appears to cover 2 topics, how the chlorinated solvents were disposed and the source of the groundwater contamination.

   Response: The sentence has been revised into two separate sentences and now reads: "Prior to the installation of the IWWS lines in 1965 in the SE Area at LEAD, chlorinated solvents were disposed in unlined lagoons. In addition to the contamination caused by this method of disposal, VOCs were released to soil from leaks in the IWWS lines after 1965."

2. Table 2-1 – The RI/FS for SE OU 7 (2009) appears to be out of order in the table.

   Response: The RI/FS was out of order. Table 2-1 has been revised.

3. Page 4-2, Section 4.1.2.4 – "PADER Title 25 Residual Waste Management Regulations", is this misprint or because it was PADER at the time? Same comment, page 4-3 third bullet of Project Schedule.

   Response: PADER has been changed to PADEP to be consistent with the remainder of the document.

4. Page 4-3 – "The K-Areas will be mowed in fall 2011 in accordance with the Cap Maintenance Plan." Was this done?

   Response: The text on Page 4-3 has been revised to state that mowing has occurred.

5. Page 7-1 – It states that "the K-Areas will be mowed in fall 2011 to meet this requirement." Again, if this has been done it should be stated here.

   Response: The text on Page 7-1 has been revised to state that mowing has occurred.

6. Page 7-17 – It states that "The PADEP and EPA ARARs for PCBs as described above have not changed." A number of the PADEP MSCs for the PCB Aroclors were changed in the latest update for Act 2.

Response: The sentence was revised to read "The PADEP and EPA ARARs for PCBs as described above have not changed to a degree that affects protectiveness of the remedy."

7. Page 7-18 – A number of the MSCs in the Table are incorrect: Benzene (current) is 57 mg/kg, benzo(a)anthracene (current) is 5.7 mg/kg, benzo(a)pyrene (current) is 0.57 mg/kg, benzo[b]fluoranthene (current) is 5.7 mg/kg, dibenz[a,h]anthracene (current) is 0.57 mg/kg, indeno[1,2,3-cd]pyrene (current) is 5.7 mg/kg.

   Response: The MSCs have been revised on the Table on page 7-18.

Locurcio, Daniel

From: Clapp, Matthew
Sent: Thursday, March 08, 2012 3:02 PM
To: Young, Stacie Popp; Locurcio, Daniel
Subject: FW: Comments on the FYR Report from EPA Tox.
Attachments: LEAD_PBA_5YR_03_D-F_Rev1epatox.doc; LEAD_PBA_5YR_07_D-F_Rev1epatox.docx; LEAD_PBA_5YR_11_D-F_Rev1epatox.doc

Matthew Clapp
Weston Solutions, Inc.
1400 Weston Way
West Chester, PA 19380
610-701-3489 (P)
610-701-3739 (F)

From: Bruce Beach [mailto:Beach.Bruce@epamail.epa.gov]
Sent: Thursday, March 08, 2012 3:01 PM
To: bryan.l.hoke@us.army.mil; rbishop@pa.gov; Clapp, Matthew
Cc: Gerald Hoover
Subject: Comments on the FYR Report from EPA Tox.

Afternoon

Attached are comments by our Tox on the referenced document. Mostly concerned with the latest changes to TCE and other volatiles as of November 2011 and the new risk methodology associated with those changes.

Also, when we finalize the Phase V BRAC Parcels ROD and the Phase I and II BRAC Parcels ESD, we need to change/correct several paragraphs in the document with new dates, et. al.

Take Care
Bruce

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

March 9, 2012

Mr. Bryan Hoke
BRAC Environmental Coordinator, Letterkenny Army Depot
ATTN: DAIM-BO-N-LE, Building 14
1 Overcash Avenue
Chambersburg, PA 17201-4150

Re: Draft-Final Five-Year Review Report for Letterkenny SE and PDO Areas

Dear Mr. Hoke:

I am drafting this letter on behalf of myself and Mr. Bruce Beach. The purpose of this letter is to provide comments on the *Draft-Final Five-Year Review Report for Letterkenny SE and PDO Areas* dated February 2012. In general, the Army and Weston did an excellent job of addressing EPA comments on the Draft Five Year Review Report, and your efforts are very much appreciated. EPA does have some additional comments on the Draft-Final Five Year Review Report as follows:

1) EPA submitted several comments via the Weston TeamLink website on March 6, 2012. These were minor editorial comments.

2) EPA submitted toxicological comments via an email from Bruce Beach on March 8, 2012.

3) The Five Year Review Report should be updated to reflect the Final ESD for the Phase I and II RODs, and the Final Phase V ROD.

4) EPA also provides the two following minor comments:
   1) There is no reference to the Executive Summary in the Table of Contents.
   2) Page 11-1, Section 11.1.1 – The first sentence references a cleanup criteria for a "soil contaminant". Is this referring to VOCs? If so please specify VOCs in this sentence.

In addition, EPA is requesting that the Army submit both a response to these comments and a "clean" copy of the Final Report before the Army signs the Final Five Year Review Report.

If you have any questions, please feel free to call me at (215) 814-2077 or Mr. Beach at (215) 814-3364.

Sincerely,

Gerald F. Hoover

Gerald F. Hoover, RPM
NPL/BRAC Federal Facilities Branch (3HS11)

cc: Ruth Bishop (PADEP, Harrisburg)
Matthew Clapp, Weston

Locurcio, Daniel

From: Locurcio, Daniel
Sent: Tuesday, March 27, 2012 10:34 AM
To: Gerald Hoover; Bruce Beach (beach.bruce@epa.gov)
Cc: Bishop, Ruth; Hoke, Bryan L CIV (US); michael.kipp@us.army.mil; Clapp, Matthew; Young, Stacie Popp; Locurcio, Daniel
Subject: Emailing: LEAD_PBA_5YR_03_FINAL_tv.doc, LEAD_PBA_5YR_07_FINAL_tv.docx, LEAD_PBA_5YR_11_FINAL.doc, RTCs_EPA_LEAD_PBA_5YR_FINAL.docx
Attachments: LEAD_PBA_5YR_03_FINAL_tv.doc; LEAD_PBA_5YR_07_FINAL_tv.docx; LEAD_PBA_5YR_11_FINAL.doc; RTCs_EPA_LEAD_PBA_5YR_FINAL.docx

Jerry, Bruce, and Ruth,

Attached to this email are the RTCs to EPA's comment letter dated March 9, 2012 and the three text sections (Sections 3, 7, and 11) containing tracked text changes and responses to EPA toxicological comments for your review.

Upon approval of these changes, the Army will prepare and submit a clean copy PDF of the Five-Year Review Report for final EPA concurrence review. Please let me know if you have questions regarding this submittal.

Dan Locurcio, LEED AP
Weston Solutions, Inc.
Project Scientist
610-701-3465 (w)
610-247-6454 (c)

Your message is ready to be sent with the following file or link attachments:

LEAD_PBA_5YR_03_FINAL_tv.doc
LEAD_PBA_5YR_07_FINAL_tv.docx
LEAD_PBA_5YR_11_FINAL.doc
RTCs_EPA_LEAD_PBA_5YR_FINAL.docx

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Army Responses to EPA Comments (March 2012) on the Draft-Final Five-Year Review Report, Letterkenny Army Depot, Southeastern (SE) Area (Third Review) and Property Disposal Office (PDO) Area (Second Review), National Priorities List Sites, Chambersburg, Pennsylvania

Background: In a letter to the Army on 9 March 2012, the EPA provided additional comments on the Draft-Final Five Year Review Report as follows:

1. EPA submitted several comments via the Weston TeamLink website on March 6, 2012. These were minor editorial comments.

   Response: The Army reviewed and accepted the edits made to the document.

2. EPA submitted toxicological comments via an email from Bruce Beach on March 8, 2012.

   Response: The text was revised and responses were provided to the toxicological comments in the MS Word sections provided in an email to EPA on March 27, 2012.

3. The Five Year Review should be updated to reflect the Final ESD for the Phase I and II RODs and the Final Phase V ROD.

   Response: The Five-Year Review Report was updated as necessary to reflect the most recent versions of both documents mentioned; however, neither report has been finalized. The Final Five-Year Review Report will include the dates for the final ESD and ROD.

4. EPA also provides the two following minor comments:
   a. There is no reference to the Executive Summary in the Table of Contents.
   b. Page 11-1, Section 11.1.1 – The first sentence references a cleanup criteria for a "soil contaminant." Is this referring to VOCs? If so, please specify VOCs in this sentence.

      Response: The Table of Contents was revised to include a reference to the Executive Summary. The text in Section 11.1.1 was revised to specify to which soil contaminant (TCE) the cleanup criteria applied.

Locurcio, Daniel

From: Locurcio, Daniel
Sent: Tuesday, July 17, 2012 4:04 PM
To: 'Hoke, Bryan L CIV (US)'; ' (Haug.Susanne@epamail.epa.gov)'; 'Gerald Hoover'
Cc: 'michael.kipp@us.army.mil'; Clapp, Matthew; Young, Stacie Popp
Subject: Emailing: LEAD_PBA_5YR_13_FINAL.docx, LEAD_PBA_5YR_00_ES&FM_FINAL.docx, LEAD_PBA_5YR_01_FINAL.docx, LEAD_PBA_5YR_02_FINAL.doc, LEAD_PBA_5YR_04 _FINAL.docx, LEAD_PBA_5YR_05_FINAL.docx, LEAD_PBA_5YR_06_FINAL.docx, LEAD_PBA_5YR_07_FINAL.docx, LEAD_PBA_5YR_08_
Attachments: LEAD_PBA_5YR_13_FINAL.docx; LEAD_PBA_5YR_00_ES&FM_FINAL.docx; LEAD_PBA_5YR_01_FINAL.docx; LEAD_PBA_5YR_02_FINAL.doc; LEAD_PBA_5YR_04_FINAL.docx; LEAD_PBA_5YR_05_FINAL.docx; LEAD_PBA_5YR_06_FINAL.docx; LEAD_PBA_5YR_07 _FINAL.docx; LEAD_PBA_5YR_08_FINAL.docx; LEAD_PBA_5YR_09_FINAL.docx; LEAD_PBA_5YR_11_FINAL.doc

Attached are the tracked changes made to the LEAD Five-Year Review based on the finalization of the Phase I and II ESD and the Phase V ROD. Once the changes are accepted a complete clean Conditional Final will be prepared and submitted for review by EPA's Division Director. Please call me if you have any questions regarding this submittal.

Dan Locurcio, LEED AP
Weston Solutions, Inc.
Project Scientist
610-701-3465 (w)
610-247-6454 (c)

Your message is ready to be sent with the following file or link attachments:

LEAD_PBA_5YR_13_FINAL.docx
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LEAD_PBA_5YR_01_FINAL.docx
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LEAD_PBA_5YR_06_FINAL.docx
LEAD_PBA_5YR_07_FINAL.docx
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LEAD_PBA_5YR_09_FINAL.docx
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Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 • Fax 610-701-3186
www.westonsolutions.com

The Trusted Integrator for Sustainable Solutions

30 August 2012

Gerald Hoover
Environmental Protection Agency, Region III
Mail Code (3HS11)
1650 Arch Str.
Philadelphia, PA 19103

Attn: Mr. Jerry Hoover

Subject: Contract No. DACA00-D-0023/D.O. 0035
Five-Year Review Report, Letterkenny Army Depot, Southeastern (SE) Area (Third Review) and Property Disposal Office (PDO) Area (Second Review) National Priorities List Sites, Chambersburg, PA

Dear Jerry:

This letter documents the transmittal of the *Conditional Final Five-Year Review Report, Letterkenny Army Depot, Southeastern (SE) Area (Third Review) and Property Disposal Office (PDO) Area (Second Review) National Priorities List Sites, Chambersburg, PA*. Enclosed please find one (1) hard copy and one (1) CD containing an electronic version of the document for review by the EPA Division Director.

Upon approval of the document, the final version will be distributed to Mike Kipp at the U.S. Army Environmental Command (USAEC), yourself and Sue Haug at the Environmental Protection Agency (EPA) Region III, and Ruth Bishop at the Pennsylvania Department of Environmental Protection (PADEP). If you have any questions, please call me at (610) 701-3489.

Very truly yours,
WESTON SOLUTIONS, INC.

Matthew Clapp, P.E.
Project Manager

Enclosures
cc: M. Kipp (USAEC)
S. Haug (EPA)
R. Bishop (PADEP)
S. Popp-Young (WESTON)
File 2.1 (letter), File 18.0 (enclosure)

Locurcio, Daniel

From: Clapp, Matthew
Sent: Tuesday, September 04, 2012 2:13 PM
To: Locurcio, Daniel
Subject: FW: Minor comments on the 5 year review

Matthew Clapp
Weston Solutions, Inc.
1400 Weston Way
West Chester, PA 19380
610-701-3489 (P)
610-701-3739 (F)

From: Gerald Hoover [mailto:Hoover.Gerald@epamail.epa.gov]
Sent: Tuesday, September 04, 2012 2:00 PM
To: Hoke, Bryan L CIV USA; Clapp, Matthew; Young, Stacie Popp
Cc: Susanne Haug
Subject: Minor comments on the 5 year review

Bryan and Matt,

EPA has only a couple minor comments on the Five Year Review as follows:

Pages ES-6 and ES-7, put the date 22 August 2012 after the 11 March 2011 in the lines for Review Period. Also put in dates for each page under Date of Site Inspection.

Please send these revised pages along with a signed page by Col. Hagan to be inserted in the document for EPA concurrence.

Jerry

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Jerry Hoover
Environmental Protection Agency, Region III
Mail Code (3HS11)
1650 Arch Str.
Philadelphia, PA 19103
(215) 814-2077
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL CLEANUP AND BROWNFIELDS PROGRAM

September 25, 2012

Mr. Bryan Hoke
Letterkenny Army Depot
DAIM-ODB-LE, Building 14
One Overcash Avenue
Chambersburg, PA 17201-4150

Re Five-Year Review Report
Letterkenny Army Depot
Greene Township, Franklin County

Dear Mr. Hoke:

The Pennsylvania Department of Environmental Protection (PADEP) has reviewed the response-to-comments and the final Five-Year Review Report for the Southeastern Area (Third) and the Property Disposal Office (Second), Letterkenny Army Depot. The response-to-comments have adequately addressed PADEP's comments. The Department has no further comments on this document and approves the final document.

If you have any questions on this matter, please contact me at 717.705.4833 or by email at rbishop@pa.gov.

Sincerely,

Ruth Bishop

Ruth Bishop
Regional Project Manager
Hazardous Sites Cleanup Section
Environmental Cleanup and Brownfields Program

cc: Gerald Hoover, USEPA Region 3 (3HS11)
Susanne Haug, USEPA Region 3 (3HS11)
Matt Clapp, Weston Solutions, Inc.
Stacie Popp-Young, Weston Solutions, Inc.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

SEP 24 2012

Col. Victor S. Hagan
Commander, Letterkenny Army Depot
ATTN: AMLD-C, Building 10
1 Overcash Avenue
Chambersburg, PA 17201-4150

Re: *Final Five-Year Review Report Letterkenny Army Depot Southeastern Area (Third Review) and Property Disposal Area (Second Review),* September 2012

Dear Colonel Hagan:

The U.S. Environmental Protection Agency (EPA) concurs with the Letterkenny Army Depot Five-Year Review Report entitled, *"Final Five-Year Review Report Letterkenny Army Depot Southeastern Area (Third Review) and Property Disposal Area (Second Review)"* dated September 2012. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires that Five-Year Reviews be completed for Sites with remedial actions that have resulted in hazardous substances, pollutants, or contaminants remaining at the Sites above levels that allow for unlimited use and unrestricted exposure (UU/UE). Five-Year Reviews are conducted in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations.

This report satisfies the Five-Year Review requirements for both the Southeastern Area (SE) and Property Disposal Area (PDO) National Priority List Sites. Previously, The SE and PDO Five-Year Reviews were conducted separately. This report marks the third Five-Year Review for the SE Area and the second for PDO. This report was triggered by the EPA concurrence on the first Five-Year Review for the PDO on March 12, 2007. The second Five-Year review for the SE was completed on June 24, 2008. Although the Five-Year review for the SE is not yet due, the two reports were combined at the Army's request.

Five SE and one PDO Operable Units (OUs) are addressed in this report:

- SE OU1 K-Areas
- SE OU2 Industrial Wastewater Sewer System
- SE OU7 Truck Open Storage Area/Waste Oil Sump
- SE OU8 BRAC Waste Sites
- SE OU10 Southern Southeast Industrial Area VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)
- PDO OU6 BRAC Waste Sites

A Five-Year Review summary of issues, recommendations and follow-up actions that will be tracked by EPA are provided below.

Issues

- *SE OU1 – The Vegetative Cover Standard Operating Procedure (SOP) states that inspections should be completed quarterly. The Army's experience has shown that annual inspections in the fall are adequate.*
- *The Land Use Control Assurance Plan Memorandum of Agreement (LUCAP MOA) expired in August 2012.*
- *PDO OU6 – groundwater restrictions for the interim remedy for Phase I and II exist in the LUCAP MOA and will ultimately be addressed in the Record of Decisions (RODs) and Remedial Designs for PDO OUs 2 and 4.*

Recommendations and Follow-up Actions

- *The SOP for SE OU1 will be revised to indicate cap inspections should be completed annually.*
- *The Land Use Control Remedial Design, which replaces the LUCAP MOA will be completed in 2012.*
- *The RODs for PDO OUs 2 and 4 are currently being developed by the Army.*

The following Protectiveness Statements will be reported to Congress:

Remedies have been completed for SE OU 1, SE OU 2, SE OU 3B, SE OU 4, SE OU 7, portions of SE OU 8, SE OU 10 and SE OU 13 and are protective of human health and the environment. Note that the selected remedies for SE OU 3B, SE OU 4, and two phases of (Phases III and IV) of SE OU 8 were no action or no further action.

The remedy for PDO OU 6 has been completed and is protective of human health and the environment. Note that an ESD to lift LUCs was completed for a subset of PDO OU 6 BRAC Parcels and those parcels are now cleared for UU/UE.

Furthermore, as part of the Five-Year Review, EPA has evaluated the Government Performance and Results Act (GPRA) measures for LEAD and has determined their status is as follows:

Environmental Indicators

Human Health: Under control for both SE and PDO
Groundwater Migration: Under control for both SE and PDO

Sitewide Ready for Anticipated Use

The SE or PDO Sites are not Site-Wide Ready for Anticipated Use but are expected to be on 9/30/2018 and 6/30/2017, respectively.

EPA concurs with the protectiveness determinations for each OU. The next combined Five-Year Review report will be due March 12, 2017.

If you have any questions, please contact Steve Hirsh, Acting Chief of the NPL/BRAC Federal Facilities Branch at 215-814-3351, Jerry Hoover at 215-814-2077, or Susanne Haug at 215-814-3394.

Sincerely,

Ronald J. Borsellino, Director
Hazardous Site Cleanup Division

cc: Bryan Hoke, LEAD
Ruth Bishop, PADEP, Harrisburg

APPENDIX A

INTERVIEW SUMMARIES

Letterkenny Army Depot Five-Year Review
Community Questionnaire – September 2011

Please mail completed questionnaire no later than October 10, 2011

If needed, please use additional paper for longer responses.

Optional:	Name:
	Title/Organization:
	Address:
	City/State/Zip:
	Telephone/E-mail:

1. What is your overall impression of the project?

DA ENVIRONMENTAL REMEDIATION FAR SLOWER THAN BASE REALIGNMENT.

2. What effects have the site operations had on the surrounding community?

WITH THE EXCEPTION OF VAPOR INTRUSION TESTING CAUSING LOCAL INTEREST AT RAB MEETING, THERE IS LITTLE INTEREST BY SURROUNDING PUBLIC OF REMEDIATION EFFORTS.

3. Are you aware of any community concerns regarding the site, or events, incidents, or activities such as vandalism, trespassing, or emergency response from local authorities? If so, please give details.

SPORADIC PUBLIC INTEREST WITH REGARD TO GASD AREA, GROUNDWATER CONTAMINATION AND PUBLIC USE. PUBLIC TRESPASSING AND HUNTING ON PHASE 6 & 7 PROPERTY YET TO TRANSFER.

4. Do you feel well informed about the site's activities and progress?

YES. ADMIN RECORD A GREAT TOOL. I ALSO ATTEND DEPOT CLEAN-UP TEAM MEETINGS.
RAB MEETINGS OF NO VALUE.

5. From whom or where do you receive most of your information about site activities? (e.g., newspapers, television, Letterkenny Army Depot, word-of-mouth, or other)

LEAD: BEL. BRINKHOFF, DCT REGULATORS & CONSULTANTS.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation, or communication of progress?

SUGGEST DROPPING RAB PROGRAM
" ANNUAL E.R. UPDATE IN NEWSPAPER
" NOT ALLOWING RPM ALLEGES W/ EPA UNTIL PROJECT IS COMPLETE.

Note: If return self-addressed stamped envelope is lost or missing, please mail your completed questionnaire to:

Matt Clapp
1400 Weston Way
West Chester, PA 19380

Letterkenny Army Depot Five-Year Review
Community Questionnaire – September 2011

Date Completed: October 7, 2011 (1:55pm phone call)

Optional:	Name: Bryan Hoke
	Title/Organization: Installation Restoration Program Manager – Letterkenny Army Depot
	Address: 1 Overcash Avenue, Building 14
	City/State/Zip: Chambersburg, PA 17201-4150
	Telephone/E-mail: 717-267-9836 bryan.l.hoke@us.army.mil

1. **What is your overall impression of the project?**
Overall impression is good. The project is moving along and is covering the environmental bases/issues needed to be addressed.

2. **What effects have the site operations had on the surrounding community?**
No negative impacts from the environmental program.

3. **Are you aware of any community concerns regarding the site, or events, incidents, or activities such as vandalism, trespassing, or emergency response from local authorities? If so, please give details.**
Since people were impacted with groundwater in the 1980s community concerns have been addressed.

4. **Do you feel well informed about the site's activities and progress?**
Yes.

5. From whom or where do you receive most of your information about site activities? (e.g., newspapers, television, Letterkenny Army Depot, word-of-mouth, or other)
Environmental contractor, Weston Solutions, Inc.; project website; and self as environmental manager. Receives information about community concerns through the Restoration Advisory Board.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation, or communication of progress?
No comments or suggestions. Satisfied.

Letterkenny Army Depot Five-Year Review
Community Questionnaire – September 2011

Date Completed: October 13, 2011

Optional:	Name: Ruth Bishop
	Title/Organization: Pennsylvania Department of Environmental Protection (PADEP)
	Address: 909 Elmerton Avenue
	City/State/Zip: Harrisburg, PA 17110
	Telephone/E-mail: 717.705.4833/rbishop@pa.gov

1. **What is your overall impression of the project?**
Overall this is a very complex project that all parties are working at resolving.

2. **What effects have the site operations had on the surrounding community?**
I'm unaware of any effects the overall operations have had on the surrounding community.

3. **Are you aware of any community concerns regarding the site, or events, incidents, or activities such as vandalism, trespassing, or emergency response from local authorities? If so, please give details.**
No, I'm not aware of any community concerns

4. **Do you feel well informed about the site's activities and progress?**
Yes, as the State Project Manager I am kept informed of activities and progress.

5. From whom or where do you receive most of your information about site activities? (e.g., newspapers, television, Letterkenny Army Depot, word-of-mouth, or other)
By LEAD's Project Manager, LEAD's contractor, and EPA through emails, meetings/conference calls, and phone calls.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation, or communication of progress?
No, I don't have any suggestions or recommendations.

Letterkenny Army Depot Five-Year Review
Community Questionnaire – September 2011

Date Completed: September 28, 2011

Optional:	Name: Paul Landry
	Title/Organization: Weston Solutions, Inc.
	Address: 1400 Weston Way
	City/State/Zip: West Chester, PA 19380
	Telephone/E-mail: 610-701-3798 P.Landry@westonsolutions.com

1. **What is your overall impression of the project?**
The in-situ bioremediation program, which was actively run for approximately 8 years, was effective in reducing the size and concentration of the volatile organic compounds (VOC) plume in groundwater. The VOC plume had retracted from being nearly 1.4 miles off-site, to only the very near vicinity of the Building 37 source area. At this time, only 2 wells contain VOCs at levels slightly above the drinking water standards. *We are now at a point where natural attenuation processes will be able to address the remaining low VOC levels.*

2. **What effects have the site operations had on the surrounding community?**
There have been known adverse effects on the surrounding community from the site cleanup operations. The in-situ bioremediation program involved the slow injection of food grade nutrients to the subsurface, which promoted the degradation of the VOCs by naturally occurring microorganisms in the groundwater system.

3. **Are you aware of any community concerns regarding the site, or events, incidents, or activities such as vandalism, trespassing, or emergency response from local authorities? If so, please give details.**
None to my knowledge.

4. **Do you feel well informed about the site's activities and progress?**
Yes, information is made readily available to the public through the Army's Administrative Record Website and bi-monthly Restoration Advisory Board (RAB) meetings.

5. From whom or where do you receive most of your information about site activities? (e.g., newspapers, television, Letterkenny Army Depot, word-of-mouth, or other)
From Letterkenny Army Depot and from working directly on the site for Bryan Hoke and the BRAC Environmental Office.

6. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation, or communication of progress?**
None at this time.

APPENDIX B

SUMMARY OF LAND USE CONTROL INSPECTIONS AND SITE INSPECTIONS

SUMMARY OF LAND USE CONTROL INSPECTIONS

LETTERKENNY ARMY DEPOT
SUMMARY OF LAND USE CONTROL INSPECTIONS

Inspection Location	Date	Operable Unit	Reason for Inspection	Inspector(s)	Inspection Activities	Results and Findings	Inspection Report/Data Location
Building 53	February 25, 1999	SE OU 10	Construction of subgrade loading docks at Building 53.	Bryan Hoke	Physical observation and check of groundwater depth in area	No stained soil observed. Groundwater 27 feet bgs at Building 56.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 44	February 25, 1999	SE OU 10	Construction of subgrade loading docks at Building 44.	Bryan Hoke	Physical observation and check of groundwater depth in area	No stained soil observed. Groundwater 27 feet bgs at Building 56.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 8	February 25, 1999	SE OU 10	Removal of conveyor. Loading dock removed. External ground disturbance.	Bryan Hoke	Physical observation	No subsurface excavation	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 500	February 25, 1999	SE OU 8	Construction for new front entrance.	Bryan Hoke	Physical observation	Excavation depth 4-6 feet bgs. No stained soil observed. No groundwater encountered.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 500	May 7, 1999	SE OU 8	Construction of elevator shaft.	Bryan Hoke	Physical observation. Spoke to construction contractor	Elevator shaft excavated to 26 ft bgs. No groundwater encountered.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 53	May 7, 1999	SE OU 10	Construction of subgrade loading docks at Building 53.	Bryan Hoke	Physical observation and check of groundwater depth in area	No stained soil observed. Groundwater 27 feet bgs	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 54	December 6, 1999	SE OU 10	Construction of subgrade loading docks at Building 54. Connection made to stormwater sewer September.	Bryan Hoke and IRG Representative Justin Anderson	Physical Observation	Excavation depth 4-6 feet bgs for loading docks. Excavation depth 12 feet bgs for stormwater connection. No stained soil observed or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 34	December 6, 1999	SE OU 10	Construction of subgrade loading docks at Building 34.	Bryan Hoke and IRG Representative Justin Anderson	Physical Observation	Excavation depth 4-6 feet bgs. No stained soil observed. No groundwater encountered.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 53	December 6, 1999	SE OU 10	Construction of subgrade loading docks at Building 53.	Bryan Hoke	Physical Observation	Subgrade docs started in May completed.	Administrative Record - Regulatory Correspondence File, 1999 and Construction Inspection Office File, 1999.
Building 43	September 20, 2000	SE OU 10	Construction of subgrade loading docks at Building 43. Construction of trench and grinder pump for sanitary sewer. Construction of storm water drain.	Bryan Hoke and IRG Representative Justin Anderson	Physical Observation. Furnished copy of soil gas borings conducted in 1999 around Building 43.	In 1999 10 soil gas borings completed around the perimeter of Building 43, results ranged from 0.0 - 1.1 ppm. Excavation depths for loading dock and storm sewer was 4-6.5 bgs. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2000 and Construction Inspection Office File, 2000
Building 31	January 9, 2001	SE OU 10	Construction of subgrade loading docks at Building 31.	Bryan Hoke, IRG Representative Justin Anderson and LIDA rep John Van Horn.	Physical Observation	Excavation depth 6 feet bgs. No stained soil observed. No groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2001 and Construction Inspection Office File, 2001
Parcel 29	April 11, 2002	PDO OU 6	Groundbreaking for construction of Warrior Roofing tar paper manufacturing plant. Topsoil was being scraped off. Monitoring well PDO-98-01 identified for action to be taken.	Bryan Hoke and LIDA representative John Van Horn	Physical Observation	Monitoring well PDO-98-01 is located within the proposed driveway of the plant. Well will be converted into a flush mounted well. NOTE: 7 soil borings completed in May 2002 for water line to plant, results range from 0.0 - 7.3 ppm.	Administrative Record - Regulatory Correspondence File, 2002 and Construction Inspection Office File, 2002

Inspection Location	Date	Operable Unit	Reason for Inspection	Inspector(s)	Inspection Activities	Results and Findings	Inspection Report/Data Location
Parcel 7	January 21-23, 2004 (2003 Report)	SE OU 10	Construction of shell building by FCADC	Bryan Hoke and LIDA Real Property Manager Mike Whiteley	Interview and Physical Observation	Building constructed on concrete slab foundation. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2003 and Construction Inspection Office File, 2003
Parcel 1/2	January 21-23, 2004 (2003 Report)	SE OU 8	Burial of formerly overhead electrical utilities.	Bryan Hoke and LIDA Real Property Manager Mike Whiteley	Interview and Physical Observation	No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2003 and Construction Inspection Office File, 2003
Building 2291	March 10, 2004	PDO OU 4	Installation of gas line from 2291 to Vehicle Road (gas main).	Bryan Hoke	Physical Observation	Trench depth is 3-4 bgs. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2004 and Construction Inspection Office File, 2004
Parcel 5	June 7, 2004	SE OU 10	Construction of Warehouse for Gabler Trucking	Bryan Hoke	Physical Observation	Concrete footers dug to 4 ft bgs. Fill brought in to raise eastern side of construction site. Groundwater height 31.2 ft bgs on 5/21/04. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2004 and Construction Inspection Office File, 2004
Coffey Avenue, former Gate 6 Guard Shack vicinity	June 25, 2004	SE OU 10	Repair of industrial wastewater sewer line.	Bryan Hoke	Physical Observation	Trench depth 5 ft bgs. Contaminated soil excavated and properly sampled and disposed.	Administrative Record - Regulatory Correspondence File, 2004 and Construction Inspection Office File, 2004
Parcels 1/2	June 25, 2004	SE OU 8	Construction of Stormwater Retention Ponds	Bryan Hoke/Martin & Martin representative Joe McDowell	Physical Observation and Interview	Bulldozer scraped soil to a depth of 3-4 bgs. Scraped soil used to create surface impoundments. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2004 and Construction Inspection Office File, 2004
Parcel 2-63 & 2-64	November/December 2005	SE OU 10	Installation of sewer line to replace industrial wastewater force main.	Bryan Hoke	Physical Observation	Excavation depths varied from 4-8 feet bgs for gravity line, manhole, and equalization tank. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2005 and Construction Inspection Office File, 2005
Building 419 (Parcel 23)	April 18, 2006	SE OU 10	Construction of shell building by LIDA.	Bryan Hoke	Physical Observation	Building constructed on concrete slab foundation. Utilities already present. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2006 and Construction Inspection Office File, 2006
Parcel 7	April 18, 2006	SE OU 10	Building out of previously constructed shell building. (See entry from January 2004 for Parcel 7)	Bryan Hoke	Physical Observation	Area cleared around building for parking. Water and electrical utilities installed. Trench depths vary from 2-4 ft. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2006 and Construction Inspection Office File, 2006
Parcel 1&2	April 18, 2006	SE OU 10	Construction of shell building by FCADC	Bryan Hoke	Physical Observation	FCADC constructing building on slab foundation. Minor utility work, trenches at 4 foot depths. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2006 and Construction Inspection Office File, 2006
Parcel 34	November 13, 2006	PDO OU 2	Construction of building for Bell Trucking.	Bryan Hoke and contractor R&D Contractors	Physical Observation and Interview	Construction of truck maintenance building with dispatch office on existing parking lot - footers 44" depth. Construction of detached loading dock - 4 foot depth. No evidence of stained soil or groundwater.	Administrative Record - Regulatory Correspondence File, 2006 and Construction Inspection Office File, 2006
Parcel 5	June 20, 2007	SE OU 10	Addition to Gabler Trucking, Building 20	Bryan Hoke and Tom Gabler, H.C. Gabler, Inc.	Physical Observation and Interview	Maintenance shop and fueling station being added to east end of Building 20-California Ave. Slab foundation with 4 foot footers. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2007 and Construction Inspection Office File, 2007
Parcel 7	January 24, 2008	SE OU 10	Addition to Bentley World Packaging	Bryan Hoke and LIDA Rep. Kip Feldman	Physical Observation and Interview	Addition constructed on a concrete slab foundation with a maximum of 4-foot footers. No groundwater or stained soil was encountered during the construction.	Administrative Record - Regulatory Correspondence File, 2008 and Construction Inspection Office File, 2008
Parcels 1, 2, 2-77 (Lot 2)	January 10, 2008	SE OU 10	Construction of 15,000 sq ft. warehouse for Meyer Distributing	Bryan Hoke and Coldsmith Construction Rep. Steve Coldsmith	Physical Observation and Interview	Constructed on concrete slab foundation with 4 foot footers. Water and sewer lines 5 ft bgs. Subgrade dock 4 ft bgs. Monitoring wells 83-11 and 83-1 were within construction footprint and abandoned. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2008 and Construction Inspection Office File, 2008
Parcel 2 (Lot 4)	March 26, 2008	SE OU 10	5K Logistics constructed a 30,000 sq ft. warehouse	Bryan Hoke and Lehman Construction Rep. Ken Myers	Physical Observation and Interview	Constructed on a concrete slab foundation with footers on ground surface. Sewer lines 3 ft. bgs. Water and gas lines 2 ft. bgs. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2008 and Construction Inspection Office File, 2008
Parcels 26, 2-49, 2-51	July 30, 2008	SE OU 10	Franklin County General Authority constructed new sewer line	Bryan Hoke and David H. Martin Excavating Rep. Trevor Rife	Physical Observation and Interview	Maximum depth of the sewer line was 10 feet bgs at manhole. No stained soil or groundwater encountered.	Administrative Record - Regulatory Correspondence File, 2008 and Construction Inspection Office File, 2008

LETTERKENNY ARMY DEPOT
SUMMARY OF LAND USE CONTROL INSPECTIONS

Inspection Location	Date	Operable Unit	Reason for Inspection	Inspector(s)	Inspection Activities	Results and Findings	Inspection Report/Data Location
Parcel 2-74A	December 2009	PDO OU 2	Cumberland Valley Animal Shelter began constructing new animal shelter on Parcel 2-74AB	Bryan Hoke and Brechbill & Helman Construction Rep. Rick Mellott.	Physical Observation and Interview	Former barracks demolished to make way for new shelter. New building was concrete walled with concrete slab foundation. Site-wide maximum excavation depth of 3 feet was required for the preparation of the concrete footers. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2009 and Construction Inspection Office File, 2009
Parcel 2-74A	January 8, 2010	PDO OU 2	Cumberland Valley Animal Shelter completed construction of nev	Bryan Hoke and Brechbill & Helman Construction Rep. Rick Mellott.	Physical Observation and Interview	Former barracks demolished to make way for new shelter. New building was concrete walled with concrete slab foundation. Site-wide maximum excavation depth of 3 feet was required for the preparation of the concrete footers. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2010 and Construction Inspection Office File, 2010
Parcel 17, Building 44	December 2010	SE OU 10	Cargill rebuilding feed depot that was destroyed in February 201	Bryan Hoke and Cargill Rep. Goerge Wagner	Physical Observation and Interview	New building being constructed on existing concrete slab. Beginning in September 2010 old footers were removed and new concrete footers were excavated to a depth of three feet. New building not supplied by water or sewer. No groundwater or stained soil encountered.	Administrative Record - Regulatory Correspondence File, 2010 and Construction Inspection Office File, 2010

SUMMARY OF SITE INSPECTIONS

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: SE OU 1 (K-Areas)	**Date of inspection:** 4/19/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: ENV. OFFICE.	**Weather/temperature:** CLOUDY MID 50's

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other Soil excavation, treatment (completed)
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply) – See Appendix A of 5 Year R

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State
   G PRP in-house G Contractor for PRP
   G Federal Facility in-house G Contractor for Federal Facility
   G Other _____

2. **O&M Cost Records** — See Section 7 of 5 Year Review
   G Readily available G Up to date
   G Funding mechanism/agreement in place
   Original O&M cost estimate _____ G Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
   Remarks Signs intact and in good condition

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes (G No) G N/A
Site conditions imply ICs not being fully enforced — G Yes (G No) G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual
Frequency Annual
Responsible party/agency Army BRAC Env Coordinator
Contact Bryan Hoke (Name) IR Program Mgr (Title) 4/19/12 (Date) 717-267-9836 (Phone no.)

Reporting is up-to-date — (G Yes) G No G N/A
Reports are verified by the lead agency — (G Yes) G No G N/A

Specific requirements in deed or decision documents have been met — (G Yes) G No G N/A
Violations have been reported — G Yes G No (G N/A)
Other problems or suggestions: G Report attached

2. **Adequacy** (G ICs are adequate) G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map (G No vandalism evident)
Remarks

2. **Land use changes on site** G (N/A)
Remarks

3. **Land use changes off site** G (N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable (G N/A)

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent Depth
Remarks

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths Widths Depths
Remarks

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent Depth
Remarks

4. **Holes** G Location shown on site map G Holes not evident
Areal extent Depth
Remarks Some animal burrows observed. See Appendix F

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks See Appendix F for more information

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

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent Height
Remarks

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

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

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

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

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

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

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks Injection wells installed in K-1 cap for pilot study

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable (G N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/lockedG Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Appendix F of the 5 Year Review presents a Cap Inspection Report. Overall the caps are functioning as intended and the remedy is effective.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Mowing of cap needs to be completed more frequently. Animal burrows noted in several areas. These items will be addressed or have already been addressed.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No remedy problems other than ~~more~~ need for mow more frequently (quarterly).

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: SE OU 2	**Date of inspection:** 4/19/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: ENV. OFFICE, Bay [illegible]	**Weather/temperature:** CLOUDY MID-50's

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other Clearing/abandonment of sewer lines (completed)
G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** SEE APPENDIX A OF FIVE-YEAR REVIEW
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____

2. **O&M Cost Records** SEE SECTION 7 OF FIVE-YEAR REVIEW
G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes (G No) G N/A
Site conditions imply ICs not being fully enforced — G Yes (G No) G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual
Frequency Annual
Responsible party/agency Army
Contact Bryan Hoke — BRAC Env Coordinator / IR Program Mgr — 4/19/12 — 717-267-9836
Name — Title — Date — Phone no.

Reporting is up-to-date — (G Yes) G No G N/A
Reports are verified by the lead agency — (G Yes) G No G N/A

Specific requirements in deed or decision documents have been met — (G Yes) G No G N/A
Violations have been reported — G Yes G No (G N/A)
Other problems or suggestions: G Report attached

2. **Adequacy** (G ICs are adequate) G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map (G No vandalism evident)
Remarks

2. **Land use changes on site** (G N/A)
Remarks

3. **Land use changes off site** (G N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable (G N/A)

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

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

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

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

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

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

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable (G N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/lockedG Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy restricts site to C/I. Remedy functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No O&M necessary other than LUC inspection.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. No issues or unexpected changes
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

(PHASE V BRAC) I. SITE INFORMATION	
Site name: SE OU 7 / SE OU 8	**Date of inspection:** 7/10/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: LEAD ENV. OFFICE, [illegible]	**Weather/temperature:** PARTLY CLOUDY / MID 80's

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- ~~G Access controls~~
- ~~G Institutional controls~~
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** SEE APPENDIX A OF 5 YEAR REVIEW
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other _____

2. **O&M Cost Records** SEE SECTION 7 OF FIVE-YEAR REVIEW
G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate _____ G Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes G No G N/A
Site conditions imply ICs not being fully enforced — G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual
Frequency Annual
Responsible party/agency Army
Contact Bryan Hoke (Name) BRAC Env Coordinator / PP Program Mgr (Title) 4/19/12 (Date) 717-267-9836 (Phone no.)

Reporting is up-to-date — G Yes G No G N/A
Reports are verified by the lead agency — G Yes G No G N/A

Specific requirements in deed or decision documents have been met — G Yes G No G N/A
Violations have been reported — G Yes G No G N/A
Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
Remarks

2. **Land use changes on site** G N/A
Remarks

3. **Land use changes off site** G N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

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

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

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

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

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

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

LUCs restrict use of site to C/I. Remedy functioning as intended.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No O&M other than regular LUC inspection.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No issues or unexpected changes

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization at this time

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: SE OU 10	**Date of inspection:** 4/19/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: ENV. OFFICE, Bryan Ve	**Weather/temperature:** CLOUDY, MID 50"

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other Biodegradation - completed
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply) - See Appendix A of 5 ye Review

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other _____

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate _____ G Breakdown attached – See Section 7 of Five Year Review

Total annual cost by year for review period if available

From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost
From _____ To _____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes (G No) G N/A
Site conditions imply ICs not being fully enforced — G Yes (G No) G N/A

Type of monitoring (e.g., self-reporting, drive by) Visual, GW monitoring
Frequency Annual
Responsible party/agency Army
Contact Bryan Hoke — BRAC Env Coordinator / IR Program Mgr — 4/19/12 — 717-267-9836
Name — Title — Date — Phone no.

Reporting is up-to-date — (G Yes) G No G N/A
Reports are verified by the lead agency — (G Yes) G No G N/A

Specific requirements in deed or decision documents have been met — (G Yes) G No G N/A
Violations have been reported — G Yes G No (G N/A)
Other problems or suggestions: G Report attached

2. **Adequacy** (G ICs are adequate) G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map (G No vandalism evident)
Remarks

2. **Land use changes on site** (G N/A)
Remarks

3. **Land use changes off site** (G N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map (G Roads adequate) G N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

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

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

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

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/lockedG Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy in MNA phase and is effective in monitoring plume concentrations, which have steadily declined over time. Will continue to monitor until all VOCs meet ARARs.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

GW is monitored regularly (annually) to assess the necessity for LUCs. Once all ARARs are met, LUCs can be lifted for all areas of SE OU 10.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. RAWP anticipated benzene would meet ARARs by 2010. Benzene still exceeds ARARs near Bldg 37. MNA phase of remedy continues to track BTEX concentrations in groundwater

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization – MNA

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

(Phase I/II BRAC) I. SITE INFORMATION	
Site name: SE OU8/ PDO OU 6	**Date of inspection:** 7/10/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: LEAD ENV. OFFICE, Bryan Hoke	**Weather/temperature:** PARTLY CLOUDY / MID 80'S

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** SEE APPENDIX A OF FIVE-YEAR REVIEW
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits_____ — G Readily available — G Up to date — G N/A

   Remarks

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State
   G PRP in-house G Contractor for PRP
   G Federal Facility in-house G Contractor for Federal Facility
   G Other _____

2. **O&M Cost Records** SEE SECTION 7 OF 5 YEAR REVIEW
   G Readily available G Up to date
   G Funding mechanism/agreement in place
   Original O&M cost estimate _____ G Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
   Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes G No G N/A
Site conditions imply ICs not being fully enforced G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual
Frequency Annual
Responsible party/agency Army
Contact Bryan Hoke (Name) IR Program Mgr (Title) BRAC Env Coordinator (Date) 4/19/12 (Phone no.) 717-267-9836

Reporting is up-to-date G Yes G No G N/A
Reports are verified by the lead agency G Yes G No G N/A

Specific requirements in deed or decision documents have been met G Yes G No G N/A
Violations have been reported G Yes G No G N/A
Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
Remarks

2. **Land use changes on site** G N/A
Remarks

3. **Land use changes off site** G N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

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

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

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

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

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

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters _____
   G Additive (*e.g.*, chelation agent, flocculent) _____
   G Others _____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually _____
   G Quantity of surface water treated annually _____
   Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks _____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks _____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks _____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks _____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks _____

D. Monitoring Data*

1. Monitoring Data
   ~~G Is routinely submitted on time~~ G Is of acceptable quality

2. ~~Monitoring data suggests:~~
   G Groundwater plume is effectively contained ~~G Contaminant concentrations are declining~~

* Groundwater in SE OU 8 addressed under SE OU 10.
Groundwater in PDO OU 6 addressed under PDO OUs 2 and 4.

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

LUCs restrict site to c/i. Remedy functioning as designed.

Groundwater restrictions in place and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No O&M necessary other than LUC inspections.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No issues or unexpected changes

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization at this time

APPENDIX C

RELEVANT PORTIONS OF DEED AND LEASE DOCUMENTS

DEPARTMENT OF THE ARMY
LETTERKENNY ARMY DEPOT
1 OVERCASH AVENUE
CHAMBERSBURG, PENNSYLVANIA 17201

REPLY TO
ATTENTION OF:

July 11, 2012

BRAC Environmental Office

U.S. Environmental Protection
Agency Region III
Hazardous Sites Cleanup Division (3HS11)
ATTN: Bruce Beach/Gerald Hoover
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Beach/Mr. Hoover:

The purpose of this letter is to submit a summary of the Phase I & II Transfer Parcels deed review as part of the Five-Year Review for the Southeastern (SE) and Property Disposal Office (PDO) Areas National Priorities List Sites, Letterkenny Army Depot.

Attached is a table summarizing the review of the Phase I & II Parcel deeds. This list is based on the January 2012 notice from the Letterkenny Industrial Development Authority (LIDA) listing property owners. The table lists the Phase I & II Parcel, building, owner, whether the deed was reviewed and any comments applicable to the deed review. Under the comments column on the summary table the deed is noted as: 1.) the parent Quitclaim deed, 2.) a successor deed from LIDA to another grantee that references the parent deed, and 3.) whether the deed contains language referencing the land use restrictions from deed Examples 1 & 2.

The Army completed an Explanation of Significant Differences (ESD) in May 2012 to lift land use restrictions from the majority of Phase I Parcels and for part of Phase II Parcel 2R-80—the Gate 1 Guardhouse, Building 511 Area. As a result of the ESD Phase I Parcels 1, 2, 10, 12, 29, 33, & 34 and all of the Phase II Parcels except the Gate 1 Guardhouse, Building 511 Area retained their land use controls (LUCs).

Phase I & II Parcel deeds were reviewed for language referencing the restrictions from the Phase I or Phase II quitclaim deed. All of the successor deeds reviewed were between LIDA and transferee. All LIDA transferee deeds for Phase I & II Parcels reference the Phase I or Phase II quitclaim deeds using the following language: *"Parcel X is under and subject to those restrictions, requirements, notices, easements and covenants imposed on the Letterkenny Industrial Development Authority and its successors-in-interest as set forth in a Quitclaim Deed dated November 6, 1998 or May 3, 2002 from the United States of America to the Letterkenny Industrial Development Authority and recorded in the Franklin County Recorder of Deeds Office in Volume 1414, Page 204 or Volume 1904, Page 388 including, but not limited to, the stated Land Use Restrictions and CERCLA remediation covenants. Said restrictions, requirements notices, easements and covenants set forth in the November 6, 1998 or May 3, 2002 Quitclaim Deed are incorporated by reference as though set forth in full herein.* This deed is enclosed as Example 1.

Only Phase I Parcels 1, 2 & 34 have a successor deed after being transferred from LIDA. Parcels 1 & 2 were transferred from LIDA to the Franklin County Area Development Corporation (FCADC) and follow the same format. However none of the successor deeds directly references the restrictions in the Phase I Quitclaim Deed, instead the Phase I Quitclaim Deed is referenced by Volume and Page. A copy of FCADC deed is enclosed as Example 2. Parcel 34 was transferred from Bell Trucking to Access Properties, LLC. The transfer deed indirectly references the restriction in the Phase I Quitclaim Deed, Instrument No. 2010-7887.

All of the Phase II Deeds were reviewed. The Phase II Parcels are either still owned by LIDA, or LIDA has transferred the property. The attached table shows whether the deeds are owned by LIDA or the successor deed type is Example 1 or 2.

If there are any questions, please contact the undersigned at (717) 267-9836.

Sincerely,

Bryan Hoke
BRAC Environmental Coordinator

LETTERKENNY ARMY DEPOT
FIVE-YEAR REVIEW
DEED REVIEW SUMMARY
JULY 2012

Parcel Number	Property	Deed Owner	Deed Reviewed	Comments
Parcels 1, 2, 2-35, 2-77	Parcels 1, 2, 2-35, 2-77	FCADC	YES	Deed references Phase I Quit Claim Deed. Vol 2003, Page 118 - EXAMPLE 1
Parcels 1, 2, 2-77 (Lot 3)	Parcels 1, 2, 2-77 (Lot 3)	Bentley World Packaging	YES	Deed indirectly references Phase I Quit Claim Deed but not restrictions by referencing previous deed (Vol 2003, Page 118), Vol 3412, Page 211 - Example 2
Parcel 2 (Lot 4)	Parcel 2 (Lot 4)	5K Logistics	YES	Deed indirectly references Phase I Quit Claim Deed but not restrictions by referencing previous deed (Vol 2003, Page 118), Vol 3411, Page 471 - Example 2
Parcel 34	Parcel 34	Access Properties, LLC	YES	Deed references Phase I Quit Claim Deed Instrument No. 2010-7887
Parcel 2-35	Parcel 2-35	FCADC	YES	Deed references Phase I Quit Claim Deed. Vol 2003, Page 118 - EXAMPLE 1
Parcel 2-36	Railroad Tracks	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-37	Parcel 2-37	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-38	Building 7	American Stair	YES	Deed references Phase II Quit Claim Deed, Vol 1991, Page 503 - EXAMPLE 1
Parcel 2-39	Building 5	American Stair	YES	Deed references Phase II Quit Claim Deed, Vol 2602, Page 359 - EXAMPLE 1
Parcel 2-40	Building 8	LamTech, Inc.	YES	Deed references Phase II Quit Claim Deed, Vol 2095, Page 469 - EXAMPLE 1
Parcel 2-41	Building 9 Railroad Tracks	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-42	Building 33	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-43	Building 32	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-44	Building 31	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-45	Building 42	Woods Co.	YES	Deed references Phase II Quit Claim Deed, Vol 2004, Page 32 - EXAMPLE 1
Parcel 2-46	Building 41	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-47	Building 247, Parcel 2-47	JSH Industries	YES	Deed references Phase II Quit Claim Deed, Vol 2052, Page 396 - EXAMPLE 1
Parcel 2-48	Golf Course	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-49	Building 503	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-50	Building 18	H.C. Gabler, Inc.	YES	Deed references Phase II Quit Claim Deed, Vol 2004, Page 060 - EXAMPLE 1
Parcel 2-51	Golf Course	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-52	Golf Course	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-53	Golf Course	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-54	Golf Course	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-55	Building 436	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-56	Building 426	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-57	Building 424	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-58	Parcel 2-58	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-59	Parcel 2-59	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-60	Building 441	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-61	Building 431	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-62	Building 421	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-63	Parcel 2-63	Letterkenny Industrial Development Authority	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-64	Parcel 2-64	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-65	Dock 36	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-66	Dock 46	Ingersoll Rand	YES	Deed references Phase II Quit Claim Deed, Vol 2785, Page 405 - EXAMPLE 1
Parcel 2-67	Building 56	Ingersoll Rand	YES	Deed references Phase II Quit Claim Deed, Vol 2785, Page 405 - EXAMPLE 1
Parcel 2-68	Building 55	Letterkenny Business Park	YES	Deed references Phase II Quit Claim Deed, Vol 2027, Page 613 - EXAMPLE 1
Parcel 2-69	Parcel 2-69	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-70	Building 521	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcel 2-77	Railroad Tracks	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388
Parcels 2R-80, 81, 84, 85	Roads	Greene Township	YES	Corrected Deed references Phase II Quit Claim Deed, Instrument No. 2008-007190
Parcels 2R-82, 83	Roads	Letterkenny Industrial Development Authority	YES	Phase II Quit Claim Deed, Vol 1904, Page 388

DIST NO.___ MAP NO. ___ BLOCK ___ LOT ___

QUITCLAIM DEED

72102

This Deed is made the 21st day of November, 2002.

Between LETTERKENNY INDUSTRIAL DEVELOPMENT AUTHORITY, a Pennsylvania non-profit municipal industrial authority, with its principal offices at 220A Coffey Avenue, Chambersburg, Pennsylvania 17201, hereinafter referred to as the Grantor;

AND

FRANKLIN COUNTY AREA DEVELOPMENT CORPORATION, a Pennsylvania non-profit industrial development corporation, with its principal office at 1900 Wayne Road, Chambersburg, Pennsylvania 17201, hereinafter referred to as the Grantee.

Witnesseth

THAT IN CONSIDERATION of Five Hundred Thousand Dollars ($500,000.00) in hand paid, the receipt whereof is hereby acknowledged, Grantor does hereby release and quitclaim to Grantee, its successors and assigns, the following two parcels:

Parcel 1

ALL THAT CERTAIN tract of land known as Parcel 1 as shown on a Master Plan, prepared by the U.S. Army Engineer District, Baltimore, Maryland, recorded in the Franklin County Recorder of Deeds Office in Plat Book 288G, Page 1066, Part I through VI, said tract located in the Township of Greene, County of Franklin and Commonwealth of Pennsylvania, bounded and described as set forth on Exhibit A hereof.

BEING A PART OF THE SAME PREMISES which the United States of America by a Quitclaim Deed dated November 6, 1998, and recorded in the Franklin County Recorder of Deeds Office in Volume 1414, Page 204, granted and conveyed unto the Letterkenny Industrial Development Authority, its successors and assigns.

Parcel 2

ALL THAT CERTAIN tract of land known as Parcel 2 as shown on a Master Plan, prepared by the U.S. Army Engineer District, Baltimore, Maryland, recorded in the Franklin

County Recorder of Deeds Office in Plat Book 288G, Page 1066, Part I through VI, said tract located in the Township of Greene, County of Franklin and Commonwealth of Pennsylvania, bounded and described as set forth on Exhibit A hereof.

BEING A PART OF THE SAME PREMISES which the United States of America by a Quitclaim Deed dated November 6, 1998, and recorded in the Franklin County Recorder of Deeds Office in Volume 1414, Page 204, granted and conveyed unto the Letterkenny Industrial Development Authority, its successors and assigns.

PARCEL 1 AND PARCEL 2 ARE UNDER AND SUBJECT to those restrictions, requirements, notices, easements and covenants imposed on the Letterkenny Industrial Development Authority and its successors-in-interest as set forth in a Quitclaim Deed dated November 6, 1998 from the United States of America to the Letterkenny Industrial Development Authority and recorded in the Franklin County Recorder of Deeds Office in Volume 1414, Page 204 including, but not limited to, the stated Land Use Restrictions and CERCLA remediation covenants. Said restrictions, requirements notices, easements and covenants set forth in the November 6, 1998 Quitclaim Deed are incorporated by reference as though set forth in full herein.

PARCEL 1 AND PARCEL 2 ARE UNDER AND SUBJECT to a Declaration of Easements dated May 3, 1999, and recorded in the Franklin County Recorder of Deeds Office in Volume 1430, Page 298, as amended by a First Amendment to Declaration of Easements dated September 29, 1999, and recorded in the Recorder's Office aforesaid in Volume 1453, Page 421.

AND ALL OF GRANTOR'S RIGHT, TITLE AND INTEREST in and to a vertical distance beginning at a point eight (8) feet below the surface and extending skyward in, and over, the following two parcels:

Parcel 2-1B

ALL THAT CERTAIN tract of land known as Parcel 2-1B as shown on a Final Land Subdivision Plan prepared by Best Angle Associates, last revised January 14, 2002 and recorded in the Franklin County Recorder of Deeds Office in Plat Book 288H, Page 881 (Parts 1 through 87), said tract located in the Township of Greene, County of Franklin and Commonwealth of Pennsylvania, bounded and described as set forth on Exhibit A hereof.

BEING A PART OF THE SAME PREMISES which the United States of America by a Quitclaim Deed dated May 3, 2002, and recorded in the Franklin County Recorder of Deeds

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Office in Volume 1904, Page 388, granted and conveyed unto the Letterkenny Industrial Development Authority, its successors and assigns.

Parcel 2-2B

ALL THAT CERTAIN tract of land known as Parcel 2-2B as shown on a Final Land Subdivision Plan prepared by Best Angle Associates, last revised January 14, 2002 and recorded in the Franklin County Recorder of Deeds Office in Plat Book 288H, Page 881 (Parts 1 through 87), said tract located in the Township of Greene, County of Franklin and Commonwealth of Pennsylvania, bounded and described as set forth on Exhibit A hereof.

BEING A PART OF THE SAME PREMISES which the United States of America by a Quitclaim Deed dated May 3, 2002, and recorded in the Franklin County Recorder of Deeds Office in Volume 1904, Page 388, granted and conveyed unto the Letterkenny Industrial Development Authority, its successors and assigns.

PARCEL 2-1B AND PARCEL 2-2B ARE UNDER AND SUBJECT to those restrictions, requirements, notices, easements and covenants imposed on the Letterkenny Industrial Development Authority and its successors-in-interest as set forth in a Quitclaim Deed dated May 3, 2002 from the United States of America to the Letterkenny Industrial Development Authority and recorded in the Franklin County Recorder of Deeds Office in Volume 1904, Page 388 including, but not limited to, the stated Land Use Restrictions and CERCLA remediation covenants. Said restrictions, requirements notices, easements and covenants set forth in the May 3, 2002 Quitclaim Deed are incorporated by reference as though set forth in full herein.

PARCEL 2-1B AND PARCEL 2-2B ARE UNDER AND SUBJECT to a Declaration of Easements dated July 22, 2002, and recorded in the Franklin County Recorder of Deeds Office in Volume 1922, Page 483, as amended.

PARCEL 1, PARCEL 2, PARCEL 2-1B AND PARCEL 2-2B ARE UNDER AND SUBJECT to a Declaration of Covenants, Conditions and Restrictions for the Cumberland Valley Business Park dated January 13, 1999, and recorded in the Franklin County Recorder of Deeds Office in Volume 1414, Page 294, as supplemented by a First Supplemental Declaration of Covenants, Conditions, and Restrictions dated July 22, 2002, and recorded in the Recorder's Office aforesaid in Volume 1922, Page 487.

PARCEL 1, PARCEL 2, PARCEL 2-1B AND PARCEL 2-2B ARE UNDER AND SUBJECT to such other restrictions, easements, rights-of-way or conditions to the extent legal

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3125.00
3125.00

5487

SPECIAL WARRANTY DEED

MADE the 1st day of March, 2007

BETWEEN

FRANKLIN COUNTY AREA DEVELOPMENT CORPORATION, a Pennsylvania non-profit corporation, and certified Pennsylvania industrial development agency, having its principal office at 1900 Wayne Road, Chambersburg, PA 17201, hereinafter called GRANTOR,

AND

PA OSP, LLC, a Wisconsin limited liability company, having its principal office at 8600 West Bradley Road, Milwaukee, Wisconsin, hereinafter called the GRANTEE,

WITNESSETH, that in consideration of **THREE HUNDRED TWELVE THOUSAND FIVE HUNDRED ($312,500.00) DOLLARS** in hand paid, the receipt whereof is hereby acknowledged, the said Grantor hereby remises, releases and quit claims it's right, title and interest, to said Grantee, in and to:

ALL the following described real estate lying and being situate in Greene Township, Franklin County, Pennsylvania, bounded and described as follows:

BEGINNING at an iron pin at corner of Lot No. 2 and the western edge of Sunset Pike (SR 0433), as shown on the hereinafter referred to subdivision plan; thence along the western edge of Sunset Pike (SR 0433), North 08 degrees 59 minutes 46 seconds East, 381.77 feet to a point; thence along the same, on a curve to the left, having a radius of 1248.33 feet, an arc length of 98.04 feet, a chord bearing North 06 degrees 44 minutes 46 seconds East and a chord length of 98.02 feet to a point; thence along the same, on a curve to the left, having a radius of 929.93 feet , an arc length of 288.35 feet, a chord bearing North 04 degrees 23 minutes 13 seconds West and a chord length of 287.19 feet to an iron pin at the southern edge of Coffey Avenue; thence along Coffey Avenue, South 64 degrees 02 minutes 56 seconds West, 577.88 feet to a point; thence along the same, on a curve to the right, having a radius of 1730.00 feet, an arc length of 232.67 feet, a chord bearing South 67 degrees 54 minutes 07 seconds West and a chord length of 232.50 feet to an iron pin at corner of Lot No. 4; thence along Lot No. 4, South 25 degrees 23 minutes 58 seconds East, 446.85 feet to an iron pin at corner common to Lot No. 4 and Lot No. 2; thence along Lot No. 2, North 63 degrees 40 minutes 31 seconds East, 105.00 feet to an iron pin; thence along the same, South 81 degrees 00 minutes 14 seconds

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EXAMPLE 2

East, 404.99 feet to an iron pin at the western edge of Sunset Pike (SR 0433), the place of BEGINNING, containing 8.5001 acres.

BEING Lot No. 3, as shown on a Master Subdivision Plan, for Franklin County Area Development Corporation, prepared by Martin & Martin Incorporated, dated August 17, 2006, which together with the necessary municipal approvals is recorded in Franklin County, Pa., Plan Book Volume 288J, Page 558, Parts 1-4.

BEING part of the same real estate which the Letterkenny Industrial Development Authority, by their deed dated November 21, 2002, recorded in Franklin County Record Book Volume 2003, Page 118, conveyed to Franklin County Area Development Corporation, Grantor herein.

SUBJECT TO any and all notes, restrictions, rights of way, easements and/or conditions that may appear on the above referenced subdivision plan.

SUBJECT ALSO TO the covenants, conditions and restrictions created by Letterkenny Industrial Development Authority as recorded in Franklin County, Pa., Record Book Volume 1430, Page 298.

AND the said Grantor will warrant title specially the property hereby conveyed.

IN WITNESS WHEREOF, said Grantor hereunto set its hand and seal the day and year first above written.

ATTEST:

FRANKLIN COUNTY AREA DEVELOPMENT CORPORATION

By _____
L. Michael Ross, President

APPENDIX D

COMMUNITY NOTICE: FIVE-YEAR REVIEW LETTERKENNY ARMY DEPOT

APPENDIX D

COMMUNITY NOTICE

2012 FIVE-YEAR REVIEW LETTERKENNY ARMY DEPOT

- Letterkenny Army Depot (LEAD), Chambersburg Pennsylvania, 17201-4150. http://leadenv.org/default.aspx
- The US Army conducted the Five-Year Review of the Southeastern (SE) Area and Property Disposal Office (PDO) Area National Priorities List Sites.
- The selected remedies for the various SE Operable Units (OUs) are:

K-areas (SE OU 1) – Low temperature thermal treatment of excavated soils and subsequent backfilling on site with a residual waste cap.

IWWS Lines (SE OU 2) – Cleaning of sewer lines followed by abandonment of the sewers and drain lines at Building 37 and 57 to prevent future use of the existing sewers.

TOSA/WOS (SE OU 7) – Land Use Controls (LUCs). The LUCs consist of deed restrictions to restrict portions of SE OU 7 to C/I.

BRAC Waste Sites (portions of SE OU 8 and PDO OU 6) – LUCs. The LUCs consist of deed restrictions to restrict portions of SE OU 8 and PDO OU 6 to C/I.

SE OU 10 – Enhanced Biodegradation, monitored natural attenuation (MNA), and LUCs preventing access to the underlying groundwater.

- The soil and/or groundwater associated with SE OUs 1, 2, 7, portions of PDO OU 6 and SE OU 8, and SE OU 10 are contaminated with metals and/or degreasing solvents.
- Summary of results.

K-areas (SE OU 1) –Continued maintenance of cap and signage.

SE OU 2 – Annual LUC Inspections.

BRAC Waste Sites (portions of SE OU 8) – Annual LUC Inspections.

Multiple OU's – Annual LUC Inspections.

- Explanation of Significant Differences (ESD) – The remedies for portions of SE OU 8, SE OU 10, and PDO OU 6 were altered in the SE OU 10 ESD and the Phase I and II ESD. The SE OU 10 ESD lifted groundwater restrictions from the majority of parcels in SE OU 8 that are within the boundaries of SE OU 10 but are no longer impacted by the SE OU 10 groundwater plume. The Phase I and II ESD lifted land use restrictions for all parcels except Phase I Parcels 1 and 2. Parcels 1 and 2 remain suitable for and will continue to be restricted to C/I use only; the remained of the Phase I and II Parcels were cleared for UU/UE.
- Protectiveness Statement.

SE OUs 1, 2, 7, and parts of PDO OU 6 and SE OU 8 (BRAC waste sites) – Remedies are still considered protective of human health and the environment.

SE OU 10 – The remedy for SE OU 10 currently protects human health and the environment based on recent groundwater results, the evaluation of the VIP, and continued LUCs for protection of human health from groundwater use and contact. The effectiveness of the remedy will be reassessed via risk calculations and comparison of data to MCLs after sufficient groundwater data are obtained.

- Documents reviewed included Land Use Control Annual Letter Report 1999-2011, site inspection forms, Land Use Control Action Plan, recorded deeds, desk files, and Administrative Record documents.
- The 2012 LEAD Five-Year Review will be placed in the Letterkenny Administrative Record. The public repository for the Administrative Record is located at 1 Overcash Avenue (Building 14), Chambersburg, PA 17201. The website for the Letterkenny Administrative Record is: http://www.leadenv.com/leadenv/
- For more information please contact Mr. Bryan Hoke, 717-267-9836.
- The next LEAD Five-Year Review will be due in June 2017, which is five years from the date of EPA concurrence of this Five-Year Review.

APPENDIX E

REPORT ON 225 PPB SOIL REMOVAL ACTION LEVEL

APPENDIX E

REPORT ON 225 PPB SOIL REMOVAL ACTION LEVEL

LETTERKENNY ARMY DEPOT
SOUTHEASTERN AREA
OPERABLE UNIT ONE (K AREAS)
FIVE YEAR REVIEW

Question One: Why was 225 ppb selected as the soil removal action level? How was it documented?

Background History:

The Record of Decision (ROD) for the Accelerated Remedial Action Southeastern Area Operable Unit One: K Area Contaminated Soils was signed by the United States Army (Army) on 28 June 1991.

An Explanation of Significant Differences (ESD) was signed by the Army on 31 July 1991 and the EPA on 02 August 1991. The ESD stated that the appropriate ARARs for any metals found in soils during the remediation at the SE Area was the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 5901 et seq., Land Disposal Restrictions promulgated at 40 C.F.R. Part 268.

These two documents constitute the ROD for this effort.

The ROD (27 June 1991) on page two identified the major components of the planned K Areas Remedial Action as:

- Excavation of 8,000 cubic yards of contaminated soils in the K Area.
- Thermal treatment of contaminated soils at a temperature not greater than 450 °F.
- Destruction of volatilized contaminants by a secondary high-temperature combustor or adsorption of volatilized contaminants onto activated carbon.
- Analysis of representative samples of treated soils and comparison with treatment criteria.
- Proper management of treated soils.

Documents:

Endangerment Assessment of the Southeastern Area at Letterkenny Army Depot, September 1988, Final

The Endangerment Assessment (EA) used two Remedial Investigation Reports to document the site conditions at the DA:

Remedial Investigation/Feasibility Study of LEAD (SIA/Disposal Area), Weston, 1984. Values for VOCs in soil and groundwater in the DA from this effort are found in Table 3.3-5.

Remedial Investigation of the Disposal Area (SIA) ESE 1986. Table 3.3-7 (page 3-22) listed the following values for soil and groundwater contamination in the DA:

Table 3.3-5. Contaminants Found Above Detection Limits in the Soils and Groundwater of Area K-1 in the DA

Contaminant	Concentration	
	Soil (µg/kg)	Groundwater (µg/L)
Organics		
Chloroform (CHCL3)	200	40
1,1-Dichloroethylene (1,1-DCE)	3,000	400
trans-1,2-Dichloroethylene (Tl2DCE)	50,000 – 2,000,000	90,000
Methylene Chloride (CH2CL2)	800 – 10,000	30
Tetrachloroethylene (TCLEE)	200 – 800,000	
Trichloroethylene (TCE)	300 – 500,000	10,000
Metals		
Arsenic (As)	6,800	—
Cadmium (Cd)	10,800 – 24,800	

Note: DA = Disposal Area.
µg/kg = micrograms per kilogram.
µg/L = micrograms per liter.
— = no data.

Source: Weston, 1984.

Table 3.3-7. Contaminants Found Above Detection Limits in the Soils and Groundwater of Area K-1 in the DA

Contaminant	Concentration	
	Soils (µg/kg)	Groundwater (µg/L)
Organics		
Benzene	100-700 (3)	30 (1)
Chlorobenzene	600 (1)	
Chloroform	200 (1)	40 (1)
1,1-Dichloroethene	3,000 (1)	400 (1)
cis/trans-1,2-Dichloroethene	50,000-2,000,000 (7)	90,000 (1)
Dichloropropane	10,000 (1)	
Ethylbenzene	9,000-10,000 (2)	50 (1)
Ethylmethylbenzene	3,000 (1)	
Methylene chloride	800-10,000 (5)	30 (1)
1,1,2,2-Tetrachloroethene	200-800,000 (7)	5,000 (1)
Toluene	1,000-100,000 (5)	20 (1)
Trichloroethylene	300-500,000 (7)	10,000 (1)
Trimethylbenzene	2,000-30,000 (2)	
Various hydrocarbons	2,000-400,000 (3)	
Vinyl chloride	5,000-200,000 (3)	10,000 (1)
xylene	1,000-700,000 (5)	
Inorganics		
Arsenic	6,800 (1)	
Barium	108,000-235,000 (3)	
Cadmium	10,800-24,800 (3)	
Chromium (total)	25,800-150,000 (3)	
Copper	53,500-156,000 (3)	
Cyanide	<10,000 (3)	
Lead	44,100-3,390,000 (3)	
Mercury	700 (1)	
Sulfide	<10,000->10,000 (3)	
Zinc	115,000-1,360,000 (3)	

*( ) - Number of positive responses.

Sources: Weston, 1984.
ESE, 1985b.

The exposure assessment and risk characterization of the EA determined that consumption of home-produced vegetables was the only exposure pathway where the estimated risks exceed the CERCLA 10-6 target risk level.

Page 6-10 of the EA states that: "*Results of the RA for use of the offpost groundwater indicate that risks associated with consumption of home-produced vegetables is the only exposure pathway where the estimated risks exceed the 10-6 target risk level (i.e., with a total estimated risk of 6.57 x 10-6). ARARs developed for drinking water are not appropriate for exposure through the vegetable-consumption pathway. Therefore, the development of criteria based on the RA would be more appropriate.*"

Risk Based Exposure Calculation Groundwater (Offpost):

The EA stated that since consumption of water contained in vegetables was a very small percentage of total water consumption; the ARAR for Offpost groundwater should not be 5 ppb but a number that reflected the actual risk that vegetables posed to Offpost residents. **All homes exceeding the ARAR of 5 ppb of TCE had already been supplied with an alternate water supply.**

Page 6-13 states: "*Using the integrated results of the exposure assessment and risk characterization, the total risk due to consumption of home-produced vegetables in the DA is 2.90 x 10-6 (Table 5.1-17). Since the total risk due to all other pathways is 3.57 x 10-7, an acceptable risk level for the contaminants in the vegetable-consumption pathway would be 1.0 x 10-6 (all other risk is negligible).*

Therefore, 1.0 x 10-6 was used as the target CRL for each carcinogen present in groundwater offpost of the DA (two carcinogens present, 1,1-DCE and TCE).

Groundwater concentrations for 1,1-DCE and TCE can be calculated by applying the risk characterization equation, as follows:

CRL = CPF x Dose

where: CRL - cancer risk level (1.0 x 10-6),

CPF = cancer potency factor (from Sec. 2.0), and

$$\textit{Dose = vegetable-consumption dose } \frac{0.108\ \text{kg/day x F (L/kg) x Cw}}{70\ \text{kg}}$$

From this the EA developed a risk-based number reflective of a 10^{-6} excess Offpost Health Risk. The risk-based number was 27.4 ppb for TCE.

Soil to Groundwater Pathway:

The soil cleanup level was calculated from the representative soil concentrations chosen for the DA along with groundwater quality data for Wells 81-7, 81-8, and 82-1 (which are located downgradient of the contaminated soils and along the installation boundary).

The first step in the guideline preparation was to calculate a dilution factor that represents the change in concentrations from soils to groundwater at the boundary.

This dilution factor was then used to back-calculate an acceptable soil concentration starting with an acceptable groundwater concentration at the receptors.

The dilution factor was assumed to be a linear relationship that implicitly accounts for parameters such as adsorption, groundwater mixing, and groundwater diffusion because they cannot be quantified explicitly. Rather, the dilution was chosen as the simple ratio between concentrations observed in soil and concentrations observed in the wells. This simplistic approach may underestimate the dilution ratio and result in an overly conservative soil cleanup guideline. For example, groundwater contamination observed now at the boundary may have been generated as a leachate at a time in the past when soil concentrations may have been substantially higher than they are now.

Two compounds, 1,1-DCE and TCE, were identified in the EA as critical contaminants offpost of the DA (Sec. 6.2) and were used to develop soil criteria for the DA. Other compounds found in DA soils or groundwater were not chosen because they were not found to be of concern at the receptor point.

The representative concentrations in soil and groundwater are presented in Table 6.3-1. The groundwater concentrations were chosen as the maximum observed in any of the three wells (81-7, 81-8, or 82-1). The ratios of soil to groundwater concentrations were found to be 1 for l,1-DCE and 45 for TCE.

The EA divided the representative soil concentration (4,900 µg/kg) by the average groundwater standard at the boundary (average of the DCE and TCE content from wells 81-7, 81-8, and 82-1) to lead to a dilution/partitioning factor of 45. The number 45 was then multiplied by 27.4 (risk-based standard) to end up with 1,230 ppb.

Feasibility Study of the Southeastern Area at Letterkenny Army Depot First Operable Unit, Final Report, September 1988: This report contained the same TCE removal value as the EA.

Focused Feasibility Study of the Accelerated Remedial Actions at Letterkenny Army Depot, Final Report, August 1990: This report states that further discussions with EPA Region III and Pennsylvania Department of Environmental Resources indicated that the groundwater must be considered a potential drinking water source and associated risk levels and cleanup criteria must take into consideration an average adult groundwater consumption rate of 2 liters per day. Based on this consumption rate the maximum groundwater contamination level for TCE was recalculated to be 3 µg/L, which is below the state ARAR of 5 µg/L (Table 1.4-3). Using 5 µg/L as the groundwater standard for TCE, a soils cleanup level was estimated to be 235* µg/kg. The average concentration of TCE in the DA soils is 4,900 µg/kg, which exceeds the calculated soil criterion. Thus, cleanup of the soil in the DA to the acceptable soil concentration of 235* µg/kg is expected to result in acceptable groundwater concentrations for offpost receptors.

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* Note number in error. 45 X 5 = 225 not 235.

Table 6.3-1. Soil Cleanup Criteria Calculations

Compound	Acceptable Groundwater Criteria (µg/L)	Representative Soil Concentration (µg/kg)	Groundwater Concentration* (µg/L)	Dilution	Soil Cleanup Criteria (µg/kg)
1,1-Dichloroethylene (1,1-DCE)	0.72	2.0	1.83	1	+
Trichloroethylene (TCE)	27.4	4,900	109	45	1,230

*Maximum observed in Wells 87-1, 81-8, and 82-1, sampled spring 1987 (ESE, 1987b).

+No cleanup criteria given; 1,1-DCE assumed to be a breakdown product of TCE in soil and groundwater.

Source: ESE, 1988a.

Table 2.2-3 Cleanup Criteria for the SE Area Soils

Compound	Acceptable Groundwater Criteria (µg/L)	Representative Soil Concentration	Groundwater Concentration[a] (µg/L)	Dilution	Soil Cleanup Criteria (µg/kg)
1,1-DCE	0.94	2.0	1.83	1	+
TCE	5.0	4,900	109	45	235[b]

Note: DA = Disposal Area.
1,1-DCE = 1,1-dichloroethylene.
TCE = trichloroethylene.
µg/kg - microgram per kilogram.
µg/L - microgram per liter.

[a] Maximum observed in Wells 87-1, 81-8, and 82-1, sampled spring 1987 (ESE, 1987b).

[b] Note number in error. 45 X 5 = 225 not 235.

+No cleanup criteria given; 1,1-DCE assumed to be a breakdown product of TCE in soil and groundwater.

Source: ESE, 1988b.

Proposed Plan for the SE Area (FFS), Final September 1990: In this document, the 235 ppb number has been corrected to 225 ppb.

Public Meeting Letterkenny Army Depot Proposed Plans, 14 May 1991: The transcript of this document indicates that the correct value of 225 ppb was used in the presentation.

Question Two: Is the 225 ppb remedial standard contained in the SE OU 1 ROD protective of the environment?

The EA (pages 6-17 and 6-18) stated that: A guideline for DA soil cleanup can be estimated through use of available soil and groundwater data with the realization that this guideline has a high degree of uncertainty. The guideline was linked to the soil-to-groundwater pathway instead of other pathways because soil cleanup is not required for contamination transported by other routes. <u>This cleanup criterion is not expected to guarantee that groundwater concentrations will be acceptable at the receptor exposure points because of the level of uncertainty associated with this approach.</u>

Since the EA and ROD were signed it was determined that the K-1 Area was more contaminated than estimated. Up to 5.5% TCE contamination as opposed to 2%.

The groundwater in the DA is also more contaminated than identified in the EA/ROD.

Of the three monitoring wells used in the EA, only in well 82-1 has dye been consistently detected. This calls into question the interconnectivity of the other wells 87-1 and 81-8.

Updated Soil to Groundwater Pathway information.

As part of the EE/CA for the Spill Area in Area A (SE OU 5), the Army developed soil removal criteria that would be protective of site groundwater (5 ppb for TCE).

Pennsylvania Act Two Guidance allowed the Army to either use 100 times the MCL, or to use a state-wide standard for groundwater compliance. The calculated value was 171 ppb for TCE.

The Army selected 171 ppb for TCE because it is a more conservative number. Based on these calculations soil containing more than 171 ppb of TCE would cause the underlying groundwater to exceed 5 ppb. This indicates an estimated partitioning coefficient of 34. The EA and FFS had identified a dilution/partitioning factor of 45 for TCE.

It has to be remembered that the ROD value of 225 ppb was to meet ARARs at the LEAD boundary (location of monitoring wells 87-1, 81-8, and 82-1). As such, the ROD value of 45 is a dilution and partitioning factor, while the SE OU 5 EE/CA value of 171 for TCE represents a partitioning coefficient only. Calculations conducted by IT Corporation of Site–Specific Soil Screening Levels for the K-Areas yielded a removal standard of 780 ppb (see Appendix A).

Another factor to consider: The Removal Areas delineated in the K Areas were delineated to non-detect, not 225. This was done because the Army had no precise number to use and was concerned it would have to go back if later studies determined that 225 ppb was not sufficiently protective.

	Compound	Acceptable Groundwater Criteria (µg/L)	Representative Soil Concentration	Groundwater Concentration* (µg/L)	Partition Dilution Factor	Soil Cleanup Criteria (µg/kg)	Point of Compliance
ROD	TCE	5.0	4,900	109	45@*	225	Boundary
SE OU 5 EE/CA Site	TCE	5.0	NA	NA	34@	170!	Site
PADEP ACT 2 100 X	TCE	5.0			100	500!!	Site
SE OU 1 SSL	TCE	5.0			156	780&	Site

@: Partitioning Value

*: Dilution Value

!: Act Two Statewide Standard

&: (See Appendix A)

!!: Act Two Standard, 100 times MCL

Appendix A

Draft Determination of Site–Specific Soil Screening Level (SSL) Letterkenny Army Depot

28 January 2000
IT Corporation

Determination of Site–Specific Soil Screening Level (SSL)
Letterkenny Army Depot

Summary

A Soil Screening Level (SSL) of 780 micrograms per kilogram (µg/kg) was calculated for trichloroethene (TCE) in soil using a conceptual site model developed for Area K-1 in the Disposal Area (DA) at the Letterkenny Army Depot. The point of compliance is the groundwater at the K-Areas. This document provides a summary of the conceptual model, the SSL method, and the calculation results.

The SSL was calculated in accordance with the "Soil Screening Level Guidance" developed by USEPA (1996a and 1996b). The SSL was calculated for migration of TCE from the soil matrix to groundwater. The SSL is the estimated soil concentration that will result in an acceptable concentration in groundwater through leaching.

Conceptual Site Model

Area K-1 was a former solvent disposal lagoon with surface area dimensions of approximately 200 feet in the north-south direction and 100 feet in the east-west direction. In a Removal Action conducted in 1993, TCE-contaminated soils were excavated to the top of bedrock, which is present at a depth of between 20 and 30 feet below ground surface. TCE was removed from the excavated soils using Low Temperature Thermal Treatment, and treated soils were placed back into the excavation. The treatment standard was 0.050 mg/kg. Post–treatment soil sampling and analysis was conducted to demonstrate compliance with the treatment standard.

A karst aquifer is present at the site, which has developed in the limestone bedrock. Remedial investigations indicate the limestone has very little primary intergranular porosity. Secondary porosity has developed by solutioning, and is important for the storage and movement of groundwater. The effective aquifer thickness is approximately 120 feet based on the distribution of solution features measured in borehole logs for the DA. Solution channels are not common below this depth. Borehole logging in the DA indicates the secondary porosity, as the percentage of void space in the bedrock, is approximately 5%.

Groundwater flow is rapid due to the open flow conditions in the solution channels of the aquifer. The average groundwater flow rate was determined to be approximately 280 feet per day (ft/day) from dye tracer studies in the DA.

SSL Calculation Method

The following is a description of the SSL calculation method as summarized from the Soil Screening Guidance (USEPA 1996a).

As soil leachate moves through soil and groundwater, contaminant concentrations are attenuated by adsorption and degradation. In the aquifer, dilution by clean ground water further reduces concentrations before contaminants reach receptor points (i.e., drinking water wells downgradient of the LEAD boundary). This reduction in concentration can be expressed by a dilution attenuation factor (DAF), defined as the ratio of soil leachate concentration to receptor

point concentration. The Soil Screening Guidance addresses only one of the dilution-attenuation processes: contaminant dilution in ground water. Attenuation by adsorption and degradation are not included in this model.

A simple mixing zone equation is derived from a water-balance relationship, and is used to calculate a site-specific dilution factor. The dilution factor is determined by estimating the volume of leachate infiltrating through the soil via precipitation, and comparing the infiltration to the volume of groundwater flowing beneath the site.

The SSL is calculated as follows. First, a mixing-zone depth is calculated based on site-specific hydrogeologic conditions including aquifer thickness, hydraulic gradient, and hydraulic conductivity (Equation 1). As shown in Equation 1, mixing beneath Area K-1 is estimated by this calculation to be in the upper 11 feet of the aquifer. Next, a dilution factor is calculated based on the estimated rate of infiltration and the flow of groundwater (Equation 2). Chemical–specific characteristics are then used to determine the chemical-specific SSLs. The ground water standard (i.e., MCL) is multiplied by the dilution factor to obtain a target soil leachate concentration. Finally, the partition equation is used to calculate the total soil concentration corresponding to this soil leachate concentration. As shown in Table 3, the SSL calculated using this method is 0.780 mg/kg or 780 µg/kg.

The SSL calculation method assumes the exposure point is immediately downgradient of the waste disposal unit. Further dilution occurs as the contamination moves downgradient, however, and the above method does not account for the dilution as groundwater flows away from the unit.

References

USEPA, 1996a. Soil Screening Guidance: Users Guide. EPA/540/R-96/018.

USEPA, 1996b. Soil Screening Guidance: Technical Background Document. EPA/540/R-95/128.

Table 1

Estimation of Mixing Zone Depth

Equation 1: $d = [0.0112 * L * L]^{1/2} + b \{ 1 – \exp [(- L * I) / (K * I * b)] \}$

Parameter	Value	Reference
L = source length parallel to groundwater flow (ft)	100 ft	East-west dimension of Area K-1
I = infiltration rate (ft/day)	0.0046 ft/day	Assumed to be 50% of total annual rainfall of 40 inches
k = aquifer hydraulic conductivity (ft/day)	3,100 ft/day	From Darcy's Law, K = n * v / i
i = hydraulic gradient (ft/ft)	0.0045 ft/day	Average hydraulic gradient from DA to Rowe Spring
b = aquifer thickness (ft)	120 ft	Effective thickness based on geophysical logging in the DA
v = groundwater velocity	280 ft/day	Velocity obtained from dye trace studies in the DA
d = mixing zone depth (ft)	11 ft	Calculated from Equation 1

Table 2

Derivation of Dilution Factor

Equation 2: DF = 1 + [k*I*d / I*L]

Parameter	Value	Reference
k = aquifer hydraulic conductivity (ft/day)	3,100 ft/day	From Darcy's Law, k = n * v / i
i = hydraulic gradient (ft/ft)	0.0045	Average gradient from DA to Rowe Spring
I = infiltration rate (ft/day)	0.0046 ft/day	Assumed to be 50% of total annual rainfall of 40 inches
d = mixing zone depth (ft)	11 ft	Calculated from Equation 1
L = source length parallel to ground water flow	100 ft	East-west dimension of Area K-1
n = aquifer porosity	0.05	Average secondary porosity observed in boreholes drilled in DA
DF = dilution factor based on water –balance relationship	330	Calculated from Equation 2

Table 3

Soil Screening Level Partitioning Equation for Migration to Groundwater

Equation 3: SSL (mg/kg) = Cw { Kd + [(Ow + Oa * H') / Pb] }

Parameter	Value	Reference
DF = dilution factor derived from water balance relationship	330	Calculated from Equation 2
MCL = Maximum Contaminant Level (mg/L)	0.005 mg/L	USEPA 1996a, MCL for TCE
Cw = target soil leachate concentration (mg/L)	1.6 mg/L	MCL * DF
Kd = soil water partition coefficient (L/kg) = Koc * foc	0.19 L/kg	Koc * foc
Koc = soil organic carbon/water partition coefficient (L/kg)	94 L/kg	USEPA 1996b, Table 38 value for TCE
foc = fraction organic carbon (g/g)	0.002	USEPA 1996a, default value
Ow = water–filled soil porosity	0.30	USEPA 1996a, default value
Oa = air-filled soil porosity	0.0	USEPA 1996a, assumed saturated with water
Pb = dry soil bulk density (kg/L)	1.5	USEPA 1996a, default value
H' = Henry's Law constant (dimensionless)	0.42	USEPA 1996b, Table 36 value for TCE
SSL = Soil Screening Level, site-specific for TCE	0.780 mg/kg or 780 µg/kg	Calculated from Equation 3

APPENDIX F

K AREA CAP INSPECTIONS

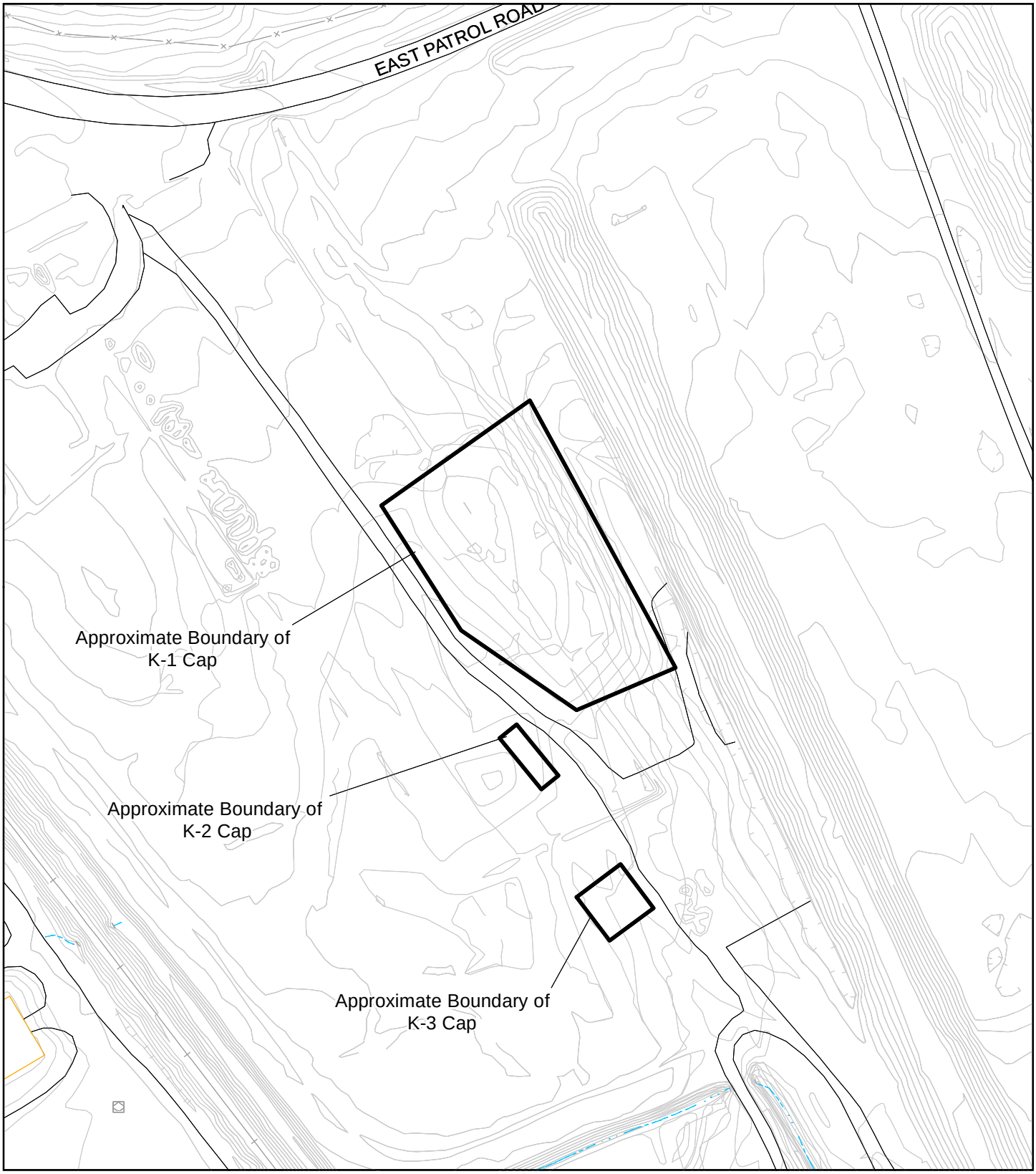
SE OU 1 (K Areas) Cap Inspections

Inspection Date: September 5, 2011

Inspected by: Weston Solutions, Inc. (Robin Dermigny, Daniel Locurcio)

During a visual inspection of the three K Area Caps (see Figure 1 for location of all three caps), photos were taken to document the condition of each of the sites and any deficiencies.

Additional Notes: Bryan Hoke (LEAD ER,A) provided the following response regarding the animal burrows remaining on K area Caps (K-1 and K-2). While the conibear traps have been effective in removing burrowing animals from the Caps, burrows were still observed on K-1 and K-2 Caps. Trapping will continue until the active burrowing ceases and existing holes will be filled to determine if new holes are being created.



Legend:

- Buildings
- Roads
- Drainage
- Contours
- Site Location

0 62.5 125 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA

U.S. Army Corps of Engineers
Baltimore District

Figure 1
SE OU 1 - K Area Cap Locations

Date:
09/21/11

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SE OU 1 – K Area – K-1

Inspected by: Robin Dermigny and Daniel Locurcio

1. **Erosion Present:** None

2. **Subsidence Present:** None

3. **Stressed Vegetative Cover:** Vegetation coverage was primarily even. No bare spots located on cap area.

4. **Burrowing Animal Damage:** Active animal burrows were located on northeastern corner of the cap area. Four (4) holes were discovered, photographed, and mapped on Figure 2.

5. **Presence of Plants (greater than two inches in diameter):** No tree or shrub-like plants present. Groundcover vegetation was evenly distributed and consisted of grass, thistle, and vetch.

6. **Mowing/Trimming Satisfactory:** Area had been recently maintained around the edges of the capped area. The caps themselves had not been mowed. The vegetation was approximately 4-5 feet in height.

7. **Evidence of Unauthorized Access:** None

8. **Evidence of Ponding:** None

9. **Additional Notes:** Deer paths and droppings evident across cap area. Attachment 1 contains photos showing the location, condition of vegetation, signage, and animal burrows.

10. **Signature of Inspector:** _____

LEAD IRA Program Manager Signature and Date:

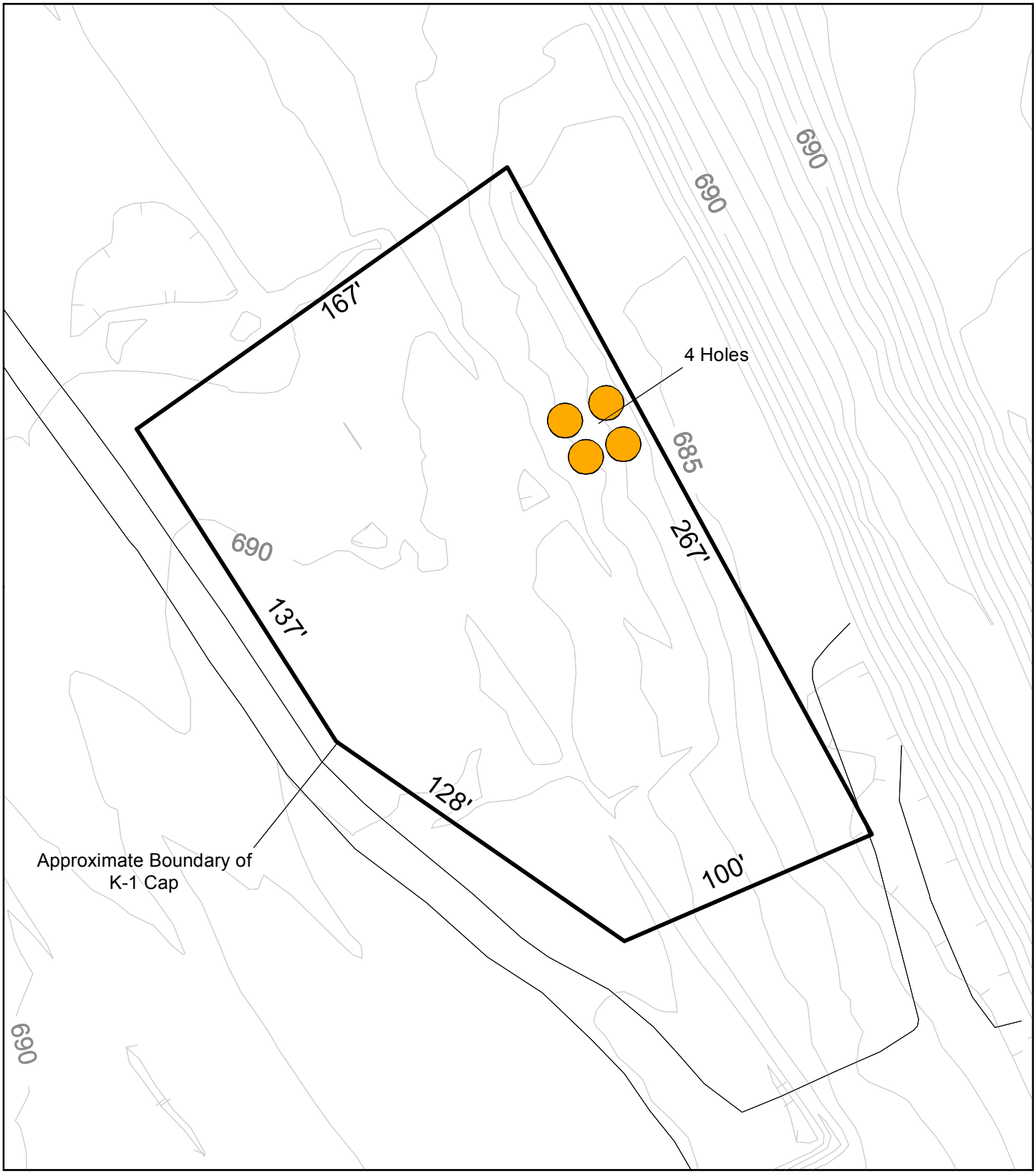
_____ 10/6/11

11. **Inspection Follow-up Response Actions:** Once burrowing animals are captured and removed from the caps, the existing burrows should be filled in to prevent further use of the burrows and to determine if additional burrows are being created.

Inspection Response Actions Completed (date): _____

LEAD IRA Program Manager Signature and Date:

_____



Legend:

- Approximate Area of Groundhog Burrows
- Roads
- Contours
- Site Location

0 30 60 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA

U.S. Army Corps of Engineers
Baltimore District

Figure 2
K-1 Cap

Date:
09/21/11

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ATTACHMENT 1 – K-1 CAP PHOTOS

SE OU 1 – K Area – K-1 Cap Site Photo
(Facing Northwest)

SE OU 1 – K Area – K-1 Animal Burrows

SE OU 1 – K Area – K-2

Inspected by: Robin Dermigny and Dan Locurcio

1. **Erosion Present:** None

2. **Subsidence Present:** None.

3. **Stressed Vegetative Cover:** Vegetative cover was evenly distributed. No obvious bare areas were located on the cap.

4. **Burrowing Animal Damage:** Three (3) animal burrows were located on the cap at a single location on the western side of the cap. It appeared as though all 3 holes were actively being used. See Figure 3 for approximate location of animal burrows.

5. **Presence of Plants (greater than two inches in diameter):** The area was covered with grass up to 4-5 feet in height; no plants greater than 2 inches in diameter were observed.

6. **Mowing/Trimming Satisfactory:** Areas around the cap were mowed; however, the cap itself had not been mowed.

7. **Evidence of Unauthorized Access:** None

8. **Evidence of Ponding:** None

9. **Additional Notes:** Attachment 2 contains photos showing the location, condition of vegetation, animal burrows, and signage.

10. **Signature of Inspector:** _____

LEAD IRA Program Manager Signature and Date:

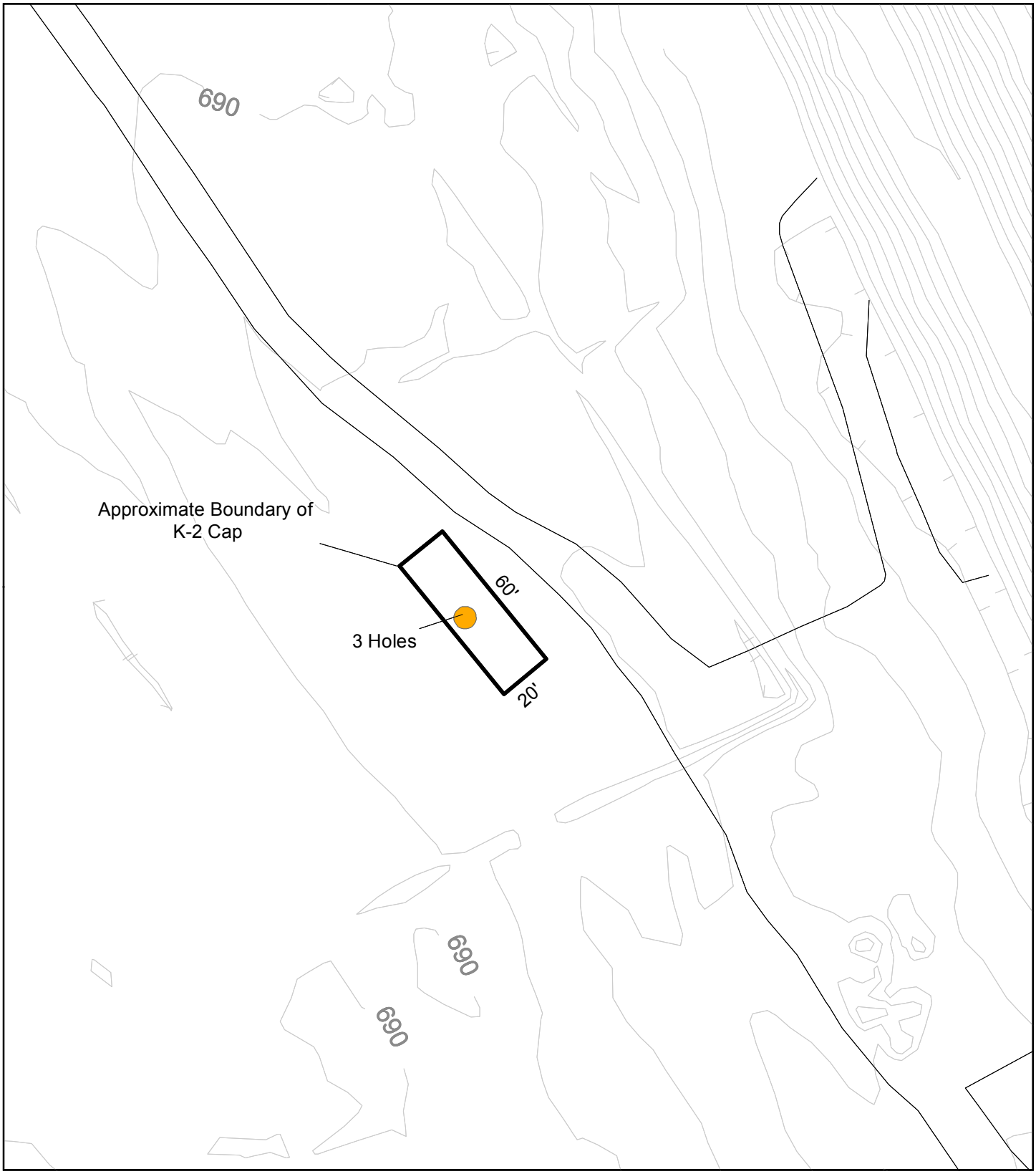
_____ 10/6/11

11. **Inspection Follow-up Response Actions:** Once burrowing animals are captured and removed from the caps, the existing burrows should be filled in to prevent further use of the burrows and to determine if additional burrows are being created.

Inspection Response Actions Completed (date): _____

LEAD IRA Program Manager Signature and Date:

_____



Legend:

- Approximate Area of Groundhog Burrows
- Roads
- Contours
- Site Location

0 30 60 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA

U.S. Army Corps of Engineers
Baltimore District

Figure 3
K-2 Cap

Date:
09/21/11

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ATTACHMENT 2 – K-2 CAP PHOTOS

SE OU 1 – K Area – K-2 Cap Site Photo
(Facing West)

SE OU 1 – K Area – K-2 Cap Animal Burrows

SE OU 1 – K Area – K-3

Inspected by: Robin Dermigny and Dan Locurcio

1. **Erosion Present:** None

2. **Subsidence Present:** None

3. **Stressed Vegetative Cover:** Cap vegetation was dense and even, including grass, milk weed, thistle, and other tall plants.

4. **Burrowing Animal Damage:** None

5. **Presence of Plants (greater than two inches in diameter):** Mixed vegetation up to 4 to 5 ½ feet in height.

6. **Mowing/Trimming Satisfactory:** The cap itself had not been mowed recently.

7. **Evidence of Unauthorized Access:** None

8. **Evidence of Ponding:** None

9. **Additional Notes:** Evidence of frequent deer habitation (trails and droppings) over entire cap. Attachment 3 contains photos showing the location, condition of vegetation and signage.

10. **Signature of Inspector:** _____

LEAD IRA Program Manager Signature and Date:

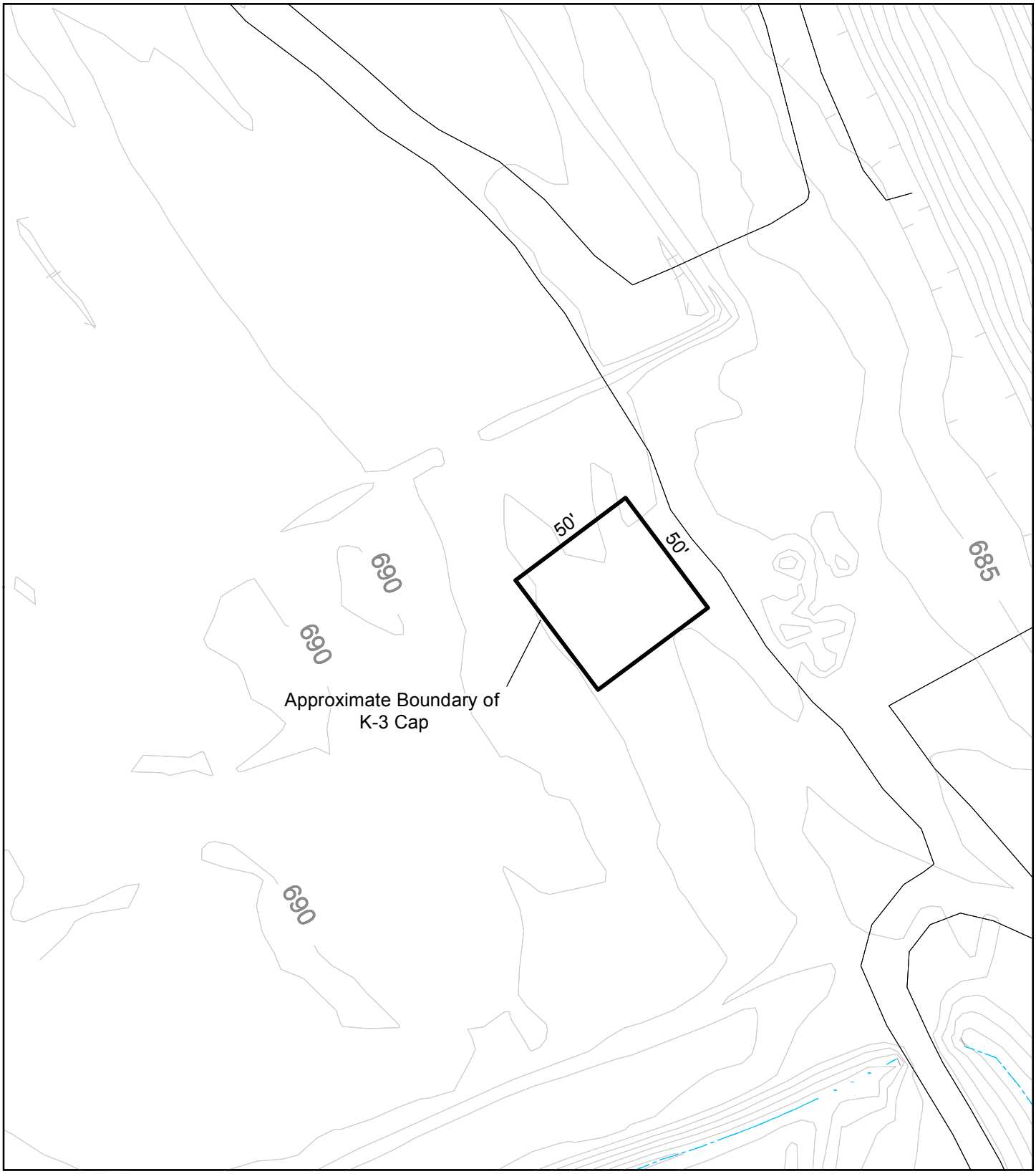
_____ 10/6/11

11. **Inspection Follow-up Response Actions:** K-3 Cap should be mowed in the fall 2011 to prevent further overgrowth.

Inspection Response Actions Completed (date): _____

LEAD IRA Program Manager Signature and Date:

_____



Legend:

- Roads
- Contours
- Site Location

0 30 60 Feet

N W E S

Letterkenny Army Depot
Chambersburg, PA

U.S. Army Corps of Engineers
Baltimore District

Figure 4
K-3 Cap

Date:
09/21/11

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ATTACHMENT 3 – K-3 CAP PHOTOS

SE OU 1 – K Area – K-3 Cap Site Photo
(Facing Northwest)

APPENDIX G

SE OU 10 GROUNDWATER DATA, TREND ANALYSES, AND RISK ASSESSMENT TABLES

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	UST-3	96-37-6	96-37-11	97-37-23	97-37-24	Hawbacker Spring
Date Sampled				4/15/2008	4/15/2008	4/14/2008	4/14/2008	4/14/2008	4/15/2008	4/14/2008
Sample Type		**EPA**	**PADEP**	GW	GW-Duplicate	GW	GW	GW	GW	SW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**						**Off-Post**
1,1,1-TRICHLOROETHANE	UG/L	200	200	10 U	**2.5 J**	1 U	1 U	**3.1**	2 U	0.88 J
1,1-DICHLOROETHANE	UG/L	NA	27	**59**	**56**	**6.8**	**1.6**	**19**	2 U	1 U
1,1-DICHLOROETHENE	UG/L	7	7	10 U	**2.1 J**	1 U	1 U	2.5 U	2 U	1 U
1,2,4-TRIMETHYLBENZENE	UG/L	NA	16	**340**	**310**	**0.16 J**	1 U	2.5 U	**0.23 J**	1 U
1,3,5-TRIMETHYLBENZENE	UG/L	NA	16	**90**	**86**	1 U	1 U	2.5 U	2 U	1 U
2-BUTANONE	UG/L	NA	NA	**8.3 J**	**8.3 J**	5 U	5 U	12 U	10 U	5 U
ACETONE	UG/L	NA	3700	50 U	**29 J**	5 U	5 U	12 U	**5.1 J**	1 U
BENZENE	UG/L	5	5	**72**	**70**	1 U	1 U	2.5 U	**1.3 J**	1 U
BROMODICHLOROMETHANE	UG/L	80	100	10 U	10 U	1 U	1 U	2.5 U	2 U	1 U
CHLOROETHANE	UG/L	NA	230	**51**	**46**	**6.5**	1 U	2.5 U	**1.3 J**	1 U
CHLOROFORM	UG/L	80	100	10 U	10 U	1 U	1 U	2.5 U	2 U	0.91 J
CIS-1,2-DICHLOROETHENE	UG/L	70	70	**2.4 J**	**2 J**	**1.6**	**0.53 J**	**58**	2 U	0.096 J
CYCLOHEXANE	UG/L	NA	NA	**21**	**22**	1 U	1 U	2.5 U	2 U	1 U
ETHYLBENZENE	UG/L	700	700	**81**	**83**	1 U	1 U	2.5 U	**0.19 J**	1 U
ISOPROPYLBENZENE	UG/L	NA	NA	**12**	**13**	1 U	1 U	2.5 U	**3.9**	1 U
METHYL TERT-BUTYL ETHER (MTBE)	UG/L	NA	20*	**1.4 J**	10 U	1 U	1 U	2.5 U	2 U	1 U
METHYLCYCLOHEXANE	UG/L	NA	NA	**18**	**21**	1 U	1 U	2.5 U	**0.51 J**	1 U
METHYLENE CHLORIDE	UG/L	5	NA	**7.8 B**	**7 B**	1 U	1 U	2.5 U	**0.67 B**	0.32 B
NAPHTHALENE	UG/L	NA	100*	**240**	**230**	1 U	1 U	2.5 U	**71**	1 U
TETRACHLOROETHENE	UG/L	5	5	10 U	10 U	1 U	**0.58 J**	2.5 U	2 U	0.35 J
TOLUENE	UG/L	1000	1000	**57**	**59**	1 U	1 U	2.5 U	2 U	1 U
TRANS-1,2-DICHLOROETHENE	UG/L	100	100	10 U	10 U	**0.2 J**	1 U	2.5 U	2 U	1 U
TRICHLOROETHENE (TCE)	UG/L	5	5	10 U	10 U	**0.85 J**	**2.7**	**9.7**	2 U	0.58 J
VINYL CHLORIDE	UG/L	2	2	10 U	10 U	**3.1**	1 U	**8.4**	**3.8**	1 U
XYLENES (TOTAL)	UG/L	10000	10000	**530**	**540**	3 U	3 U	7.5 U	6 U	3 U

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-11	97-37-23	97-37-23	97-37-24
Date Sampled				8/18/2008	8/18/2008	8/18/2008	8/19/2008	8/19/2008	8/18/2008
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW-Duplicate	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**					
1,1,1-TRICHLOROETHANE	UG/L	200	200	100 U	1 U	**0.12 J**	**1**	**1.2**	2.5 U
1,1,2-TRICHLOROETHANE	UG/L	5	5	**34 J**	1 U	1 U	1 U	1 U	2.5 U
1,1-DICHLOROETHANE	UG/L	NA	27	**37 J**	**1.7**	**6**	**12**	**12**	**1.2 J**
1,1-DICHLOROETHENE	UG/L	7	7	100 U	1 U	1 U	**0.22 J**	**0.33 J**	2.5 U
1,2,4-TRICHLOROBENZENE	UG/L	70	70	**16 J**	1 U	**0.13 J**	1 U	1 U	2.5 U
1,2,4-TRIMETHYLBENZENE	UG/L	NA	16	**1500**	**0.19 J**	1 U	**0.88 J**	**0.97 J**	2.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	NA	16	**400**	1 U	1 U	**0.26 J**	**0.31 J**	2.5 U
BENZENE	UG/L	5	5	**54 J**	1 U	**1.1**	**0.51 J**	**0.56 J**	**2 J**
CHLOROETHANE	UG/L	NA	230	**33 J**	**1.9 J**	1 U	1 U	1 U	**2.2 J**
CHLOROFORM	UG/L	80	100	100 U	1 U	1 U	1 U	1 U	2.5 U
CHLOROMETHANE	UG/L	NA	NA	100 U	1 U	**0.19 J**	1 U	1 U	2.5 U
CIS-1,2-DICHLOROETHENE	UG/L	70	70	100 U	**0.49 J**	**1**	**23**	**23**	2.5 U
CYCLOHEXANE	UG/L	NA	NA	**38 J**	1 U	**0.23 J**	**0.14 J**	**0.22 J**	**0.82 J**
ETHYLBENZENE	UG/L	700	700	**120**	1 U	1 U	**0.11 J**	**0.1 J**	**0.44 J**
ISOPROPYLBENZENE	UG/L	NA	NA	**46 J**	1 U	1 U	1 U	1 U	**6.5**
METHYL TERT-BUTYL ETHER	UG/L	NA	20*	100 U	1 U	**0.22 J**	1 U	1 U	2.5 U
METHYLCYCLOHEXANE	UG/L	NA	NA	**71 J**	1 U	1 U	1 U	**0.25 J**	**1.8 J**
METHYLENE CHLORIDE	UG/L	5	NA	100 U	1 U	1 U	1 U	1 U	**1.2 B**
NAPHTHALENE	UG/L	NA	100*	**900**	1 U	1 U	**1.5**	**0.49 J**	**45 J**
TETRACHLOROETHENE	UG/L	5	5	100 U	1 U	1 U	**0.14 J**	1 U	2.5 U
TOLUENE	UG/L	1000	1000	**42 J**	1 U	1 U	1 U	1 U	2.5 U
TRANS-1,2-DICHLOROETHENE	UG/L	100	100	100 U	1 U	**0.15 J**	**0.11 J**	**0.14 J**	2.5 U
TRICHLOROETHENE	UG/L	5	5	100 U	**0.22 J**	**1.1**	**3.1**	**3.4**	2.5 U
VINYL CHLORIDE	UG/L	2	2	100 U	**0.42 J**	**0.28 J**	**5.2**	**5.8**	**1.1 J**
XYLENES (TOTAL)	UG/L	10000	10000	**830**	3 U	3 U	**0.53 J**	**0.64 J**	**0.72 J**

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-11	97-37-23	97-37-23	97-37-24	96-37-12	98-37-27
Date Sampled				12/16/2008	12/15/2008	12/15/2008	12/16/2008	12/16/2008	12/16/2008	12/16/2008	12/15/2008
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW-Duplicate	GW	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	UG/L	200	200	1 U	1 U	1 U	1 U	**1.4**	1 U	**1.4**	**1.4**
1,1-DICHLOROETHANE	UG/L	NA	27	**1.2**	**2.6**	**1.4**	**13**	**12**	**1.1**	**1.3**	**0.3 J**
1,1-DICHLOROETHENE	UG/L	7	7	1 U	1 U	1 U	1 U	**0.3 J**	1 U	1 U	1 U
1,2,4-TRIMETHYLBENZENE	UG/L	NA	16	**13**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-TRIMETHYLBENZENE	UG/L	NA	16	**3.9**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ACETONE	UG/L	NA	3700	5 U	5 U	5 U	5 U	5 U	**7.6 B**	5 U	5 U
BENZENE	UG/L	5	5	**1.5**	1 U	1 U	**0.59 J**	**0.59 J**	**1.2**	**0.29 J**	1 U
CHLOROETHANE	UG/L	NA	230	1 U	**0.74 J**	1 U	1 U	1 U	**1.4**	**0.93 J**	1 U
CHLOROFORM	UG/L	80	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**0.86 J**
CHLOROMETHANE	UG/L	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	UG/L	70	70	1 U	**3**	**0.51 J**	**26**	**27**	**0.94 J**	**0.46 J**	1 U
CYCLOHEXANE	UG/L	NA	NA	**0.42 J**	1 U	1 U	1 U	1 U	**0.74 J**	1 U	1 U
ETHYLBENZENE	UG/L	700	700	**0.71 J**	1 U	1 U	1 U	1 U	**0.24 J**	1 U	1 U
ISOPROPYLBENZENE	UG/L	NA	NA	**0.33 J**	1 U	1 U	1 U	1 U	**5.7**	1 U	1 U
METHYLCYCLOHEXANE	UG/L	NA	NA	**0.45 J**	1 U	1 U	1 U	1 U	**2**	1 U	1 U
NAPHTHALENE	UG/L	NA	100*	**12**	1 U	1 U	**0.77 J**	1 U	**11**	**0.27 J**	1 U
TETRACHLOROETHENE	UG/L	5	5	1 U	1 U	1 U	1 U	1 U	1 U	**1.1**	1 U
TOLUENE	UG/L	1000	1000	**0.54 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	UG/L	5	5	1 U	**0.5 J**	**2.1**	**9.4**	**9.6**	**1.1**	**2.7**	**0.92 J**
VINYL CHLORIDE	UG/L	2	2	1 U	**3.1**	1 U	**3.1**	**3.5**	**3.7**	1 U	1 U
XYLENES (TOTAL)	UG/L	10000	10000	**10**	3 U	3 U	3 U	3 U	3 U	3 U	3 U

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-6	96-37-11	97-37-23	97-37-24	96-37-12	98-37-27
Date Sampled				4/8/2009	4/6/2009	4/6/2009	4/6/2009	4/6/2009	4/8/2009	4/6/2009	4/7/2009
Sample Type		**EPA**	**PADEP**	GW	GW	GW-Duplicate	GW	GW	GW	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	12 U	1 U	1 U	1 U	**1.2**	**0.58 J**	**1.7**	**2.2**
1,1-DICHLOROETHANE	µg/L	NA	27	**40**	**2.8**	**2.9**	**1.6**	**12**	**0.49 J**	**3.4**	**0.55 J**
1,1-DICHLOROETHENE	µg/L	7	7	12 U	1 U	1 U	1 U	**0.32 J**	1 U	1 U	1 U
1,2,4-TRIMETHYLBENZENE	µg/L	NA	16	**420**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-TRIMETHYLBENZENE	µg/L	NA	16	**130**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-DIOXANE	µg/L	NA	5.6	**4.2**	1.9 U	1.9 U	NS	**4.4**	NS	NS	NS
ACETONE	µg/L	NA	3700	**34 J**	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BENZENE	µg/L	5	5	**48**	1 U	1 U	1 U	**0.73 J**	**0.28 J**	2.1	1 U
CHLOROETHANE	µg/L	NA	230	**43**	**2.9**	**2.7**	1 U	1 U	1 U	**5.6**	1 U
CHLOROFORM	µg/L	80	100	12 U	1 U	1 U	1 U	1 U	1 U	1 U	**1.5**
CIS-1,2-DICHLOROETHENE	µg/L	70	70	12 U	**0.75 J**	**0.67 J**	**0.64 J**	**20**	**3.5**	**0.62 J**	**0.42 J**
CYCLOHEXANE	µg/L	NA	NA	**6.5 J**	1 U	1 U	1 U	1 U	**0.44 J**	**1.6**	1 U
ETHYLBENZENE	µg/L	700	700	**25**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ISOPROPYLBENZENE	µg/L	NA	NA	**11 J**	1 U	1 U	1 U	1 U	**2.1**	**0.55 J**	1 U
METHYLCYCLOHEXANE	µg/L	NA	NA	**11 J**	1 U	1 U	1 U	1 U	**1.4**	**0.90 J**	1 U
METHYLENE CHLORIDE	µg/L	5	NA	**6.1 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
NAPHTHALENE	µg/L	NA	100*	**340**	1 U	1 U	1 U	1 U	**6.2**	**0.60 J**	1 U
TETRACHLOROETHENE (PCE)	µg/L	5	5	12 U	1 U	1 U	1 U	**0.43 J**	**2**	**1.2**	**0.38 J**
TOLUENE	µg/L	1000	1000	**14**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE (TCE)	µg/L	5	5	12 U	1 U	1 U	2.1	**6.5**	**13**	**3.1**	**2.1**
VINYL CHLORIDE	µg/L	2	2	12 U	**1**	**1.1**	1 U	**1.7**	**0.99 J**	1 U	1 U
XYLENES (TOTAL)	µg/L	10000	10000	**280**	3 U	3 U	3 U	3 U	3 U	3 U	3 U

Notes: **Bolded** values indicate compound was detected.
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GW - Groundwater.
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Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-11	97-37-23	97-37-23	97-37-24	96-37-12	98-37-27
Date Sampled				8/26/2009	8/25/2009	8/25/2009	8/26/2009	8/26/2009	8/26/2009	8/25/2009	8/25/2009
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW-Duplicate	GW	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	10 U	1 U	1 U	**1.6**	**1.7**	1 U	**1.6**	**1.8**
1,1-DICHLOROETHANE	µg/L	NA	27	**27**	**3.5**	**0.46 J**	**11**	**11**	**0.55 J**	**1.7**	**0.57 J**
1,1-DICHLOROETHENE	µg/L	7	7	10 U	1 U	1 U	**0.5 J**	**0.42 J**	1 U	1 U	1 U
1,2,4-TRIMETHYLBENZENE	µg/L	NA	16	**140**	**0.15 J**	1 U	1 U	1 U	1 U	**0.18 J**	1 U
1,3,5-TRIMETHYLBENZENE	µg/L	NA	16	**42**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-DIOXANE	µg/L	NA	5.6	**7.2**	2.1 U		**7.1**	**7**			
ACETONE	µg/L	NA	3700	50 U	5 U	5 U	5 U	5 U	5 U	**5.2**	5 U
BENZENE	µg/L	5	5	**41**	1 U	1 U	**0.63 J**	**0.63 J**	**0.31 J**	**1.3**	1 U
CHLOROETHANE	µg/L	NA	230	**25**	**1.9**	1 U	1 U	1 U	1 U	**2.6**	1 U
CHLOROFORM	µg/L	80	100	10 U	1 U	1 U	1 U	1 U	1 U	1 U	**0.98 J**
CIS-1,2-DICHLOROETHENE	µg/L	70	70	10 U	**0.85 J**	**0.36 J**	**31**	**31**	**2.6**	**0.24 J**	**0.53 J**
CYCLOHEXANE	µg/L	NA	NA	**12**	1 U	1 U	1 U	1 U	**0.4 J**	**0.82 J**	1 U
ETHYLBENZENE	µg/L	700	700	**23**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ISOPROPYLBENZENE	µg/L	NA	NA	**6.1 J**	1 U	1 U	1 U	1 U	**1.1**	**0.35 J**	1 U
METHYLCYCLOHEXANE	µg/L	NA	NA	**11**	1 U	1 U	1 U	1 U	**1.2**	**0.47 J**	1 U
METHYLENE CHLORIDE	µg/L	5	NA	10 U	1 U	1 U	1 U	1 U	1 U	**0.25 J**	1 U
NAPHTHALENE	µg/L	NA	100*	**150**	1 U	1 U	1 U	1 U	**4.5**	**0.86 J**	1 U
TETRACHLOROETHENE (PCE)	µg/L	5	5	10 U	1 U	**1.1**	1 U	1 U	**0.68 J**	**0.71 J**	**0.25 J**
TOLUENE	µg/L	1000	1000	**10**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	10 U	1 U	1 U	**0.23 J**	**0.17 J**	1 U	1 U	1 U
TRICHLOROETHENE (TCE)	µg/L	5	5	10 U	1 U	**3.6**	**14**	**14**	**5**	**2.2**	**2.2**
VINYL CHLORIDE	µg/L	2	2	10 U	**1.5**	1 U	**1.2**	**1.2**	**1.9**	1 U	1 U
XYLENES (TOTAL)	µg/L	10000	10000	**160**	3 U	3 U	3 U	3 U	3 U	3 U	3 U

Notes: **Bolded** values indicate compound was detected.
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SW - Surface water.
NS - Not Sampled.
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Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-11	96-37-12	97-37-23	97-37-24	98-37-27	98-37-27
Date Sampled				12/3/2009	12/2/2009	12/3/2009	12/2/2009	12/3/2009	12/3/2009	12/2/2009	12/2/2009
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW	GW	GW	GW-Duplicate
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	10 U	1 U	1 U	**1.3**	**0.58 J**	1 U	**1.5**	**1.5**
1,1-DICHLOROETHANE	µg/L	NA	27	**32**	**3.6**	**1.5**	**1.9**	**0.85 J**	**0.46 J**	**0.42 J**	**0.39 J**
1,1-DICHLOROETHENE	µg/L	7	7	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-TRIMETHYLBENZENE	µg/L	NA	16	**250**	**1 U**	1 U	1 U	1 U	1 U	NA	1 U
1,3,5-TRIMETHYLBENZENE	µg/L	NA	16	**75**	1 U	1 U	1 U	1 U	1 U	NA	1 U
1,4-DIOXANE	µg/L	NA	5.6	**4.3**	1.8	NA	NA	**0.57**	NA	NA	NA
ACETONE	µg/L	NA	3700	50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BENZENE	µg/L	5	5	**51**	1 U	1 U	**1.2**	1 U	**0.26 J**	1 U	1 U
CHLOROETHANE	µg/L	NA	230	**36**	**2.2**	1 U	**2.6**	1 U	1 U	1 U	1 U
CHLOROFORM	µg/L	80	100	10 U	1 U	1 U	**0.18 J**	1 U	1 U	**0.64 J**	**0.64 J**
CIS-1,2-DICHLOROETHENE	µg/L	70	70	10 U	**0.9 J**	**0.56 J**	**0.34 J**	**2**	**3.6**	**0.3 J**	**0.4 J**
CYCLOHEXANE	µg/L	NA	NA	**24**	1 U	1 U	**0.94 J**	1 U	**0.37 J**	1 U	1 U
ETHYLBENZENE	µg/L	700	700	**35**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ISOPROPYLBENZENE	µg/L	NA	NA	**13**	1 U	1 U	**0.37 J**	1 U	**0.54 J**	1 U	1 U
METHYLCYCLOHEXANE	µg/L	NA	NA	**30**	1 U	1 U	**0.62 J**	1 U	**1**	1 U	1 U
METHYLENE CHLORIDE	µg/L	5	NA	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
NAPHTHALENE	µg/L	NA	100*	**200 B**	1 U	1 U	**0.38 J B**	1 U	**1 B**	NA	1 U
TETRACHLOROETHENE (PCE)	µg/L	5	5	10 U	1 U	**0.49 J**	**0.96 J**	**1.9**	**1.5**	**0.26 J**	**0.35 J**
TOLUENE	µg/L	1000	1000	**15**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE (TCE)	µg/L	5	5	10 U	0.17 J	**2**	**2.4**	**2.3**	**9.9**	**1.4**	**1.6**
VINYL CHLORIDE	µg/L	2	2	10 U	**1.2**	1 U	1 U	**0.25 J**	**1.8**	1 U	1 U
XYLENES (TOTAL)	µg/L	10000	10000	**250**	3 U	3 U	3 U	3 U	3 U	3 U	3 U

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SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-6	96-37-11	97-37-23	97-37-24	98-37-27
Date Sampled				4/27/2010	4/27/2010	4/27/2010	NS	4/28/2010	4/27/2010	NS
Sample Type		**EPA**	**PADEP**	GW	GW	GW-Duplicate	GW	GW	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**						
1,1,1-TRICHLOROETHANE	µg/L	200	200	4 U	1 U	1 U	NS	**0.55 J**	**0.33 J**	NS
1,1-DICHLOROETHANE	µg/L	NA	27	**22**	**6.8**	**6.7**	NS	**1.1**	**0.22 J**	NS
1,1-DICHLOROETHENE	µg/L	7	7	4 U	1 U	1 U	NS	1 U	1 U	NS
1,2,4-TRIMETHYLBENZENE	µg/L	NA	16	**140 J**	1 U	1 U	NS	1 U	1 U	NS
1,3,5-TRIMETHYLBENZENE	µg/L	NA	16	**40 J**	1 U	1 U	NS	1 U	1 U	NS
1,4-DIOXANE	µg/L	NA	5.6	**8.1**	**3.8**	**2.1 J**	NS	**1.4 J**	NS	NS
ACETONE	µg/L	NA	3700	20 U	5 U	5 U	NS	5 U	5 U	NS
BENZENE	µg/L	5	5	**32**	1 U	1 U	NS	1 U	**0.43 J**	NS
CHLOROETHANE	µg/L	NA	230	**17**	**2.4**	**2.4**	NS	1 U	1 U	NS
CHLOROFORM	µg/L	80	100	4 U	1 U	1 U	NS	**0.82 J**	**1.8**	NS
CIS-1,2-DICHLOROETHENE	µg/L	70	70	**1.2 J**	**0.47 J**	**0.43 J**	NS	**3.4**	**3.4**	NS
CYCLOHEXANE	µg/L	NA	NA	**11**	1 U	1 U	NS	1 U	1 U	NS
ETHYLBENZENE	µg/L	700	700	**16**	1 U	1 U	NS	1 U	1 U	NS
ISOPROPYLBENZENE	µg/L	NA	NA	**6.3**	1 U	1 U	NS	1 U	**0.3 J**	NS
METHYLCYCLOHEXANE	µg/L	NA	NA	**9.2**	1 U	1 U	NS	1 U	**0.39 J**	NS
METHYLENE CHLORIDE	µg/L	5	NA	4 U	1 U	1 U	NS	1 U	1 U	NS
NAPHTHALENE	µg/L	NA	100*	**140**	1 U	1 U	NS	1 U	**1.2**	NS
TETRACHLOROETHENE (PCE)	µg/L	5	5	4 U	1 U	1 U	NS	**1.4**	**2**	NS
TOLUENE	µg/L	1000	1000	**7.9**	1 U	1 U	NS	1 U	1 U	NS
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	4 U	1 U	1 U	NS	1 U	1 U	NS
TRICHLOROETHENE (TCE)	µg/L	5	5	4 U	1 U	1 U	NS	**3.4**	**10**	NS
VINYL CHLORIDE	µg/L	2	2	4 U	**1.2**	**1.2**	NS	**0.27 J**	1 U	NS
XYLENES (TOTAL)	µg/L	10000	10000	**120**	3 U	3 U	NS	3 U	3 U	NS

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SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
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Well Number				UST-3	96-37-6	96-37-11	96-37-12	97-37-23	97-37-23	97-37-24	98-37-27
Date Sampled				8/17/2010	8/16/2010	8/17/2010	8/16/2010	8/17/2010	8/17/2010	8/17/2010	8/16/2010
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW	GW-Duplicate	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	7.5 U	**0.41 J**	1 U	**1.2**	**1.2**	**1**	1 U	**1.7**
1,1-DICHLOROETHANE	µg/L	NA	27	**30**	**10**	**2.1**	**2.9**	**10**	**10**	**1.1**	**0.73 J**
1,1-DICHLOROETHENE	µg/L	7	7	7.5 U	1 U	1 U	1 U	**0.34 J**	**0.31 J**	1 U	1 U
1,2,4-TRIMETHYLBENZENE	µg/L	NA	16	**180**	**0.13 J**	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-TRIMETHYLBENZENE	µg/L	NA	16	**50**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-DIOXANE	µg/L	NA	5.6	**5.8**	**3.1**	NS	NS	**3.2**	**4.9**	NS	NS
ACETONE	µg/L	NA	3700	38 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BENZENE	µg/L	5	5	**50**	1 U	1 U	**2.7**	**0.6 J**	**0.59 J**	**0.56 J**	1 U
CHLOROETHANE	µg/L	NA	230	**47**	**1.5**	1 U	**6.3**	1 U	1 U	1 U	1 U
CHLOROFORM	µg/L	80	100	7.5 U	1 U	1 U	**0.24 B**	1 U	1 U	1 U	**0.99 B**
CIS-1,2-DICHLOROETHENE	µg/L	70	70	**1.9 J**	**1.4**	**0.58 J**	**0.43 J**	**26**	**26**	**7.7**	**0.83 J**
CYCLOHEXANE	µg/L	NA	NA	**27**	1 U	1 U	**1.8**	**0.26 J**	**0.26 J**	**0.62 J**	1 U
ETHYLBENZENE	µg/L	700	700	**29**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
ISOPROPYLBENZENE	µg/L	NA	NA	**10**	1 U	1 U	**0.41 J**	1 U	1 U	**0.96 J**	1 U
METHYLCYCLOHEXANE	µg/L	NA	NA	**24**	1 U	1 U	**0.8 J**	1 U	1 U	**0.97 J**	1 U
METHYLENE CHLORIDE	µg/L	5	NA	7.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
NAPHTHALENE	µg/L	NA	100*	**180**	1 U	1 U	**0.48 J**	1 U	1 U	**6.4**	1 U
TETRACHLOROETHENE (PCE)	µg/L	5	5	7.5 U	1 U	**0.62 J**	**0.69 J**	**0.17 J**	**0.26 J**	**0.81 J**	**0.37 J**
TOLUENE	µg/L	1000	1000	**12**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	7.5 U	**0.26 J**	1 U	1 U	**0.24 J**	**1 U**	1 U	1 U
TRICHLOROETHENE (TCE)	µg/L	5	5	7.5 U	**0.27 J**	**2.3**	**1.9**	**6.4**	**6.7**	**6.3**	**2.6**
VINYL CHLORIDE	µg/L	2	2	7.5 U	**1.9**	1 U	1 U	**2**	**2.2**	**2**	1 U
XYLENES (TOTAL)	µg/L	10000	10000	**190**	3 U	3 U	3 U	3 U	3 U	3 U	3 U

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-11	96-37-12	97-37-23	97-37-23	97-37-24	98-37-27
Date Sampled				12/7/2010	12/7/2010	NS	NS	12/7/2010	12/7/2010	12/7/2010	NS
Sample Type		**EPA**	**PADEP**	GW	GW	GW	GW	GW	GW-Duplicate	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	10 U	1 U	NS	NS	**0.99 J**	**0.96 J**	0.42 J	NS
1,1-DICHLOROETHANE	µg/L	NA	31	**28**	**4.9**	NS	NS	**0.3 J**	**0.28 J**	1 U	NS
1,1-DICHLOROETHENE	µg/L	7	7	10 U	1 U	NS	NS	1 U	1 U	1 U	NS
1,2,4-TRIMETHYLBENZENE	µg/L	NA	15	**220 L**	1 U	NS	NS	1 U	1U	1U	NS
1,3,5-TRIMETHYLBENZENE	µg/L	NA	13	**56**	1 U	NS	NS	1 U	1U	1U	NS
1,4-DIOXANE	µg/L	NA	6.4	**0.22 U**	**0.7**	NS	NS	0.19 U	**2.1**	NA	NS
ACETONE	µg/L	NA	33,000	50 U	5 U	NS	NS	5 U	5 U	5 U	NS
BENZENE	µg/L	5	5	**39**	1 U	NS	NS	1 U	1 U	**0.14 J**	NS
CHLOROETHANE	µg/L	NA	230	**33**	**0.94 J**	NS	NS	1 U	1 U	1 U	NS
CHLOROFORM	µg/L	80	80	10 U	1 U	NS	NS	0.33 B	**0.31 B**	**0.42 B**	NS
CIS-1,2-DICHLOROETHENE	µg/L	70	70	10 U	**3.4**	NS	NS	**0.84 J**	**0.79 J**	**3**	NS
CYCLOHEXANE	µg/L	NA	NA	**13**	1 U	NS	NS	1 U	1 U	1 U	NS
ETHYLBENZENE	µg/L	700	700	**22**	1 U	NS	NS	1 U	1 U	1 U	NS
ISOPROPYLBENZENE	µg/L	NA	NA	**9 J**	1 U	NS	NS	1 U	1 U	**0.3 J**	NS
METHYLCYCLOHEXANE	µg/L	NA	NA	**12**	1 U	NS	NS	1 U	1 U	**0.48 J**	NS
METHYLENE CHLORIDE	µg/L	5	NA	10 U	**0.15 J**	NS	NS	1 U	**0.2 J**	1 U	NS
NAPHTHALENE	µg/L	NA	100*	**200**	1 U	NS	NS	1 U	1 U	**1.6**	NS
TETRACHLOROETHENE (PCE)	µg/L	5	5	10 U	1 U	NS	NS	**1.9**	**1.9**	**2**	NS
TOLUENE	µg/L	1000	1,000	**10**	**0.17 J**	NS	NS	1 U	1 U	1 U	NS
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	10 U	**0.19 J**	NS	NS	1 U	1 U	1 U	NS
TRICHLOROETHENE (TCE)	µg/L	5	5	10 U	**2.1**	NS	NS	**2.9**	**3**	**11**	NS
VINYL CHLORIDE	µg/L	2	2	10 U	**3.5**	NS	NS	1 U	1 U	**1**	NS
XYLENES (TOTAL)	µg/L	10000	10,000	**180**	3 U	NS	NS	3 U	3 U	3 U	NS

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

Table G-1
SE OU 10 Groundwater Sampling Results - April 2008 to December 2011
Letterkenny Army Depot - Chambersburg, PA

Well Number				UST-3	96-37-6	96-37-6	96-37-11	96-37-12	97-37-23	97-37-24	98-37-27
Date Sampled				12/6/2011	12/6/2011	12/6/2011	NS	12/5/2011	12/6/2011	12/6/2011	12/5/2011
Sample Type		**EPA**	**PADEP**	GW	GW	GW-Duplicate	GW	GW	GW	GW	GW
Compound	**UNITS**	**MCL**	**MSC**	**On-Post Locations**							
1,1,1-TRICHLOROETHANE	µg/L	200	200	13 U	**0.40 J**	**0.40 J**	NS	**0.86 J**	**0.66 J**	1 U	**1.1**
1,1-DICHLOROETHANE	µg/L	NA	31	**18**	**4.4**	**4.2**	NS	**0.81 J**	1 U	1 U	1 U
1,1-DICHLOROETHENE	µg/L	7	7	13 U	1 U	1 U	NS	1 U	1 U	1 U	1 U
1,2,4-TRIMETHYLBENZENE	µg/L	NA	15	**150**	1 U	1 U	NS	1 U	1 U	1 U	1 U
1,3,5-TRIMETHYLBENZENE	µg/L	NA	13	**33**	1 U	1 U	NS	1 U	1 U	1 U	1 U
1,4-DIOXANE	µg/L	NA	6.4	**3.3**	**1.1 J**	**1.3 J**	NS	200 U	2 U	200 U	200 U
ACETONE	µg/L	NA	33,000	63 U	5 U	5 U	NS	5 U	5 U	5 U	5 U
BENZENE	µg/L	5	5	**30**	1 U	1 U	NS	**0.15 J**	1 U	1 U	1 U
CHLOROETHANE	µg/L	NA	230	**21**	1 U	1 U	NS	**0.40 J**	1 U	1 U	1 U
CHLOROFORM	µg/L	80	80	13 U	1 U	1 U	NS	**1.2**	1 U	1 U	**0.30 J**
CIS-1,2-DICHLOROETHENE	µg/L	70	70	13 U	**2.5**	**2.4**	NS	**0.30 J**	**1.2**	1 U	1 U
CYCLOHEXANE	µg/L	NA	NA	**7.1 J**	1 U	1 U	NS	1 U	1 U	1 U	1 U
ETHYLBENZENE	µg/L	700	700	**11 J**	1 U	1 U	NS	1 U	1 U	1 U	1 U
ISOPROPYLBENZENE	µg/L	NA	NA	**6.4 J**	1 U	1 U	NS	1 U	1 U	1 U	1 U
METHYLCYCLOHEXANE	µg/L	NA	NA	**7.3 J**	1 U	1 U	NS	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	µg/L	5	NA	**3.6 J**	1 U	1 U	NS	**0.16 J**	1 U	1 U	1 U
NAPHTHALENE	µg/L	NA	100*	**110**	1 U	1 U	NS	1 U	1 U	1 U	1 U
TETRACHLOROETHENE (PCE)	µg/L	5	5	13 U	1 U	1 U	NS	**0.79 J**	**2.3**	1 U	**0.32 J**
TOLUENE	µg/L	1000	1,000	**6.1 J**	1 U	1 U	NS	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	100	13 U	**0.22 J**	**0.21 J**	NS	1 U	1 U	1 U	1 U
TRICHLOROETHENE (TCE)	µg/L	5	5	13 U	**0.87 J**	**0.89 J**	NS	**1.5**	**3**	1 U	**0.98 J**
VINYL CHLORIDE	µg/L	2	2	13 U	**1.3**	**1.2**	NS	1 U	1 U	1 U	1 U
XYLENES (TOTAL)	µg/L	10000	10,000	**91**	3 U	3 U	NS	3 U	3 U	3 U	3 U

Notes: **Bolded** values indicate compound was detected.
Shaded values indicate compound was detected at or above its MCL, MSC, or SWQC.
GW - Groundwater.
SW - Surface water.
NS - Not Sampled.
MCL - Maximum Contaminant Levels published by the U.S. Environmental Protection Agency (EPA) for drinking water.
MSC - Medium Specific Concentration published by the Pennsylvania Dept. of Environmental Protection (PADEP) for drinking water.
NA - Not available; MCL/MSC/SWQC is not listed for this compound.
U - Compound was analyzed for but not detected.
J - Estimated value.
B - Compound was also found in the laboratory blank indicating laboratory contamination.
µg/L - Micrograms per liter which is equivalent to parts per billion (ppb).
*Lifetime Health Advisory Level -
adverse noncarcinogenic effects based on a lifetime of exposure.

TABLE G-2 - Site Conceptual Model
RAGS PART D Table 1
SELECTION OF EXPOSURE PATHWAYS
Building 37 Site (On-Post), Letterkenny Army Depot, Chambersburg, PA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future Industrial/	Groundwater	Shallow aquifer	Tap	Adult	ED, 25 yr	Ingestion	On-Site	Quantitative	Worker drinks water
Commercial Worker						Inhalation	On-Site	Quantitative	Worker inhales VOCs from indoor water use
Future	Groundwater	Shallow aquifer	Tap	Child	1 - 6 yr	Ingestion	On-Site	Quantitative	Child resident drinks water
Resident						Dermal Contact	On-Site	Quantitative	Child resident dermally absorbs contaminants while bathing
				Adult	ED, 30 yr	Ingestion	On-Site	Quantitative	Adult resident drinks water
						Inhalation	On-Site	Quantitative	Adult resident inhales VOCs from indoor water use

ED = Exposure duration

Table G-3
Groundwater Data Summary
Raw Statistics using Detected Observations

Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	SD	UCL (EPC)
1,1,2-TRICHLOROETHANE	8	37	82.22%	1	34	5.938	11.56	3.104
1,1-DICHLOROETHANE	51	2	3.77%	0.22	57.5	8.425	12.61	18.82
1,2,4-TRIMETHYLBENZENE	16	37	69.81%	0.13	1500	199.4	372.3	112.2
1,3,5-TRIMETHYLBENZENE	10	43	81.13%	0.285	400	88.52	115.9	31.22
1,4-DIOXANE	15	3	16.67%	0.57	8.1	3.848	2.38	4.365
BENZENE	29	24	45.28%	0.14	71	13.99	22.31	32.29
CHLOROETHANE	25	28	52.83%	0.74	48.5	13.05	16.71	9.962
1,2-DICHLOROPROPANE	7	38	84.44%	1	7.5	1.929	2.457	1.443
CIS-1,2-DICHLOROETHENE	44	9	16.98%	0.24	58	5.499	11.28	11.17
NAPHTHALENE	23	30	56.60%	0.27	900	100.4	199	236.4
TRICHLOROETHENE	39	14	26.42%	0.17	14	4.002	3.721	4.284
VINYL CHLORIDE	26	27	50.94%	0.25	8.4	2.164	1.817	1.842

all units in µg/L.

TABLE G-4

RAGS Part D Table 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Commercial/Industrial Worker	Adult	Tap Water	EPC	Exposure Point Concentration	Chemical-specific	µg/L	See Table G-3 [1]	Chronic daily intake (CDI)(mg/kg-day) =
				IR-G	Ingestion Rate of Groundwater	1	L/day	EPA, 2002c	EPC x IR-G x CF x EF x ED x 1/BW x 1/AT
				CF	Conversion Factor	1.00E-03	mg/µg	-----	
				EF	Exposure Frequency	250	days/year	EPA, 2002c	
				ED	Exposure Duration	25	years	EPA, 2002c	
				BW	Body Weight	70	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Resident	Child	Tap Water	EPC	Exposure Point Concentration	Chemical-specific	µg/L	See Table G-3 [1]	Chronic daily intake (CDI)(mg/kg-day) =
				IR-G	Ingestion Rate of Groundwater	1	L/day	EPA, 2002c	EPC x IR-G x CF x EF x ED x 1/BW x 1/AT
				CF	Conversion Factor	1.00E-03	mg/µg	-----	
				EF	Exposure Frequency	350	days/year	EPA, 2002c	
				ED	Exposure Duration	6	years	EPA, 2002c	
				BW	Body Weight	15	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Adult	Tap Water	EPC	Exposure Point Concentration	Chemical-specific	µg/L	See Table G-3 [1]	Chronic daily intake (CDI)(mg/kg-day) =
				IR-G	Ingestion Rate of Groundwater	2	L/day	EPA, 2002c	EPC x IR-G x CF x EF x ED x 1/BW x 1/AT
				CF	Conversion Factor	1.00E-03	mg/µg	-----	
				EF	Exposure Frequency	350	days/year	EPA, 2002c	
				ED	Exposure Duration	24	years	EPA, 2002c	
				BW	Body Weight	70	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE G-4

RAGS Part D Table 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Commercial/Industrial Worker	Adult	Tap Water (Hand washing)	SA	Skin Surface Area Available for Contact	2,076	cm^2	EPA, 2003a, 2004c	Dermally Absorbed Dose (DAD)(mg/kg-day) =
				DA_{EVENT}	Absorbed Dose Per Event	Chemical-specific	mg/cm^2-event	EPA, 2004c; See Table G-6	DA_{EVENT} x EV x SA x EF x ED x 1/BW x 1/AT
				EV	Event Frequency	1	event/day	EPA, 2004c	
				EF	Exposure Frequency	250	days/year	Professional Judgement	
				ED	Exposure Duration	25	years	Professional Judgement	
				BW	Body Weight	70	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	9,125	days	Professional Judgement	
				FA	Fraction Absorbed Water	Chemical-specific	unitless	EPA, 2004c; See Table G-6	if $t_{event} \leq t^*$, then DA_{EVENT} (Organic) =
				K_p	Dermal Permeability Coefficient	Chemical-specific	cm/hour	EPA, 2004c; See Table G-6	$2\ FA \times K_p \times C_w \times CF_1 \times CF_2 \times \sqrt{(6\tau_{event} \times t_{event}/\pi)}$
				C_w	Chemical Concentration in Water	Chemical-specific	µg/L	See Table G-6	
				CF_1	Conversion Factor	1.0E-03	mg/µg	-----	otherwise if $t_{event} > t^*$, then DA_{EVENT} (Organic) =
				CF_2	Conversion Factor	1.0E-03	L/cm^3	-----	$FA \times K_p \times C_w \times CF_1 \times CF_2 \times$
				B	Ratio of Permeability Coefficient	Chemical-specific	unitless	EPA, 2004c; See Table G-6	$[((t_{event})/(1+B)) + 2\tau_{event}((1 + 3B + 3B^2)/(1+B)^2)]$
				t*	Time to Reach Steady State	Chemical-specific	hour	EPA, 2004c; See Table G-6	
				τ_{event}	Lag Time Per Event	Chemical-specific	hr/event	EPA, 2004c; See Table G-6	DA_{EVENT} (Inorganic) =
				t_{event}	Event Duration	0.5	hr/event	EPA, 2004c	$K_p \times C_w \times CF_1 \times CF_2 \times t_{event}$

TABLE G-4

RAGS Part D Table 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Resident	Child	Tap Water While Bathing	SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2003a, 2004c	Dermally Absorbed Dose (DAD)(mg/kg-day) =
				DA_{EVENT}	Absorbed Dose Per Event	Chemical-specific	mg/cm^2-event	EPA, 2004c; See Table G-6	DA_{EVENT} x EV x SA x EF x ED x 1/BW x 1/AT
				EV	Event Frequency	1	event/day	EPA, 2004c	
				EF	Exposure Frequency	350	days/year	EPA, 2002c	
				ED	Exposure Duration	6	years	EPA, 2002c	
				BW	Body Weight	15	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				FA	Fraction Absorbed Water	Chemical-specific	unitless	EPA, 2004c; See Table G-6	if $t_{event} \leq t^*$, then DA_{EVENT} (Organic) =
				K_p	Dermal Permeability Coefficient	Chemical-specific	cm/hour	EPA, 2004c; See Table G-6	$2\ FA \times K_p \times C_w \times CF_1 \times CF_2 \times \sqrt{(6\tau_{event} \times t_{event}/\pi)}$
				C_w	Chemical Concentration in Water	Chemical-specific	µg/L	See Table G-6	
				CF_1	Conversion Factor	1.0E-03	mg/µg	-----	otherwise if $t_{event} > t^*$, then DA_{EVENT} (Organic) =
				CF_2	Conversion Factor	1.0E-03	L/cm^3	-----	$FA \times K_p \times C_w \times CF_1 \times CF_2 \times$
				B	Ratio of Permeability Coefficient	Chemical-specific	unitless	EPA, 2004c; See Table G-6	$[((t_{event})/(1+B)) + 2\tau_{event}((1 + 3B + 3B^2)/(1+B)^2)]$
				t*	Time to Reach Steady State	Chemical-specific	hour	EPA, 2004c; See Table G-6	
				τ_{event}	Lag Time Per Event	Chemical-specific	hr/event	EPA, 2004c; See Table G-6	DA_{EVENT} (Inorganic) =
				t_{event}	Event Duration	1.00	hr/event	EPA, 2004c	$K_p \times C_w \times CF_1 \times CF_2 \times t_{event}$

TABLE G-4

RAGS Part D Table 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Adult	Tap Water While Showering	SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2003a, 2004c	Dermally Absorbed Dose (DAD)(mg/kg-day) =
				DA_{EVENT}	Absorbed Dose Per Event	Chemical-specific	mg/cm^2-event	EPA, 2004c; See Table G-6	DA_{EVENT} x EV x SA x EF x ED x 1/BW x 1/AT
				EV	Event Frequency	1	event/day	EPA, 2004c	
				EF	Exposure Frequency	350	days/year	EPA, 2002c	
				ED	Exposure Duration	24	years	EPA, 2002c	
				BW	Body Weight	70	kg	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-NC	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				FA	Fraction Absorbed Water	Chemical-specific	unitless	EPA, 2004c; See Table G-6	if $t_{event} \leq t^*$, then DA_{EVENT} (Organic) =
				K_p	Dermal Permeability Coefficient	Chemical-specific	cm/hour	EPA, 2004c; See Table G-6	$2\ FA \times K_p \times C_w \times CF_1 \times CF_2 \times \sqrt{(6\tau_{event} \times t_{event}/\pi)}$
				C_w	Chemical Concentration in Water	Chemical-specific	µg/L	See Table G-6	
				CF_1	Conversion Factor	1.0E-03	mg/µg	-----	otherwise if $t_{event} > t^*$, then DA_{EVENT} (Organic) =
				CF_2	Conversion Factor	1.0E-03	L/cm^3	-----	$FA \times K_p \times C_w \times CF_1 \times CF_2 \times$
				B	Ratio of Permeability Coefficient	Chemical-specific	unitless	EPA, 2004c; See Table G-6	$[((t_{event})/(1+B)) + 2\tau_{event}((1 + 3B + 3B^2)/(1+B)^2)]$
				t*	Time to Reach Steady State	Chemical-specific	hour	EPA, 2004c; See Table G-6	
				τ_{event}	Lag Time Per Event	Chemical-specific	hr/event	EPA, 2004c; See Table G-6	DA_{EVENT} (Inorganic) =
				t_{event}	Event Duration	0.58	hr/event	EPA, 2004c	$K_p \times C_w \times CF_1 \times CF_2 \times t_{event}$

[1] The EPC is based on the lower of the 95% UCL and the maximum detected concentration.

TABLE G-5

RAGS Part D Table 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR ADULT INHALATION OF VOCs WHILE SHOWERING

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Vapors While Showering at SE OU10	E	Inhalation Exposure per Shower	Chemical-specific	$\mu g/m^3$	See Tables G-8 through G-16 [1]	Exposure Concentration (EC)(mg/m^3) =
				CF	Conversion Factor	1.00E-03	mg/µg	-----	E x CF x EF x ED x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 2002a	
				ED	Exposure Duration	24	years	EPA, 2002a	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 2009a	
				AT-NC	Averaging Time (Non-Cancer)	8,760	days	EPA, 2009a	
	Industrial Worker	Adult	Vapors While Showering at SE OU10	E	Inhalation Exposure per Shower	Chemical-specific	$\mu g/m^3$	See Tables G-8 through G-16 [1]	Exposure Concentration (EC)(mg/m^3) =
				CF	Conversion Factor	1.00E-03	mg/µg	-----	E x CF x EF x ED x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 2002a	
				ED	Exposure Duration	25	years	EPA, 2002a	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 2009a	
				AT-NC	Averaging Time (Non-Cancer)	9,125	days	EPA, 2009a	

[1] Foster-Chrostowski (1987) Model.

Table G-6

Dermally Absorbed Dose per Event (DA_{event}) Calculations[a]
SE OU10 - Letterkenny Army Depot - Chambersburg, PA

COPC	EPC[b] (µg/L)	EPC[b] (mg/cm^3)	FA (unitless)	K_p (cm/hr)	τ_{event} (hr/event)	B (unitless)	t^* (hr)	DA_{event} (mg/cm^2-event)[c] Industrial Worker	Construction Worker	Child Resident	Adult Resident
1,1,2-TRICHLOROETHANE	3.10E+00	3.10E-06	1.00E+00	6.40E-03	6.00E-01	0.00E+00	1.43E+00	3.01E-08	6.36E-08	4.25E-08	3.24E-08
1,1-DICHLOROETHANE	1.88E+01	1.88E-05	1.00E+00	6.70E-03	3.80E-01	0.00E+00	9.20E-01	1.52E-07	3.48E-07	2.22E-07	1.64E-07
1,2,4-TRIMETHYLBENZENE	1.12E+02	1.12E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TRIMETHYLBENZENE	3.12E+01	3.12E-05	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-DIOXANE	4.37E+00	4.37E-06	1.00E+00	3.30E-04	3.30E-01	0.00E+00	8.00E-01	1.62E-09	3.83E-09	2.39E-09	1.74E-09
BENZENE	3.23E+01	3.23E-05	1.00E+00	1.50E-02	2.90E-01	1.00E-01	7.00E-01	5.10E-07	1.25E-06	8.12E-07	5.49E-07
CHLOROETHANE	9.96E+00	9.96E-06	1.00E+00	6.10E-03	2.40E-01	0.00E+00	5.90E-01	5.82E-08	1.51E-07	8.99E-08	6.27E-08
1,2-DICHLOROPROPANE	1.44E+00	1.44E-06	1.00E+00	7.80E-03	4.60E-01	0.00E+00	1.10E+00	1.49E-08	3.29E-08	2.11E-08	1.61E-08
CIS-1,2-DICHLOROETHENE	1.12E+01	1.12E-05	1.00E+00	7.70E-03	3.70E-01	0.00E+00	8.90E-01	1.02E-07	2.36E-07	1.50E-07	1.10E-07
NAPHTHALENE	2.36E+02	2.36E-04	1.00E+00	4.70E-02	5.60E-01	2.00E-01	1.34E+00	1.63E-05	3.95E-05	2.30E-05	1.75E-05
TRICHLOROETHENE	4.28E+00	4.28E-06	1.00E+00	1.20E-02	5.80E-01	1.00E-01	1.39E+00	7.65E-08	1.72E-07	1.08E-07	8.24E-08
VINYL CHLORIDE	1.84E+00	1.84E-06	1.00E+00	5.60E-03	2.40E-01	0.00E+00	5.70E-01	9.88E-09	2.56E-08	1.53E-08	1.09E-08

NOTE: Trans-1,2-dichloroethene was used as a surrogate for cis-1,2-dichloroethene.
[a] EPA, 2004b
[b] See Table G-3.
[c] Calculated based on Equation 3.2 or 3.3 for organics and Equation 3.4 for inorganics in EPA, 2004b where t_{event} equals 0.50 and 2.0 for commercial/industrial workers and construction workers, respectively.
B = Ratio of the permeability coefficient of a COPC through the stratum corneum relative to its permeability coefficient across the viable epidermis.
FA = Fraction absorbed.
K_p = Dermal permeability coefficient.
NA = Not applicable.
τ_{event} = Lag time per event.
t^* = Time to reach steady-state.

TABLE G-7

NON-CANCER AND CANCER TOXICITY DATA

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Chemical of Potential Concern	Oral RfD		Oral Absorption Efficiency for Dermal	Inhalation RfC		Oral Cancer Slope Factor		Unit Risk	
	Value	Units		Value	Units	Value	Units	Value	Units
1,1,2-TRICHLOROETHANE	4.00E-03	---	1.00E+00	NA	---	5.70E-02	1/mg/kg/day	1.60E-05	1/µg/m3
1,1-DICHLOROETHANE	2.00E-01	---	1.00E+00	NA	---	5.70E-03	1/mg/kg/day	1.60E-06	1/µg/m3
1,2,4-TRIMETHYLBENZENE	NA	---	---	7.00E-03	mg/m3	NA	---	NA	---
1,3,5-TRIMETHYLBENZENE	5.00E-02	---	1.00E+00	6.00E-03	mg/m3	NA	---	NA	---
1,4-DIOXANE	3.00E-02	mg/kg/day	1.00E+00	3.00E+00	mg/m3	1.00E-01	1/mg/kg/day	7.70E-06	1/µg/m3
BENZENE	4.00E-03	mg/kg/day	1.00E+00	3.00E-02	mg/m3	5.50E-02	1/mg/kg/day	7.80E-06	1/µg/m3
CHLOROETHANE	NA	mg/kg/day	---	1.00E+01	mg/m3	NA	---	NA	---
1,2-DICHLOROPROPANE	9.00E-02	mg/kg/day	1.00E+00	4.00E-03	mg/m3	3.60E-02	1/mg/kg/day	1.00E-05	1/µg/m3
CIS-1,2-DICHLOROETHENE	1.00E-02	mg/kg/day	1.00E+00	NA	---	NA	---	NA	---
NAPHTHALENE	2.00E-02	mg/kg/day	1.00E+00	3.00E-03	mg/m3	NA	---	3.40E-05	1/µg/m3
TRICHLOROETHENE	5.00E-04	mg/kg/day	1.00E+00	2.00E-03	mg/m3	4.60E-02	1/mg/kg/day	4.10E-06	1/µg/m3
VINYL CHLORIDE	3.00E-03	mg/kg/day	1.00E+00	1.00E-01	mg/m3	7.20E-01	1/mg/kg/day	4.40E-06	1/µg/m3

All toxicity values were obtained from IRIS and the ORNL RSL Table (November 2011).

IRIS = Integrated Risk Information System.

NA=Not available.

RSL = Regional Screening Level.

Table G-8
Foster-Chrostowski Model

112-trichloroethane

E	inhalation exposure per shower	2.0951E-08	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	0.252856722	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	0.303428067	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	3.10E+00	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	12.34415331	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	9.124485991	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	11.63548948	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1116	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	130	g/mol	chem-specific
H	Henry's law constant	9.1E-04	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	6.51E-08	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	2.23E-08	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	1.60E-05	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	3.57155E-10	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	NA	(mg/m^3)	chem-specific
HQ	hazard quotient	NA	unitless	HQ = Erevised/RfC

Table G-9
Foster-Chrostowski Model 11 dca

E	inhalation exposure per shower	1.74202E-07	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	2.102437177	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	2.522924613	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	1.88E+01	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	17.27213599	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	12.76712618	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	13.33602775	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1279.462802	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	98.96	g/mol	chem-specific
H	Henry's law constant	5.6E-03	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	5.41E-07	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	1.86E-07	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	1.60E-06	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	2.96965E-10	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	NA	(mg/m^3)	chem-specific
HQ	hazard quotient	#VALUE!	unitless	HQ = Erevised/RfC

Table G-10
Foster-Chrostowski Model

		Benzene		
E	inhalation exposure per shower	3.33637E-07	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	4.026650559	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	4.831980671	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	3.23E+01	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	19.45191796	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	14.3783659	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	15.02135232	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1441	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	78	g/mol	chem-specific
H	Henry's law constant	5.6E-03	atm-m^3/mol	chem-specific
Dose				
Erevised-r	backing out BW and VR-noncancer	1.04E-06	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	3.55E-07	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		
Cancer Risk				
IUR	inhalation unit risk	7.80E-06	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	2.77269E-09	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		
Noncancer HI				
RfC	reference concentration	0.03	(mg/m^3)	chem-specific
HQ	hazard quotient	3.45599E-05	unitless	HQ = Erevised/RfC

Table G-11
Foster-Chrostowski Model

Chloroethane

E	inhalation exposure per shower	1.13527E-07	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	1.370156336	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	1.644187603	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	9.96E+00	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	21.64542809	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	15.99975312	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	16.45506702	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1579	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	65	g/mol	chem-specific
H	Henry's law constant	8.8E-03	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	3.53E-07	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	1.21E-07	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	NA	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	#VALUE!	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	10	(mg/m^3)	chem-specific
HQ	hazard quotient	3.52793E-08	unitless	HQ = Erevised/RfC

Table G-12
Foster-Chrostowski Model

12-dichloropropane

E	inhalation exposure per shower	1.22245E-08	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	0.147536785	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	0.177044142	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	1.44E+00	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	15.70761884	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	11.61067467	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	12.64911064	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1214	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	110	g/mol	chem-specific
H	Henry's law constant	2.8E-03	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	3.80E-08	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	1.30E-08	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	1.00E-05	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	1.30246E-10	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	0.004	(mg/m^3)	chem-specific
HQ	hazard quotient	9.49707E-06	unitless	HQ = Erevised/RfC

Tabld G-13
Foster-Chrostowski Model

cis12dce

E	inhalation exposure per shower	1.02849E-07	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	1.241280645	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	1.489536774	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	11.17	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	17.17462308	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	12.6950471	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	13.47425699	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1292.724559	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	96.94	g/mol	chem-specific
H	Henry's law constant	4.1E-03	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	3.20E-07	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	1.10E-07	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	---	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	#VALUE!	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	0.06	(mg/m^3)	chem-specific--trans value
HQ	hazard quotient	5.32682E-06	unitless	HQ = Erevised/RfC

Table G-14
Foster-Chrostowski Model

Naphthalene

E	inhalation exposure per shower	1.34813E-06	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	16.27057946	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	19.52469536	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	2.36E+02	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	10.34432762	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	7.646265409	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	11.63548948	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1116	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	130	g/mol	chem-specific
H	Henry's law constant	4.8E-04	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	4.19E-06	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	1.44E-06	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	3.40E-05	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	4.88365E-08	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	0.003	(mg/m^3)	chem-specific
HQ	hazard quotient	0.001396469	unitless	HQ = Erevised/RfC

Table G-15
Foster-Chrostowski Model

TCE

E	inhalation exposure per shower	3.5532E-08	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	0.428834945	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	0.514601933	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	4.28E+00	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	15.35661935	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	11.35122472	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	11.63548948	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1116	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	130	g/mol	chem-specific
H	Henry's law constant	1.0E-02	atm-m^3/mol	chem-specific

Dose

Erevised-r	backing out BW and VR-noncancer	1.10E-07	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	3.79E-08	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		

Cancer Risk

IUR	inhalation unit risk	4.10E-06	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	1.55216E-10	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		

Noncancer HI

RfC	reference concentration	0.002	(mg/m^3)	chem-specific
HQ	hazard quotient	5.5209E-05	unitless	HQ = Erevised/RfC

Table G-16
Foster-Chrostowski Model

		VC		
E	inhalation exposure per shower	2.16608E-08	mg/kg/day	E = ((Vr*S)/(BW*R*10^6))*(Ds + exp(-R*Dt)/R - exp(R*(Ds-Dt))/R)
VR	ventilation rate	15	l/min	from paper (value from Table III)
S	indoor VOC generation rate	0.261423958	µg/m^3-min	S = (Cwd*FR)/SV
BW	body weight	70	kg	adult bw
R	air exchange rate	90	min^{-1}	from paper (upper bound value from Table III)
Ds	shower duration	34.8	min	0.58 hr/evet from Rags E
Dt	total duration in shower room	60	min	
Cwd	concentration leaving shower droplet after time ts	0.31370875	µg/l	Cwd = Cwo(1-exp(-KaL*ts/60*d))
FR	shower water flow rate	10	l/min	
SV	shower room air volume	12	m^3	
Cwo	shower water concentration	1.842	µg/l	EPC - chem-specific
KaL	adjusted overall mass transfer coefficient	22.40419878	cm/hr	KaL = KL(T1*µs/Ts*µ1)$^{-0.5}$
ts	shower droplet drop time	0.5	sec	
d	shower droplet diameter	1	mm	from paper (value from Table III)
KL	overall mass transfer coefficient	16.56061723	cm/hr	KL = ((1/kl-voc) + (R * T/(H * kg-voc)))$^{-1}$
T	absolute temperature	293	K	known constant (presented in paper)
µ1	water viscosity at T1	1.002	cp	constant (presented in 2003 paper)
Ts	shower water temperature	318.15	K	45° C from paper (upper bound value from Table III)
µs	water viscosity at Ts	0.594464922	cp	µs = 10^(8.67e-4 + (1.3272 * (20 - (Ts - 273)) - 0.001053 * ((Ts - 273) - 20)^2)/((Ts - 273) + 105))
kl-voc	liquid-film mass transfer coefficient for VOC	16.71421788	cm/hr	kl-voc = kl-CO2 * (44/MW)$^{0.5}$
R	gas constant	0.000082	atm-m^3/mol-K	known constant (presented in paper)
kg-voc	gas-film mass transfer coefficient for VOC	1603.567451	cm/hr	kg-voc = kg-H2O* (18/MW)$^{0.5}$
kl-CO2	liquid-film mass transfer coefficient for CO2	20	cm/hr	known constant (presented in paper)
kg-H2O	gas-film mass transfer coefficient for H2O	3000	cm/hr	known constant (presented in paper)
MW	molecular weight	63	g/mol	chem-specific
H	Henry's law constant	2.7E-02	atm-m^3/mol	chem-specific
Dose				
Erevised-r	backing out BW and VR-noncancer	6.73E-08	mg/m^3	Dose = E*BW*CF1*(1/VR)*CF2*CF3*ED*EF*1/AT
Erevised-c	backing out BW and VR-cancer	2.31E-08	mg/m^3	
CF1	L/m3	1000		
CF2	d/min	0.000694444		
ED	years	24		
EF	days/year	350		
ATnc	days	8760		
Atc	days	25550		
Cancer Risk				
IUR	inhalation unit risk	4.40E-06	(ug/m^3)$^{-1}$	chem-specific
CR	cancer risk	1.01546E-10	unitless	CR = Erevised*IUR*CF3
CF3	µg/mg	1000		
Noncancer HI				
RfC	reference concentration	0.1	(mg/m^3)	chem-specific
HQ	hazard quotient	6.73124E-07	unitless	HQ = Erevised/RfC

Table G-17

RAGS Part D TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap water	Ingestion	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	1.08E-05	mg/kg/day	5.70E-02	1/mg/kg/day	6.18E-07	3.04E-05	mg/kg/day	4.00E-03	mg/kg/day	7.59E-03
		at SE OU10		1,1-DICHLOROETHANE	1.88E+01	µg/L	6.58E-05	mg/kg/day	5.70E-03	1/mg/kg/day	3.75E-07	1.84E-04	mg/kg/day	2.00E-01	mg/kg/day	9.21E-04
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	3.92E-04	mg/kg/day	NA	NA	NA	1.10E-03	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	1.09E-04	mg/kg/day	NA	NA	NA	3.05E-04	mg/kg/day	5.00E-02	mg/kg/day	6.11E-03
				1,4-DIOXANE	4.37E+00	µg/L	1.53E-05	mg/kg/day	1.00E-01	1/mg/kg/day	1.53E-06	4.27E-05	mg/kg/day	3.00E-02	mg/kg/day	1.42E-03
				BENZENE	3.23E+01	µg/L	1.13E-04	mg/kg/day	5.50E-02	1/mg/kg/day	6.21E-06	3.16E-04	mg/kg/day	4.00E-03	mg/kg/day	7.90E-02
				CHLOROETHANE	9.96E+00	µg/L	3.48E-05	mg/kg/day	NA	NA	NA	9.75E-05	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	5.04E-06	mg/kg/day	3.60E-02	1/mg/kg/day	1.82E-07	1.41E-05	mg/kg/day	9.00E-02	mg/kg/day	1.57E-04
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	3.90E-05	mg/kg/day	NA	NA	NA	1.09E-04	mg/kg/day	1.00E-02	mg/kg/day	1.09E-02
				NAPHTHALENE	2.36E+02	µg/L	8.26E-04	mg/kg/day	NA	NA	NA	2.31E-03	mg/kg/day	2.00E-02	mg/kg/day	1.16E-01
				TRICHLOROETHENE	4.28E+00	µg/L	1.50E-05	mg/kg/day	4.60E-02	1/mg/kg/day	6.89E-07	4.19E-05	mg/kg/day	5.00E-04	mg/kg/day	8.38E-02
				VINYL CHLORIDE	1.84E+00	µg/L	6.44E-06	mg/kg/day	7.20E-01	1/mg/kg/day	4.63E-06	1.80E-05	mg/kg/day	3.00E-03	mg/kg/day	6.01E-03
			Exp. Route Total								1.42E-05					3.12E-01

Table G-17

RAGS Part D TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Water Vapors from Showerhead	Inhalation	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	1.66E-08	mg/m3	1.60E-02	1/mg/m^3	2.66E-10	4.65E-08	mg/kg/day	NA	NA	NA
				1,1-DICHLOROETHANE	1.88E+01	µg/L	1.38E-07	mg/m^3	1.60E-03	1/mg/m^3	2.21E-10	3.87E-07	mg/kg/day	NA	NA	NA
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	NA	mg/m^3	NA	1/mg/m^3	NA	NA	mg/kg/day	7.00E-03	mg/m^3	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	NA	mg/m^3	NA	1/mg/m^3	NA	NA	mg/kg/day	6.00E-03	mg/m^3	NA
				BENZENE	3.23E+01	µg/L	2.64E-07	mg/m^3	7.80E-03	1/mg/m^3	2.06E-09	7.41E-07	mg/kg/day	3.00E-02	mg/m^3	2.47E-05
				CHLOROETHANE	9.96E+00	µg/L	9.00E-08	mg/m^3	NA	1/mg/m^3	NA	2.52E-07	mg/kg/day	1.00E+01	mg/m^3	2.52E-08
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	9.69E-09	mg/m^3	1.00E-02	1/mg/m^3	9.69E-11	2.71E-08	mg/kg/day	4.00E-03	mg/m^3	6.78E-06
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	8.15E-08	mg/m^3	NA	1/mg/m^3	NA	2.28E-07	mg/kg/day	NA	NA	NA
				NAPHTHALENE	2.36E+02	µg/L	1.07E-06	mg/m^3	3.40E-02	1/mg/m^3	3.63E-08	2.99E-06	mg/kg/day	3.00E-03	mg/m^3	9.97E-04
				TRICHLOROETHENE	4.28E+00	µg/L	2.82E-08	mg/m^3	4.10E-03	1/mg/m^3	1.15E-10	7.89E-08	mg/kg/day	2.00E-03	mg/m^3	3.94E-05
				VINYL CHLORIDE	1.84E+00	µg/L	1.72E-08	mg/m^3	4.40E-03	1/mg/m^3	7.56E-11	4.81E-08	mg/kg/day	1.00E-01	mg/m^3	4.81E-07
			Exp. Route Total								2.34E-05					2.08E-03
		Exposure Point Total									3.76E-05					3.14E-01
	Exposure Medium Total										3.76E-05					3.14E-01
Groundwater Total											3.76E-05					3.14E-01
										Total of Receptor Risks Across All Media	3.76E-05			Total of Receptor Hazards Across All Media		3.14E-01

Table G-18

RAGS Part D TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Groundwater	Groundwater	Tap water at SE OU10	Ingestion	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	1.98E-04	mg/kg/day	4.00E-03	mg/kg/day	4.96E-02
				1,1-DICHLOROETHANE	1.88E+01	µg/L	1.20E-03	mg/kg/day	2.00E-01	mg/kg/day	6.02E-03
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	7.17E-03	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	2.00E-03	mg/kg/day	5.00E-02	mg/kg/day	3.99E-02
				1,4-DIOXANE	4.37E+00	µg/L	2.79E-04	mg/kg/day	3.00E-02	mg/kg/day	9.30E-03
				BENZENE	3.23E+01	µg/L	2.06E-03	mg/kg/day	4.00E-03	mg/kg/day	5.16E-01
				CHLOROETHANE	9.96E+00	µg/L	6.37E-04	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	9.22E-05	mg/kg/day	9.00E-02	mg/kg/day	1.02E-03
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	7.14E-04	mg/kg/day	1.00E-02	mg/kg/day	7.14E-02
				NAPHTHALENE	2.36E+02	µg/L	1.51E-02	mg/kg/day	2.00E-02	mg/kg/day	7.56E-01
				TRICHLOROETHENE	4.28E+00	µg/L	2.74E-04	mg/kg/day	5.00E-04	mg/kg/day	5.48E-01
				VINYL CHLORIDE	1.84E+00	µg/L	1.18E-04	mg/kg/day	3.00E-03	mg/kg/day	3.93E-02
			Exp. Route Total								2.04E+00
			Dermal	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	1.79E-05	mg/kg/day	4.00E-03	mg/kg/day	4.49E-03
				1,1-DICHLOROETHANE	1.88E+01	µg/L	9.36E-05	mg/kg/day	2.00E-01	mg/kg/day	4.68E-04
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	NA	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	NA	mg/kg/day	5.00E-02	mg/kg/day	NA
				1,4-DIOXANE	4.37E+00	µg/L	1.01E-06	mg/kg/day	3.00E-02	mg/kg/day	3.36E-05
				BENZENE	3.23E+01	µg/L	3.43E-04	mg/kg/day	4.00E-03	mg/kg/day	8.57E-02
				CHLOROETHANE	9.96E+00	µg/L	3.79E-05	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	8.90E-06	mg/kg/day	9.00E-02	mg/kg/day	9.89E-05
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	6.31E-05	mg/kg/day	1.00E-02	mg/kg/day	6.31E-03
				NAPHTHALENE	2.36E+02	µg/L	9.70E-03	mg/kg/day	2.00E-02	mg/kg/day	4.85E-01
				TRICHLOROETHENE	4.28E+00	µg/L	4.57E-05	mg/kg/day	5.00E-04	mg/kg/day	9.13E-02
				VINYL CHLORIDE	1.84E+00	µg/L	6.44E-06	mg/kg/day	3.00E-03	mg/kg/day	2.15E-03
			Exp. Route Total								6.76E-01
		Exposure Point Total									2.71E+00
	Exposure Medium Total										2.71E+00
Groundwater Total											2.71E+00
							Total of Receptor Hazards Across All Media				2.71E+00

Table G-19

RAGS Part D TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Groundwater	Groundwater	Tap water at SE OU10	Ingestion	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	8.50E-05	mg/kg/day	4.00E-03	mg/kg/day	2.13E-02
				1,1-DICHLOROETHANE	1.88E+01	µg/L	5.16E-04	mg/kg/day	2.00E-01	mg/kg/day	2.58E-03
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	3.07E-03	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	8.55E-04	mg/kg/day	5.00E-02	mg/kg/day	1.71E-02
				1,4-DIOXANE	4.37E+00	µg/L	1.20E-04	mg/kg/day	3.00E-02	mg/kg/day	3.99E-03
				BENZENE	3.23E+01	µg/L	8.85E-04	mg/kg/day	4.00E-03	mg/kg/day	2.21E-01
				CHLOROETHANE	9.96E+00	µg/L	2.73E-04	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	3.95E-05	mg/kg/day	9.00E-02	mg/kg/day	4.39E-04
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	3.06E-04	mg/kg/day	1.00E-02	mg/kg/day	3.06E-02
				NAPHTHALENE	2.36E+02	µg/L	6.48E-03	mg/kg/day	2.00E-02	mg/kg/day	3.24E-01
				TRICHLOROETHENE	4.28E+00	µg/L	1.17E-04	mg/kg/day	5.00E-04	mg/kg/day	2.35E-01
				VINYL CHLORIDE	1.84E+00	µg/L	5.05E-05	mg/kg/day	3.00E-03	mg/kg/day	1.68E-02
			Exp. Route Total								8.73E-01
		Exposure Point Total									8.73E-01
	Exposure Medium Total										8.73E-01
	Air	Water Vapors from Showerhead	Inhalation	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	6.51E-08	mg/kg/day	NA	NA	NA
				1,1-DICHLOROETHANE	1.88E+01	µg/L	5.41E-07	mg/kg/day	NA	NA	NA
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	NA	mg/kg/day	7.00E-03	mg/m^3	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	NA	mg/kg/day	6.00E-03	mg/m^3	NA
				BENZENE	3.23E+01	µg/L	1.04E-06	mg/kg/day	3.00E-02	mg/m^3	3.46E-05
				CHLOROETHANE	9.96E+00	µg/L	3.53E-07	mg/kg/day	1.00E+01	mg/m^3	3.53E-08
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	3.80E-08	mg/kg/day	4.00E-03	mg/m^3	9.50E-06
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	3.20E-07	mg/kg/day	NA	NA	NA
				NAPHTHALENE	2.36E+02	µg/L	4.19E-06	mg/kg/day	3.00E-03	mg/m^3	1.40E-03
				TRICHLOROETHENE	4.28E+00	µg/L	1.10E-07	mg/kg/day	2.00E-03	mg/m^3	5.52E-05
				VINYL CHLORIDE	1.84E+00	µg/L	6.73E-08	mg/kg/day	1.00E-01	mg/m^3	6.73E-07
			Exp. Route Total								2.51E-03
		Exposure Point Total									2.51E-03
	Exposure Medium Total										2.51E-03
Groundwater Total											8.75E-01
										Total of Receptor Hazards Across All Media	8.75E-01

Table G-20

RAGS Part D TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Groundwater	Groundwater	Tap water at SE OU10	Ingestion	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	4.62E-05	mg/kg/day	5.70E-02	1/mg/kg/day	2.63E-06
				1,1-DICHLOROETHANE	1.88E+01	µg/L	2.80E-04	mg/kg/day	5.70E-03	1/mg/kg/day	1.60E-06
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	1.67E-03	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	4.64E-04	mg/kg/day	NA	NA	NA
				1,4-DIOXANE	4.37E+00	µg/L	6.49E-05	mg/kg/day	1.00E-01	1/mg/kg/day	6.49E-06
				BENZENE	3.23E+01	µg/L	4.80E-04	mg/kg/day	5.50E-02	1/mg/kg/day	2.64E-05
				CHLOROETHANE	9.96E+00	µg/L	1.48E-04	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	2.15E-05	mg/kg/day	3.60E-02	1/mg/kg/day	7.73E-07
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	1.66E-04	mg/kg/day	NA	NA	NA
				NAPHTHALENE	2.36E+02	µg/L	3.52E-03	mg/kg/day	NA	NA	NA
				TRICHLOROETHENE-Kidney (ADAF)	4.28E+00	µg/L	1.99E-04	mg/kg/day	4.60E-02	1/mg/kg/day	1.85E-06
				TRICHLOROETHENE- Liver (NHL)	4.28E+00	µg/L	6.37E-05	mg/kg/day	4.60E-02	1/mg/kg/day	2.36E-06
				VINYL CHLORIDE	1.84E+00	µg/L	8.55E-05	mg/kg/day	7.20E-01	1/mg/kg/day	6.15E-05
			Exp. Route Total								1.04E-04
			Dermal	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	4.17E-06	mg/kg/day	5.70E-02	1/mg/kg/day	2.38E-07
				1,1-DICHLOROETHANE	1.88E+01	µg/L	2.11E-05	mg/kg/day	5.70E-03	1/mg/kg/day	1.20E-07
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	NA	mg/kg/day	NA	NA	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	NA	mg/kg/day	NA	NA	NA
				1,4-DIOXANE	4.37E+00	µg/L	2.24E-07	mg/kg/day	1.00E-01	1/mg/kg/day	2.24E-08
				BENZENE	3.23E+01	µg/L	7.07E-05	mg/kg/day	5.50E-02	1/mg/kg/day	3.89E-06
				CHLOROETHANE	9.96E+00	µg/L	8.36E-06	mg/kg/day	NA	NA	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	2.07E-06	mg/kg/day	3.60E-02	1/mg/kg/day	7.45E-08
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	1.42E-05	mg/kg/day	NA	NA	NA
				NAPHTHALENE	2.36E+02	µg/L	2.25E-03	mg/kg/day	NA	NA	NA
				TRICHLOROETHENE-Kidney (ADAF)	4.28E+00	µg/L	2.95E-05	mg/kg/day	4.60E-02	1/mg/kg/day	2.74E-07
				TRICHLOROETHENE- Liver (NHL)	4.28E+00	µg/L	1.02E-05	mg/kg/day	4.60E-02	1/mg/kg/day	3.78E-07
				VINYL CHLORIDE	1.84E+00	µg/L	6.06E-06	mg/kg/day	7.20E-01	1/mg/kg/day	4.36531E-06
			Exp. Route Total								9.36E-06
		Exposure Point Total									1.13E-04
	Exposure Medium Total										1.13E-04

Table G-20

RAGS Part D TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SE OU10 - Letterkenny Army Depot - Chambersburg, PA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
	Air	Water Vapors from Showerhead	Inhalation	1,1,2-TRICHLOROETHANE	3.10E+00	µg/L	2.23E-08	mg/m3	1.60E-02	1/mg/m3	3.57E-10
				1,1-DICHLOROETHANE	1.88E+01	µg/L	1.86E-07	mg/m3	1.60E-03	1/mg/m3	2.97E-10
				1,2,4-TRIMETHYLBENZENE	1.12E+02	µg/L	NA	mg/m3	NA	1/mg/m3	NA
				1,3,5-TRIMETHYLBENZENE	3.12E+01	µg/L	NA	mg/m3	NA	1/mg/m3	NA
				BENZENE	3.23E+01	µg/L	3.55E-07	mg/m3	7.80E-03	1/mg/m3	2.77E-09
				CHLOROETHANE	9.96E+00	µg/L	1.21E-07	mg/m3	NA	1/mg/m3	NA
				1,2-DICHLOROPROPANE	1.44E+00	µg/L	1.30E-08	mg/m3	1.00E-02	1/mg/m3	1.30E-10
				CIS-1,2-DICHLOROETHENE	1.12E+01	µg/L	1.10E-07	mg/m3	NA	1/mg/m3	NA
				NAPHTHALENE	2.36E+02	µg/L	1.44E-06	mg/m3	3.40E-02	1/mg/m3	4.88E-08
				TRICHLOROETHENE-Kidney (ADAF)	4.28E+00	µg/L	2.23E+00	mg/m^3	4.10E-03	$1/mg/m^3$	2.23E-06
				TRICHLOROETHENE- Liver (NHL)	4.28E+00	µg/L	8.80E-01	mg/m^3	4.10E-03	$1/mg/m^3$	2.73E-06
				VINYL CHLORIDE	1.84E+00	µg/L	9.58E-01	mg/m^3	4.40E-03	$1/mg/m^3$	9.58E-07
			Exp. Route Total								2.93E-05
		Exposure Point Total									2.93E-05
	Exposure Medium Total										2.93E-05
Groundwater Total											1.42E-04
										Total of Receptor Risks Across All Media	1.42E-04

APPENDIX H

LIDA NOTIFICATION LETTERS

DEPARTMENT OF THE ARMY
LETTERKENNY ARMY DEPOT
1 OVERCASH AVENUE
CHAMBERSBURG, PENNSYLVANIA 17201

REPLY TO
ATTENTION OF:

February 2, 2010

BRAC Environmental Office

John Van Horn
Executive Director
Letterkenny Industrial Development Authority
5540 Coffey Avenue
Chambersburg, PA 17201-8382

Dear Mr. Van Horn:

As a requirement of the Land Use Control Assurance Plan (LUCAP) Memorandum of Agreement for the Phase I & II Parcels, a notification letter and map documenting the land use controls (LUCs) was to be prepared jointly by the Army, the Environmental Protection Agency (EPA), and the Pennsylvania Department of Environmental Protection (PADEP). The purpose of this letter is the annual reminder for calendar year 2010 to the Letterkenny Industrial Development Authority (LIDA) of the existing LUCs in place on the Phase I and II Transfer Parcels. A map showing the Phase I and II Parcels is enclosed (Figure 1). The LUCs consist of four restrictions:

1. Commercial/Industrial Use Restriction – Except as otherwise noted, the Phase I and II property shall be used solely for commercial, industrial and agricultural purposes, and not for residential purposes. Parcels 2-74A and 2-74B may be used for any purpose, including residential use. A map showing the commercial/industrial and unrestricted parcels is enclosed (Figure 2).

2. Ground Water Restriction – There shall be no access or use of the ground water underlying the Phase I and II property for any purpose without the prior written approval of Army, PADEP and the EPA, except for access to ground water in accordance with approved excavation activities (see Soil Excavation Restriction below).

3. Soil Excavation Restriction - There shall be no excavation of the soil within 3 feet of the water table on the Phase I and II property without prior written approval of the Army. The Army's approval of excavation activities within 3 feet of the water table will require compliance with (1) the LIDA Sampling plan dated October 1998, (2) the LIDA Health Safety plan dated October 1998, and (3) proper procedures for disposal of contaminated soil and/or ground water. If the ground water is encountered during any excavation activities, all such activities must immediately cease until the Army's written approval is obtained allowing such activities to continue.

The Army must be notified of any excavations greater than 8 feet on certain Phase I & II parcels to prevent contact with underlying groundwater. **Table 1** entitled **"Phase I & II Parcels Requiring Excavation Notification"** lists the Phase I & II parcels that require Army notification prior to excavations greater than 8 feet. Figure 2 identifies the Phase I & II parcel numbers.

4. Subsurface Structure Construction Restriction - There shall be no construction of any subsurface structure for human occupation on the Phase I and II property, without the prior written approval of the Army, PADEP and the EPA.

In summary requests for approval to use or access ground water, excavate soil within 3 feet of the water table or construct a subsurface structure should be directed to the appropriate Army, EPA or PADEP points of contact listed in Appendix B of the LUCAP.

The Army requests that LIDA annually distribute this letter to all of the Cumberland Valley Business Park landowners and tenants.

If there are any questions regarding this matter, please contact the undersigned at (717) 267-9836.

Sincerely,

Bryan Hoke

Bryan Hoke
BRAC Environmental Coordinator

TABLE 1

PHASE I and II PARCELS REQUIRING EXCAVATION NOTIFICATION**

PHASE I	PHASE II
Parcel 1	Parcel 2-35
Parcel 2	Parcel 2-36
Parcel 3	Parcel 2-37
Parcel 4	Parcel 2-38
Parcel 5	Parcel 2-39
Parcel 6	Parcel 2-40
Parcel 7	Parcel 2-41
Parcel 8	Parcel 2-42
Parcel 9	Parcel 2-43
Parcel 10	Parcel 2-44
Parcel 11	Parcel 2-45
Parcel 12	Parcel 2-46
Parcel 13	Parcel 2-47
Parcel 16	Parcel 2-65
Parcel 17	Parcel 2-66
Parcel 18	Parcel 2-67
Parcel 19	Parcel 2-68
Parcel 20	Parcel 2-69
Parcel 21	Parcel 2-71
Parcel 22	Parcel 2-72
Parcel 29	Parcel 2-74A
Parcel 31	Parcel 2-74B
Parcel 33	Parcel 2-76
Parcel 34	

** Notification applies to any excavations greater than 8 feet in depth 2/3/2010

APPENDIX B

AGENCY POINTS OF CONTACT - 2010

1. ARMY POCs:

Bryan Hoke
Letterkenny Army Depot
1 Overcash Avenue, Building 14
Chambersburg, Pennsylvania 17201-4150
717-267-9836

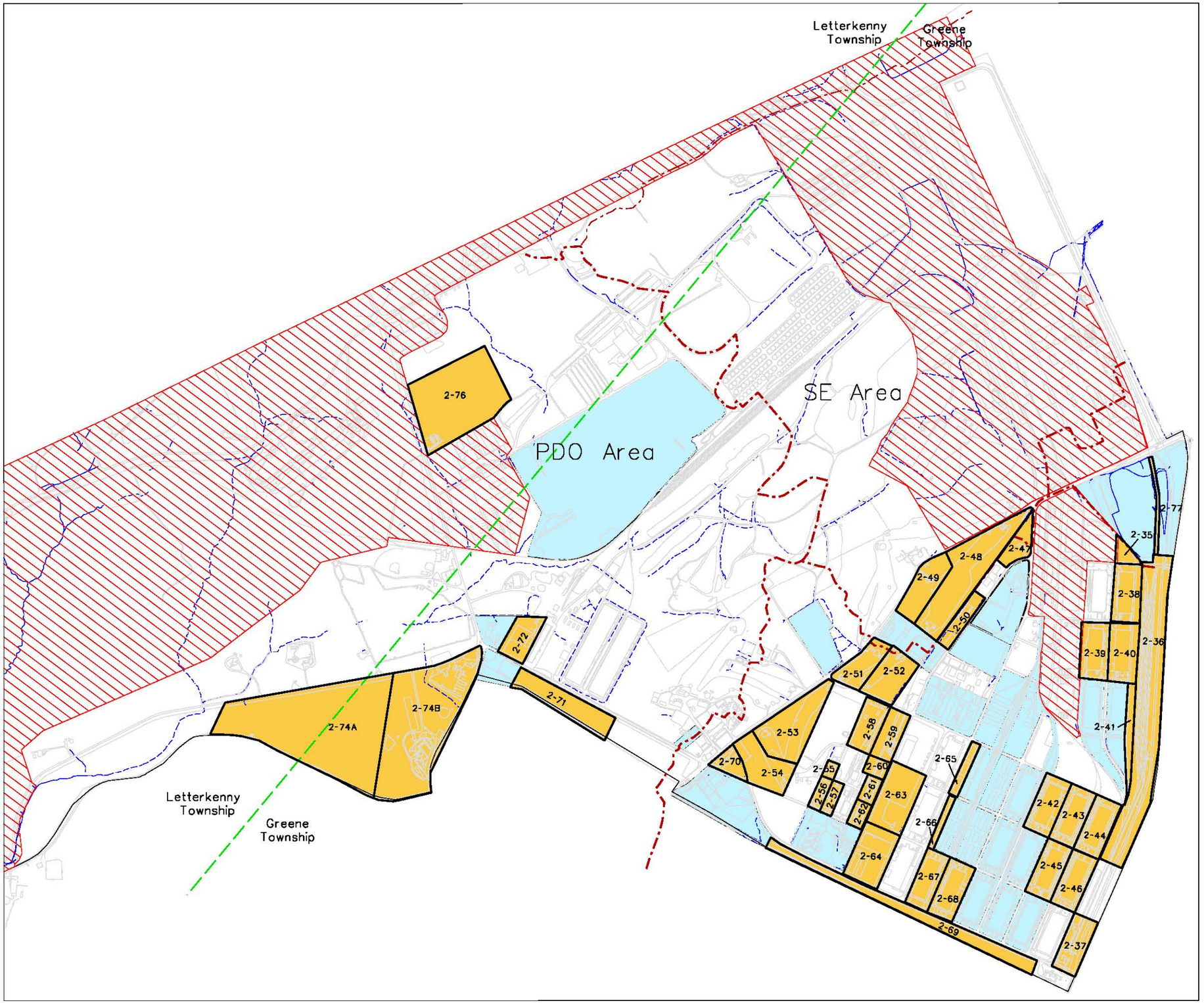
2. EPA POCs:

Susanne Haug (SE Area)
U.S. Environmental Protection Agency Region III
NPL/BRAC Federal Facilities Branch
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
215-814-3357

Gerald Hoover (PDO Area)
U.S. Environmental Protection Agency Region III
NPL/BRAC Federal Facilities Branch
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
215-814-2181

3. PADEP POCs:

Ruth Bishop
Pennsylvania Department of Environmental Protection
Environmental Clean-up Program
909 Elmerton Avenue
Harrisburg, Pennsylvania 17110-8200
717-705-4833



LEGEND:

- Buildings
- Roads
- Letterkenny Active Area
- Phase II Transfer Area
- 2-48 Parcel ID
- Drainage Divide
- Phase I Parcels

0 600 1200 1800 2400
Feet

N

Letterkenny Army Depot
Chambersburg, PA

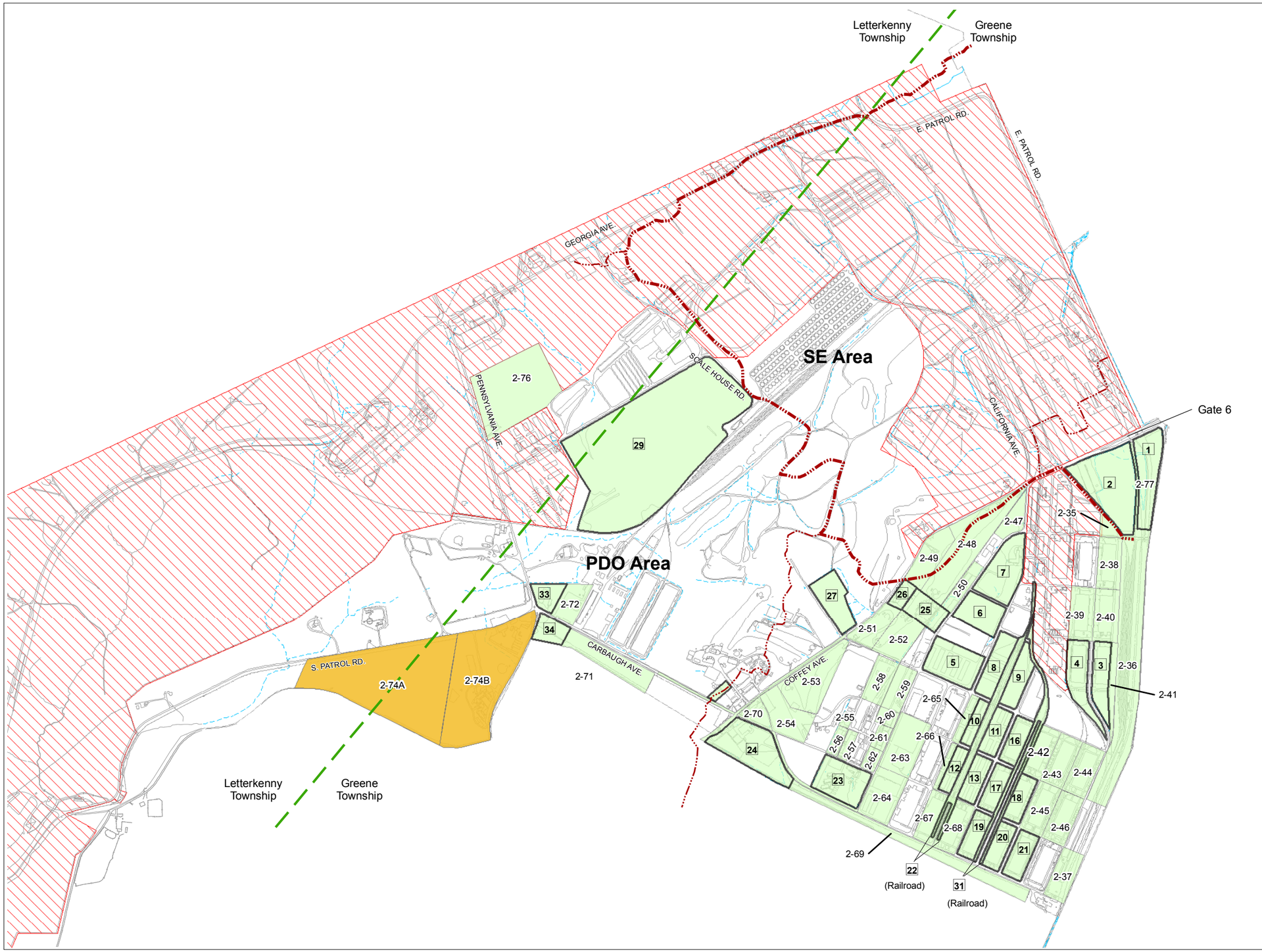
Figure 1
Location of Phase II
Parcels Within PDO and SE Areas

U.S. Army Corps of Engineers
Baltimore District

WESTON

Revision *
Date: 11-21-2001

FSWC6:proj5\letter\mapping\n27\phaseII\lease_fost4a.dgn



Legend:

- Buildings
- Army Retained Area
- 2-48 Parcel ID
- Commercial/Industrial Use
- Unrestricted Use
- Roads
- SE/PDO Divide Major
- SE/PDO Divide Sub-division
- Drainage
- Township Line (Approximate)

N W E S

1,350 675 0 1,350 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 2
Phase I and II
Parcels Within PDO and SE Areas

U.S. Army Corps of Engineers
Baltimore District

Date:
02/02/10

File: \\fsfed01\tig\LEAD\MXD\PhaseI_II_Parcel.mxd, 02-Feb-10 10:40, ricksc

DEPARTMENT OF THE ARMY
LETTERKENNY ARMY DEPOT
1 OVERCASH AVENUE
CHAMBERSBURG, PENNSYLVANIA 17201

REPLY TO
ATTENTION OF:

January 24, 2011

BRAC Environmental Office

John Van Horn
Executive Director
Letterkenny Industrial Development Authority
5540 Coffey Avenue
Chambersburg, PA 17201-8382

Dear Mr. Van Horn:

As a requirement of the Land Use Control Assurance Plan (LUCAP) Memorandum of Agreement for the Phase I & II Parcels, a notification letter and map documenting the land use controls (LUCs) was to be prepared jointly by the Army, the Environmental Protection Agency (EPA), and the Pennsylvania Department of Environmental Protection (PADEP). The purpose of this letter is the annual reminder for calendar year 2011 to the Letterkenny Industrial Development Authority (LIDA) of the existing LUCs in place on the Phase I and II Transfer Parcels. A map showing the Phase I and II Parcels is enclosed (Figure 1). The LUCs consist of four restrictions:

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3. Soil Excavation Restriction - There shall be no excavation of the soil within 3 feet of the water table on the Phase I and II property without prior written approval of the Army. The Army's approval of excavation activities within 3 feet of the water table will require compliance with (1) the LIDA Sampling plan dated October 1998, (2) the LIDA Health Safety plan dated October 1998, and (3) proper procedures for disposal of contaminated soil and/or ground water. If the ground water is encountered during any excavation activities, all such activities must immediately cease until the Army's written approval is obtained allowing such activities to continue.

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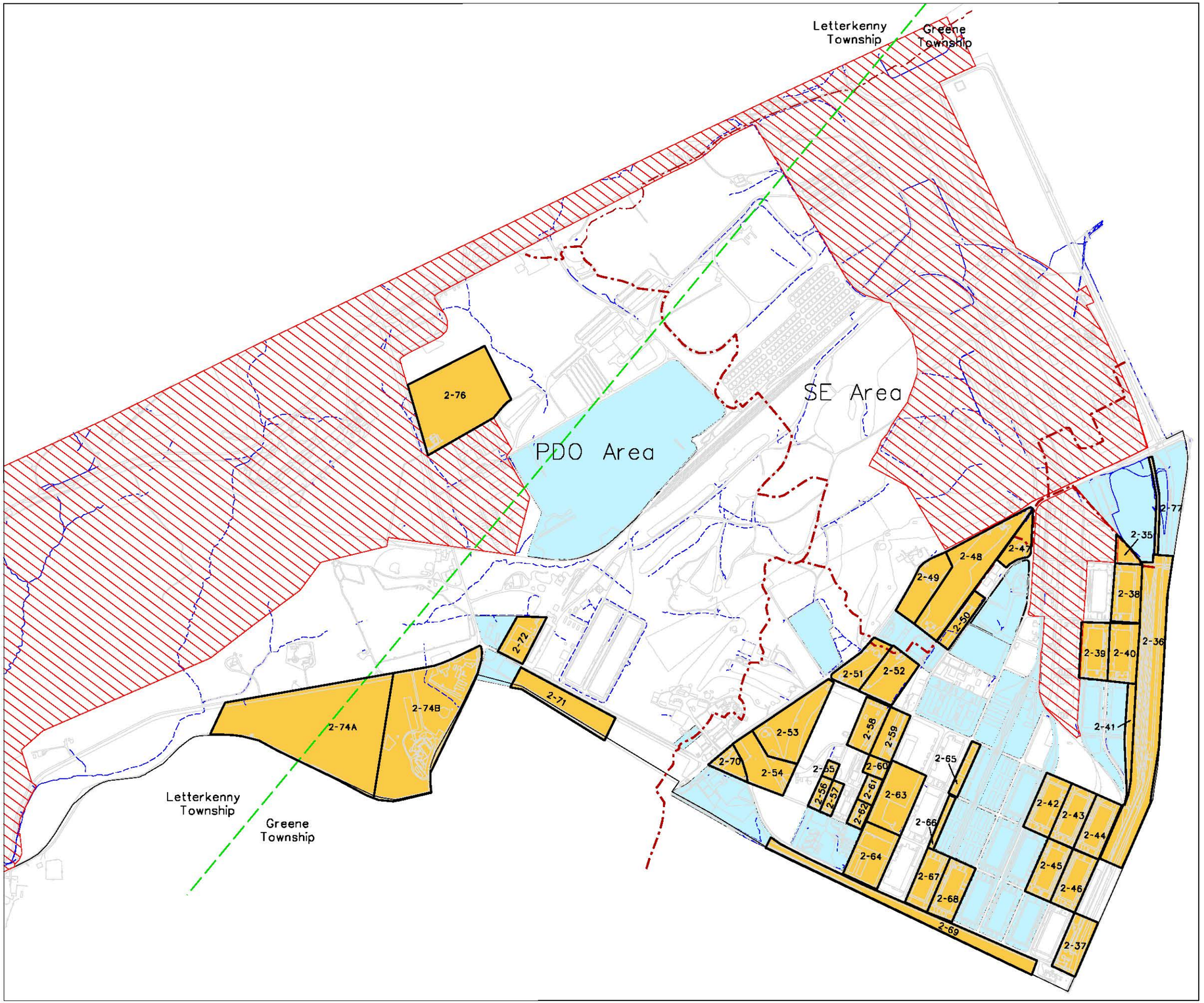
In summary requests for approval to use or access ground water, excavate soil within 3 feet of the water table or construct a subsurface structure should be directed to the appropriate Army, EPA or PADEP points of contact listed in Appendix B of the LUCAP.

The Army requests that LIDA annually distribute this letter to all of the Cumberland Valley Business Park landowners and tenants.

If there are any questions regarding this matter, please contact the undersigned at (717) 267-9836.

Sincerely,

Bryan Hoke
BRAC Environmental Coordinator



LEGEND:

- Buildings
- Roads
- Letterkenny Active Area
- Phase II Transfer Area
- 2-48 Parcel ID
- Drainage Divide
- Phase I Parcels

0 600 1200 1800 2400
Feet

N

Letterkenny Army Depot
Chambersburg, PA

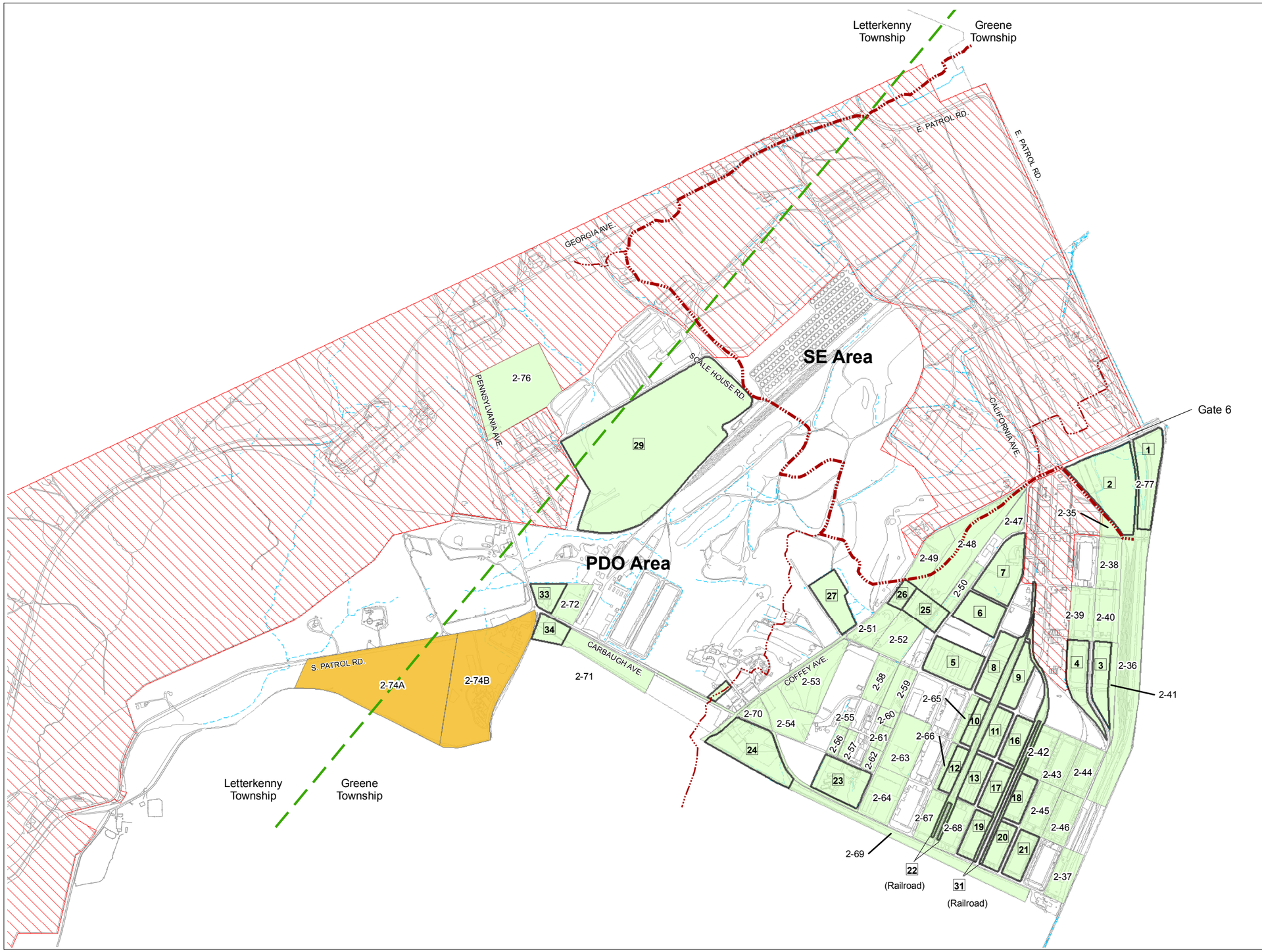
Figure 1
Location of Phase II
Parcels Within PDO and SE Areas

U.S. Army Corps of Engineers
Baltimore District

WESTON

Revision *
Date: 11-21-2001

FSWC6:proj5\letter\mapping\n27\phaseII\lease_fost4a.dgn



Legend:

- Buildings
- Army Retained Area
- 2-48 Parcel ID
- Commercial/Industrial Use
- Unrestricted Use
- Roads
- SE/PDO Divide Major
- SE/PDO Divide Sub-division
- Drainage
- Township Line (Approximate)

N W E S

1,350 675 0 1,350 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 2
Phase I and II
Parcels Within PDO and SE Areas

U.S. Army Corps of Engineers
Baltimore District

Date:
02/02/10

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APPENDIX I

SE OU 2 SOIL DATA SUMMARY TABLE

Appendix I

TCE Soil Concentrations from Figure 3 of the FS (1994 and 2001 data) (Shaw, 2004e)

1994 Sample ID - depth (ft)	Result µg/kg	Qualifier	2001 Sample ID - depth (ft)	Result µg/kg	Qualifier
109M-22	1.4	B	37A-01-2	**5**	J
109L-12	3.1	B	37A-01-9	6	U
109J-8	3.5	UJ	37A-01-14	6	U
109K-16	**18**		37A-02-7	7	U
109-1	3.5	UJ	37A-02-9	7	U
109C-16	**50**	J	37A-02-14	**4**	J
109D-8	3.3	UJ	37A-03-5	5	U
1010-2	3.2	B	37A-03-16	7	U
101A-16	**36**	J	37A-04-6	7	U
101M-9	**12.8**		37A-04-9	**45**	
101P-13	**27**	J	37A-04-11	**18**	
103E-4	3.1	B	37A-05-6	6	U
103C-16	3.6	UJ	37A-05-10	7	U
104L-9	1.8	UJ	37A-05-14	**21**	
104K-9	3.6	UJ	37A-06-5	6	U
105F-9	1.2	UJ	37A-06-10	7	U
105G-9	1.1	UJ	37A-06-14	6	U
105-20	**36**	J	37A-07-5	6	U
104F-9	3.9	UJ	37A-07-10	6	U
105D-9	3.3	UJ	37A-07-14	6	U
			37A-08-5	6	U
			37A-08-10	6	U
Samples replaced by 2001 sampling event:			37A-08-15	6	U
109B	101I		37A-08-19	6	U
109E	101G		37A-09-5	6	U
109N	101N		37A-09-10	7	U
109I	102		37A-09-16	7	U
See Figure 3 of the SE OU2 FS (Shaw, 2004e)			37A-10-2	6	U
			37A-10-5	7	U

Overall Stats:	
Frequency of Detection=	**11/49**
Overall Max=	**50**
Overal Mean=	**24.8**

U = Not detected at detection limit indicated

UJ = Not detected at estimated detection limit indicated

J = Estimated value, below detection limit