United States Department of Energy

Savannah River Site

Record of Decision
Remedial Alternative Selection for the
L-Area Southern Groundwater Operable Unit (NBN) (U)

CERCLIS Number: 77

WSRC-RP-2006-4052

Revision 1.1

March 2007

Prepared by:
Washington Savannah River Company LLC
Savannah River Site
Aiken, SC 29808

Prepared for U.S. Department of Energy under Contract No. DE-AC09-96SR18500

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Prepared for
U.S. Department of Energy
and
Washington Savannah River Company LLC
Aiken, South Carolina

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

L-Area Southern Groundwater Operable Unit (NBN) (U)

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WSRC-RP-2006-4052
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Savannah River Site
Aiken, South Carolina

Prepared by:

Washington Savannah River Company LLC
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U. S. Department of Energy under Contract DE-AC09-96SR18500
Savannah River Operations Office
Aiken, South Carolina

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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

L-Area Southern Groundwater (NBN)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU-77

Savannah River Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy

The L-Area Southern Groundwater Operable Unit (NBN) (LASG OU) is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/CERCLA unit in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS).

The FFA is a legally binding agreement between regulatory agencies (United States Environmental Protection Agency [USEPA] and South Carolina Department of Health and Environmental Control [SCDHEC]) and regulated entities (United States Department of Energy [USDOE]) that establishes the responsibilities and schedules for the comprehensive remediation of SRS. Local groundwater is the only environmental medium that will be addressed by the Selected Remedy at the LASG OU; surface water downgradient of the LASG OU will be monitored to evaluate the effectiveness of the Selected Remedy.

Statement of Basis and Purpose

This decision document presents the Selected Remedy for the LASG OU in northwestern Barnwell County, South Carolina, which was chosen in accordance with CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), and, to the extent

practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record File for this site.

USEPA, SCDHEC, and USDOE concur with the Selected Remedy.

Assessment of the Site

There have been releases of tritium, tetrachloroethylene (PCE), and trichloroethylene (TCE) to the environment at LASG, resulting in three groundwater plumes with contaminant concentrations above maximum contaminant levels (MCLs). The response action selected in this record of decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. There are no active sources of groundwater contamination in the LASG OU. Historical sources have been remediated, depleted, or reconditioned for new missions (L-Area Disassembly Basin [LADB]).

Description of the Selected Remedy

The scope of the LASG OU remedial action is limited to local groundwater. The expected future use of L Area and the LASG OU is industrial.

The Selected Remedy for the LASG OU is monitored natural attenuation with institutional controls (MNA/IC). MNA/IC has been selected over the more robust technologies considered in the Corrective Measures Study/Feasibility Study (CMS/FS) (WSRC 2006a) for the following reasons:

- There are no active, continuing sources of groundwater contamination at the LASG OU.

- There is no practicable treatment technology to remove tritium from groundwater.

- Natural attenuation processes (dispersion, dilution, and radioactive decay) are occurring at the LASG OU and are effective in reducing contaminant concentrations below remedial goal options (RGOs).

- The only construction required for implementation of MNA/IC is the installation of additional groundwater monitoring wells; MNA/IC can be implemented in 3 to 6 months.

- MNA/IC will achieve the LASG OU remedial objectives for all contaminants within a time frame (approximately 90 years) that is comparable to that offered by the more robust technologies and at significantly lower cost.

- Groundwater discharge to surface water is not impacting human health or ecological receptors. Although tritium concentrations have exceeded the MCL in L Lake in the vicinity of plume discharge, concentrations are less than the MCL at the L Lake spillway. Volatile organic compounds (VOCs) have not been detected in the surface water in L Lake.

The components of MNA/IC at the LASG OU are:

- Contaminant concentrations in local groundwater and surface water will be reduced by natural attenuation processes including dispersion, dilution, and radioactive decay.

- The long-term monitoring of groundwater conditions in the plumes and surface water conditions in L Lake will ensure that the expected natural attenuation processes are performing as modeled. It will also ensure that changing conditions are recognized and will allow for response to the new conditions: a re-evaluation of the groundwater model or MNA monitoring network, an earlier than anticipated suspension of operations and maintenance (O&M) activities, or implementation of a supplementary or alternate technology.

- ICs at LASG OU will consist of groundwater use restrictions and Site Use/Site Clearance restrictions. The SRS site boundary fencing and security personnel will prevent trespassers from gaining access to the surface of LASG OU and the monitoring wells. In the long term, if the property is transferred to nonfederal ownership, the U.S. Government will take those actions mandated by Section 120(h) of CERCLA including deed notification to disclose former waste management and disposal activities as well as remedial actions taken on the site. Deed restrictions will preclude the use of local groundwater as a source of potable water, until the remedial action objectives (RAOs) for groundwater are achieved.

Due to the complexity of multiple contaminated areas, SRS has been divided into Integrator Operable Units (IOUs) for the purpose of managing a comprehensive cleanup strategy. IOU boundaries generally correspond to natural watersheds or drainage corridors and may include many OUs. OUs within an IOU are evaluated and remediated individually. The public has the opportunity to participate in the remedy selection process for each OU. The LASG is an OU located within the Steel Creek IOU and any remedial action for the surface water will be developed under the Steel Creek IOU ROD. This is the final ROD for the LASG OU. Upon disposition of all OUs within the Steel Creek IOU, a comprehensive ROD for the IOU will be pursued with additional public involvement.

Source units have been dispositioned under separate RODs or will be addressed as part of the L-Area OU. The LASG OU remedial action will address the two commingled VOCs and tritium plumes south of L Area and the tritium plume west of the reactor. The final overall strategy for addressing the LASG OU is to implement MNA/IC as the final remedy to remediate groundwater contamination at LASG OU.

The RCRA permit will be revised to reflect selection of the final remedy using the procedures under 40 CFR Part 270 and SCHWMR R.61-79.264.101; 270.

Statutory Determinations

Based on the unit RCRA Facility Investigation/Remedial Investigation (RFI/RI) report the LASG OU poses a threat to human health and the environment. Therefore, MNA/IC (Alternatives VT-3A and T-2) has been selected as the remedy for the LASG OU. LASG OU does not contain principal threat source material. The future land use of the LASG OU is assumed to be industrial land use.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate (ARARs) to the remedial action (unless justified by a waiver), and is cost-effective. The remedy in this OU does not satisfy the statutory preference for treatment as a principal element of the remedy because there is no practicable remedial technology capable of reducing the toxicity, mobility, or volume of tritium in the groundwater and the predicted concentrations of TCE and PCE are low enough that treatment is unnecessary, given the predicted length of time required for tritium to attenuate to its MCL.

Section 120(h) of CERCLA requires performance of specific actions if the property is ever transferred to nonfederal ownership. Those actions include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the groundwater beneath the property is contaminated. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

The deed shall also include deed restrictions precluding residential use of contaminated groundwater. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with USEPA and SCDHEC review and approval.

In addition, if the site is ever transferred to nonfederal ownership, a survey plat of the OU will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

The Selected Remedy for the LASG OU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions until groundwater is restored to MCLs. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS has implemented a Land Use Control and Assurance Plan (LUCAP) to ensure that the LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific Land Use Control Implementation Plan (LUCIP) incorporated by reference into this ROD will provide details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this ROD. The LUCIP, developed as part of this action, will be submitted concurrently with the Corrective Measures Implementation (CMI)/Remedial Action Implementation Plan (RAIP), as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect unless and until modifications are approved as needed to be protective of human health and the environment. LUCIP modification will only occur through another CERCLA document.

Data Certification Checklist

This ROD provides the following information:

- Refined constituents of concern (RCOCs) and their respective concentrations (Sections II and V)

- Cleanup levels established for the RCOCs and the basis for the levels (Section VIII, Table 2)

- Current and reasonably anticipated future land and groundwater use assumptions used in the ROD (Section XII)

- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (Section XI)

- Estimated capital, operation and maintenance, and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected (Section XI, Appendix C)

- Key decision factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) (Section XI)

- All historical source materials constituting principal threats in the LASG OU have been remediated or depleted (Section II)

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4/11/07
Date

Jeffrey M. Allison
Manager
U. S. Department of Energy
Savannah River Operations Office

4/24/07
Date

Franklin E. Hill
Acting Director
Superfund Division
U. S. Enyironmental Protection Agency - Region 4

4/20/07
Date

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Deputy Commissioner
Environmental Quality Control
South Carolina Department of Health and Environmental Control

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

L-Area Southern Groundwater Operable Unit

CERCLIS Number: 77

WSRC-RP-2006-4052
Revision 1.1

March 2007

Savannah River Site
Aiken, South Carolina

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Aiken, South Carolina

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

4Q2000	fourth calendar quarter 2000
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CMI	corrective measures implementation
CMS	corrective measures study
COC	constituent of concern
CPT	cone penetrometer technology
CSM	conceptual site model
CY	calendar year
DQO	data quality objectives
ESD	explanation of significant difference
FFA	Federal Facility Agreement
FS	feasibility study
g/cc	grams per cubic centimeters
HBL	health-based limit
HSWA	Hazardous and Solid Waste Amendments
IC	institutional controls
IOU	integrator operable unit
J	data qualifier, The analyte was positively detected below quantitation limits, the reported value is estimated.
LAACB	L-Area Acid/Caustic Basin
LAC	L-Area Acid/Caustic Basin groundwater monitoring well
LADB	L-Area Disassembly Basin
LAERB	L-Area Emergency Retention Basin
LAHS	L-Area Hot Shop
LAOCB	L-Area Oil and Chemical Basin
LAOU	L-Area Operable Unit
LASG	L-Area Southern Groundwater
LAW	L-Area Research Well groundwater monitoring well
LCO	L-Area Oil and Chemical Basin groundwater monitoring well
LDB	L-Area Disassembly Basin groundwater monitoring well
LLC	Limited Liability Company
LRSB	L-Area Reactor Seepage Basin
LSB	L-Area Reactor Seepage Basin groundwater monitoring well
LUC	Land Use Controls
LUCAP	Land Use Controls Assurance Plan
LUCIP	Land Use Controls Implementation Plan

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

MCL	maximum contaminant level
MDL	method detection limit
µg/L	micrograms/liter (parts per billion)
mg/L	milligrams per liter (parts per million)
mmHg	millimeters of mercury
MNA	monitored natural attenuation
MNA/IC	monitored natural attenuation/institutional controls
mrem	millirem (Roentgen equivalent man)
msl	mean sea level
NBN	no building number
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Protection Act
NPL	National Priorities List
O&M	operations and maintenance
OMB	Office of Management and Budget
OU	operable unit
PCE	tetrachloroethylene
pCi/L	picoCuries/liter
PRB	permeable reactive barrier
PRG	preliminary remedial goal
RAIP	remedial action implementation plan
RAO	remedial action objective
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RFI/RI	RCRA facility investigation/remedial investigation
RG	remedial goal
RGO	remedial goal option
RI	remedial investigation
ROD	record of decision
SARA	Superfund Amendments Reauthorization Act
SB/PP	statement of basis/proposed plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SRS	Savannah River Site
TBC	to-be-considered
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WSRC	Westinghouse Savannah River Company LLC prior to December 8, 2005; Washington Savannah River Company LLC after December 8, 2005

I. SAVANNAH RIVER SITE AND OPERABLE UNIT NAME, LOCATION, AND DESCRIPTION

Unit Name, Location, and Brief Description

L-Area Southern Groundwater (LASG) Operable Unit (OU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 77

Savannah River Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy (USDOE)

Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina.

USDOE owns SRS, which historically produced tritium, plutonium, and other special nuclear materials for national defense and the space program. Chemical and radioactive wastes are byproducts of nuclear material production processes. Hazardous substances, as defined by the CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists the LASG OU as a Resource Conservation and Recovery Act (RCRA) Solid Waste Management Unit/CERCLA unit requiring further evaluation.

The LASG was evaluated through an investigation process that integrates and combines the RCRA corrective action process with the CERCLA remedial process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

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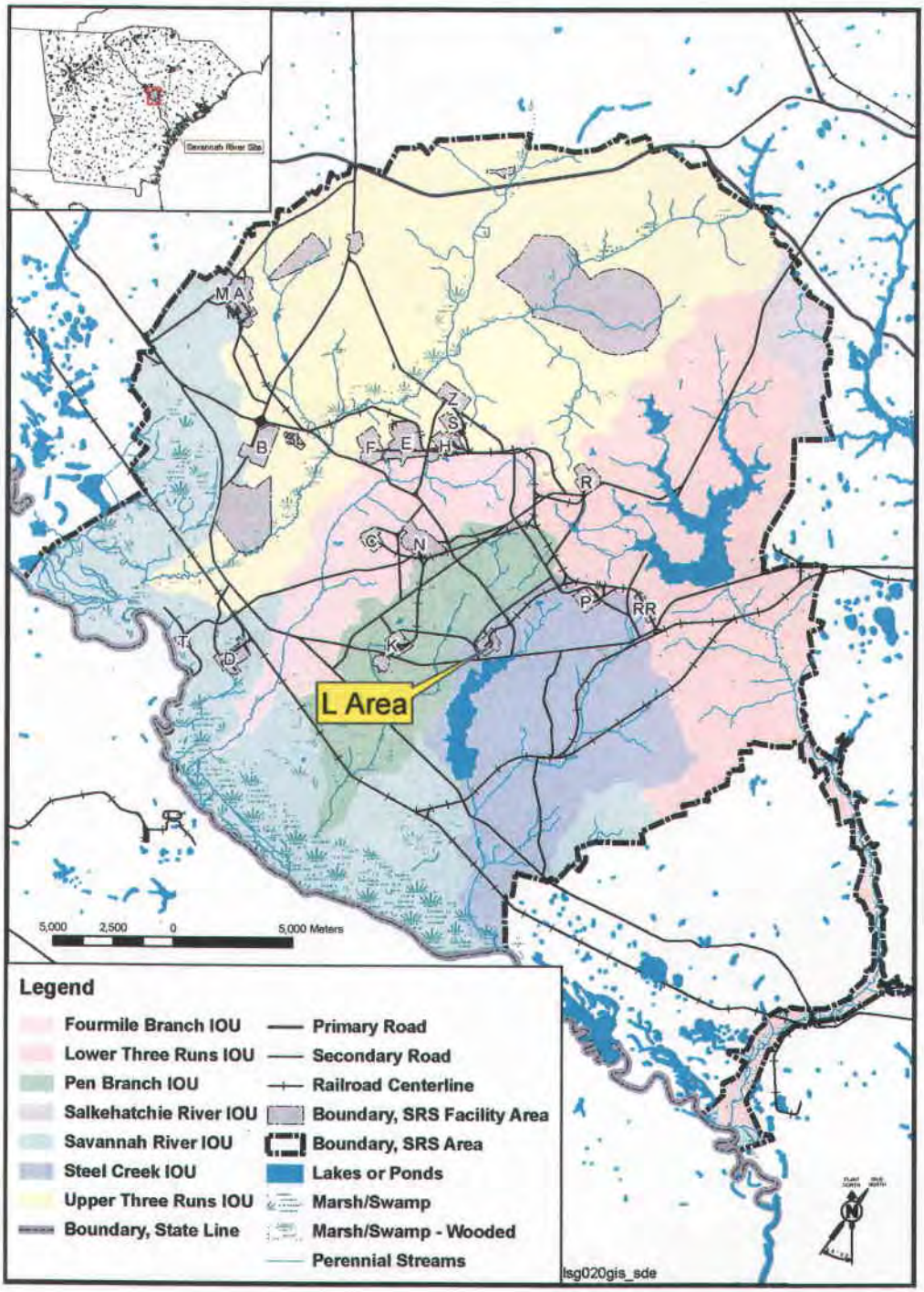

Figure 1. Location of the LASG OU within the Savannah River Site

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II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

The primary mission of SRS has been to produce tritium, plutonium, and other special nuclear materials for our nation's defense programs. Production of nuclear materials for the defense program was discontinued in 1988. SRS has provided nuclear materials for the space program, as well as for medical, industrial, and research efforts up to the present. Chemical and radioactive wastes are byproducts of nuclear material production processes. These wastes have been treated, stored, and in some cases, disposed at SRS. Past disposal practices have resulted in soil and groundwater contamination.

Hazardous waste materials handled at SRS are managed under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities require South Carolina Department of Health and Environmental Control (SCDHEC) operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from SCDHEC, which was most recently renewed on September 30, 2003. Module VIII of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List (NPL). The inclusion created a need to integrate the established RCRA facility investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 United States Code Section 9620, USDOE has negotiated an FFA (FFA 1993) with United States Environmental Protection Agency (USEPA) and SCDHEC to coordinate remedial activities at SRS as one comprehensive strategy to fulfill

these dual regulatory requirements. USDOE functions as the lead agency for remedial activities at SRS, with concurrence by USEPA-Region 4 and SCDHEC.

Operable Unit Operational and Compliance History

The L-Area Reactor achieved criticality in August 1954 and operated from 1954 to 1968 and 1984 to 1988. Between 1968 and 1984, the status of L Reactor was warm standby due to decreased demand for plutonium and tritium. L Lake, constructed in 1985 as a cooling pond for L-Reactor, covers 1034 acres and contains 7-billion gallons of water.

The LASG OU encompasses all of the groundwater from the L-Area groundwater divide south to L Lake. The original pre-characterization LASG OU covered about 1250 acres and included several remediated/depleted source units. The remediated/depleted (historical) source units supported past production activities at L-Reactor and other production areas that produced nuclear materials for national defense. Past activities at the remediated/depleted source units have resulted in groundwater contamination beneath LASG OU. As the result of characterization activities, SRS has identified the areas in which groundwater contamination exceeds applicable maximum contaminant levels (MCLs) and developed a land use controls (LUC) outline. The LUC outline (Figure 2) includes all groundwater contaminated above MCLs within the OU and under adjacent portions of L Lake, comprising approximately 950 acres. Restrictions on the use of groundwater within the LUC outline will be enforced as long as contaminant levels exceed MCLs. In this ROD, the LUC outline will be used as the OU outline. The original OU outline and the LUC outline are both shown on Figure D-1 in Appendix D.

The LASG OU has been administratively separated from surficial source units to provide a comprehensive evaluation of groundwater beneath southern L Area.

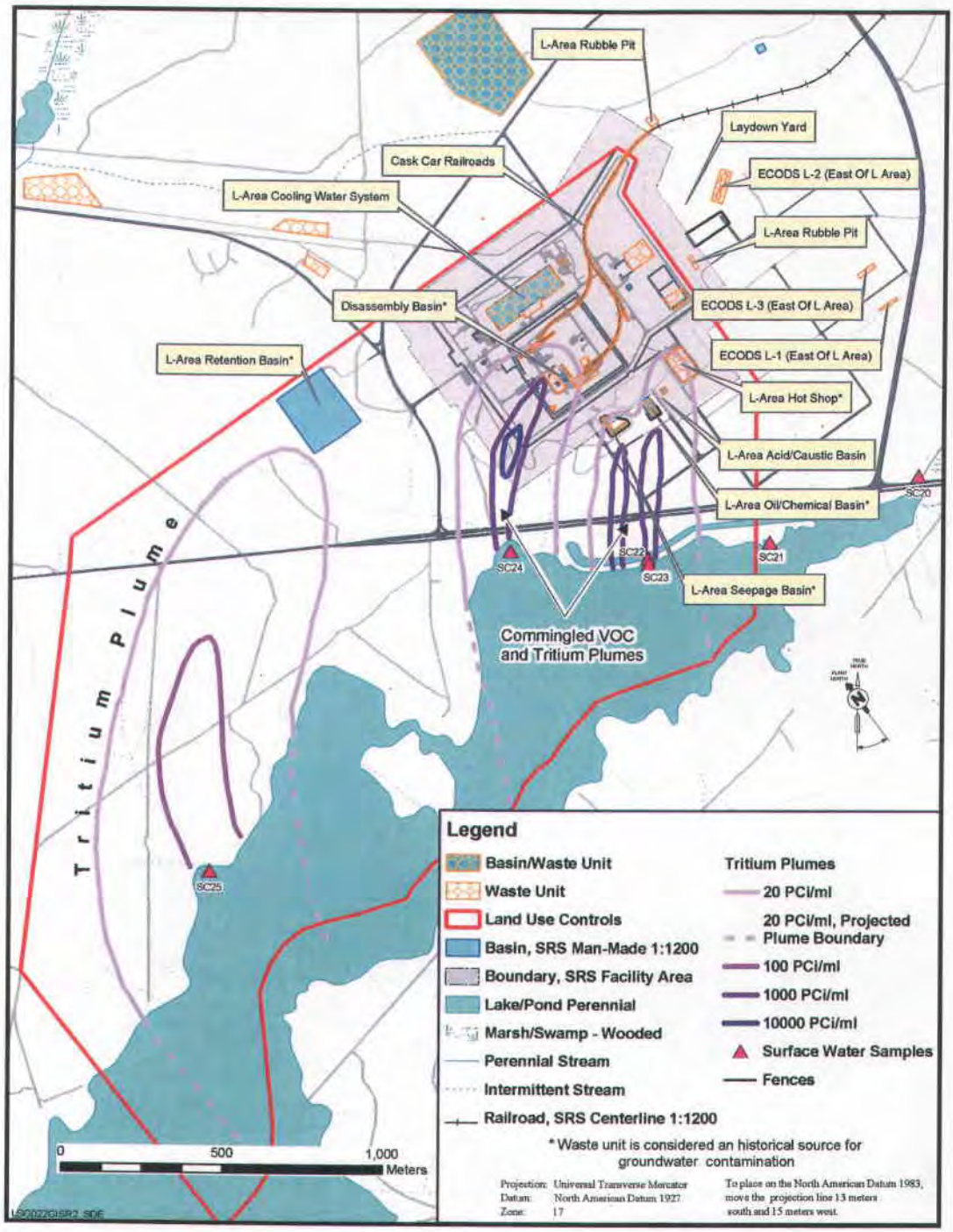

Figure 2. Layout of the L-Area Southern Groundwater Operable Unit with Tritium Plumes

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The known surficial source units in and around L Area were previously evaluated individually to assess the surficial source unit's impact on local groundwater.

The remedy proposed under this ROD only addresses contaminated groundwater. Recognized source units within L Area have been remediated to reduce the toxicity, mobility, or volume of the contamination which constituted sources of contamination to the groundwater. The source units are discussed briefly in this ROD to provide context for the contaminated groundwater and are not addressed under this ROD. The source units have been remediated under the following RODs:

- *Unit-specific Plug-in Record of Decision Amendment for the C-Area Reactor Seepage Basin (904-67G) and L-Area Reactor Seepage Basin (904-54G) (U)*, WSRC-RP-2002-4063, Revision 1, August 2002 (WSRC 2002)
- *Record of Decision/Remedial Alternative Selection for the L-Area Oil and Chemical Basin (904-83G) and L-Area Acid/Caustic Basin (904-79G) (U)*, WSRC-RP-97-143, Revision 1, July 1997 (WSRC 1997)
- *Record of Decision/Remedial Alternative Selection for the L-Area Hot Shop (Including CML-003 Sandblast Area) Operable Unit (U)*, WSRC-RP-2002-4025, Revision 1.1, May 2003 (Building Numbers: 712-G, 717-G, 707-G, 080-1G, and 080-2G) (WSRC 2003)

Other historical sources, listed below, also previously contributed to groundwater contamination. However, these contaminant sources do not currently contribute to groundwater contamination and therefore do not require remediation.

- L-Area Emergency Retention Basin (904-87G) (LAERD) – LAERD was never used as designed; tritiated water was released to the basin during testing in the 1980s. The LAERD is no longer active. Rainwater flushed

the original tritium source out of the unit into the groundwater through the permeable bottom of the basin.

- L-Area Disassembly Basin (LADB) – Groundwater contamination is the result of leaks and spills associated with previous operations. Upgrades to equipment and handling processes at LADB support its current mission as the receiving basin for offsite fuel. Current data indicate the LADB is not an active source of ground water contamination.

The following subsections provide background information on the activities at the sources that led to the contamination of the groundwater in specific portions of the OU.

Groundwater conditions in the LASG OU were investigated by sampling groundwater from 109 cone penetrometer technology (CPT) locations between January 2000 and January 2004 (most of the sampling occurred in 2000).

The first groundwater monitoring wells at L Area were installed in November 1981 at the L-Area Oil and Chemical Basin (LAOCB). Groundwater characterization included the review of analytical data from 93 monitoring wells within the LASG OU. The refined constituents of concern (RCOCs) for groundwater at LASG OU are tritium, tetrachloroethylene (PCE), and trichloroethylene (TCE). Tritium, a radioactive isotope of hydrogen, was produced in the reactor and the volatile organic compounds (VOCs), PCE and TCE, were used as solvents and degreasers. The highest contaminant levels observed in local groundwater, broken into three groups (Pre-remedial investigation [RI], RI, and Post-RI), are summarized in the following insert; CPT data are included in the pre-RI data set.

RCOC	MCL	Pre-RI	RI	Post-RI
Tritium	20 pCi/mL	26,200	5,850	1230
PCE	5 µg/L	165	58	60
TCE	5µg/L	124	9	21

Monitoring well data collected in the period fourth calendar quarter 2000 through second calendar quarter 2004 (4Q2000 through 2Q2004) were evaluated to assess current groundwater concentrations of the RCOCs during the RI; well data were selected over CPT data because multiple samples from the same interval over time could be compared to resolve anomalies. The bulk of contaminated groundwater (more than 92%) is confined to the portion of the Upper Three Runs aquifer above the tan clay. Groundwater contamination at the LASG OU comprises three plumes (see Figure 2):

- the western tritium plume, which originated at the L-Area Emergency Retention Basin (LAERB);
- the southwest commingled VOC and tritium plume, which originated in the vicinity of the L-Area Disassembly Basin (LADB); and
- the southeast commingled VOC and tritium plume, with likely sources in L-Area Reactor Seepage Basin (LRSB), the L-Area Oil and Chemical Basin (LAOCB), and the L-Area Hot Shop (LAHS).

As discussed in the following paragraphs, all former (remediated/depleted) source units are either remediated or depleted and are no longer a threat to groundwater.

Source of Western Tritium Plume

L-Area Emergency Retention Basin: The 50,000,000-gallon LAERB, located west of L Area, was the source of the western tritium plume. The LAERB was constructed in 1963 to serve as containment for the emergency reactor cooling system in the event that a loss of cooling or circulation occurred within the reactor. The LAERB was never used for its intended purpose, but a spray test of the piping system leading to the basin was conducted in the mid-1980s using water from the LADB. The water was first processed using a deionizer to remove cesium and filters to remove particulate matter, but it still contained some tritium.

The LAERB is normally dry and does not contain standing water except immediately after rainfall events. This condition indicates that the basin bottom is permeable and rainfall infiltrates rapidly. The soil of the basin floor has not been sampled. Soil sampling is not necessary because tritium was flushed out of vadose zone soils by infiltrating rainfall.

Groundwater conditions in the western tritium plume and adjacent to the LAERB were investigated utilizing CPT samples from 2000 to 2004. Based on process history, there is no indication that significant concentrations of VOCs were discharged to the basin. Only one sample from the entire western tritium plume contained detectable VOCs; a CPT sample contiguous to the basin yielded 1.33 µg/L TCE. The highest tritium activity found in samples located adjacent to the basin was 3.86 pCi/mL, which is not significantly higher than background levels. The maximum tritium activity in the western tritium plume was 365 pCi/mL in a CPT located 1,100 ft downgradient of the basin. Given the low tritium and VOC levels adjacent to the LAERB, the basin is now depleted as a source. The LAERB will be evaluated under the L-Area Operable Unit (LAOU).

Sources of Southwest Commingled VOC and Tritium Plume

L-Area Disassembly Basin Area: The sources of the commingled VOC and tritium plume southwest of L Area have been attributed to leaks in transfer equipment and lines around the LADB. The LADB actually consisted of a series of concrete basins, which were coated with a protective vinyl barrier to minimize contact between the basin water and the concrete, reducing the potential for leakage. During the period that the reactor was operating, the basins were used for cooling and disassembling irradiated fuel and target assemblies before components were transferred to the separations facilities. Since the Receiving Basin for Offsite Fuel was shut down in 2003, the LADB has been reconditioned for a new mission, including unloading, inspecting, storing, disassembling, and

repacking spent fuel from offsite sources. Receiving activities at the LADB will be a continuing mission for USDOE as needed for the foreseeable future.

During operation, tritiated water was routinely transferred to the reactor seepage basin to maintain tritium activity below the 400,000 pCi/mL tritium limit in the LADB for the safety of reactor workers. Tritium activity in the LADB water has been steadily decreasing due to radioactive decay and evaporation since L-Reactor went inactive in 1988. From December 1992 through December 2005, tritium activity in the basin water decreased from 77,000 pCi/mL to 11,000 pCi/mL. Non-tritiated water is added to the LADB to offset evaporation and maintain water level, diluting the tritium level in the basin water and effecting more reduction in tritium activity than can be accounted for by radioactive decay.

Monitoring wells were installed at the LADB in September 1985. There is no indication that the integrity of the LADB was ever compromised. Water levels in the LADB are monitored visually and mechanically; water level data are integrated with records of make-up water added to ensure that the basin is not leaking. Downgradient groundwater in the LDB wells is monitored bimonthly for tritium to detect any increases in tritium which would indicate leaking.

VOCs were not used in disassembly basin processes, but PCE and TCE were used for degreasing new fuel components prior to preparing the fuel assemblies and for maintenance activities performed in the reactor area. Releases from these activities, associated with degreasing operations, were the likely source of the VOCs in the groundwater.

Sources of the Southeast Commingled VOC and Tritium Plume

The source of the commingled tritium and VOC plume southeast of L Area is uncertain, but probable sources were the L-Area Reactor Seepage Basin (LRSB), the L-Area Oil and Chemical Basin (LAOCB), and the L-Area Hot Shop (LAHS).

These waste units have already been closed under separate records of decision (RODs).

L-Area Reactor Seepage Basin: The LRSB was constructed and placed in service in 1958. The LRSB received discharges from the LADB infrequently during the period that the reactor was active. Groundwater monitoring began in 1986 at the seepage basin.

The cumulative radiological risk to the industrial worker from the LRSB was $3x10^{-3}$, primarily due to cobalt-60 in soil. Strontium-90 was also identified as a contaminant migration constituent of concern (COC) in soil. Remedial action was required to prevent exposure of receptors to contaminated soils and prevent migration of strontium-90 to the aquifer. From 3Q1989 through 4Q1991, tritium levels in local groundwater were greater than 4000 pCi/mL; tritium in the groundwater has not exceeded the MCL since 3Q2000. The remedial action for the LRSB, completed in August 2003, consisted of backfilling the basin and installing a low permeability cover.

There is no active source of tritium at the LRSB, and tritium levels in the groundwater are declining. PCE and TCE have not been detected in the surrounding monitoring wells; LRSB never contained VOCs.

L-Area Oil and Chemical Basin: The LAOCB was constructed in 1961 to receive low-level radioactive oil and chemical wastes from production and research areas throughout SRS. The basin was deactivated in 1979 and groundwater monitoring began in 1985.

The cumulative radiological risk to the future industrial worker from direct external exposure to soil within the LAOCB was $2.4x10^{-2}$, primarily due to cobalt-60 and cesium-137. Remedial action was required to prevent exposure of receptors to contaminated soils. In the late 1980s, tritium levels in local groundwater ranged as high as 2210 pCi/mL; tritium in the groundwater has not

exceeded the MCL since 4Q2002. The remedial action for the LAOCB, which was completed in November 2001, consisted of placing the pipelines and contaminated soil in the basin, backfilling and grouting the basin, and installing a low permeability cover.

Tritium and VOCs have not exceeded MCLs in the groundwater at the basin since 2002. Declining tritium and VOC levels in the local groundwater indicate that the remedial action is effective and there is no active source of tritium or VOCs in the basin.

The L-Area Acid/Caustic Basin (LAACB) was closed as a no action site at the same time as the LAOCB, under the same ROD. LAACB never received waste water contaminated with high concentrations of VOCs or tritium; LAACB was not a source of groundwater contamination in LASG OU. Tritium and VOCs detected in the LAC wells may have been released from leaks along the drain lines which connected the LAHS to the LAOCB. These lines passed just north of the LAACB.

L-Area Hot Shop: The LAHS was constructed in the 1960s to repair equipment from the reactor areas. It operated until 1983.

The LAHS buildings were demolished in 1993, leaving concrete slabs and drain lines to the LAOCB. The drain lines were grouted in place in 1998. The concrete slabs, contaminated soil, and grout-filled drain lines were placed in P-Area Reactor Seepage Basin #3 in 2005 and were grouted in place when the basin was remediated.

No monitoring well network was installed at the LAHS; conditions in the local groundwater were evaluated by CPTs. CPT samples collected adjacent to the LAHS slabs yielded contaminant levels of 555 pCi/mL tritium (LSCPT-50), 50.2 µg/L PCE (LSCPT-87), and 12.8 µg/L TCE (LSCPT-50). LAHS was a historical source of tritium and VOC contamination in the groundwater. The LAHS has

been demolished and the slabs and lines have been removed. There is no longer an active source of tritium and VOCs at the LAHS.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require that the public be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA (42 United States Code Sections 9613 and 9617). These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternative for addressing LASG OU groundwater. The Administrative Record File must be established at or near the facility at issue.

The SRS Public Involvement Plan (USDOE 1994) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS Public Involvement Plan addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969 (NEPA). SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. The *Statement of Basis/Proposed Plan for the L-Area Southern Groundwater Operable Unit (NBN) (U)* (WSRC 2006b), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the LASG OU.

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the following locations:

US Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

The RCRA Administrative Record File for SCDHEC is available for review by the public at the following locations:

The South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
8911 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

The South Carolina Department of Health and Environmental Control – Region 5
Aiken Environmental Quality Control Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 641-7670

The public was notified of the public comment period through the *SRS Environmental Bulletin*, a newsletter sent to citizens in South Carolina and Georgia, and notices in the *Aiken Standard*, the *Allendale Citizen Leader*, the *Augusta Chronicle*, the *Barnwell People-Sentinel*, and *The State* newspaper. The public comment period was also announced on local radio stations.

The Statement of Basis/Proposed Plan (SB/PP) 45-day public comment period began on August 16, 2006 and ended on September 29, 2006, no comments were received. A Responsiveness Summary, prepared to address any comments received during the public comment period, is provided in Appendix A of this ROD and will also be available in the final RCRA permit.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT

Due to the complexity of multiple contaminated areas, SRS has been divided into Integrator Operable Units (IOUs) for the purpose of managing a comprehensive cleanup strategy. Waste units within an IOU are evaluated and remediated individually; the public has the opportunity to be involved in the remedy selection

process for each waste unit. The LASG is an OU located within the Steel Creek IOU. This is the final ROD for LASG OU. Upon disposition of all OUs within the Steel Creek IOU, a comprehensive ROD will be pursued with additional public involvement.

The scope of the LASG OU remedial action is limited to local groundwater. As discussed in Section II, source units such as the LRSB, LAOCB, and LAHS have been dispositioned under separate RODs or will be addressed as part of the LAOU (e.g., the 50,000,000-gallon LAERB). Activities around the LADB during operations are the likely historical source of the southwest commingled VOC and tritium plume; the LADB is still in service as the receiving facility for off-site fuel shipments. The LASG OU remedial action will address both of the commingled VOCs and tritium plumes south of L Area and the tritium plume west of the L Area.

The final overall strategy for addressing the LASG OU is to implement monitored natural attenuation (MNA)/institutional controls (IC) as the final remedy to remediate groundwater contamination at LASG OU. The natural processes of dispersion, dilution, and radioactive decay will be monitored at selected groundwater monitoring wells and surface water monitoring stations. ICs will prevent exposure of human health receptors. Periodic reporting (five-year remedy reviews) will document the progress of the remediation effort.

V. OPERABLE UNIT CHARACTERISTICS

The LASG OU water table aquifer is located in sandy and clayey strata of the transmissive zone (Upper Eocene Tobacco Road and Dry Branch Formations). Groundwater flows southward from L Area toward L Lake. Operations activities in L Area have resulted in three contaminant plumes in the local groundwater. The western plume is only contaminated with tritium while the two plumes directly downgradient southwest and southeast of L Area are contaminated with tritium, PCE, and TCE.

The tritium plumes are shown on Figure 2. Figure 3 shows the schematic relationship between the remediated/depleted source units in LASG OU, the tritium plumes, and L Lake. The PCE and TCE plumes are shown on Figures 4 and 5, respectively; these figures also show CPT and well locations. Surface water in L Lake was monitored in October 2005 and June 2006. The analytical results for tritium are summarized in Table 1, surface water stations are shown on Figure 6. PCE and TCE have not been detected in the surface water. The "J" qualifier on a value indicates that the analyte was positively identified in the sample at a concentration below the quantitation limit; the reported value is estimated. Results in bold face type exceed the 20 pCi/mL MCL for tritium.

Table 1. Analytical Results for Tritium (pCi/mL) in L Lake

Station ID	10/2005	6/2006
SC20	16.5	14.2
SC21	14.3	13.9
SC22	J0.984	2.14
SC23	**30**	19.5
SC24	**22.1**	**53.2**
SC25	13.3	9.8
SC26	11.3	12.9
SC27	11.9	11.9

The LASG OU comprises a total of 950 acres; the western tritium plume encompasses approximately 90 acres above the L Lake shoreline and 70 acres beneath L Lake and the two commingled VOCs and tritium plumes encompass approximately 130 acres above the L Lake shoreline and 85 acres beneath L Lake. The western tritium plume is about 4600 ft in length and the commingled plumes are about 2,000 ft in length before they reach the shoreline of L Lake.

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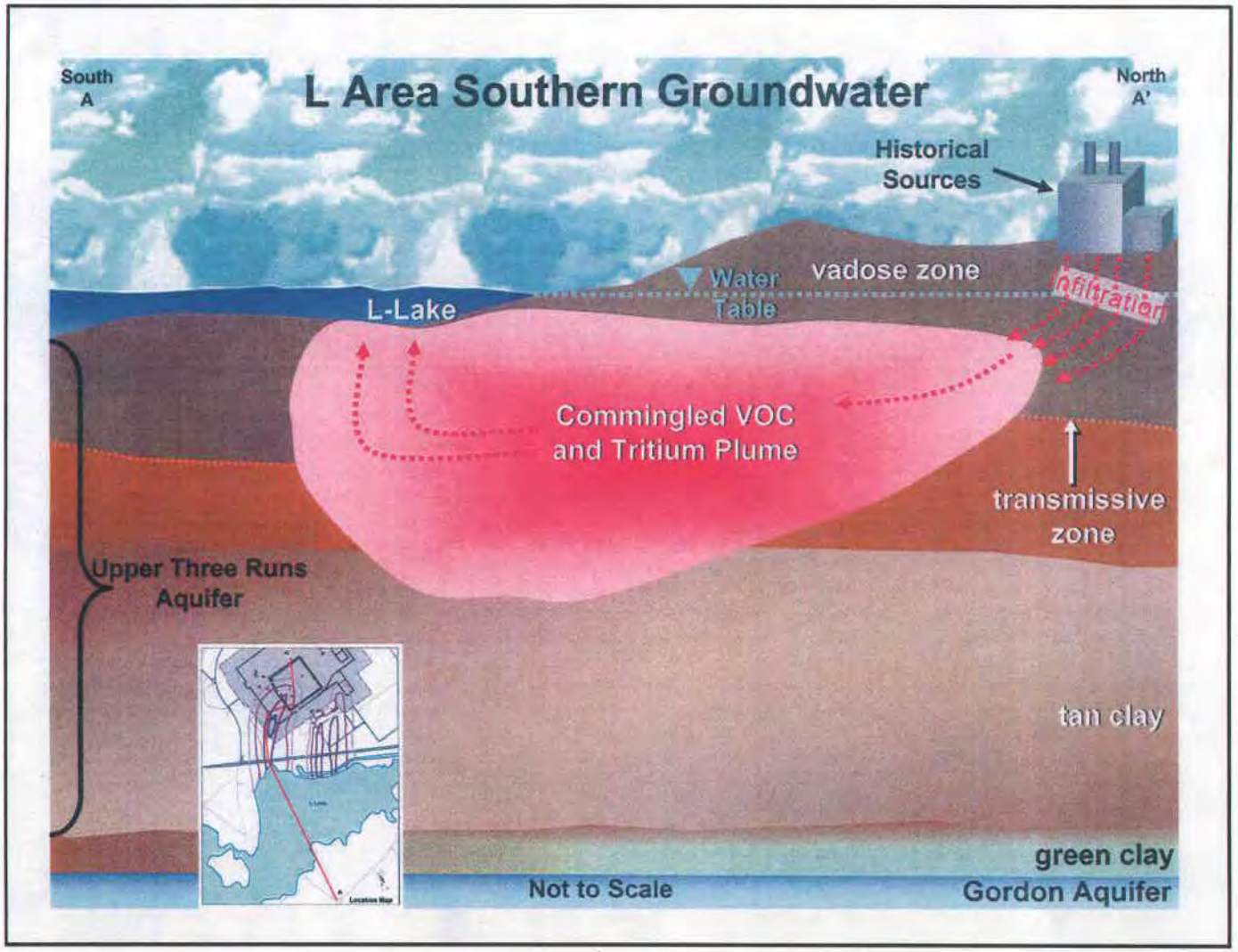

Figure 3. Schematic Cross Section of LASG OU

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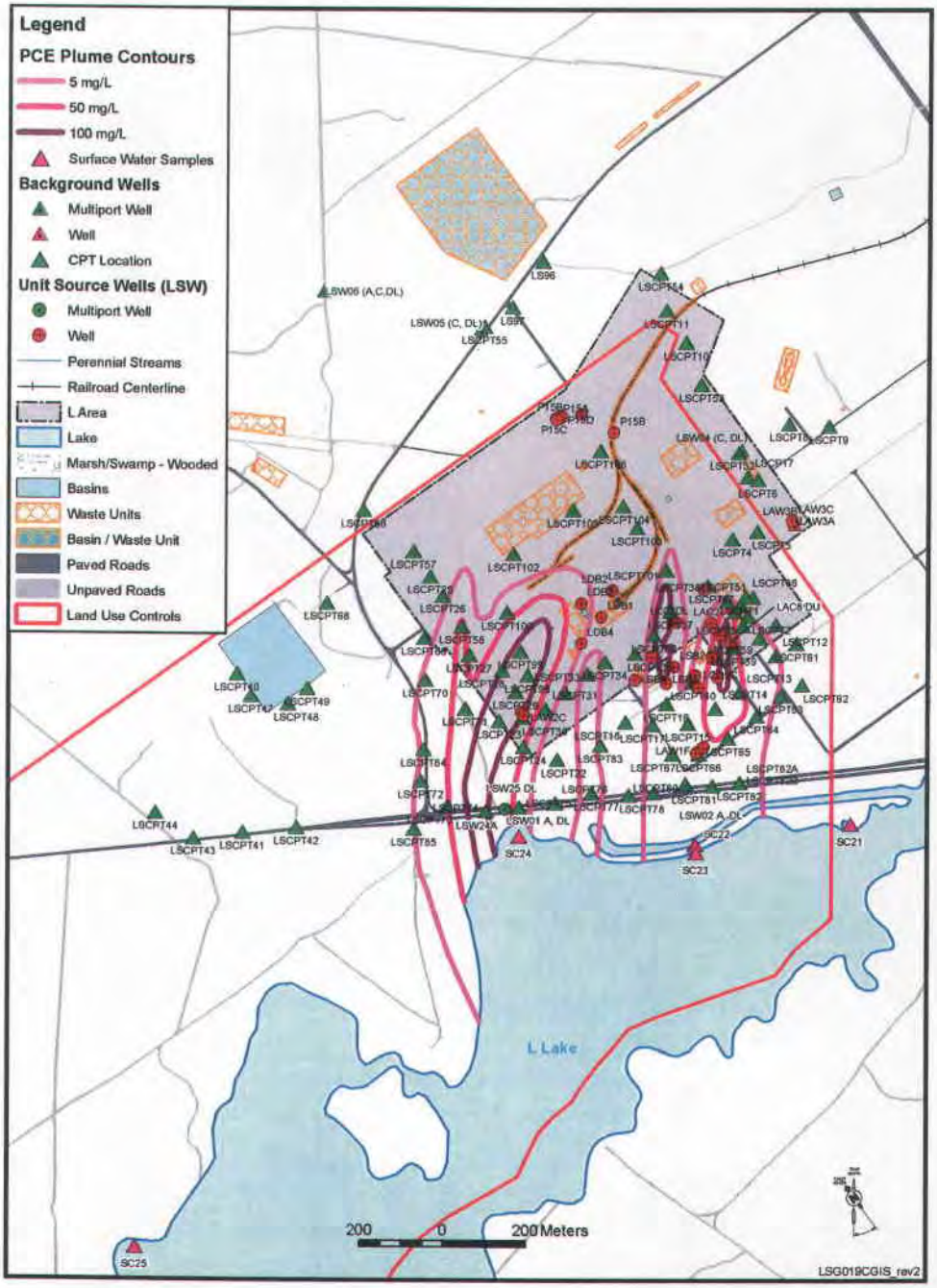

Figure 4. PCE Plumes in the LASG OU

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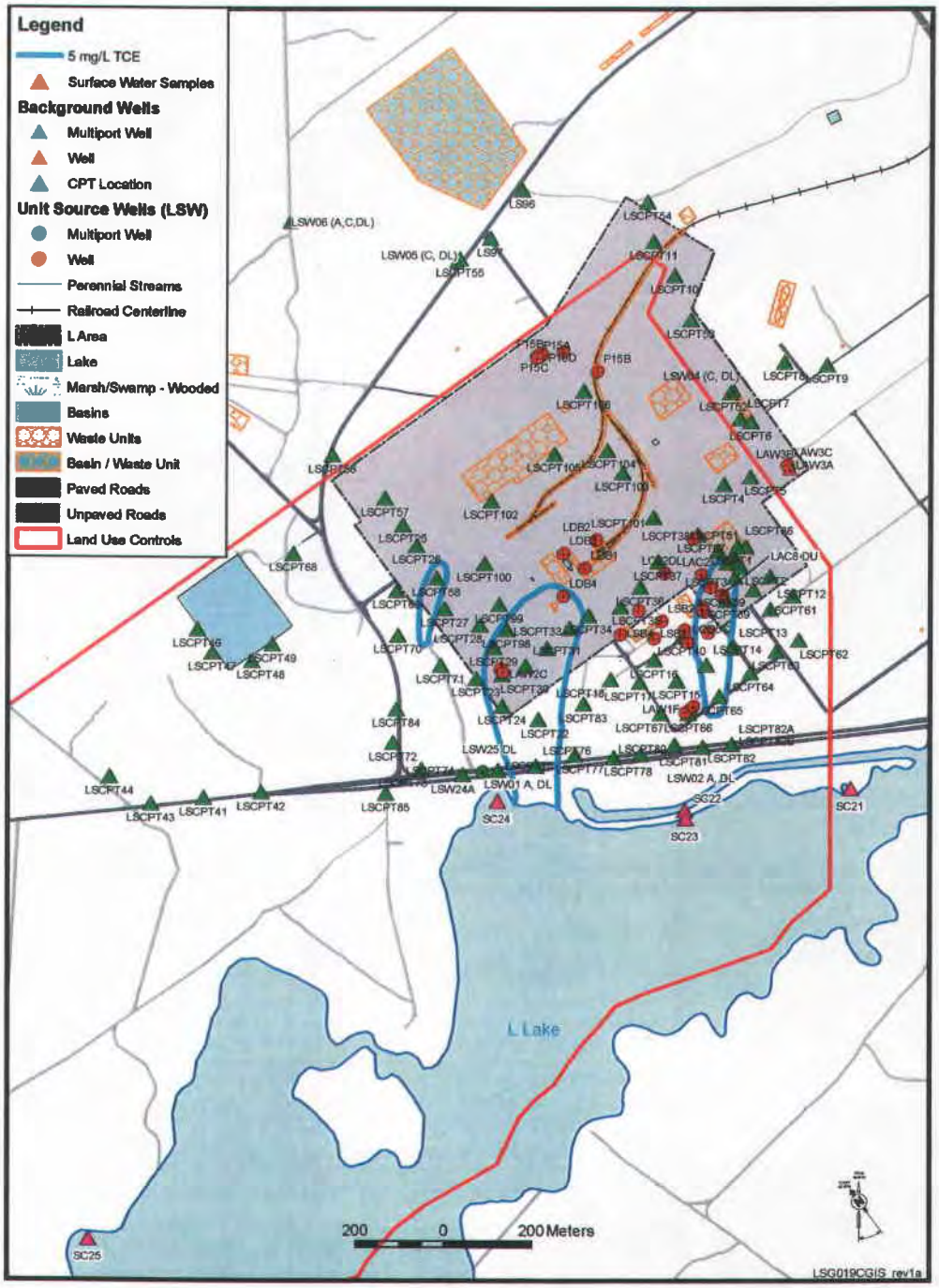

Figure 5. TCE Plumes in the LASG OU

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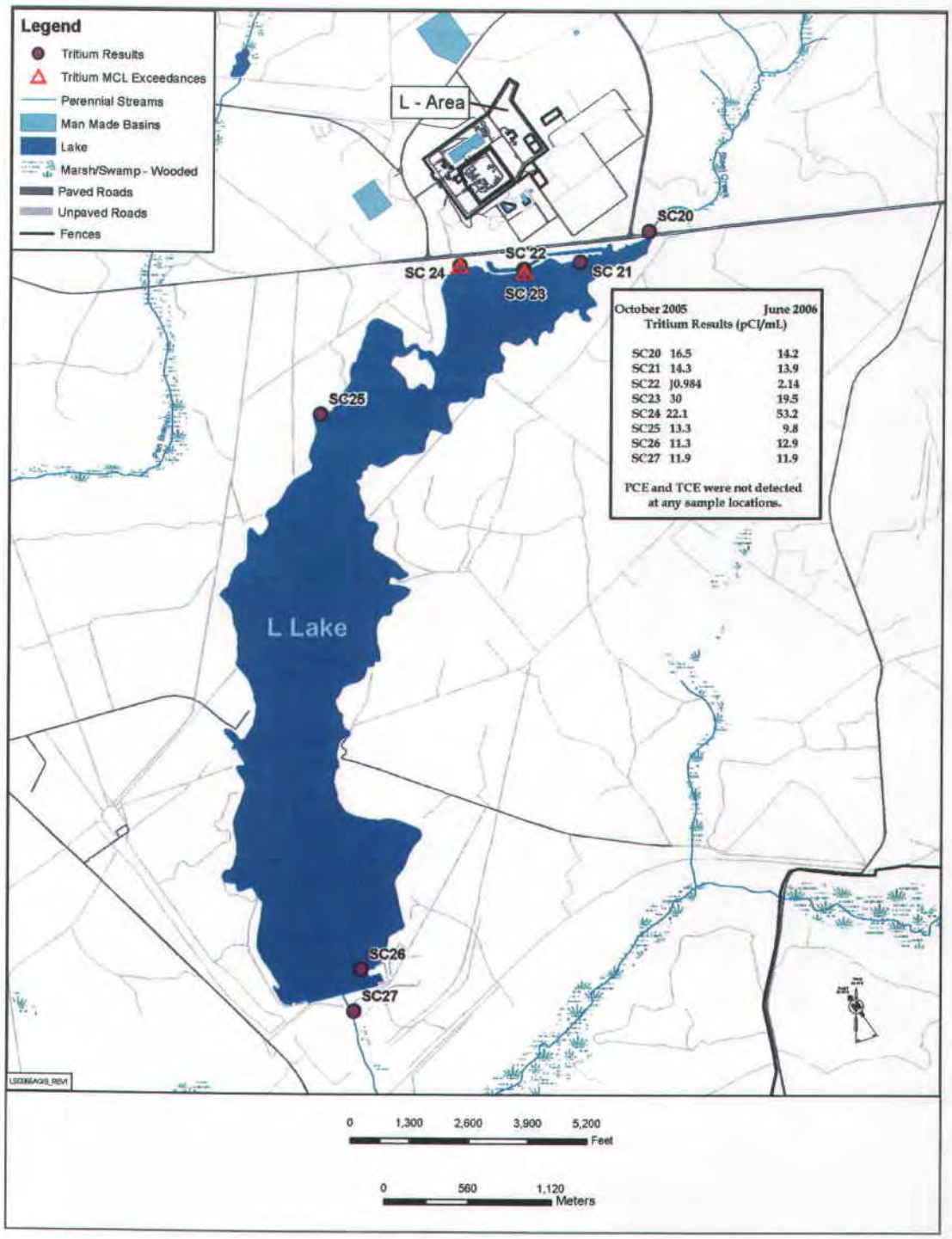

Figure 6. L Lake Surface Water Sampling Stations

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The western tritium plume extends approximately an additional 1000 ft beneath L Lake and the commingled plume extend an additional 1300 ft beneath L Lake.

Groundwater contamination beneath L Lake will be inaccessible to remedial activities. Tritium activity in water passing through the L Lake spillway (11.9 pCi/mL in October 2005 and June 2006, station SC27) does not exceed the 20 pCi/mL MCL for tritium, indicating that the average tritium activity in L Lake is well below the MCL. Localized areas, where the plumes discharge to the lake, slightly exceed the MCL (the highest observed tritium activity was 30 pCi/mL in October 2005, station SC23 and 53.2 pCi/mL in June 2006, station SC24).

Western Tritium Plume

The likely historical source of the tritium plume west of L Area is the 50,000,000-gallon LAERB. A groundwater monitoring network was not installed at the LAERB. Sixteen groundwater samples were collected using CPT along the downgradient (southeast and southwest) sides of the LAERB. The highest tritium activity reported in any of the samples contiguous to the basin was 3.86 pCi/mL at an elevation of +190 ft above mean sea level (msl) or 66 ft below ground surface (bgs) in the transmissive zone.

The highest tritium activity found in this plume was 365 pCi/mL at an elevation of +156 ft msl (90 ft bgs in the transmissive zone) about 1100 ft downgradient of the LAERB. The closest CPT sample to L Lake, about 240 ft from the lake, was 22.3 pCi/mL at an elevation of +170 ft msl or 39 ft bgs in the transmissive zone. The surface water samples collected in October 2005 and June 2006 from L Lake along the axis of this plume yielded 13.3 and 9.8 pCi/mL tritium. These relationships indicate that tritium released in the LAERB has been depleted below levels that will impact local groundwater above MCLs; tritium levels in the plume are reduced by dispersion, dilution, and radioactive decay.

The only VOC detected in the western tritium plume was TCE, found in one CPT sample adjacent to the LAERB at a concentration of J1.33 µg/L. PCE was not detected in the western tritium plume.

Southwest Commingled VOC and Tritium Plume

The source of the commingled VOC and tritium plume southwest of L Area is probably the L-Area Disassembly Basin (LADB), resulting from operations activities around the LADB. Equipment and material handling practices have been upgraded and the LADB has been reconditioned for a new mission in the role of receiving basin for offsite fuel assemblies.

Well LDB 3 is located about 35 feet (ft) south of LADB, on the axis of the plume. Individual samples in groundwater adjacent to LADB have exceeded the MCL for tritium, but for the last three years tritium activities from LDB 3 have averaged 16.3 pCi/mL, less than the MCL (20 pCi/mL). Even though the historical source of the tritium plume appears to have been LADB, these conditions indicate that the integrity of LADB has not been compromised. Tritium in the local groundwater is being depleted.

The highest tritium activities reported at any time in the plume were from the mid-plume area around well LAW 2C (screened in the transmissive zone) about 1000 ft south and downgradient of LADB. The highest tritium value in LAW 2C was 23,103 pCi/mL reported in December 1997. LSCPT-23 about 165 ft southeast of LAW 2C recovered a sample from the transmissive zone that yielded 26,200 pCi/mL tritium in September 2000.

The highest tritium activity from the CPTs near L Lake was 4810 pCi/mL in LSCPT-75 located on the plume axis about 100 ft from the edge of L Lake. Tritium activity in L Lake surface water at SC 24 was 22.1 pCi/mL in October 2005 and 53.2 pCi/mL in June 2006.

The highest VOC concentrations reported in the LDB wells in the upgradient portion of the plume were 10.2 µg/L PCE in LDB 1 in March 1994 and 7.88 µg/L TCE in LDB 1 in February 2001. The MCLs for both PCE and TCE are 5.0 µg/L. The highest VOC concentrations in well LAW 2C along the axis of the plume in the mid-plume area were 11.8 µg/L PCE in April 2004 and 3.5 µg/L TCE in December 1993. The highest PCE value reported in the mid-plume was 139 µg/L in LSCPT-99, about 320 ft northeast of LAW 2C; and the highest TCE value reported was 17.2 µg/L in LSCPT-22, about 440 ft south of LAW 2C. The highest VOC concentrations in the CPTs near L Lake were 51.6 µg/L PCE in LSCPT-73 and 7.65 µg/L TCE in LSCPT-76.

1,2-Dichloroethylene (1,2-DCE, total of *cis-* and *trans-* isomers), 1,1-dichloroethylene (1,1-DCE), and chloroethylene (CE) were not identified as constituents of concern for LASG OU; however, they are degradation products of PCE and TCE. Ethylene is the ultimate degradation product for PCE and TCE; ethylene is rarely analyzed in groundwater. 1,1-DCE and CE were not detected in any of the CPT samples collected near the lake. 1,2-DCE was detected in LSCPT-75, LSCPT-76, and LSCPT-77 along the eastern margin of the southwest commingled VOC and tritium plume. Compared to PCE (51.6 µg/L) and TCE (7.65 µg/L), the highest concentration of 1,2-DCE in this area was J2.75 µg/L in LSCPT-76, indicating some reductive dechlorination.

The fact that PCE and TCE degradation products are only sparsely detected in the plumes near the lake should not be interpreted as lack of evidence of natural reductive dechlorination; the low density, low boiling point, high vapor pressure, and low water solubility (see insert) of DCE, CE, and ethylene relative to PCE and TCE means that the degradation products will rapidly partition to the vapor phase. Reductive dechlorination is a mechanism for natural attenuation of VOCs at LASG OU, but it was not considered in the groundwater modeling.

Analyte	Density g/cc	Boiling point °C @ 760 mm Hg	Vapor Pressure mm Hg @ 20°C	Water Solubility mg/L
Water	1.0 0.62/air	100	17.535	
Tetrachloroethylene	1.623	121	13.8	150 @ 25°C
Trichloroethylene	1.45	86.7	57.4	1100 @ 25°C
1,1-Dichloroethylene	1.213	30-32	51.5	400 @ 20°C
c-1,2-Dichloroethylene	1.284	60	142.6	800 @ 20°C
t-1,2-Dichloroethylene	1.257	48	233.7	600 @ 20°C
Chloroethylene (Vinyl chloride)	0.911 2.2/air	-13	3424.8	1100 @ 25°C
Ethylene	1.0/air	-104	52,976.5	131 @ 20°C

Southeast Commingled VOC and Tritium Plume

The source of the commingled VOC and tritium plume southeast of L Area is uncertain, but probable historical sources are the LRSB, the LAOCB, and the LAHS. The southeast commingled VOC and tritium plume consists of lobes that appear to originate at these remediated waste sites; the lobes merge in the mid-plume area and cannot be distinguished near L Lake.

L-Area Reactor Seepage Basin: LSB 1 is the most directly downgradient well at the LRSB; the highest tritium activity reported in the LSB wells was 10,100 pCi/mL in a sample collected in May 1991 from LSB 1. Groundwater samples from LSB 1 have not exceeded the tritium MCL (20 pCi/mL) since 3Q2000 when

32.41 pCi/mL tritium was reported. Tritium levels in LSB 4 (43.3 pCi/mL in 3Q2005) are still higher than the MCL. Upgradient CPTs (LSCPT-34 and LSCPT-35) recovered 11 CPT samples from the Upper Three Runs aquifer during the 2000-2004 CPT campaign; the highest tritium value reported was 7.51 pCi/mL. This demonstrates that the tritium observed in LSB 4 is not from an unidentified upgradient source. Tritium levels in all LSB wells have been declining since the late 1990s. There is no active source of tritium at LRSB and tritium levels in the groundwater are being depleted. PCE and TCE have not been detected in the LSB monitoring wells; LRSB has never contained significant amounts of these VOCs.

L-Area Oil and Chemical Basin: The highest tritium activity reported in the groundwater at LAOCB was 2550 pCi/mL in a May 1985 sample from well LCO 1. Tritium has only exceeded the MCL one time since the remedial action was completed in November 2001; the single exceedance was 20.9 pCi/mL in LCO 6DL in November 2002. The low tritium activity in the local groundwater indicates that there is no active source of tritium at the LAOCB and tritium levels in the groundwater at LAOCB are being depleted.

The highest concentration of PCE detected in the LCO wells was 86 µg/L from LCO 4 in November 1985; the last exceedance of the PCE MCL in any of the LCO wells occurred in November 2002 in LCO 6DL (11.5 µg/L). LCO 6DL has been sampled three times since November 2002 and the highest concentration of PCE during this period was 3.1 µg/L. The highest concentration of TCE detected in the LCO wells was 30.1 µg/L from LCO 3 on January 30, 1988; the last MCL exceedance by TCE in any of the LCO wells occurred in October 2000 in LCO 7DL (8.66 µg/L). The source of VOCs in the LAOCB is controlled by the remedial action (grout stabilization and low permeability soil cover) and VOC concentrations in the surrounding groundwater are being depleted.

The LAACB was closed as a no action waste site at the same time as the LAOCB, under the same ROD.

The highest tritium level ever detected in the original LAC wells was 18 pCi/mL in well LAC 1 in February 1991.

The highest PCE level in the original LAC wells was 36 μg/L in LAC 3 in September 1989; PCE has not exceeded its MCL in the original LAC wells since March 1995 (8.13 μg/L in LAC 3). The highest TCE level reported from any of the original LAC wells was 124 μg/L in LAC 2 in August 1987; except for two exceedances in well LAC 4 in 2002 (9.07 μg/L in November and 8.95 μg/L in May), TCE has not exceeded its MCL in the original LAC wells since April 1994. These TCE values and other tritium and PCE anomalies in the newer LAC wells may have been due to minor releases during the grouting and removal of the drain lines that connected the LAHS to the LAOCB. The LAACB is not a source of tritium, PCE, or TCE contamination in the groundwater.

L-Area Hot Shop: The LAHS buildings have been demolished and the slabs, grout-filled drain lines, and associated contaminated soil have been removed. No monitoring well network was installed at the LAHS; conditions in the local groundwater were evaluated by 11 CPTs and 47 individual samples during the CPT campaign from 2000 to 2004. Only two of these samples exceeded the MCL for tritium: 555 pCi/mL in LSCPT-50 about 50 ft southwest of the LAHS slab and 26.7 pCi/mL in LSCPT-39 about 330 ft southwest of the LAHS and 15 ft south of well LAC 8DL. Well LAC 8DL, located about 130 ft southeast of LAACB and 315 ft south of LAHS, has yielded anomalous levels of PCE, TCE, and tritium activity since removal of the LAHS drain lines in 2004 compared to previous levels in the following insert:

Quarter of Calendar Year	PCE µg/L	TCE µg/L	Tritium pCi/mL
Average 1Q94-4Q00	17.5	2.7	9.6
4Q2004	50	13	42.8
1Q2005	26	21	34.5
3Q2005	60	15	68.5

Because of the snap-shot nature of CPT data, it is not possible to infer that tritium activity in the groundwater is being depleted, but the highest tritium activity in the groundwater at LAHS (555 pCi/mL) is relatively small when compared to historical maxima at the LRSB (10,100 pCi/mL) or the LAOCB (2550 pCi/mL).

The highest PCE value in the CPTs around LAHS was 165 µg/L in LSCPT-3, located about 90 ft south of the LAHS; the highest PCE concentration adjacent to the LAHS slab was 50.2 µg/L in LSCPT-87. Almost all of the TCE found in the southeast commingled VOC and tritium plume is in the lobe which originated at the LAHS. The highest TCE concentration is 12.8 µg/L in LSCPT-50 (adjacent to the southwest corner of the LAHS slab).

The maximum tritium activities in the mid-plume area are 2270 pCi/mL in LSCPT-15 and 1950 pCi/mL in LSCPT-17 (both in the transmissive zone); these CPTs are about 300 ft downgradient from well LSB 1 (maximum tritium 10,100 pCi/mL 2Q1991). The maximum PCE concentration in this area was 82.1 µg/L in LSCPT-14 (approximately 740 ft south of the LAHS slab) and the maximum TCE concentration was 12.8 µg/L in LSCPT-65 (approximately 1000 ft south of the LAHS slab).

The maximum tritium activity in the CPTs at the lake margin (about 1400 ft south of LAHS and 410 ft upgradient from the discharge canal) was 4330 pCi/mL in the transmissive zone in LSCPT-79 and 1580 pCi/mL in the transmissive zone in LSCPT-81. The maximum PCE concentration in this area was 9.94 µg/L

(LSCPT-82) and the maximum TCE concentration was 1.4 µg/L. PCE and TCE were not detected in samples from surface water stations SC 22 and SC 23 which are located near the axis of the southeastern commingled VOC and tritium plume. 1,2-DCE, 1,1-DCE, and CE were not detected in the CPTs near where the southeastern commingled VOC and tritium plume goes under L Lake.

Conceptual Site Model (CSM) for the LASG OU

The CSM is shown on Figure 7. The primary sources of contamination, as discussed in the preceding text, were:

1) tritium-bearing water which was used to test the transfer piping to the LAERB,

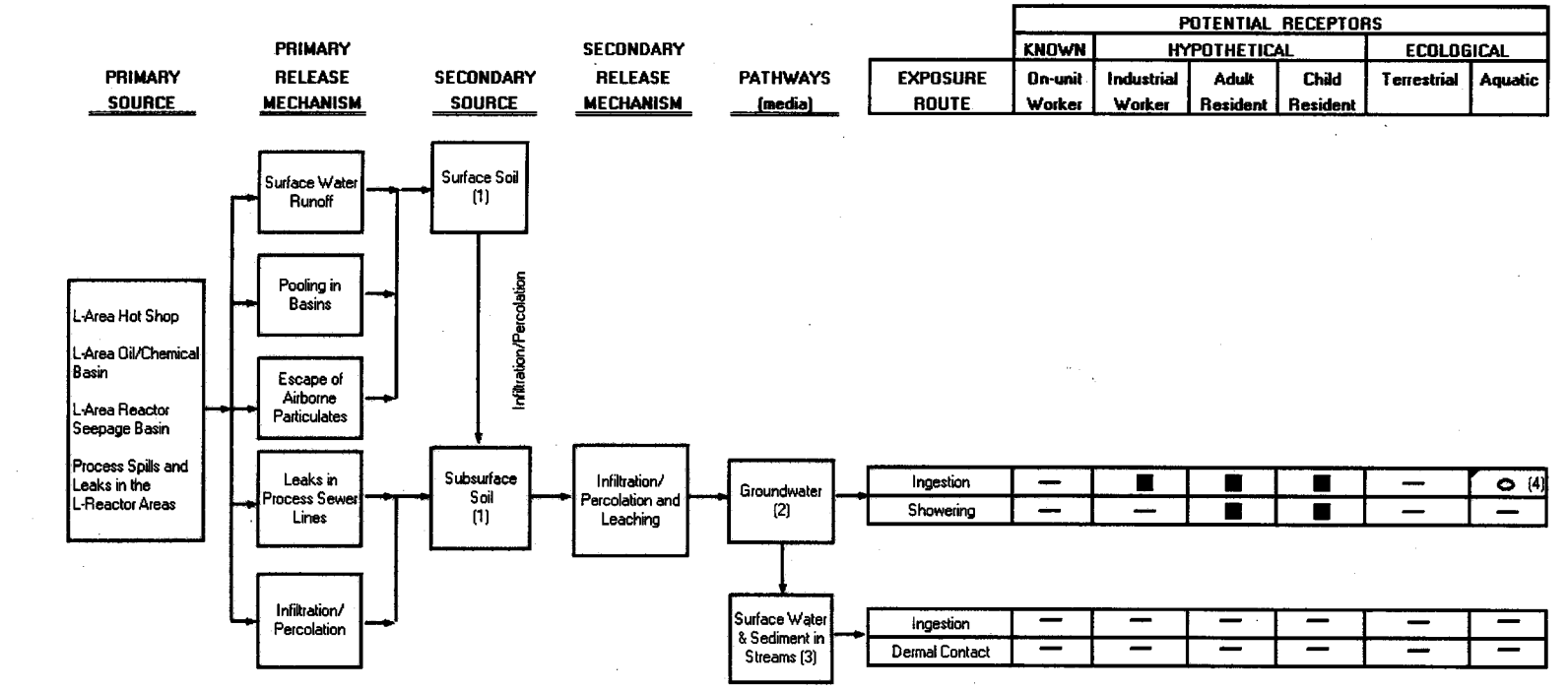
2) releases of VOCs and tritium during operational activities at the LADB,

3) water discharged to the LASB during operations,

4) water discharged to the LAOCB during operations, and

5) releases at the LAHS.

The primary historical sources of contamination in the groundwater in the LASG OU have been remediated or depleted. Subsurface soils beneath these remediated wastes sites were the secondary sources of groundwater contamination; these secondary sources are depleted or controlled by the remedial action at the individual waste sites. The release mechanism was infiltration/percolation and leaching from the subsurface soil to groundwater. The only pathway with RCOCs is to future industrial workers and residents, this pathway will only be complete if institutional controls are suspended. The CSM considered a hypothetical future residential scenario, but ICs will preclude future residential use of LASG OU groundwater. There are no complete pathways with RCOCs to ecological receptors.



(1) Soils have been or will be addressed with the surface units
(2) Standard exposure scenarios are presented basd on MCL (ARAR) exceedances.
(3) Impact surface water/sediments will be addressed as part of the L-Lake OU in the Steel Creek IOU
(4) Groundwater does not provide an exposure pathway for ecological receptors; however, groundwater has been evaluated for ecological impact at the groundwater-surface water interface.

Figure 7. Conceptual Site Model for the LASG OU

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Media Assessment

Media assessments were conducted for each of the sources except the LADB which is still in service as the receiving basin for offsite fuel assemblies. These assessments are documented in the RFI/RI reports for each waste site. The only media of concern at the LASG OU is local groundwater. Surface water in L Lake and Steel Creek will be addressed in a separate IOU.

Groundwater Investigation

The first groundwater monitoring wells at L Area were installed in November 1981 at the LAOCB. Groundwater characterization included the review of analytical data from 93 monitoring wells within the LASG OU (see insert). Appendix D contains a map showing the location of monitoring wells and a summary of the maximum and most recent analytical results for the RCOCs.

Groundwater Monitoring Network	Installed	Active Wells	Abandoned Wells
LAC (L-Area Acid/Caustic Basin)	1983-1994	12	0
LAW (L-Area Research Wells)	1985	12	1
LCO (L-Area Oil and Chemical Basin)	1981-1993	8	4
LDB (L-Area Disassembly Basin)	1985-1995	4	0
LSB (L-Area Reactor Seepage Basin)	1983	4	0
LSW (L-Area Southern Wells)	2001-2004	53	3
Totals		93	8

Groundwater geochemistry and shallow stratigraphy were investigated with 109 CPTs during the January 2000 to January 2004 campaign. Typically two to six groundwater samples were collected from each CPT. All CPT samples were analyzed for VOCs and tritium.

Media Assessment Results

Groundwater

The RCOCs for groundwater at LASG OU are PCE, TCE, and tritium. PCE and TCE were used as solvents at SRS between approximately 1951 and 1979. PCE, TCE, and tritium are mobile, carcinogenic contaminants. Sample results for PCE, TCE, and tritium are discussed for the near-source, mid-plume, and near-L Lake portions of each of the plumes in Section V, Operable Unit Characteristics. Contaminant concentrations near the remediated source units are declining, indicating that the sources are depleted or controlled by the source-specific remedial action, discussed in Section II. Contaminant levels within the plumes are still above MCLs. The bulk of contaminated groundwater (more than 92%) is confined to the portion of the Upper Three Runs aquifer above the tan clay.

Groundwater modeling demonstrates that attainment of remedial action objectives will require approximately 30 years in the western tritium plume and approximately 90 years in the commingled VOC and tritium plumes.

Site-Specific Factors

There are no active, continuing sources of groundwater contamination at the LASG OU. There is no practicable treatment technology for tritium in groundwater. Natural attenuation processes (dispersion, dilution, and radioactive decay) are occurring at the LASG OU and are effective in reducing contaminant concentrations below remedial goals (RGs).

Groundwater contamination beneath L Lake will be inaccessible to remedial activities. Tritium activity in water passing through the L Lake spillway (11.9 pCi/mL) does not exceed the MCL, indicating that the water in L Lake averages well below the MCL. Localized areas where the plumes discharge to the lake

slightly exceed the MCL (the highest observed tritium activity was 52 pCi/mL). PCE and TCE were not detected in the surface water samples. Groundwater discharge to surface water is not impacting human health or ecological receptors.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

The current on-site land use of L Area is industrial. Timber and pulpwood are harvested from the surrounding woodlands. Controlled deer hunts are conducted in the surrounding areas several times each year. Currently, there is no residential use of any land at SRS and surface water in L Lake is not used for recreational purposes.

The LASG OU is located in an area that has been recommended for future industrial use by the SRS Citizens Advisory Board (CAB).

Groundwater Uses/Surface Water Uses

Shallow groundwater and surface water are currently not used for drinking water, hygiene, recreation, and process water as prohibited by existing institutional controls; groundwater and surface water are not used for agricultural purposes at SRS. Drinking water is supplied to SRS workers from carefully monitored wells in deep, uncontaminated aquifers. Institutional controls are currently in place to prevent use of contaminated water; including SRS site boundary fencing and controlled access gates, and the Site Use/Site Clearance program that controls construction, excavation, and well installation activities.

Surface water in Steel Creek and L Lake is not used for any purpose where significant human exposure might occur (i.e., drinking water supply or hygiene, agricultural, process, or recreational purposes) at SRS. Surface water in Steel Creek and L Lake is not used for any recreational or agricultural purpose at SRS.

However, Steel Creek does feed into the Savannah River, which may be used for recreational and agricultural purposes outside of SRS and as a source of drinking water for distant downstream communities.

VII. SUMMARY OF OPERABLE UNIT RISKS

Baseline Risk Assessment

A baseline risk assessment was not performed for the LASG OU. In place of a human-health baseline risk assessment, regulatory concurrence was obtained to use MCLs (South Carolina Primary Drinking Water Regulation SC R61-58.5) as a point of comparison for definition of the problem(s) because the only medium under consideration in the LASG OU ROD is groundwater. Using MCLs as a point of comparison is appropriate because MCL exceedances by RCOCs in groundwater provide the basis for demonstrating that a remedial action is necessary to prevent human exposure, determining the appropriate remedial action, and justification for performing that remedial action.

The ecological exposure pathway to groundwater in the Conceptual Site Model is incomplete because ecological receptors are not typically exposed to groundwater, however, ecological receptors may be exposed to surface water in L Lake. The RFI/RI Report (WSRC 2005) considered a groundwater scenario in which the maximum RCOC concentrations in LASG OU groundwater discharging to L Lake surface water with a dilution factor of 10 were compared to the corresponding aquatic organism toxicity reference value protocol. Ecological hazard quotients for the RCOCs in this scenario were calculated to be less than 1 and so pose minimal potential risk to the aquatic ecosystem.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

Remedial action objectives (RAOs) are unit-specific goals that establish the extent of cleanup required to protect human health and the environment and to mitigate

the effects of contamination. RAOs are based on an evaluation of applicable or relevant and appropriate requirements (ARARs) and to-be-considered (TBC) requirements [CERCLA 121(d)(2)(A)]. The following RAOs have been identified for the LASG OU:

- Prevent human exposure to groundwater above MCLs.

- Treat and/or mitigate groundwater contaminated above MCLs to reduce the discharge of groundwater exceeding MCLs to L Lake.

These RAOs are intended to protect current workers and future industrial workers; minimize the impact of groundwater discharging to surface water, and return groundwater to usable conditions. The remedial goals (RGs) for LASG OU are the MCLs, which are the chemical-specific ARARs listed in Table 2. Potential ARARs are summarized in Table 3.

Table 2. Summary of the RGs for LASG OU

RCOC	Highest Concentration Observed During RFI/RI	RG	Basis
PCE	58 µg/L	5 µg/L	ARAR (MCL)
TCE	9 µg/L	5 µg/L	ARAR (MCL)
Tritium	5850 pCi/mL	20 pCi/mL	ARAR (MCL)

Table 3. Summary of the Potential ARARs for the LASG OU

Location-Specific ARARs				
Location	**Citation**	**Synopsis**	**Comments**	**Remedial Alternative**
FEDERAL				
Wetlands	Section 404, Clean Water Act	For action involving construction of facilities or management of property in wetlands (as defined by 40 *CFR* Part 6, Appendix A, section 4(j), action must be taken to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible.	The LASG OU is adjacent to L Lake.	VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2, T-3
Wetlands	Section 401, Clean Water Act	Establishes applicable requirements for the construction or operation of facilities, which may result in any discharge into navigable waters.	The LASG OU is adjacent to L Lake.	VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2, T-3
STATE				
Wetlands	SC R.61-101, S.C. Water Quality Certification	Establishes procedures and policies for implementing State water quality certification requirements of Section 401 of the Clean Water Act, 33 U.S.C. Section 1341.	The LASG OU is adjacent to L Lake.	VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2, T-3
Classification and potential use of an aquifer and surface water.	SC R.61-68, SC Water Classification Standards	Consider State aquifer classification in the assessment of remedial action objectives.	Groundwater at the LASG OU is contaminated.	All
Chemical-Specific ARARs				
Chemical	**Citation**	**Synopsis**	**Comments**	**Remedial Alternative**
STATE				
Tritium	SC R.61-68	Average annual concentrations calculated to produce a total body dose of 4 mrem/year for tritium (20 pCi/mL).	Pursuant to the Memorandum of Agreement	All
PCE and TCE	SC R.61-68	MCLs for PCE (5 µg/L) and TCE (5 µg/L).	ARAR because PCE and TCE have been detected in groundwater.	All

Table 3. Summary of the Potential ARARs (Continued)

Action-Specific ARARs				
Action	**Citation / Title**	**Synopsis**	**Comments**	**Remedial Alternative**
Air Quality Standards	40CFR50, 40CFR60, 40CFR61, 40CFR63 Subpart G SC R.61-62.5	Identifies allowable air concentrations and permit requirements for air emissions of toxic chemicals from new and existing sources.	VOCs will be subjected to photolytic degradation.	VT-4, T-3
Underground Injection Permit	SC R.61-87	Provides authority for permits to ensure that all underground injection systems are designed and operated in a manner that is protective of groundwater quality.	Nutrients injected for enhanced bioremediation are usually food-grade products.	VT-3b, VT-3c, VT-3d
Action-Specific ARARs				
Action	**Citation / Title**	**Synopsis**	**Comments**	**Remedial Alternative**
In situ treatment	SC R.61-79	Establishes operating requirements for land treatment of RCRA hazardous wastes during the active life of the facility, and closure and post-closure	Land treatment must be designed to maximize degradation, transformation, or immobilization of hazardous constituents.	VT-4, T-3
Groundwater Protection	SC R.61-79.264.90-97 RCRA Groundwater Protection Standard	Identifies the ground-water protection standard, hazardous constituents, concentration limits, conditions of compliance, and groundwater monitoring requirements for hazardous waste facilities	RCRA groundwater protection standards could not be fully achievable using available technologies. Applicable only for hazardous constituents (i.e., PCE and TCE).	All VT alternatives
Well construction for remediation	SC R.61-58.2 Construction and Operation Permits - Groundwater Sources and Treatment	Prescribes minimum standards for the construction of groundwater sources and treatment facilities	Groundwater wells must be installed / abandoned and drilling wastes disposed of in a manner to prevent cross-contamination of aquifers.	All except VT-1, T-1

IX. DESCRIPTION OF ALTERNATIVES

Remedy Components, Common Elements, and Distinguishing Features of Each Alternative

This section summarizes the remedial alternatives studied in the detailed analysis phase of the LASG OU Corrective Measures Study (CMS)/Feasibility Study (FS) (WSRC 2006a). In accordance with the National Oil and Hazardous Substances Contingency Plan (NCP), it is desirable, when practical, to offer a range of diverse alternatives to compare during the detailed analysis. The range of alternatives includes options that (1) immobilize chemicals, (2) reduce the contaminant volume, or (3) reduce the need for long-term, onsite management. Some alternatives have been developed that involve little or no treatment yet provide protection to human health and the environment by preventing or controlling exposure to or migration of the contaminants through engineered or institutional controls.

There is no practicable remedial technology capable of removing tritium throughout an aquifer. The following are the only viable processes for reducing tritium concentrations in groundwater:

1) natural radioactive decay (the half life for tritium is 12.3 years);

2) reducing groundwater flow velocity and thereby increasing travel time to allow more time for radioactive decay before downgradient discharge;

3) natural dispersion and dilution with uncontaminated groundwater; and

4) cross-media transfer of tritiated water in the aquifer to water vapor in the atmosphere.

Remedial alternatives were developed to address the commingled VOC and tritium plumes (alternative designation: VT-#) and the western tritium plume

(alternative designation: T-#). Operations and maintenance (O&M) time for all of the alternatives is based on groundwater monitoring; the O&M times are estimates based on the best available information.

All the alternatives presented, with the exception of the no action alternatives, have a common set of institutional controls. Physical access controls such as the SRS site boundary fencing and security personnel will prevent trespassers from gaining access to the surface of the LASG OU and the monitoring wells. All monitoring wells are locked to prevent access to groundwater or tampering, and the integrity of the monitoring wells is maintained. The SRS Site Use/Site Clearance program controls construction, excavation, and well installation. SRS employee training programs and jobsite health and safety briefings ensure future environmental monitoring workers are not exposed to contaminated groundwater without adequate personal protective equipment.

In the long term, if the property is ever transferred to nonfederal ownership, the U. S. Government will take those actions necessary pursuant to Section 120(h) of CERCLA, including preparation of a survey plat, deed notification, and deed restrictions precluding the use of contaminated groundwater as a source of drinking water.

Alternative VT-1 and T-1. No Action

As required by the NCP, the No Action alternative (VT-1 and T-1) is provided as a baseline for comparison. The No Action alternative is the same for the commingled VOC and tritium plumes and the western tritium plume. No controls are established to prevent contact with contaminated groundwater and no measures are taken to demonstrate that MCLs are being achieved.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 90 years; tritium will be reduced below its MCL in about 50 years in the commingled plumes and approximately

30 years in the western tritium plume. VOCs will be removed by natural volatilization, dilution, and dispersion; radioactive decay will reduce tritium activity and dispersion will reduce tritium activity per unit of volume (concentration).

Parameter	VT-1	T-1
Estimated capital cost	$0	$0
Present worth O&M cost	$0	$0
Total estimated cost	$0	$0
Time to implement	Not applicable	Not applicable
Approximate operating time	90 years	30 years

Alternatives VT-3a and T-2. Monitored Natural Attenuation with Institutional Controls

The CMS/FS (WSRC 2006a) included separate alternatives for ICs with monitoring (VT-2) and MNA/IC (VT-3a). These alternatives are essentially identical, except that VT-3a includes surface water monitoring in L Lake and provides documentation that natural attenuation processes are occurring as predicted. Alternative VT-2 has been combined into VT-3a, and VT-2 no longer exists separately.

The MNA/IC alternative (VT-3a and T-2) will employ ICs to limit access and exposure to contaminated groundwater by using Site Use/Site Clearance restrictions, groundwater use restrictions, and deed restrictions. Periodic groundwater and surface water monitoring will be conducted in each of the plumes and in L Lake on the axis of each plume; the preliminary monitoring network for LASG OU is shown in Appendix B. Surface water samples will also be collected at the head of L Lake and in the spillway from L Lake to evaluate the contribution of upgradient sources and LASG OU's contribution to contaminant levels in the lower reaches of Steel Creek. The analytical results from monitoring

will be used to evaluate the performance of the natural attenuation processes (dispersion, dilution, and radioactive decay) and determine if contaminant concentrations are decreasing as predicted.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 90 years; tritium will be reduced below its MCL in about 50 years in the commingled plumes and approximately 30 years in the western tritium plume. VOCs will be removed by natural attenuation through volatilization, dilution, and dispersion; tritium activity will be reduced by radioactive decay, dilution, and natural dispersion. A discount rate of 3.9% is applied for all O&M activities which are expected to require 30 or more years to complete.

Parameter	VT-3a	T-2
Estimated capital cost	$180,000	$125,000
Present worth O&M cost	$2,132,000	$1,196,000
Total estimated cost	$2,312,000	$1,321,000
Time to implement	3-6 months	3-6 months
Approximate operating time	90 years	30 years

Alternatives VT-3b. Permeable Reactive Barrier with Monitoring and Institutional Controls

The permeable reactive barrier (PRB) with monitoring and institutional controls alternative (VT-3b) combines alternative VT-3a with a PRB. The PRB will use zero-valent iron to reductively dechlorinate PCE and TCE in the groundwater; the PRB will not affect tritium activity, volume, or mobility.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 80 years; tritium will be reduced below its MCL in about 50 years. Tritium activity will be reduced by radioactive decay, dilution, and dispersion.

Parameter	VT-3b
Estimated capital cost	$18,791,000
Present worth O&M cost	$10,292,000
Total estimated cost	$29,083,000
Time to implement	6-9 months
Approximate operating time	80 years

Alternative VT-3c. Enhanced Bioremediation with Monitoring and Institutional Controls

The enhanced bioremediation with monitoring and institutional controls alternative (VT-3c) combines alternative VT-3a with an enhanced bioremediation system. Enhanced bioremediation will adjust available nutrients and oxygen in the plumes to enhance microbial reductive dechlorination of PCE and TCE in the groundwater. Proprietary microbial cultures may also be introduced in the treatment zone. Enhanced bioremediation will not affect tritium activity, volume, or mobility.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 80 years; tritium will be reduced below its MCL in about 50 years. Tritium activity will be reduced by radioactive decay, dilution, and natural dispersion.

Parameter	VT-3c
Estimated capital cost	$1,026,000
Present worth O&M cost	$4,632,000
Total estimated cost	$5,658,000
Time to implement	9-12 months
Approximate operating time	80 years

Alternative VT-3d. Chemical Oxidation with Monitoring and Institutional Controls

The chemical oxidation with monitoring and institutional controls alternative (VT-3d) combines alternative VT-3a with a strongly oxidizing chemical such as permanganate. Chemical oxidation will rapidly destroy PCE and TCE in the groundwater by oxidation. Chemical oxidation will not affect tritium activity, volume, or mobility.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 80 years; tritium will be reduced below its MCL in about 50 years. Tritium activity will be reduced by radioactive decay, dilution, and natural dispersion.

Parameter	VT-3d
Estimated capital cost	$1,196,000
Present worth O&M cost	$6,081,000
Total estimated cost	$7,277,000
Time to implement	9-12 months
Approximate operating time	80 years

Alternatives VT-4 and T-3. Spray Irrigation/Phytoremediation with Monitoring and Institutional Controls

The spray irrigation/phytoremediation with monitoring and institutional controls alternative (VT-4 and T-3) will reduce tritium activity in the groundwater by pumping the contaminated water to the surface and spraying it on woodlands. The application rate will be controlled to prevent re-infiltration or runoff of any of the contaminated water. VOCs will also be volatilized and exposed to photolytic degradation at the same time.

Modeling has predicted that PCE concentrations throughout the commingled plumes will be reduced below the MCL in about 90 years; tritium will be reduced below its MCL in about 50 years in the commingled plumes and 30 years in the western tritium plume.

Parameter	VT-4	T-3
Estimated capital cost	$5,275,000	$4,507,000
Present worth O&M cost	$9,037,000	$6,939,000
Total estimated cost	$14,312,000	$11,446,000
Time to implement	9-12 months	9-12 months
Approximate operating time	90 years	30 years

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

A set of nine criteria established by the NCP is used to compare alternatives. The criteria were derived from the statutory requirements of CERCLA Section 121. The NCP [40 CFR § 300.430 (e) (9)] sets forth nine evaluation criteria that provide the basis for evaluating alternatives and selecting a remedy. The nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major tradeoffs among the alternatives. The modifying criteria consider public and regulatory acceptance. The criteria are:

Threshold Criteria

1) overall protection of human health and the environment;

2) compliance with ARARs;

Primary Balancing Criteria

3) long-term effectiveness and permanence;

4) reduction of toxicity, mobility, or volume through treatment;

5) short-term effectiveness;

6) implementability;

7) cost;

Modifying Criteria

8) state acceptance; and

9) community acceptance.

Seven of the criteria are used to evaluate all the alternatives based on human health and environmental protection, cost, and feasibility issues (Tables 4 and 5). The preferred alternative is further evaluated under the final two criteria: state acceptance and community acceptance, based on comments during the public review period. Brief descriptions of all nine criteria are given below.

1. Overall Protection of Human Health and the Environment - The remedial alternatives are assessed to determine the degree to which each alternative eliminates, reduces, or controls threats to human health and the environment through treatment, engineering methods, or ICs.

Groundwater modeling indicates contaminant concentrations eventually decrease to below MCLs in all alternatives. The No Action alternative (VT-1 and T-1) will not be protective of human health and the environment because continued ICs on the use of groundwater cannot be assured. Alternatives VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2 and T-3 will all use ICs to prevent human exposure.

2. Compliance with ARARs - ARARs are federal and state environmental regulations that establish standards that remedial actions must meet unless waived

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls
1. Overall Protection of Human Health and the Environment						
Human Health	Not protective	Institutional controls prevent exposure to groundwater.	Institutional controls prevent exposure to groundwater.	Institutional controls prevent exposure to groundwater.	Institutional controls prevent exposure to groundwater.	Institutional controls prevent exposure to groundwater.
Environment	Incomplete pathway	Incomplete pathway	Incomplete pathway	Incomplete pathway	Incomplete pathway	Incomplete pathway
2. Compliance with ARARs						
Chemical-Specific	Does not control or monitor VOCs and tritium. Does not comply with ARARs.	Complies with ARARs for VOCs and tritium through long-term monitoring.	Complies with ARARs for VOCs through treatment and for tritium through long-term monitoring.	Complies with ARARs for VOCs through treatment and for tritium through long-term monitoring.	Complies with ARARs for VOCs through treatment and for tritium through long-term monitoring.	Complies with ARARs for tritium through groundwater extraction and VOCs through volatilization.
Location-Specific	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands
Action-Specific	Not applicable	Complies with ARARs for well construction.	Complies with ARARs for treatment of contaminated groundwater and well construction.	Complies with ARARs for treatment of contaminated groundwater and well construction.	Complies with ARARs for treatment of contaminated groundwater and well construction.	Complies with ARARs for well construction.

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation With Monitoring and Institutional Controls
3. Long-Term Effectiveness and Permanence						
Magnitude of Residual Risks	No residual risk after 90 years	No residual risk after 90 years	No residual risk after 80 years	No residual risk after 80 years	No residual risk after 80 years	No residual risk after 90 years
Adequacy of Controls	No expressed institutional controls to prevent human exposure	Institutional controls required to prevent human exposure until RGs met.	Institutional controls required to prevent human exposure until RGs met.	Institutional controls required to prevent human exposure until RGs met.	Institutional controls required to prevent human exposure until RGs met.	Institutional controls required preventing human exposure until RGs met, air monitoring and vegetation sampling may be required.
4. Reduction of Toxicity, Mobility, or Volume Through Treatment						
Treatment Process Used and Materials Treated	VOCs and Tritium will be reduced by natural processes.	VOCs and Tritium will be reduced by natural processes.	Zero-valent iron treats PCE and TCE. Tritium will be reduced by natural processes.	Bioremediation treats PCE and TCE. Tritium will be reduced by natural processes.	Chemical-oxidation treats PCE and TCE. Tritium will be reduced by natural processes.	Cross-media transfer of tritium, PCE, and TCE.
Amount of Hazardous Materials Destroyed or Treated	No treatment	No treatment	Would treat 40 kg of PCE and 3 kg of TCE. No treatment for Tritium.	Would treat 40 kg of PCE and 3 kg of TCE. No treatment for Tritium.	Would treat 40 kg of PCE and 3 kg of TCE. No treatment for Tritium.	Would remove 40 kg of PCE, 3 kg of TCE, and 2250 Ci of tritium.

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls
4. Reduction of Toxicity, Mobility, or Volume Through Treatment (Continued)						
Degree of Expected Reduction in Toxicity, Mobility, or Volume*	Low Volume of VOCs and tritium reduced through natural processes.	Low Volume of VOCs and tritium reduced through natural processes.	Low Volume of PCE and TCE reduced through treatment. Volume of tritium reduced through natural processes.	Low Volume of PCE and TCE reduced through treatment. Volume of tritium reduced through natural processes.	Low Volume of PCE and TCE reduced through treatment. Volume of tritium reduced through natural processes.	Low Volume and mobility of tritium reduced through phytoremediation. Volume of PCE and TCE reduced through volatilization.
Degree to Which Treatment is Irreversible	No treatment	No treatment	Irreversible	Irreversible	Irreversible	Irreversible
Types and Quantities of Residuals Remaining after Treatment	No treatment	No treatment	Spent zero-valent iron left in-situ.	Potential for small quantities of microorganisms and nutrients.	Potential for small quantities of potassium permanganate	Potentially contaminated vegetation

* Concentration of VOCs is dilute. Any active remediation will not reduce groundwater concentrations below MCLs within the O&M period.

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls
5. Short-Term Effectiveness						
Risks to Remedial Workers	None	Minimal risk from well installation, well abandonment, and sampling activities	Minimal risk from PRB installation, well installation, well abandonment, and sampling activities	Minimal risk from injection of microorganisms and nutrients, well installation, well abandonment, and sampling activities	Minimal risk from injection of potassium permanganate, well installation, well abandonment, and sampling activities	Minimal risk from well installation, well abandonment, and sampling activities; minor risk from spray operation
Risks to Community	None	None	None	None	None	Minimal risk from spray operation
Risks to Environment	None	None	None	None	None	Minor risk due to spray operation.
Approximate Time to Achieve Remedial Action Objectives	90 years	90 years	80 years	80 years	80 years	90 years

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls
6. Implementability						
Availability of Materials, Equipment, Skilled Labor	Not applicable	Readily available	Available from specialty vendors/ subcontractors	Available from specialty vendors/ subcontractors	Available from specialty vendors/ subcontractors	Readily available
Ability to Construct and Operate the Technology	Not applicable	Easily implemented	Moderately complex to implement	Moderately complex to implement	Moderately complex to implement	Moderately difficult due to contamination in low-permeability regions.
Ability to Obtain Permits / Approvals from Other Agencies	Not applicable	Routine permits - easily obtained	Routine permits - easily obtained	Routine permits - easily obtained, underground injection permit required	Routine permits - easily obtained, underground injection permit required	Waiver may be required to not treat VOCs prior to spray irrigation
Ability to Monitor Effectiveness of Remedy	Not applicable	Easily monitored through sampling	Easily monitored through sampling	Easily monitored through sampling	Easily monitored through sampling	Easily monitored through sampling

Table 4. Comparison of Commingled Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative VT-1 No Action	Alternative VT-3a Monitored Natural Attenuation and Institutional Controls	Alternative VT-3b Permeable Reactive Barrier with Monitoring and Institutional Controls	Alternative VT-3c Enhanced Bioremediation with Monitoring and Institutional Controls	Alternative VT-3d Chemical Oxidation with Monitoring and Institutional Controls	Alternative VT-4 Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls
6. Implementability (Continued)						
Ease of Undertaking Additional Actions (if necessary)	Not incompatible	Not incompatible	Not incompatible	Not incompatible	Not incompatible	Not incompatible
Time to Implement	Minimal	3 to 6 months	6 to 9 months	9 to 12 months	9 to 12 months	9 to 12 months
7. Cost						
Capital Cost	$0	$180,000	$18,791,000	$1,026,000	$1,196,000	$5,275,000
Present Worth O&M Cost	$0	$2,132,000	$10,292,000	$4,632,000	$6,081,000	$9,037,000
Total Present Worth Cost	$0	$2,312,000	$29,083,000	$5,658,000	$7,277,000	$14,312,000

Table 5. Comparison of Tritium Plume Alternatives against the Nine Criteria

Criterion	Alternative T-1 No Action	Alternative T-2 Monitored Natural Attenuation and Institutional Controls	Alternative T-3 Spray Irrigation/ Phytoremediation with Monitoring and Institutional Controls
1. Overall Protection of Human Health and the Environment			
Human Health	Not protective	Institutional controls prevent exposure to groundwater.	Institutional controls prevent exposure to groundwater.
Environment	Incomplete pathway	Incomplete pathway	Incomplete pathway
2. Compliance with ARARs			
Chemical-Specific	Does not comply with ARAR for tritium.	Complies with ARARs for tritium through long-term monitoring.	Complies with ARARs for tritium through groundwater removal for phytoremediation with long-term monitoring
Location-Specific	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands	Complies with ARARs to protect wetlands
Action-Specific	Not applicable	Complies with ARARs for well construction.	Complies with ARARs for well construction.
3. Long-Term Effectiveness and Permanence			
Magnitude of Residual Risks	MCL will be exceeded for 30 years	No residual risk	No residual risk
Adequacy of Controls	No expressed institutional controls on human exposure	Institutional controls required to prevent human exposure until RGOs met.	Institutional controls required to prevent human exposure until RGOs met.
4. Reduction of Toxicity, Mobility, or Volume through Treatment			
Treatment Process Used and Materials Treated	Tritium reduced by radioactive decay and other natural processes	Tritium reduced by radioactive decay and other natural processes	Cross-media transfer and Phytoremediation
Amount of Hazardous Materials Destroyed or Treated	No treatment	No treatment	Treats tritium
Degree of Expected Reduction in Toxicity, Mobility, or Volume	Low Volume of tritium reduced through natural processes	Low Volume of tritium reduced through radioactive decay	Low Volume and mobility of tritium reduced through phytoremediation..
Degree to Which Treatment is Irreversible	No treatment	No treatment	Irreversible
Types and Quantities of Residuals Remaining after Treatment	No treatment	No treatment	Potentially contaminated vegetation

Table 5. Comparison of Tritium Plume Alternatives against the Nine Criteria (Continued)

Criterion	Alternative T-1 No Action	Alternative T-2 Monitored Natural Attenuation and Institutional Controls	Alternative T-3 Spray Irrigation/ Phytoremediation with Monitoring and Institutional Controls
5. Short-Term Effectiveness			
Risks to Remedial Workers	None	Negligible risk from well installation, well abandonment, and sampling activities	Minor risk during construction; negligible risk from well installation, well abandonment, and sampling activities
Risks to Community	None	None	Minimal risk from spray operation
Risks to Environment	None	None	Minor risk due to spray operation.
Approximate Time to Achieve Remedial Action Objectives	30 years	30 years	30 years
6. Implementability			
Availability of Materials, Equipment, Skilled Labor	Not applicable	Readily available	Readily available
Ability to Construct and Operate the Technology	Not applicable	Easily implemented	Moderately complex due to contamination in low-permeability regions.
Ability to Obtain Permits/Approvals from Other Agencies	Not applicable	Routine permits - easily obtained	Routine permits - easily obtained
Ability to Monitor Effectiveness of Remedy	Not applicable	Easily monitored through sampling	Easily monitored through sampling
Ease of Undertaking Additional Actions (if necessary)	Not incompatible	Not incompatible	Not incompatible
Time to Implement	Minimal	3 to 6 months	9 to 12 months
7. Cost			
Capital Cost	$0	$125,000	$4,507,000
Present Worth O&M Cost	$0	$1,196,000	$6,939,000
Total Present Worth Cost	$0	$1,321,000	$11,446,000

consistent with the NCP. There are three types of ARARs: (1) chemical-specific, (2) location-specific, and (3) action-specific.

Chemical-specific ARARs are usually health- or risk-based levels or methodologies that, when applied to unit-specific conditions, result in the establishment of numerical values. Often these numerical values are promulgated in federal or state regulations. RGs for the LASG OU are based on chemical-specific ARARs (Tables 2 and 3).

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. Some examples of specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

Action-specific ARARs are usually technology- or remedial activity-based requirements or limitations on actions taken with respect to hazardous substances or unit-specific conditions. These requirements are triggered by the particular remedial activities selected to accomplish a remedy.

In addition to ARARs, compliance with other criteria, guidance, and proposed standards that are not legally binding but may provide useful information or recommended procedures should be reviewed as to-be-considered (TBC) when setting remedial objectives.

Chemical-Specific ARARs: Under the No Action alternatives (VT-1 and T-1), no controls are established to prevent human contact with contaminated groundwater and no measures are taken to demonstrate that MCLs are being achieved.. All other alternatives (VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2, and T-3) use combinations of treatment and MNA to achieve MCLs and institutional controls to prevent human exposure. The treatment component of Alternatives VT-3b, VT-3c, and VT-3d is only effective for VOC contamination and these alternatives rely

on natural attenuation to reduce tritium. Only Alternatives VT-4 and T-3 reduce both VOC and tritium contamination in the groundwater by cross-media transfer. Alternatives VT-3a and T-2 used MNA to reduce VOC and tritium levels in groundwater.

Location-Specific ARARs: There are no location-specific ARARs applicable to the No Action alternatives (VT-1 and T-1). All other alternatives will be implemented in a manner that complies with location-specific ARARs.

Action-specific ARARs: There are no action-specific ARARs applicable to the No Action alternatives (VT-1 and T-1). Alternatives VT-3a, VT-3b, VT-3c, VT-3d, VT-4, T-2, and T-3 will be implemented to comply with ARARs for monitoring well construction. Alternatives VT-3b, VT-3c, and VT-3d will be implemented to comply with action-specific ARARs to treat contaminated groundwater and limit worker exposure to treatment process chemicals and microbial cultures. Alternatives VT-4 and T-3 will be implemented to comply with air quality ARARs.

3. Long-Term Effectiveness and Permanence – The remedial alternatives are assessed based on their ability to maintain reliable protection of human health and the environment after implementation.

The No Action alternatives (VT-1 and T-1) provide no long-term effectiveness or permanence since no controls are established to prevent contact with contaminated groundwater and no measures are taken to demonstrate that MCLs are being achieved.

All other alternatives are long-term, permanent remedies. Alternatives VT-3b, VT-3c, and VT-3d permanently reduce PCE and TCE concentrations through dechlorination or oxidation. VT-4 and T-3 permanently remove groundwater contaminated with PCE, TCE, and tritium from the aquifer by cross-media transfer. The O&M time required for these alternatives is the same as for VT-3a

and T-2. The overall long-term effectiveness and permanence of all alternatives, including VT-3a and T-2, is dependent on natural attenuation, which is monitored through continued O&M and ICs until RGs are achieved.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment - The remedial alternatives are assessed based on the degree to which they employ treatment that reduces toxicity (the harmful nature of the contaminants), mobility (the ability of the contaminants to move through the environment), or volume of contaminants associated with the unit.

The No Action alternatives (VT-1 and T-1) do not reduce the toxicity, mobility, or volume of contaminants. Alternatives VT-3a and T-2 do not include a treatment component; therefore, the toxicity, mobility, or volume of contaminants is reduced through natural processes rather than treatment. The use of a PRB (VT-3b), enhanced bioremediation (VT-3c), and chemical oxidation (VT-3d) reduces the toxicity, mobility, and volume of PCE and TCE by destroying the contaminants in situ. Spray irrigation and phytoremediation (VT-4 and T-3) reduce mobility and volume of contaminants through cross-media transfer. The toxicity and volume are reduced in the atmosphere through photodegradation and dispersion.

5. Short-Term Effectiveness - The remedial alternatives are assessed considering factors relevant to implementation of the remedial action, including risks to the community during implementation, impacts on workers, potential environmental impacts (e.g., air emissions), and the time until protection is achieved.

Implementation of the No Action alternatives (VT-1 and T-1) presents no short-term risk to the community or the environment. The No Action alternatives are not effective in the short term in reducing contaminant concentrations but would be effective in protecting workers since none would be exposed to contaminated groundwater.

Remedial worker exposure is minimized and maintained below occupational-health criteria through the proper use of engineering controls, procedures, appropriate personal protective equipment, site monitoring, and adherence to a health and safety plan. Potential contact with chemicals presents an additional hazard during implementation of a PRB (VT-3b), enhanced bioremediation (VT-3c), or chemical oxidation (VT-3d) system; the risk may be mitigated by establishing exclusion zones and using appropriate personal protective equipment for workers who handle the chemicals.

The approximate operating time for alternatives VT-1, VT-3a, and VT-4 is 90 years. The actions involved in alternatives VT-3b, VT-3c, and VT-3d reduce treatment time to 80 years.

Alternatives T-1, T-2, and T-3 require 30 years of O&M time.

6. Implementability - The remedial alternatives are assessed by considering the difficulty of implementing the alternative, including technical feasibility, constructability, reliability of technology, ease of undertaking additional remedial actions (if required), monitoring considerations, administrative feasibility (regulatory requirements), and availability of services and materials.

No construction is required for the No Action alternatives, so they could be implemented immediately. Implementation of the other alternatives is achieved using conventional construction equipment, materials, and methods that are readily available. Alternatives VT-3a and T-2 involve only monitoring well installation and can be implemented in 3 to 6 months. VT-3b will require 6 to 9 months for implementation and VT-3c and VT-3d will require 9 to 12 months for implementation. VT-4 and T-3 involve the installation of recovery wells and spray fields and will require 9 to 12 months for implementation.

7. Cost - The evaluation of remedial alternatives must include capital and O&M costs. Present value costs are estimated within +50/-30% according to USEPA

guidance, with a graduated discount factor for increasing O&M time (2.1% for 0 to 3 years, 2.8% for 4 to 5 years, 3.0% for 6 to 7 years, 3.1% for 8 to 10 years, and 3.9% for 11 years or longer). Discount rates are from ERTEC-2002-00011 (Rehder 2002) based on values for 2002 available in Office of Management and Budget [OMB] Circular No. A-94, Appendix C, 2006 (OMB 2006). The 2006 annual review of ERTEC-2002-00011 versus OMB 2006 found that changes to discount rates for more recent years were not enough to warrant revising ERTEC-2002-00011 at this time. The cost estimates given with each alternative are prepared from the best information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs may vary from the estimates presented herein.

The total present worth costs of alternatives addressing the commingled VOC and tritium plumes range from $0 (VT-1) to $29.1 million (VT-3b). The total present worth costs of alternatives addressing the western tritium plume range from $0 (T-1) to $11.4 million (T-3). Present value costs for all alternatives are shown in the following insert:

8. State Acceptance – SCDHEC approval of the proposed action in the SB/PP constitutes acceptance of the Selected Remedy.

9. Community Acceptance - The community acceptance of the preferred alternative is assessed by giving the public an opportunity to comment on the remedy selection process. A public comment period was held between August 16, 2006 and September 29, 2006; no comments were received. Had SRS received public comments concerning the proposed remedy, the comments and responses would have been incorporated in the *Responsiveness Summary* in Appendix A of this ROD.

Alternative	Cost
Commingled VOCs and Tritium Plume	
VT-1: No Action	$0
VT-3a: Monitored Natural Attenuation and Institutional Controls	$2,312,000
VT-3b: Permeable Reactive Barrier with Monitoring and Institutional Controls	$29,083,000
VT-3c: Enhanced Bioremediation with Monitoring and Institutional Controls	$5,658,000
VT-3d: Chemical Oxidation with Monitoring and Institutional Controls	$7,277,000
VT-4: Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls	$14,312,000
Tritium Plume West of the Reactor	
T-1: No Action	$0
T-2: Monitored Natural Attenuation and Institutional Controls	$1,321,000
T-3: Spray Irrigation / Phytoremediation with Monitoring and Institutional Controls	$11,446,000

XI. THE SELECTED REMEDY

Detailed Description of the Selected Remedy

The scope of the LASG OU remedial action is limited to local groundwater. Source units have been dispositioned under separate RODs or will be addressed as part of the LAOU. The LASG OU remedial action will address both commingled VOC and tritium plumes and the tritium plume west of the reactor. Minor changes to the Selected Remedy may occur during the remedial design or construction processes. Changes to the remedy described in this ROD will be

documented in the Administrative Record File with a memo, an explanation of significant difference (ESD), or ROD amendment.

The Selected Remedy for the LASG OU is Alternatives VT-3a and T-2, MNA/IC. The bases for selecting MNA/IC over the more robust technologies considered in the CMS/FS (WSRC 2006a) are as follows:

- There are no active, continuing sources of groundwater contamination at the LASG OU. The identified sources have either been remediated or depleted or are still active facilities; LADB is still in service as the receiving basin for offsite fuel assemblies.

- Numerous proven treatment technologies are available for VOC contamination, but there is no practicable treatment technology for tritium in groundwater (see Section IX).

- Natural attenuation processes (dispersion, dilution, and radioactive decay) are occurring at the LASG OU and are effective in reducing VOC and tritium contaminant concentrations below RGs in L Lake.

- MNA/IC provides the same level of protection as the more robust technologies at a much lower cost.

- MNA/IC will achieve the LASG OU remedial objectives within a time frame (approximately 90 years) that is comparable to that offered by the more robust technologies and at significantly lower cost.

- Groundwater discharge to surface water is not impacting human health or ecological receptors.

The components of MNA/IC at the LASG OU will include the following:

- Institutional controls at LASG OU will consist of general site access controls, groundwater use restrictions, the SRS Site Use/Site Clearance program, and deed restrictions and notifications.

- Contaminant concentrations in local groundwater and surface water will be reduced by natural attenuation processes including dispersion, dilution, and radioactive decay.

- The long-term monitoring of groundwater conditions in the plumes and surface water conditions in L Lake will allow an evaluation of the performance of the Selected Remedy and changing conditions in LASG OU.

Based on modeling and current conditions, RAOs and RGs are expected to be achieved in approximately 90 years. MNA/IC will continue until the FFA Core Team agrees that RAOs and RGs have been met.

Remedy Component: Institutional Controls

ICs to prevent exposure to on-site workers via the Site Use/Site Clearance Program, work control, worker training, and worker briefing of health and safety requirements. General site access controls to prevent exposure to trespassers, as described in the 2000 RCRA Part B Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary. The SRS site boundary fencing and security personnel will prevent trespassers from gaining access to the general site including the surface of LASG OU and the monitoring wells.

In the long term, if the property is ever transferred to nonfederal ownership, the US Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the groundwater beneath the property is contaminated. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

The deed shall also include deed restrictions precluding residential use of contaminated groundwater. The deed shall contain provisions to ensure that appropriate LUCs remain with the affected area upon any and all transfers. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with USEPA and SCDHEC review and approval.

In addition, if the site is ever transferred to nonfederal ownership, a survey plat of the OU will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

The Selected Remedy for LASG OU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for an indefinite period of time. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a Land Use Control and Assurance Plan (LUCAP) to ensure that the LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific Land Use Controls Implementation Plan (LUCIP) referenced in this ROD will provide

details and specific measures required to implement and maintain the LUCs selected as part of this remedy (Table 6). The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this ROD. The LUCIP, developed as part of this action, will be submitted concurrently with the corrective measures implementation (CMI)/remedial action implementation plan (RAIP), as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA and the *SRS Federal Facility Agreement* (FFA 1993). The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect unless and until modifications are approved as needed to be protective of human health and the environment. The deed shall contain provisions to ensure that appropriate LUCs remain with the affected area upon any and all transfers. The LUCs, listed in Table 6, shall be maintained until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use. Approval by USEPA and SCDHEC is required for any modification or termination of the ICs.

Future residential water usage will be prohibited until RAOs and RGs are attained (approximately 90 years) to ensure long-term protectiveness. LUCs will prohibit residential use of local groundwater and will be maintained until groundwater is restored to MCLs. Termination of any LUCs will be subject to CERCLA requirements for documenting changes in remedial actions.

Table 6. Land Use Controls for LASG OU

Type of Control	Purpose of Control	Duration	Implementation	Affected Areas[a]
1. Property Record Notices[b]	Provide notice to anyone searching records about the existence and location of contaminated areas.	Until the concentrations of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	Areas of groundwater contamination exceeding MCLs.
2. Property record restrictions[c]: Groundwater	Prohibit the use of groundwater in areas of known or suspected contamination.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Drafted and implemented by USDOE upon transfer of affected areas. Recorded by USDOE in accordance with state law at County Register of Deeds office.	Areas of groundwater contamination exceeding MCLs.
3. Other Notices[d]	Provide notice to city and/or county about the existence and location of waste disposal and residual contamination areas for zoning/planning purposes.	Until the concentrations of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	Areas of groundwater contamination exceeding MCLs.
4. Site Use Program[e]	Provide notice to worker/developer (i.e., permit requestor) on extent of contamination and limit penetration activities to those approved by SRS.	As long as property remains under USDOE control	Implemented by USDOE and site contractors Initiated by permit request	Remediation and monitoring systems and areas where groundwater contamination exceeds MCLs.
5. Physical Access Controls[f] (e.g., gates, portals)	Control and restrict general site access by workers and the public to prevent unauthorized entry.	Until the concentrations of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Controls maintained by USDOE	At select locations throughout SRS.
6. Security Surveillance Measures	Control and monitor access by workers/public	Until the concentrations of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Established and maintained by USDOE Necessity of patrols evaluated upon completion of remedial actions.	Patrol of selected areas throughout SRS, as necessary.

Table 6. Land Use Controls for LASG OU (Continued)

[a]Affected areas – Specific locations identified in the SRS LUCIP or subsequent post-ROD documents.
[b]Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of USDOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination and waste disposal areas in the property.
[c]Property Record Restrictions – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of USDOE and its predecessor agencies.
[d]Other Notices – Includes information on the location of waste disposal areas and residual contamination depicted on survey plat, which is provided to a zoning authority (i.e., city planning commission) for consideration in appropriate zoning decisions for non-USDOE property.
[e]Site Use Program – Refers to the internal USDOE/USDOE contractor administrative program(s) that requires the permit requestor to obtain authorization, usually in the form of a permit, before beginning any penetration activity (e.g., well drilling) for the purpose of ensuring that the proposed activity will not affect underground utilities/structures, or in the case of contaminated groundwater, will not disturb the affected areas without appropriate precautions and safeguards.
[f]Physical Access Controls – Physical barriers or restrictions to entry.

The LUC objectives necessary to ensure the protectiveness of the Selected Remedy are:

- preclude residential use of local contaminated groundwater;
- maintain the integrity of any current or future remedial or monitoring system or component such as monitoring wells until remedial goals are achieved and restrictions are no longer warranted, and
- prevent unauthorized access to contaminated groundwater in the area.

Groundwater contamination within the OU boundary was investigated during the RFI/RI, three contamination plumes were mapped in the RFI/RI Report. The LUC boundary (Figure 8) includes all areas currently contaminated above the MCLs and adequate buffer zone to include any changes in plume geometry over time. Plume boundaries extend to the submerged channel of Steel Creek as shown on the 1987 Savannah River Plant 1:48,000 topographic map. Thus the LUC boundary will remain valid if L Lake is ever drained.

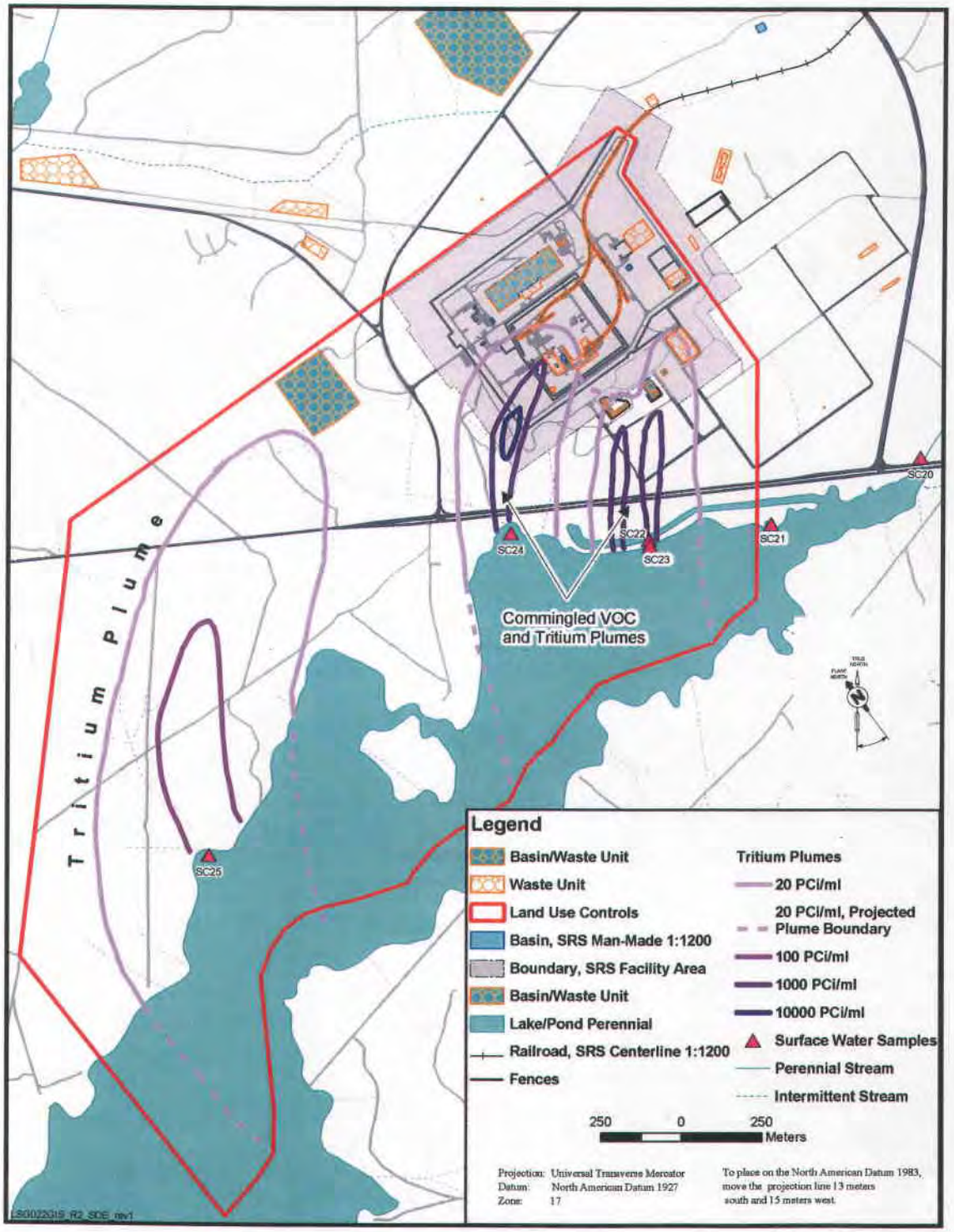

Figure 8. Land Use Control Outline for LASG OU

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Remedy Component: Natural Attenuation

Natural attenuation refers to natural processes such as advection, diffusion, dilution, hydrodynamic dispersion, sorption, aerobic and anaerobic biodegradation, radioactive decay, and numerous other natural processes that can reduce the concentration of contaminants in groundwater without human intervention.

PCE and TCE concentrations can be reduced by most of the processes discussed in the preceding paragraph, except radioactive decay. PCE and TCE are subject to more rapid biodegradation under anaerobic than aerobic conditions; DCE and CE are degraded more rapidly under aerobic conditions. Aerobic conditions prevail throughout most of the plumes except near and beneath L Lake, suggesting that very little biodegradation of PCE and TCE is to be expected in the aerobic upgradient portion of the commingled VOC and tritium plumes. 1,2-DCE, a degradation product of PCE and TCE, was found in concentrations as high as J3.34 µg/L in the mid-plume area (LSCPT-22), therefore some biodegradation of PCE and TCE is taking place even in the aerobic portion of the plumes. Other processes such as dilution would obviously be effective in reducing PCE and TCE concentrations. PCE and TCE have not been detected in surface water samples from L Lake, indicating that natural attenuation is effective in reducing PCE and TCE concentrations below MCLs in this system.

Radioactive decay is the only process that can reduce the amount of tritium in the groundwater. Natural dilution and dispersion within the plume may effectively reduce the tritium concentration below MCLs. As shown in Table 1, dispersion, dilution, and radioactive decay are generally effective in reducing tritium concentrations to below the MCL at LASG OU.

Remedy Component: Groundwater Monitoring and Reporting

The long-term monitoring of groundwater conditions in the plumes and surface water conditions in L Lake will ensure that the expected natural attenuation processes (dispersion, dilution, and radioactive decay) are performing as modeled and contaminant concentrations are decreasing as predicted.

The following monitoring data quality objectives (DQOs) will be used for the LASG monitoring program:

DQO #1: Perform monitoring to ensure that the plume(s) movement horizontally is trending consistent with the conceptual flow path to L Lake as predicted by the model.

DQO #2: Perform monitoring to ensure that the plume(s) movement vertically is trending consistent with the conceptual flow path as predicted by the model.

DQO #3: Perform monitoring to ensure that the plume(s) contaminants (tritium and VOCs) are trending to lower concentration/activity as they approach L Lake in the groundwater.

DQO #4: Perform surface water monitoring to ensure that the plume(s) contaminants (tritium and VOCs) are below regulatory thresholds and not trending to higher concentration/activity as they leave L Lake at the dam to ensure protection of downstream receptors.

DQO #5: Perform groundwater monitoring to ensure that there are no releases of contaminants from unknown or existing sources and that existing remediated or depleted sources are under control.

Before preparing the Effectiveness Monitoring Plan, SRS will collect shallow and deep water samples from L Lake at several locations at increasing distances from the shoreline along the axes of the southwest and southeast commingled VOC and tritium plumes for tritium activity. The results from this one-time sampling

activity will be used as input in designing the surface water component of the MNA monitoring network, which will be presented in detail in the Effectiveness Monitoring Plan associated with the CMI/RAIP.

The monitoring well network will include approximately five existing wells and three new wells in the western tritium plume and nine existing wells and five new wells in the commingled VOC and tritium plumes. The preliminary monitoring network for LASG OU is available in Appendix B of this ROD. The final version of the monitoring network will be produced during the design phase of the project. The network at the commingled VOC and tritium plumes includes two A-screen wells (LSW 2A and LSW 24A), which are screened below the green clay in the Gordon aquifer. All of the other wells are or will be screened in the Upper Three Runs aquifer above the tan clay.

Monitoring activities and submittal of an Effectiveness Monitoring Report will comply with the schedule that will be developed in the CMI/RAIP.

Cost Estimate for the Selected Remedy

Separate present worth cost estimates were prepared for Alternative VT-3a, Monitored Natural Attenuation and Institutional Controls for the Commingled VOC and Tritium Plumes, and Alternative T-2, Monitored Natural Attenuation and Institutional Controls for the Western Tritium Plume. These alternatives were combined into the Selected Remedy; the actual cost for the Selected Remedy will be less than the total of the separate estimates because duplicated activities such as report preparation and deed notification will be consolidated. Implementation of the same technology for all of the LASG OU plumes will also result in an economy of scale for contracting well installation and materials purchases. The following insert summarizes the separate detailed cost estimates, which are available in Appendix C.

	Alternative VT-3a		Alternative T-2	
Component/Item	**Quantity**	**Total Cost $1000**	**Quantity**	**Total Cost $1000**
Direct Capital Costs				
Monitoring Wells	5 wells	60	3 wells	36
LUCIP	1 plan	5	1 plan	5
Deed Restrictions	1 notification	8	1 notification	8
Mobilization/Demobilization		6		4
Site Preparation/Restoration		12		9
Indirect Capital Costs				
Engineering/Design		17		12
Project/Construction Management		23		16
Health and Safety		4		3
Overhead		27		19
Contingency		18		12
Total Capital Costs		180		124
Component/Item	**Years O&M**	**Total Cost $1000**	**Years O&M**	**Total Cost $1000**
Direct O&M Costs				
Access Control	2006-8	6	2006-8	6
Sampling Wells	2008-9	99	2008-9	60
Institutional Controls Sampling	2009-13	172	2009-13	105
Institutional Controls Sampling	2013-98	477	2013-38	187
5-year Remedy Review	2008-98	115	2008-38	88
Indirect O&M Costs				
Project Management		827		511
Health and Safety		44		40
Overhead		261		133
Contingency		131		67
Total O&M costs		2132		1197
Total Capital and O&M Costs		2312		1321

Present value costs are estimated within +50/-30% according to USEPA guidance, with a graduated discount factor for increasing O&M time (2.1% for 0 to 3 years, 2.8% for 4 to 5 years, 3.0% for 6 to 7 years, 3.1% for 8 to 10 years, and 3.9% for 11 years or longer). Discount rates are from ERTEC-2002-00011 (Rehder 2002), based on values for 2002 available in Office of Management and Budget [OMB] Circular No. A-94, Appendix C, 2006 (OMB 2006). The 2006 annual review of ERTEC-2002-00011 versus the latest revision of Circular No. A-94 found that changes to discount rates for more recent years were not enough to warrant revising ERTEC-2002-00011 at this time. The cost estimates given for each alternative are prepared from the best information available at the time of the estimate.

The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs may vary from the estimates presented herein. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record File, an ESD, or a ROD amendment.

Estimated Outcomes of Selected Remedy

After the MNA/IC O&M period (approximately 90 years in the commingled VOC and tritium plumes and 30 years in the western tritium plume), groundwater in the LASG OU should have attained the RGs listed in Table 2, contaminant levels at which time the groundwater can be released for unrestricted use.

Waste Disposal and Transport

The only remedial activities under MNA/IC that will produce waste are the installation of additional monitoring wells, sampling, and finally abandonment of the groundwater monitoring network.

- All unused environmental samples may be returned to the waste site, within the area of contamination. This only includes samples that have had no preservatives added.

- Decontamination solutions and rinsates from cleaning items intended for reuse or recycle (e.g., field sampling tools, equipment, or personal protective equipment) may be discharged to the ground surface at an area which will not runoff or cause erosion. This method for handling decontamination solutions does not require an engineering evaluation to determine a waste disposal strategy. Decontamination wash and rinse

solutions typically include laboratory grade soap and deionized water, and laboratory grade isopropyl alcohol for residual organic compound stripping and tool drying. Any residual isopropyl alcohol must be containerized and combined with the soapy wash water before the solution is discharged to the ground surface to avoid discharging an ignitable hazardous solution.

- Environmental sampling boreholes may be abandoned by backfilling with native soil, regardless of the level of contamination. The soil will be placed in the borehole in the reverse order as removed to maintain the original stratigraphy.

- Wells in the LAHS lobe of the southeastern commingled VOC and tritium plume may require purged water management.

- Prior sources of contamination in the groundwater plumes included the LAERB, LADB, LRSB, LAOCB, and LAHS. The LAOCB and LAHS were previously identified as containing RCRA-listed PCE and TCE (F001/F002). Other historical sources to the groundwater plumes are not considered RCRA listed. To be consistent across the entire groundwater plume and facilitate MNA monitoring, groundwater will not be considered RCRA hazardous unless it exhibits a RCRA characteristic. Subsequently, waste materials will be managed in accordance with the most current approved revision of the *Investigation-Derived Waste Management Plan* (WSRC-RP-94-1227). The approach is consistent with the RCRA substantive requirements, protective of human health and the environment and cost effective.

XII. STATUTORY DETERMINATIONS

Based on the unit RFI/RI report the LASG OU poses a threat to human health and the environment. Therefore, MNA/IC (Alternatives VT-3A and T-2) has been selected as the remedy for the LASG OU. LASG OU does not contain principal threat source material. The future land use of the LASG OU is assumed to be industrial land use.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are legally ARARs to the remedial action (unless justified by a waiver), and is cost-effective. The remedy in this OU does not satisfy the statutory preference for treatment as a principal element of the remedy because there is no practicable remedial technology capable of reducing the toxicity, mobility, or volume of tritium in the groundwater. The Selected Remedy does not include treatment as a principal element of the remedy since there is no practicable treatment alternative for tritium that significantly improves remedy performance; the Selected Remedy will reduce tritium, PCE, and TCE by natural processes, such as radioactive decay, dispersion, dilution, and volatilization. The Selected Remedy includes institutional controls and monitoring of groundwater to ensure protection of human health and the environment and compliance with ARARs.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

The remedy/remedies selected in this ROD do not contain any significant changes from the preferred alternative(s) presented in the SB/PP. No comments were received during the public comment period.

XIV. RESPONSIVENESS SUMMARY

The Responsiveness Summary serves the dual purposes of (1) presenting stakeholder concerns about the site and preferences regarding the remedial alternatives, and (2) explaining how those concerns were addressed and how the preferences were factored into the remedy selection process.

The Responsiveness Summary is included as Appendix A of this document.

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

The final ROD, which responds to regulatory agency comments, is scheduled to be issued in May 2007. After the ROD is signed, SRS will submit a CMI/RAIP to USEPA and SCDHEC. The remedial action start is anticipated to be April 2008. The post-ROD schedule is presented in Figure 9.

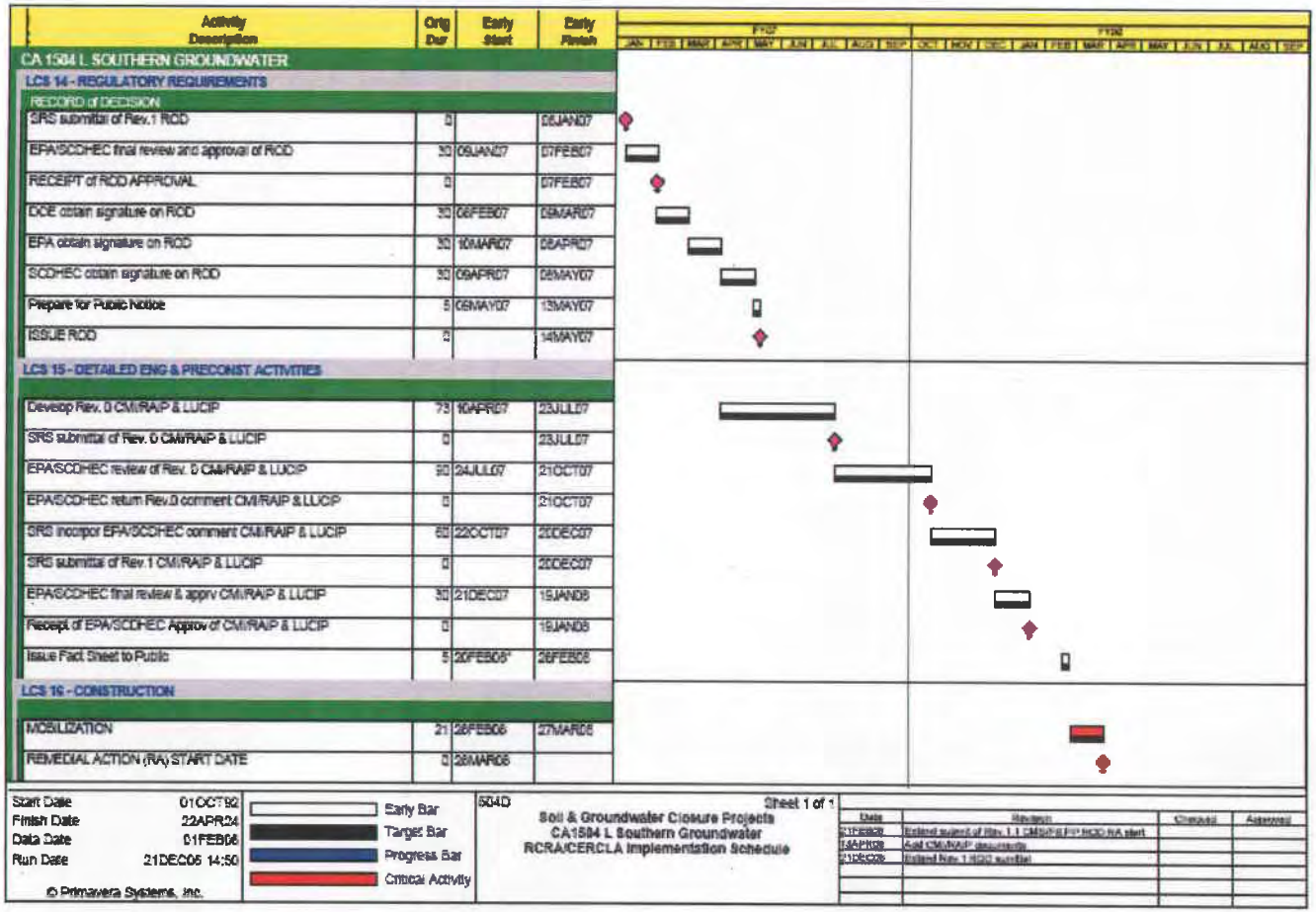

Figure 9. Post-ROD Schedule

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XVI. REFERENCES

FFA 1993. *Federal Facility Agreement for the Savannah River Site,* Administrative Docket No. 89-05-FF (Effective Date: August 16, 1993)

Office of Management and Budget (OMB) 2006. "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (10/29/1992) OMB Circular A-94, http://www.whitehouse.gov/omb/circulars/a094/a094.pdf

Appendix C updated January 2006.

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Table of Past Years Discount Rates from Appendix C of OMB Circular No. A-94

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Rehder, T. E. 2002. Revised Discount Factors for Use in Cost Estimates for the Corrective Measures Study/Feasibility Sturdy, ERTEC-2002-0001, Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (April 16) http://noteer01.srs.gov/ER-DCC/ERFUI.nsf/0/E0D0C2D046CFA7C585256B9E006B25C5/$File/ERTEC-2002-00011.pdf

USDOE 1994. *Public Involvement, A Plan for the Savannah River Site,* Savannah River Operations Office, Aiken SC

USDOE 1994. *Public Involvement, A Plan for the Savannah River Site,* Savannah River Operations Office, Aiken, SC

WSRC 1997. *Record of Decision/Remedial Alternative Selection for the L-Area Oil and Chemical Basin (904-83G) and L-Area Acid/Caustic Basin (904-79G) (U),* WSRC-RP-97-143, Revision 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (July)

WSRC 2002. *Unit-specific Plug-in Record of Decision Amendment for the C-Area Reactor Seepage Basin (904-67G) and L-Area Reactor Seepage Basin (904-54G) (U)*, WSRC-RP-2002-4063, Revision 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (August)

WSRC 2003. *Record of Decision/Remedial Alternative Selection for the L-Area Hot Shop (Including CML-003 Sandblast Area) Operable Unit (U)*, WSRC-RP-2002-4025, Revision 1.1, (Building Numbers: 712-G, 717-G, 707-G, 080-1G, and 080-2G), Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (May)

WSRC 2006a. *Corrective Measures Study/ Feasibility Study Report for the L-Area Southern Groundwater Operable Unit (NBN) (U),* WSRC-RP-2005-4025, Rev. 1.1, Washington Savannah River Company, Savannah River Site, Aiken, South Carolina (April)

WSRC 2006b. *Statement of Basis/Proposed Plan for the L-Area Southern Groundwater Operable Unit (NBN) (U),* WSRC-RP-2005-4101, Rev. 1, Washington Savannah River Company, Savannah River Site, Aiken, South Carolina (July)

APPENDIX A - RESPONSIVENESS SUMMARY

Responsiveness Summary

The SB/PP 45-day public comment period began on August 16, 2006 and ended on September 29, 2006.

Public Comments

No public comments were received.

APPENDIX B - PRELIMINARY MONITORING NETWORK FOR LASG OU

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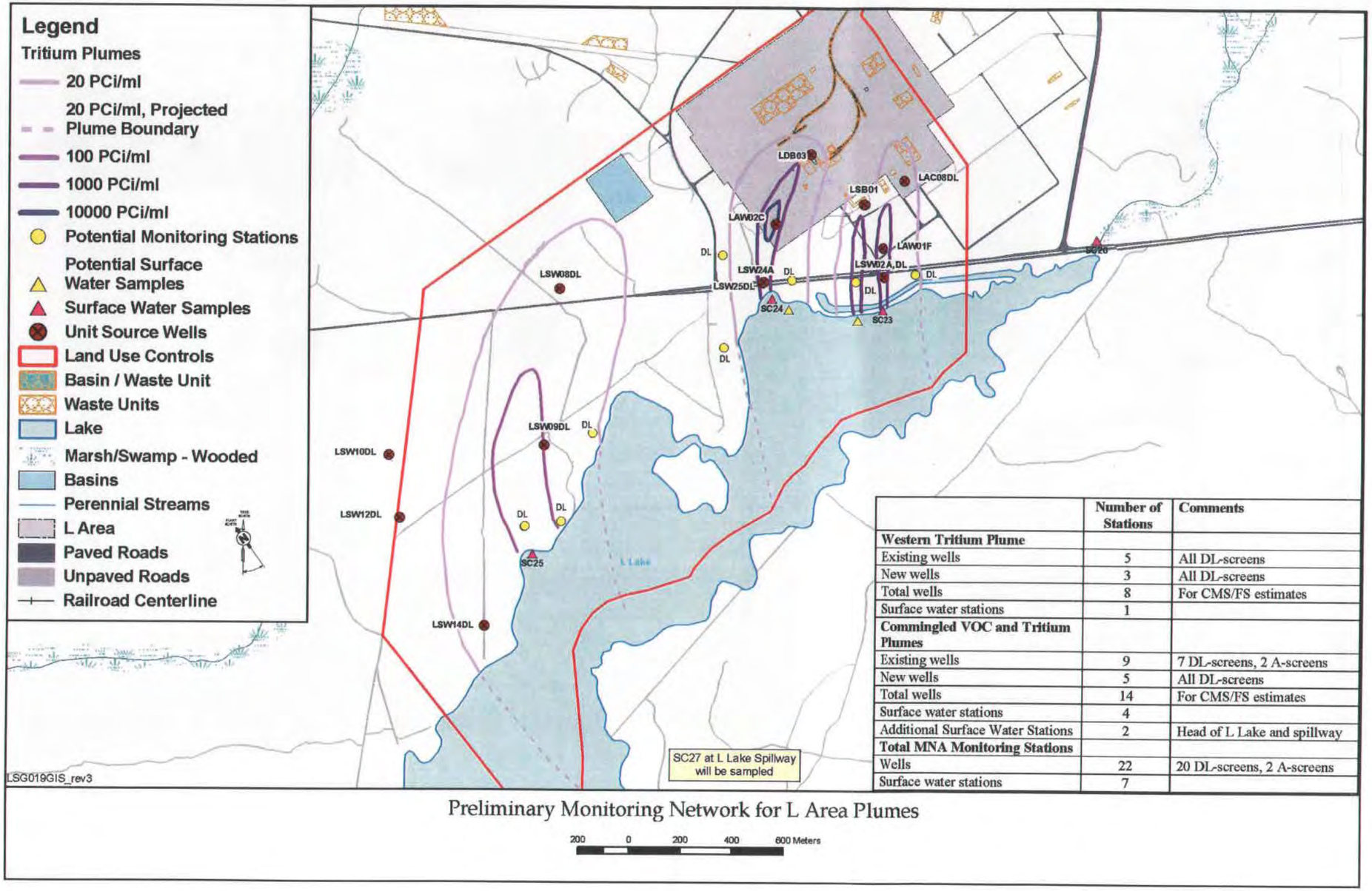

	Number of Stations	Comments
Western Tritium Plume		
Existing wells	5	All DL-screens
New wells	3	All DL-screens
Total wells	8	For CMS/FS estimates
Surface water stations	1	
Commingled VOC and Tritium Plumes		
Existing wells	9	7 DL-screens, 2 A-screens
New wells	5	All DL-screens
Total wells	14	For CMS/FS estimates
Surface water stations	4	
Additional Surface Water Stations	2	Head of L Lake and spillway
Total MNA Monitoring Stations		
Wells	22	20 DL-screens, 2 A-screens
Surface water stations	7	

Figure B-1. Preliminary Monitoring Network for LASG OU. (The tritium plumes are shown for reference.)

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APPENDIX C - PRESENT WORTH COST ESTIMATES FOR SELECTED REMEDY

Table C-1. Alternative VT-3a: (Commingled VOC and Tritium Plume) Monitored Natural Attenuation and Institutional Controls

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
2" Monitoring Wells					
A-Series Wells In GA (170-180 ft bgs)	0	ea	$14,000	$0	
DL-Series Wells in the TZ (40-60 ft bgs)	5	ea	$12,000	$60,000	
Institutional Controls					
Land Use Control Implementation Plan	1	ea	$8,000	$8,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$73,000	*
Mobilization/Demobilization	8.0%	of subtotal direct capital		$5,840	*
Site Preparation/Site Restoration	16.0%	of subtotal direct capital		$11,680	*
Total Direct Capital Cost	(sum of * items)			**$90,520**	
Indirect Capital Costs					
Engineering & Design	18.5%	of direct capital		$16,746	
Project/Construction Management	25.0%	of direct capital		$22,630	
Health & Safety	5.0%	of direct capital		$4,526	
Overhead	30.0%	of direct capital		$27,156	
Contingency	20.0%	of direct capital		$18,104	
Total Indirect Capital Cost				**$89,162**	
Total Estimated Capital Cost				**$179,682**	
Direct O&M Costs	3.9% discount rate for costs > 30 years duration[1]				
Annual Costs (Existing Configuration during Post-ROD Design & Const)	2 year O&M			*Year 2006 - 2008*	
Access Controls	1	ea	$3,000	$3,000	
Subtotal - Annual Costs				$3,000	
Present Worth Annual Costs (2.1% Discount Rate)				$5,816	
Annual Costs (Institutional Controls - Quarterly Sampling, New Wells)	1 year O&M			*Year 2008 - 2009*	
Access Controls	1	ea	$3,000	$3,000	
Monitoring Well Sampling (5 Wells, Quarterly Sampling)	20	ea	$200	$4,000	
Sample Analysis (VOCs and Tritium)	20	ea	$200	$4,000	
Data Review & Interpretation	1	ls	$1,280	$1,280	
Well Redevelopment / Waste Management	20	ea	$3,000	$60,000	
Subtotal - Annual Costs				$72,280	
Annual Costs (Institutional Controls - Annual Sampling, Existing Wells)				*Years 2008 - 2009*	
Access Controls	1	ea	$3,000	$3,000	
Monitoring Well Sampling (8 Wells, Annual Sampling)	8	ea	$200	$1,600	
Sample Analysis (VOCs and Tritium)	8	ea	$200	$1,600	
Surface Water Sampling (4 Locations, Annual Sampling)	**6**	**ea**	**$200**	**$1,200**	
Sample Analysis (VOCs and Tritium)	**6**	**ea**	**$200**	**$1,200**	
Data Review & Interpretation	1	ls	$720	$720	
Well Redevelopment / Waste Management	8	ea	$3,000	$24,000	
Subtotal - Annual Costs				$33,320	
Present Worth Annual Costs (2.1% Discount Rate)				$99,217	

Table C-1. Alternative VT-3a: (Commingled VOC and Tritium Plume) Monitored Natural Attenuation and Institutional Controls (Continued)

Annual Costs (Institutional Controls - Annual Sampling)		4 years O&M		*Years 2009 - 2013*
Access Controls	1	ea	$3,000	$3,000
Monitoring Well Sampling (13 Wells, Annual Sampling)	13	ea	$200	$2,600
Sample Analysis (VOCs and Tritium)	13	ea	$200	$2,600
Surface Water Sampling (4 Locations, Annual Sampling)	**6**	**ea**	**$200**	**$1,200**
Sample Analysis (VOCs and Tritium)	**6**	**ea**	**$200**	**$1,200**
Data Review & Interpretation	1	ls	$1,040	$1,040
Well Redevelopment / Waste Management	13	ea	$3,000	$39,000
Subtotal - Annual Costs				$50,640
Present Worth Annual Costs (3.0% Discount Rate)				$172,261
Biennial Costs (Institutional Controls - Biennial Sampling)		85 years O&M		*Years 2013 - 2098*
Access Controls	1	ea	$3,000	$3,000
Monitoring Well Sampling (13 Wells, Biennial Sampling)	13	ea	$200	$2,600
Sample Analysis (VOCs and Tritium)	13	ea	$200	$2,600
Surface Water Sampling (4 Locations, Annual Sampling)	**6**	**ea**	**$200**	**$1,200**
Sample Analysis (VOCs and Tritium)	**6**	**ea**	**$200**	**$1,200**
Data Review & Interpretation	1	ls	$1,040	$1,040
Well Redevelopment / Waste Management	13	ea	$3,000	$39,000
Subtotal - Biennial Costs				$50,640
Present Worth Annual Costs (3.9% Discount Rate)				$477,475
Five Year Costs		19		
Remedy Review (includes sample results)	1	ea	$25,000	$25,000
Subtotal - Five Year O&M Costs				$25,000
Present Worth Five Year Costs				$115,457
Total Present Worth Direct O&M Cost				**$870,226**
Indirect O&M Costs				
Project/Admin Management		95% of direct O&M		$826,715
Health & Safety		5% of direct O&M		$43,511
Overhead		30% of direct O&M		$261,068
Contingency		15% of direct O&M		$130,534
Total Present Worth Indirect O&M Cost				**$1,261,828**
Total Estimated Present Worth O&M Cost				**$2,132,054**
TOTAL ESTIMATED COST				**$2,311,736**

1. Interest rate for costs with duration < 30 years (i.e., before 2034) is based on WSRC's 16 April 2002 Technical Memorandum.

Table C-2. Alternative T-2: (Western Tritium Plume) Monitored Natural Attenuation and Institutional Controls

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
2" Monitoring Wells					
A-Series Wells In GA (170-180 ft bgs)	0	ea	$20,000	$0	
C-Series Wells In LAZ (70-90 ft bgs)	0	ea	$14,000	$0	
DL-Series Wells in the TZ (40-60 ft bgs)	3	ea	$12,000	$36,000	
Institutional Controls					
Land Use Control Implementation Plan	1	ea	$5,000	$5,000	
Deed Restrictions	1	ea	$8,000	$8,000	
Subtotal - Direct Capital Cost				$49,000	*
Mobilization/Demobilization	9.0%	of subtotal direct capital		$4,410	*
Site Preparation/Site Restoration	18.0%	of subtotal direct capital		$8,820	*
Total Direct Capital Cost		(sum of * items)		**$62,230**	
Indirect Capital Costs					
Engineering & Design	20.0%	of direct capital		$12,446	
Project/Construction Management	25.0%	of direct capital		$15,558	
Health & Safety	5.4%	of direct capital		$3,360	
Overhead	30.0%	of direct capital		$18,669	
Contingency	20.0%	of direct capital		$12,446	
Total Indirect Capital Cost				**$62,479**	
Total Estimated Capital Cost				**$124,709**	
Direct O&M Costs	3.9% discount rate for costs > 30 years duration[1]				
Annual Costs (Existing System during Post-ROD Design & Const)		2 year O&M		*Years 2006 - 2008*	
Access Controls	1	ea	$3,000	$3,000	
Subtotal - Annual Costs				$3,000	
Present Worth Annual Costs (2.1% Discount Rate)				$5,816	
Annual Costs (Quarterly Sampling, New Wells)		1 year O&M		*Year 2008 - 2009*	
Access Controls	1	ea	$3,000	$3,000	
Monitoring Well Sampling (3 Wells, Quarterly Sampling)	12	ea	$200	$2,400	
Sample Analysis (Tritium)	12	ea	$100	$1,200	
Data Review & Interpretation	1	ls	$480	$480	
Well Redevelopment / Waste Management	12	ea	$3,000	$36,000	
Subtotal - Annual Costs				$43,080	
Annual Costs (Institutional Controls - Annual Sampling, Existing Wells)				*Year 2008 - 2009*	
Access Controls	1	ea	$3,000	$3,000	
Monitoring Well Sampling (5 Wells, Annual Sampling)	5	ea	$200	$1,000	
Sample Analysis (Tritium)	5	ea	$100	$500	
Surface Water Sampling (3 Locations, Annual Sampling)	**3**	**ea**	**$200**	**$600**	
Sample Analysis (VOCs and Tritium)	**3**	**ea**	**$200**	**$600**	
Data Review & Interpretation	1	ls	$160	$160	
Well Redevelopment / Waste Management	5	ea	$3,000	$15,000	
Subtotal - Annual Costs				$20,860	
Present Worth Annual Costs (2.1% Discount Rate)				$60,075	

Table C-2. Alternative T-2: (Western Tritium Plume) Monitored Natural Attenuation and Institutional Controls (Continued)

Annual Costs (Annual Sampling)		4 years O&M		*Years 2009 - 2013*
Access Controls	1	ea	$3,000	$3,000
Monitoring Well Sampling (8 Wells, Annual Sampling)	8	ea	$200	$1,600
Sample Analysis (Tritium)	8	ea	$100	$800
Surface Water Sampling (3 Locations, Annual Sampling)	**3**	**ea**	**$200**	**$600**
Sample Analysis (VOCs and Tritium)	**3**	**ea**	**$200**	**$600**
Data Review & Interpretation	1	ls	$160	$160
Well Redevelopment / Waste Management	8	ea	$3,000	$24,000
Subtotal - Annual Costs				$30,760
Present Worth Annual Costs (3.0% Discount Rate)				$104,635
Biennial Costs (Institutional Controls - Biennial Sampling)		25 years O&M		*Years 2013 - 2038*
Access Controls	1	ea	$3,000	$3,000
Monitoring Well Sampling (8 Wells, Biennial Sampling)	8	ea	$200	$1,600
Sample Analysis (Tritium)	8	ea	$100	$800
Surface Water Sampling (3 Locations, Annual Sampling)	**3**	**ea**	**$200**	**$600**
Sample Analysis (VOCs and Tritium)	**3**	**ea**	**$200**	**$600**
Data Review & Interpretation	1	ls	$280	$280
Well Redevelopment / Waste Management	8	ea	$3,000	$24,000
Subtotal - Biennial Costs				$30,880
Present Worth Biennial Costs (3.9% Discount Rate)				$186,500.45
Five Year Costs		7		
Remedy Review (includes sample results)	1	ea	$25,000	$25,000
Subtotal - Five Year O&M Costs				$25,000
Present Worth Five Year Costs				$87,506
Total Present Worth Direct O&M Cost				**$444,534**
Indirect O&M Costs				
Project/Admin Management		115% of direct O&M		$511,214
Health & Safety		9% of direct O&M		$40,008
Overhead		30% of direct O&M		$133,360
Contingency		15% of direct O&M		$66,680
Total Present Worth Indirect O&M Cost				**$751,262**
Total Estimated Present Worth O&M Cost				**$1,195,796**
TOTAL ESTIMATED COST				**$1,320,505**

1. Interest rate for costs with duration < 30 years (i.e., before 2034) is based on WSRC's 16 April 2002 Technical Memorandum.

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APPENDIX D - SUMMARY OF MAXIMUM AND MOST RECENT RCOC (PCE, TCE, AND TRITIUM) CONCENTRATIONS IN LASG OU WELLS 1983-2006

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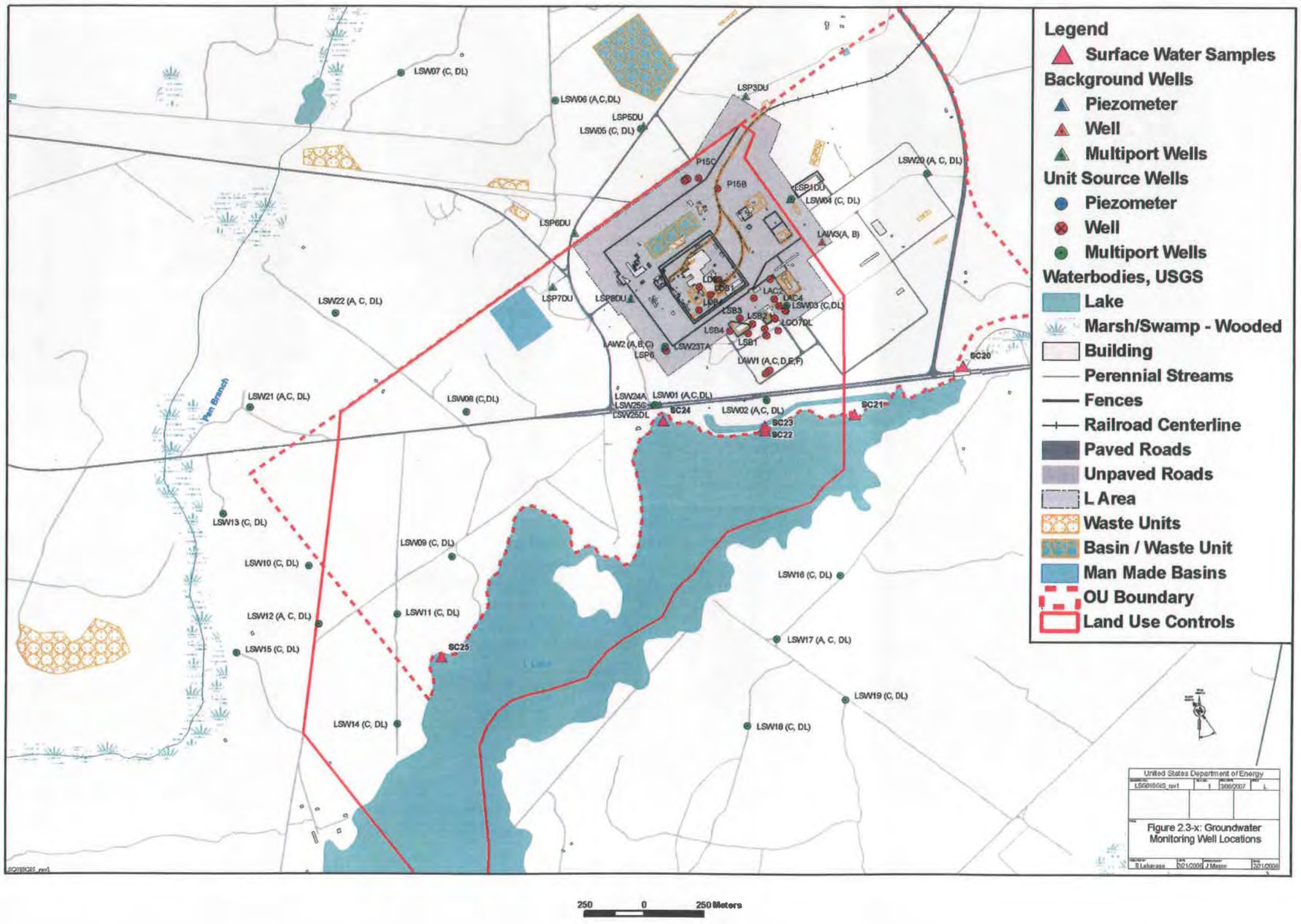

Figure D-1. Groundwater Monitoring Wells in and around the LASG OU

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Table D-1. Analyte: Tetrachloroethylene (PCE)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LAC 1	221.1-191.1	19.7	3/11/87	U1	3/8/95
LAC 2	223.4-193.4	20.2	3/11/87	U1	9/22/05
LAC 3	220.7-190.7	36	9/9/89	U1	11/17/99
LAC 4	215.3-185.3	10.8	1/31/88	J2.45	11/13/02
LAC 5DL	186.2-176.2	4.07	3/9/95	4.07	3/9/95
LAC 5DU	227.8-207.9	1.33	12/6/94	U1	3/9/95
LAC 6DL	185.9-175.9	12.8	3/14/94	1.75	3/9/95
LAC 6DU	221.7-201.7	2.51	3/14/94	1.54	3/9/95
LAC 7DL	187.4-177.4	25.8	3/14/94	J2.61	11/18/02
LAC 7DU	224.8-204.9	5.31	4/28/94	U5	9/28/00
LAC 8DL	190.4-180.4	60	9/22/05	60	9/22/05
LAC 8DU	219.8-199.8	0.46	3/15/94	U5	9/26/00
LAW 1A	-157.2- -162.2	U5	8/8/01	U1	9/20/05
LAW 1C	-29- -34	U5	11/13/02	U1	9/21/05
LAW 1D	11.6-6.6	U5	11/13/02	U5	11/13/02
LAW 1E	95.1-90.1	U5	11/12/02	U5	11/12/02
LAW 1F	185.9-165.9	U5	11/12/02	U1	9/21/05
LAW 2A	-147.2- -152.2	U5	8/8/01	U2	10/18/02
LAW 2B	-4.8- -9.8	1.24	12/2/03	J0.524	9/13/05
LAW 2C	191.2-171.2	11.8	4/27/04	6.89	9/13/05
LAW 3B	4- -1	U5	11/14/02	U5	11/14/02
LAW 3C	214.9-194.9	U5	3/10/93	U0.4	12/13/94
LCO 1	225.8-195.8	5.11	1/31/88	U1	6/3/96
LCO 2	226.6-196.6	9.58	3/2/87	U1	2/29/96
LCO 2DL	188.2-178.14	1.36	11/13/02	J1.36	11/13/02
LCO 3	226.3-196.3	24	9/20/88	4.62	3/10/95
LCO 4	222.3-192.3	86	11/4/85	7.4	5/13/97
LCO 5A	40-30	U1	9/21/94	U1	3/10/95
LCO 5C	120.5-110.5	J0.26	9/22/94	U5	9/26/00
LCO 5DL	184.9-174.9	22.9	12/9/94	J3.45	10/25/00
LCO 6DL	188-178	15	9/22/94	3	9/22/05
LCO 7DL	180.2-170.2	8.75	10/25/00	J0.66	9/21/05
LCO 8DL	188.4-178.4	1.91	3/13/95	J1.23	9/26/00
LCO 8DU	226.1-211.1	U1	9/23/94	U1	3/13/95
LDB 1	215-185	10.2	3/7/94	5.2	9/21/05
LDB 2	214.5-184.5	J0.19	9/21/05	J0.19	9/21/05

Table D-1. Analyte: Tetrachloroethylene (PCE) (Continued)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LDB 3	219.3-199.3	U5	11/25/02	U1	9/13/05
LDB 4	220.7-200.7	U5	11/25/02	U1	9/21/05
LSB 1	222.7-192.7	U5	11/13/02	U1	9/22/05
LSB 2	225-195	U5	8/8/97	U5	8/8/97
LSB 3	226.6-196.6	U5	11/15/02	U1	9/22/05
LSB 4	221.5-191.5	U5	12/30/02	U1	9/22/05
LSW 1A	4.16- -1.5	10.5	8/6/02	J2.3	9/18/04
LSW 1C	95.28-89.62	15.6	5/4/04	12	9/13/04
LSW 1DL	156.24-150.58	58	6/27/03	43.59	9/21/04
LSW 2A	8.82-3.16	J0.77	5/10/04	J0.33	9/18/04
LSW 2C	89.63-83.97	U5	12/16/02	U1	3/23/05
LSW 2DL	150.29-144.63	2.43	8/7/02	U1	3/23/05
LSW 3C	119.47-113.81	U5	12/17/02	U1	3/23/05
LSW 3DL	155.15-149.49	1.74	12/17/04	J0.447	3/23/05
LSW 4C	119.24-113.58	U5	9/13/04	U1	3/23/05
LSW 4DL	139.85-134.19	U5	9/13/04	U1	3/23/05
LSW 5C	102.09-96.43	U5	12/16/02	U5	9/20/04
LSW 5DL	152.69-147.03	U5	12/16/02	U5	9/20/04
LSW 6A	48.39-42.69	U5	9/18/04	U5	9/18/04
LSW 6C	99.29-93.59	U5	9/14/04	U5	3/28/05
LSW 6DL	165.29-159.59	U5	9/14/04	U1	3/28/05
LSW 7C	105.57-99.91	U5	9/15/04	U1	3/31/05
LSW 7DL	181.59-175.9	U5	9/15/04	U1	3/31/05
LSW 8C	108.71-103.04	U5	9/14/04	U1	9/13/05
LSW 8DL	164.5-158.83	U5	9/14/04	U1	9/20/05
LSW 9C	89.08-83.38	U5	9/15/04	U1	9/19/05
LSW 9DL	129.78-124.08	U5	9/14/04	U1	9/19/05
LSW 10C	103.23-97.53	U5	9/15/04	U1	9/19/05
LSW 10DL	154.13-148.43	U5	9/14/04	U1	9/19/05
LSW 11C	92.02-86.32	U5	9/15/04	U1	9/19/05
LSW 11DL	137.92-132.22	U5	9/15/04	U1	9/19/05
LSW 12A	59.92-54.22	U5	9/18/04	U5	9/18/04
LSW 12C	92.61-86.91	U5	9/15/04	U1	3/24/05
LSW 12DL	148.62-142.92	U5	9/15/04	U1	3/24/05
LSW 13C	103.65-97.95	U5	9/15/04	U1	3/24/05
LSW 13DL	154.66-148.96	U5	9/15/04	U1	3/24/05

Table D-1. Analyte: Tetrachloroethylene (PCE) (Continued)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LSW 14C	105.47-99.77	U5	9/15/04	U1	3/24/05
LSW 14DL	156.45-150.75	U5	9/15/04	U5	9/15/04
LSW 15C	94.2-88.5	U5	9/16/04	U1	3/31/05
LSW 15DL	155.33-149.63	U5	9/16/04	U1	3/31/05
LSW 16C	87.16-81.48	U5	9/21/04	U5	9/21/04
LSW 16DL	127.89-122.24	U5	9/15/04	U1	3/28/05
LSW 17A	16.44-10.74	U5	9/20/04	U5	9/20/04
LSW 17C	112.31-106.61	U5	9/20/04	U5	9/20/04
LSW 17DL	173.18-167.48	U5	9/21/04	U5	9/21/04
LSW 18C	117.62-111.92	U5	9/15/04	U1	9/28/05
LSW 18DL	178.52-172.82	U1	5/19/04	U1	5/19/04
LSW 19C	119.55-113.85	U5	9/16/04	U5	9/16/04
LSW 19DL	165.39-159.69	U5	9/16/04	U1	3/28/05
LSW 20A	58.05-52.34	U1	6/30/03	U1	6/30/03
LSW 20C	119.36-113.66	U5	9/16/04	U5	9/16/04
LSW 20DL	152.77-147.06	U5	9/16/04	U1	3/28/05
LSW 21A	67.49-61.78	U5	9/20/04	U5	9/20/04
LSW 21C	123.24-117.54	U5	9/16/04	U1	3/31/05
LSW 21DL	168.98-163.28	U5	9/16/04	U1	3/31/05
LSW 22A	79.71-74.07	U5	9/18/04	U5	9/18/04
LSW 22C	114.8-109.12	U5	9/21/04	U5	9/21/04
LSW 22DL	178.33-172.65	U5	9/1/6/04	U1	3/23/05
LSW 23		18.9	6/6/03	U1	6/17/03
LSW 23TA	-145.2- -150.2	U5	9/16/04.	U1	9/15/05
LSW 24		U1	6/2/03	U1	6/2/03
LSW 24A	-22.14- -27.15	U5	9/21/04	U1	9/15/05
LSW 25C	95.01-90.01	17	9/16/04	12.7	9/15/05
LSW 25DL	155.39-150.39	57.4	6/14/04	46.9	9/20/05

J result qualifier: The analyte was positively detected below quantitation limits, the reported value is an estimated quantity.

U result qualifier: The material was analyzed for but was not detected. The analyte concentration is less than the sample-specific estimated quantitative limit.

Table D-2. Analyte: Trichloroethylene (TCE)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LAC 1	221.1-191.1	55	3/11/94	U1	3/8/95
LAC 2	223.4-193.4	124	8/13/87	U1	9/22/05
LAC 3	220.7-190.7	51.51	9/1/86	U1	11/17/99
LAC 4	215.3-185.3	49.8	1/31/88	9.07	11/13/02
LAC 5DL	186.2-176.2	U1	9/21/94	U1	3/9/95
LAC 5DU	227.8-207.9	4.28	3/15/94	U1	3/9/95
LAC 6DL	185.9-175.9	3.45	3/14/94	2.24	3/9/95
LAC 6DU	221.7-201.7	U1	9/26/94	U1	3/9/95
LAC 7DL	187.4-177.4	6.17	5/30/02	J4.02	11/18/02
LAC 7DU	224.8-204.9	U5	9/28/00	U5	9/28/00
LAC 8DL	190.4-180.4	21	3/31/05	15	9/22/05
LAC 8DU	219.8-199.8	U5	9/26/00	U5	9/26/00
LAW 1A	-157.2- -162.2	U5	8/8/01	U1	9/20/05
LAW 1C	-29- -34	U5	11/13/02	U1	9/21/05
LAW 1D	11.6-6.6	U5	11/13/02	U5	11/13/02
LAW 1E	95.1-90.1	U5	11/12/02	U5	11/12/02
LAW 1F	185.9-165.9	U5	11/12/02	U1	9/21/05
LAW 2A	-147.2- -152.2	U5	8/8/01	U2	10/18/02
LAW 2B	-4.8- -9.8	U5	12/18/02	U1	9/13/05
LAW 2C	191.2-171.2	U5	11/13/02	1.4	9/13/05
LAW 3B	4- -1	U5	11/14/02	U5	11/14/02
LAW 3C	214.9-194.9	U5	3/10/93	U0.1	12/13/94
LCO 1	225.8-195.8	U5	10/22/85	U1	6/3/96
LCO 2	226.6-196.6	U5	11/14/85	U1	2/29/96
LCO 2DL	188.2-178.14	U5	11/13/02	U5	11/13/02
LCO 3	226.3-196.3	30.1	1/30/88	U1	3/10/95
LCO 4	222.3-192.3	18	11/19/91	3.99	5/13/97
LCO 5A	40-30	U1	9/21/94	U1	3/10/95
LCO 5C	120.5-110.5	U5	9/26/00	U5	9/26/00
LCO 5DL	184.9-174.9	6.68	4/16/94	U5	10/25/00
LCO 6DL	188-178	U5	11/18/02	U1	9/22/05
LCO 7DL	180.2-170.2	8.66	10/25/00	J0.53	9/21/05
LCO 8DL	188.4-178.4	U5	9/26/00	U5	9/26/00
LCO 8DU	226.1-211.1	U1	9/23/94	U1	3/13/95
LDB 1	215-185	7.88	3/16/88	J0.66	9/21/05
LDB 2	214.5-184.5	U5	11/25/25	U1	9/21/05

Table D-2. Analyte: Trichloroethylene (TCE) (Continued)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LDB 3	219.3-199.3	U5	11/25/02	U1	9/13/05
LDB 4	220.7-200.7	U5	11/25/02	J0.18	9/21/05
LSB 1	222.7-192.7	U5	11/13/02	U1	9/22/05
LSB 2	225-195	U5	8/8/97	U5	8/8/97
LSB 3	226.6-196.6	U5	11/15/02	U1	9/22/05
LSB 4	221.5-191.5	U5	12/30/02	U1	9/22/05
LSW 1A	4.16- -1.5	J0.48	5/4/04	U5	9/18/04
LSW 1C	95.28-89.62	J0.5	6/18/03	U5	9/13/04
LSW 1DL	156.24-150.58	1.17	6/7/04	J0.7915	9/21/04
LSW 2A	8.82-3.16	U5	12/16/02	U5	9/18/04
LSW 2C	89.63-83.97	U5	12/16/02	U1	3/23/05
LSW 2DL	150.29-144.63	U5	12/16/02	U1	3/23/05
LSW 3C	119.47-113.81	U5	12/17/02	U1	3/23/05
LSW 3DL	155.15-149.49	U5	12/17/02	U1	3/23/05
LSW 4C	119.24-113.58	U5	9/13/04	U1	3/23/05
LSW 4DL	139.85-134.19	U5	9/13/04	U1	3/23/05
LSW 5C	102.09-96.43	U5	12/16/02	U5	9/20/04
LSW 5DL	152.69-147.03	U5	12/16/02	U5	9/20/04
LSW 6A	48.39-42.69	U5	9/18/04	U5	9/18/04
LSW 6C	99.29-93.59	U5	9/14/04	3.31	3/28/05
LSW 6DL	165.29-159.59	U5	9/14/04	U1	3/28/05
LSW 7C	105.57-99.91	U5	9/15/04	U1	3/31/05
LSW 7DL	181.59-175.9	U5	9/15/04	U1	3/31/05
LSW 8C	108.71-103.04	U5	9/14/04	U1	9/13/05
LSW 8DL	164.5-158.83	U5	9/14/04	U1	9/20/05
LSW 9C	89.08-83.38	U5	9/15/04	U1	9/19/05
LSW 9DL	129.78-124.08	U5	9/14/04	U1	9/19/05
LSW 10C	103.23-97.53	U5	9/15/04	U1	9/19/05
LSW 10DL	154.13-148.43	U5	9/14/04	U1	9/19/05
LSW 11C	92.02-86.32	U5	9/15/04	U1	9/19/05
LSW 11DL	137.92-132.22	U5	9/15/04	U1	9/19/05
LSW 12A	59.92-54.22	U5	9/18/04	U5	9/18/04
LSW 12C	92.61-86.91	U5	9/15/04	U1	3/24/05
LSW 12DL	148.62-142.92	U5	9/15/04	U1	3/24/05
LSW 13C	103.65-97.95	U5	9/15/04	U1	3/24/05
LSW 13DL	154.66-148.96	U5	9/15/04	U1	3/24/05

Table D-2. Analyte: Trichloroethylene (TCE) (Continued)

Well ID	Screened Interval ft msl	Maximum µg/L	Date	Latest Value µg/L	Date
LSW 14C	105.47-99.77	U5	9/15/04	U1	3/24/05
LSW 14DL	156.45-150.75	U5	9/15/04	U5	9/15/04
LSW 15C	94.2-88.5	U5	9/16/04	U1	3/31/05
LSW 15DL	155.33-149.63	U5	9/16/04	U1	3/31/05
LSW 16C	87.16-81.48	U5	9/21/04	U5	9/21/04
LSW 16DL	127.89-122.24	U5	9/15/04	U1	3/28/05
LSW 17A	16.44-10.74	U5	9/20/04	U5	9/20/04
LSW 17C	112.31-106.61	U5	9/20/04	U5	9/20/04
LSW 17DL	173.18-167.48	U5	9/21/04	U5	9/21/04
LSW 18C	117.62-111.92	U5	9/15/04	U1	9/28/05
LSW 18DL	178.52-172.82	U1	5/19/04	U1	5/19/04
LSW 19C	119.55-113.85	U5	9/16/04	U5	9/16/04
LSW 19DL	165.39-159.69	U5	9/16/04	U1	3/28/05
LSW 20A	58.05-52.34	U1	6/30/03	U1	6/30/03
LSW 20C	119.36-113.66	U5	9/16/04	U5	9/16/04
LSW 20DL	152.77-147.06	U5	9/16/04	U1	3/28/05
LSW 21A	67.49-61.78	U5	9/20/04	U5	9/20/04
LSW 21C	123.24-117.54	U5	9/16/04	U1	3/31/05
LSW 21DL	168.98-163.28	U5	9/16/04	U1	3/31/05
LSW 22A	79.71-74.07	41.6	6/19/03	U5	9/18/04
LSW 22C	114.8-109.12	U5	9/21/04	U5	9/21/04
LSW 22DL	178.33-172.65	J0.59	6/19/03	U1	3/23/05
LSW 23		J0.96	6/5/03	U1	6/17/03
LSW 23TA	-145.2- -150.2	U5	9/16/04.	U1	9/15/05
LSW 24		U1	6/2/03	U1	6/2/03
LSW 24A	-22.14- -27.15	U5	9/21/04	U1	9/15/05
LSW 25C	95.01-90.01	J0.82	6/14/04	J0.587	9/15/05
LSW 25DL	155.39-150.39	U1	6/14/04	U1	9/20/05

J result qualifier: The analyte was positively detected below quantitation limits, the reported value is an estimated quantity.

U result qualifier: The material was analyzed for but was not detected. The analyte concentration is less than the sample-specific estimated quantitative limit.

Table D-3. Analyte: Tritium

Well ID	Screened Interval ft msl	Maximum pCi/mL	Date	Latest Value pCi/mL	Date
LAC 1	221.1-191.1	18	2/12/91	4.39	6/21/95
LAC 2	223.4-193.4	16.8	1/30/88	1	9/22/05
LAC 3	220.7-190.7	9.98	4/20/89	2.71	5/13/97
LAC 4	215.3-185.3	11.6	3/17/87	4.4	11/13/02
LAC 5DL	186.2-176.2	5.9	12/9/94	3.47	6/21/95
LAC 5DU	227.8-207.9	6.35	9/21/94	3.54	6/21/95
LAC 6DL	185.9-175.9	4.83	3/9/95	4.27	6/21/95
LAC 6DU	221.7-201.7	5.33	9/26/94	4.44	6/21/95
LAC 7DL	187.4-177.4	6.08	3/14/94	2.26	11/18/02
LAC 7DU	224.8-204.9	4.1	3/10/95	J2.09	9/28/00
LAC 8DL	190.4-180.4	68.5	9/22/05	68.5	9/22/05
LAC 8DU	219.8-199.8	2.41	3/9/95	U0.86	9/26/00
LAW 1A	-157.2- -162.2	J21.78	8/8/01	3.05	9/20/05
LAW 1C	-29- -34	5.11	9/21/05	5.11	9/21/05
LAW 1D	11.6-6.6	1.73	12/14/91	U0.3	11/13/02
LAW 1E	95.1-90.1	1.17	3/9/94	J0.442	11/12/02
LAW 1F	185.9-165.9	3.6	12/5/93	J0.4	9/21/05
LAW 2A	-147.2- -152.2	J929.48	8/8/01	12.8	3/14/03
LAW 2B	-4.8- -9.8	57.7	6/18/03	52	9/13/05
LAW 2C	191.2-171.2	J23104.58	12/9/97	70.4	9/16/05
LAW 3A	-159- -164	U0.359	1/27/03	U0.359	1/27/03
LAW 3B	4- -1	U0.7	12/7/92	U0.0759	11/14/02
LAW 3C	214.9-194.9	3.82	9/20/94	3.82	9/20/94
LCO 1	225.8-195.8	2550	9/22/85	177	5/7/97
LCO 2	226.6-196.6	18.7	3/2/87	3.47	5/7/97
LCO 2DL	188.2-178.14	2.6	11/13/02	2.6	11/13/02
LCO 3	226.3-196.3	13.1	5/1/91	4.79	6/22/95
LCO 4	222.3-192.3	831.11	3/12/86	45.2	5/13/97
LCO 5A	40-30	0.53	3/16/94	U0.0904	6/22/95
LCO 5C	120.5-110.5	J2.06	3/15/95	U0.25	9/26/00
LCO 5DL	184.9-174.9	6.53	3/16/94	3.35	10/25/00
LCO 6DL	188-178	82.98	4/16/94	2.02	9/22/05
LCO 7DL	180.2-170.2	46.75	6/22/95	1.1	9/21/05
LCO 8DL	188.4-178.4	9.84	6/22/95	J1.78	9/26/00
LCO 8DU	226.1-211.1	3.5	7/12/94	2.1	6/22/95
LDB 1	215-185	237.55	2/27/01	6.01	11/29/06

Table D-3. Analyte: Tritium (Continued)

Well ID	Screened Interval ft msl	Maximum pCi/mL	Date	Latest Value pCi/mL	Date
LDB 2	214.5-184.5	J786.17	6/30/00	J1.18	11/29/06
LDB 3	219.3-199.3	1875.92	7/28/00	188	11/29/06
LDB 4	220.7-200.7	845.83	3/24/03	J1.33	11/29/06
LSB 1	222.7-192.7	10100	5/1/91	1.79	9/22/05
LSB 2	225-195	11.1	12/16/91	U2.44	8/8/97
LSB 3	226.6-196.6	12890	9/11/93	0.87	9/22/05
LSB 4	221.5-191.5	4259	11/8/89	43.3	9/22/05
LSW 1A	4.16- -1.5	621	9/20/03	68.2	9/18/04
LSW 1C	95.28-89.62	782	6/18/03	693	9/13/04
LSW 1DL	156.24-150.58	683	12/17/02	621	9/21/04
LSW 2A	8.82-3.16	99.1	5/10/04	5.69	9/18/04
LSW 2C	89.63-83.97	7.88	8/12/02	U0.0585	3/23/05
LSW 2DL	150.29-144.63	160	12/16/02	49.7	3/23/05
LSW 3C	119.47-113.81	1.59	6/18/03	1.23	3/23/05
LSW 3DL	155.15-149.49	1.98	6/19/03	1.63	3/23/05
LSW 4C	119.24-113.58	U0.677	6/23/03	U0.0695	3/23/05
LSW 4DL	139.85-134.19	U0.223	6/23/03	U0.0619	3/23/05
LSW 5C	102.09-96.43	U0.185	6/2/04	U0.08	9/20/04
LSW 5DL	152.69-147.03	2.35	6/23/03	J0.36	9/20/04
LSW 6A	48.39-42.69	U0.369	12/27/02	U0.09	9/18/04
LSW 6C	99.29-93.59	J0.765	6/17/02	U0.014	3/28/05
LSW 6DL	165.29-159.59	U0.46	12/7/02	U0.121	3/28/05
LSW 7C	105.57-99.91	U0.494	6/17/02	J0.47	3/31/05
LSW 7DL	181.59-175.9	2.38	6/14/02	1.51	3/31/05
LSW 8C	108.71-103.04	39.7	9/13/05	39.7	9/13/05
LSW 8DL	164.5-158.83	42.7	6/19/03	32.2	9/20/05
LSW 9C	89.08-83.38	111	12/18/02	21.6	9/19/05
LSW 9DL	129.78-124.08	126	6/19/03	94.6	9/19/05
LSW 10C	103.23-97.53	U0.301	12/18/02	U0.0151	9/19/05
LSW 10DL	154.13-148.43	2.2	12/31/02	1.32	9/19/05
LSW 11C	92.02-86.32	12.5	7/8/02	8.33	9/19/05
LSW 11DL	137.92-132.22	66.4	6/20/03	59.8	9/19/05
LSW 12A	59.92-54.22	1.95	7/11/02	U0.14	9/18/04
LSW 12C	92.61-86.91	5.49	5/17/04	U0.175	3/24/05
LSW 12DL	148.62-142.92	J0.778	7/11/02	U0.00593	3/24/05
LSW 13C	103.65-97.95	1.63	5/18/04	0.985	3/24/05

Table D-3. Analyte: Tritium (Continued)

Well ID	Screened Interval ft msl	Maximum pCi/mL	Date	Latest Value pCi/mL	Date
LSW 13DL	154.66-148.96	2.28	5/18/04	1.64	3/24/05
LSW 14C	105.47-99.77	22.4	9/15/04	21.3	3/24/05
LSW 14DL	156.45-150.75	6.99	9/15/04	6.99	9/15/04
LSW 15C	94.2-88.5	J1	5/18/04	J0.478	3/31/05
LSW 15DL	155.33-149.63	2.85	6/27/03	1.48	3/31/05
LSW 16C	87.16-81.48	2.01	12/30/02	U0.18	9/21/04
LSW 16DL	127.89-122.24	1.81	12/30/02	J0.655	3/28/05
LSW 17A	16.44-10.74	U0.517	7/24/02	U0.03	9/20/04
LSW 17C	112.31-106.61	U0.293	7/24/02	U0.13	9/20/04
LSW 17DL	173.18-167.48	U52.22	8/5/02	1.24	9/21/04
LSW 18C	117.62-111.92	J1.32	12/30/02	J1.08	9/28/05
LSW 18DL	178.52-172.82	2.63	6/25/03	1.79	5/19/04
LSW 19C	119.55-113.85	J1.41	6/25/03	0.84	9/16/04
LSW 19DL	165.39-159.69	1.83	7/25/02	J0.871	3/28/05
LSW 20A	58.05-52.34	J1.04	6/30/03	J1.04	6/30/03
LSW 20C	119.36-113.66	U0.559	9/19/03	U0.07	9/16/04
LSW 20DL	152.77-147.06	3.58	6/25/03	U0.0566	3/28/05
LSW 21A	67.49-61.78	U0.475	12/3/03	U0.12	9/20/04
LSW 21C	123.24-117.54	J0.63	6/24/03	U0.219	3/31/05
LSW 21DL	168.98-163.28	2.6	12/5/03	1.48	3/31/05
LSW 22A	79.71-74.07	U0.607	9/20/03	U0.009	9/18/04
LSW 22C	114.8-109.12	U0.314	6/19/03	U0.13	9/21/04
LSW 22DL	178.33-172.65	3.96	6/19/03	1.42	3/23/05
LSW 23		309	6/5/03	U0.26	6/17/03
LSW 23TA	-145.2- -150.2	J0.895	5/13/04.	U0.214	9/15/05
LSW 24		7.58	5/29/03	U0.0242	6/2/03
LSW 24A	-22.14 - -27.15	12.4	5/13/04	J0.617	9/15/05
LSW 25C	95.01-90.01	389	9/16/04	336	9/15/05
LSW 25DL	155.39-150.39	1250	6/14/04	887	9/20/05

J result qualifier: The analyte was positively detected below quantitation limits, the reported value is an estimated quantity.

U result qualifier: The material was analyzed for but was not detected. The analyte concentration is less than the sample-specific estimated quantitative limit.

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