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United States Department of Energy

Savannah River Site

Record of Decision
Remedial Alternative Selection for the L-Area Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) (U)

WSRC-RP-98-4195

Rev. 1.1

July 2002

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

SRS

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

DISCLAIMER

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

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

L-Area Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) Operable Unit

WSRC-RP-98-4195
Rev. 1.1

July 2002

Savannah River Site
Aiken, South Carolina

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Westinghouse Savannah River Company LLC
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U. S. Department of Energy under Contract DE-AC09-96SR18500
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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

L-Area Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) Operable Unit

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Identification Number: OU-56

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

Savannah River Site

Aiken, South Carolina

United States Department of Energy

The L-Area Burning/Rubble Pit (131-L) (LBRP), Gas Cylinder Disposal Facility (131-2L) (GCDF), and L-Area Rubble Pile (131-3L) (LRP) Operable Unit (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 (USEPA and SCDHEC) and regulated entities (USDOE) that establishes the responsibilities and schedules for the comprehensive remediation of the SRS.

The media associated with this operable unit are soil and groundwater. The LBRP, GCDF, and LRP OU consists of five subunits: (1) LBRP, a single burning/rubble pit; (2) GCDF, an area where gas cylinders were placed and vented, (3) LRP; an area of rubble piles; (4) LRP Ditch, a natural drainage ditch north of the rubble piles; and (5) groundwater.

Statement of Basis and Purpose

This decision document presents the selected remedy for the LBRP, GCDF, and LRP OU, located at the Savannah River Site (SRS) in Aiken, South Carolina. The remedy 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.

The State of South Carolina Department of Health and Environmental Control (SCDHEC) and the United States Environmental Protection Agency (USEPA) concur with the selected remedy.

Assessment of the Site

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.

Description of the Selected Remedy

The LBRP, GCDP, and LRP Operable Unit contains five subunits. The RCRA Facility Investigation/Remedial Investigation Report with Baseline Risk Assessment (RFI/RI/BRA) identified contamination warranting remediation in two of these subunits, the LRP and groundwater. The selected remedy for LRP is Alternative LRP 2: Removal/Disposal with institutional controls contingent on confirmation sampling. The selected remedy for the groundwater subunit is Alternative GW 2: Groundwater Mixing Zone with institutional controls until the maximum contaminant level (MCL) is attained. The purposes of the selected institutional controls are: 1) prevent residential use of the LRP subunit (unless cleanup is sufficient for unrestricted use) and 2) to prevent use of the groundwater subunit as a drinking water source until MCLs are attained. This investigation showed that there are no constituents at the other three subunits – LBRP, GCDF, and LRP Ditch – that pose a threat to human health or the environment warranting remediation, and that they are available for unrestricted use. Therefore no institutional controls or other remedial action is being selected for the LBRP, GCDF, and LRP Ditch subunits

The selected remedy entails the following:

- Remove the stockpiles of soil/debris and contaminated soils under the piles at LRP (approximately 750 cubic yards of non-hazardous waste and 320 cubic yards of suspect hazardous waste). If confirmatory sampling results indicate that contamination above anticipated (residential) remedial goals (RGs) remains after removal, implement institutional controls including long-term site maintenance and site controls (warning signs and land use restrictions).

- Treat the groundwater plume in-situ by natural processes and implement a compliance monitoring strategy.

- Implement institutional controls (environmental monitoring, site maintenance, warning signs, and land use controls) as long as groundwater concentrations exceed MCLs.

- Perform five-year CERCLA ROD reviews to ensure that the selected remedy is still protective of human health and the environment.

The estimated time to complete construction is 6 months after the remedial action start date.

Removal/disposal of contaminated soil/debris at LRP will protect future industrial workers and ecological receptors from exposure to refined constituents of concern (RCOCs). This will allow future industrial land use of the site and will be protective of the environment. Monitoring of the groundwater plume will verify that the contaminant concentrations decrease through natural processes to levels below MCLs, consistent with cleanup objectives. This remedy was selected because existing groundwater data and modeling indicate the plume is small and diffuse and will attenuate below MCLs within 5 years.

The RFI/RI/BRA determined that there is no problem warranting action for LBRP, GCDF, and LRP Ditch, therefore no action is selected for these subunits. The no action determination is based upon constituent concentration levels representing a risk level $< 10^{-6}$ for potential receptors. No Further Action has been selected for the LBRP and GCDF subunits because previous time-critical removal actions have already removed unit-related contamination at those subunits. No Action was selected for the LRP Ditch subunit because the ditch has not been impacted. The no action determination is based upon constituent concentration levels representing a risk level $< 10^{-6}$ for potential receptors.

The LBRP, GCDF, and LRP OU is within the Pen Branch watershed. In addition to this OU, there are many other OUs within this watershed. Under the overall site management strategy, all source control and groundwater OUs within this watershed will be evaluated to determine their impacts, if any, on the associated streams and wetlands. SRS will manage all OUs to mitigate impact to the watershed. Upon disposition of all OUs, a final comprehensive ROD for the watershed will be pursued. The response action for this OU will not impact the response actions of other OUs at SRS.

SCDHEC has modified the SRS RCRA permit to incorporate the Removal/Disposal remedy for LRP, the Groundwater Mixing Zone remedy for groundwater, the No Further Action remedy for the LBRP and GCDF, and the No Action remedy for the LRP Ditch.

Statutory Determinations

Based on the unit RFI/RI/BRA report, LRP soil and groundwater pose a threat to human health and the environment. Therefore, Alternative LRP 2 (Removal/Disposal, with institutional controls contingent on confirmation sampling) for the LRP and Alternative GW 2 (Groundwater Mixing Zone, with institutional controls until the MCL is attained) for the groundwater have been selected as the remedies for the LBRP, GCDF, and LRP OU.

Section 300.430(f)(ii) of the NCP requires that a five-year remedy review of the ROD be performed if hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure remain in the OU. The three parties, SCDHEC, USEPA, and United States Department of Energy (USDOE), have determined that a five-year review of the ROD for the LBRP, GCDF, and LRP OU will be performed to ensure that the remedy continues to provide adequate protection 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 to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment (removal) as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment).

Per the USEPA – Region IV Land Use Controls (LUCs) Policy, a LUC Assurance Plan (LUCAP) for SRS has been developed and approved by the regulators. In addition, a LUC Implementation Plan (LUCIP) for the LBRP, GCDF, and LRP OU will be developed and submitted to the regulators for their approval with the post-ROD documentation. The LUCIP will detail how SRS will implement, maintain, and monitor the land use control elements of the LBRP, GCDF, and LRP OU selected alternative to ensure that the remedy remains protective of human health and the environment.

In the long-term, if the property is ever transferred to non-federal 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, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of waste. 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 the property. However, the need for these deed restrictions may be re-evaluated 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 re-evaluation 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 non-federal 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 leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for an indefinite period of time. As negotiated with EPA, and in accordance with EPA Region 4 Policy (*Assuring Land Use Controls at Federal Facilities*, April 21, 1998), SRS has developed a Land Use Control Assurance Plan (LUCAP) to ensure that land use restrictions are maintained and periodically verified. The unit-specific Land Use Control Implementation Plan (LUCIP) referenced in this ROD will provide detail and specific measures required for the land use controls selected as part of this remedy. DOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the land use control selected under this ROD. The LUCIP developed as part of this action will be submitted concurrently with the Corrective Measures Implementation/Remedial Action Implementation Plan (CMI/RAIP), as required in the FFA for review and approval by EPA 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 until modified 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:

- RCOCs and their respective concentrations
- Baseline risk represented by the RCOCs
- Cleanup levels established for the RCOCs and the basis for the levels
- Current and future land and groundwater use assumptions used in the BRA and ROD
- Land and groundwater use that will be available at the site as a result of the selected remedy
- 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
- Decision factor(s) that led to selecting the remedy (i.e., describes how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria)
- How source materials are addressed (there is no principal threat source material at this unit)

AUTHORIZING SIGNATURES

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

L-Area Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) Operable Unit

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
bls	below land surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CMI/RAIP	corrective measures implementation/ remedial action implementation plan
CMS/FS	corrective measures study/feasibility study
CPT	cone penetrometer technology
CSM	conceptual site model
ESD	Explanation of Significant Difference
FFA	Federal Facility Agreement
GCDF	Gas Cylinder Disposal Facility (131-2L)
GPR	ground penetrating radar
HBLs	health-based limits
HQ	hazard quotient
HSWA	Hazardous and Solid Waste Amendments
IDW	investigation-derived waste
IOU	integrator operable unit
LBRP	L-Area Burning/Rubble Pit (131-L)
LLC	Limited Liability Company
LOAEL	Lowest Observed Adverse Effects Level
LUC	Land Use Controls
LUCAP	Land Use Controls Assurance Plan
LUCIP	Land Use Controls Implementation Plan
LRP	L-Area Rubble Pile (131-3L)
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NOAEL	No Observed Adverse Effects Level
NPL	National Priorities List
O&M	operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PTSM	principal threat source material
RAO	remedial action objective
RBC	risk-based concentration
RCOC	refined constituent of concern

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RG	remedial goal
RGO	remedial goal option
RI	Remedial Investigation
RME	reasonable maximum exposure
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
SVOC	semivolatile organic compound
TAL	target analyte list
TBC	to-be-considered
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
ug/L	micrograms per liter
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WSRC LLC	Westinghouse Savannah River Company Limited Liability Company

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

Unit Name, Location, and Brief Description

L-Area Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) Operable Unit

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Identification Number: OU-56

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

Savannah River Site

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.

The 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 by-products of nuclear material production processes. Hazardous substances, as defined by CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists the L-Area Burning/Rubble Pit (131-L) (LBRP), Gas Cylinder Disposal Facility (131-2L) (GCDF), and L-Area Rubble Pile (131-3L) (LRP) Operable Unit (OU) as a Resource Conservation and Recovery Act (RCRA) Solid Waste Management Unit/CERCLA unit requiring further evaluation. The LBRP, GCDF, and LRP OU required further evaluation through an investigation process that integrates and combines the RCRA Facility Investigation

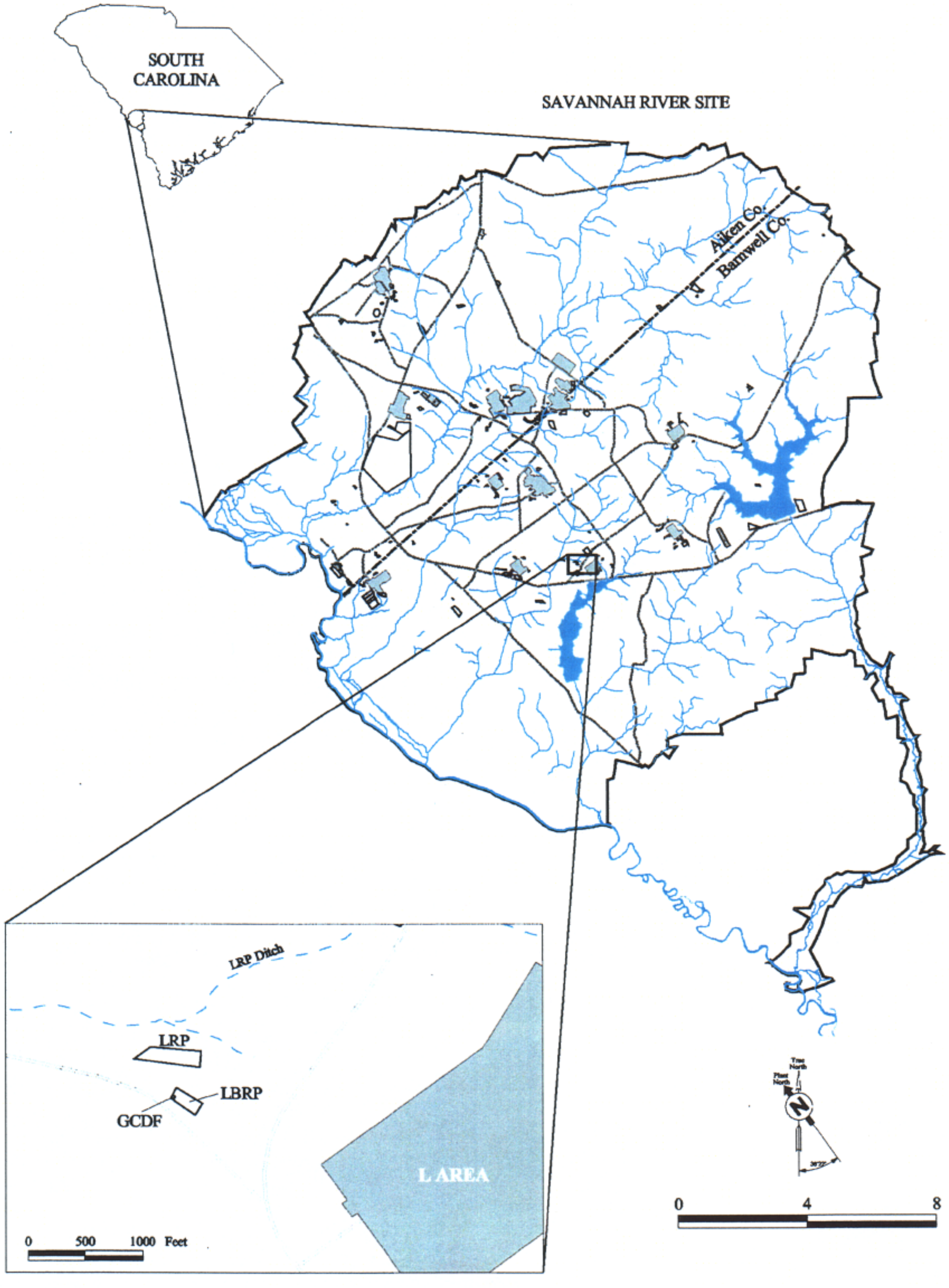


Figure 1. Location of the LBRP, GCDF, and LRP OU within SRS

(RFI) process with the CERCLA remedial investigation (RI) process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

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 the SCDHEC, which was most recently renewed on September 5, 1995. Module IV 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 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 a FFA (FFA 1993) with United States Environmental Protection Agency (USEPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. USDOE functions as the lead agency for remedial activities at SRS, with concurrence by the USEPA - Region IV and the SCDHEC.

Operable Unit Operational and Compliance History

The LBRP, GCDF, and LRP OU consists of five subunits: (1) LBRP, a single burning/rubble pit; (2) GCDF, an area where gas cylinders were placed and vented; (3) LRP, an area of rubble piles; (4) LRP Ditch, a natural drainage ditch north of the rubble piles; and (5) groundwater. The ground surface at LBRP and GCDF is nearly level. At LRP, the topography slopes gently (3 percent grade) to the north-northwest toward LRP Ditch, which is approximately 5 feet wide and 3 feet deep.

An aerial photograph with overlay of the OU is provided as Figure 2. Ground-level photographs are provided as Figures 3 and 4.

The OU has been assessed through characterization (Table 1) and a series of documents written by USDOE and approved by the regulatory agencies (SCDHEC and USEPA). These documents include a Work Plan (WSRC 1997), RFI/RI report with Baseline Risk Assessment (BRA) (WSRC 2000a), and a Statement of Basis/Proposed Plan (SB/PP) (WSRC 2001). A corrective measures study/feasibility study (CMS/FS) was not prepared because USDOE, SCDHEC, and USEPA agreed that the problem warranting action and the scope of the problem at each subunit was well-defined and that the list of likely response actions was short enough to proceed directly from the RFI/RI/BRA to the SB/PP. The types of assessments typically done in a CMS/FS were included in Appendix A of the SB/PP.

LBRP

LBRP is a 230 ft x 29 ft x 10 ft burial trench that was used from 1951 to 1973 for periodic burning of combustible wastes. Information obtained from historical records

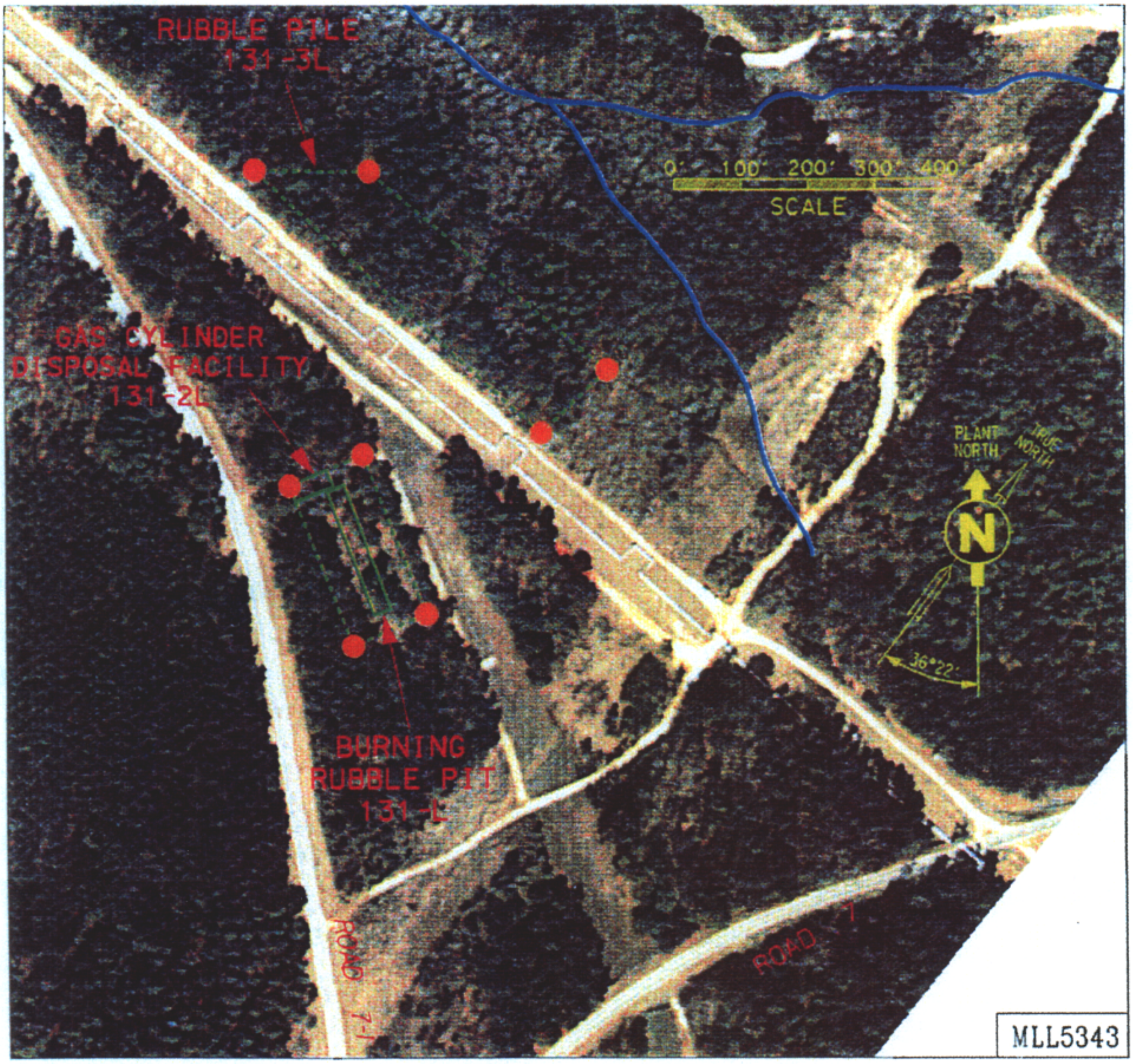


Figure 2. Aerial Photograph of the LBRP, GCDF, and LRP OU

Figure 3. Photograph of LBRP and GCDF

Photograph taken in May 2001, after the 1997 removal action at GCDF and the 1998 removal action at LBRP. LBRP is in the open grassy area in the center of the photograph; GCDF is in the grassy area at the far right.

Figure 4. Photograph of LRP

Photograph taken in May 2001, after the 1997 removal action at LRP. Stockpile of soil and debris approximately 3 ft high is evident in center of photograph.

Table 1. History of Characterization Activities at the LBRP, GCDF, and LRP

Investigation Dates	Media Sampled or Activity	Locations	Description
1984 –1996	Groundwater	Wells LRP-1,-2, -3, and -4	Periodic sampling – limited analytes
1988	Soil	LBRP	2 inside pit, 2 outside pit
	GPR survey	LBRP	To delineate pit boundary
1990-1992	Soil Gas	LBRP	29 samples
		GCDF	7 samples
		LRP	121 samples
Phase I: 1996	Soil	LBRP	15 samples (3 borings)
		LRP	15 samples (5 borings)
		Background	13 samples (3 borings)
Pre-Phase II 1997	Source Removal	LRP	Removed rubble piles
	GPR Survey	GCDF	To verify status of gas cylinders
	Source Removal	GCDF	Removed cylinders, asphalt, and soil
Phase II: 1997 – 1998	Screening Soil	LRP	LBRP-26 through -75, -84 through -90, and -100 through –115
	Soil	LBRP	3 borings (2 angled) within LBRP, and 6 perimeter borings
	Source Removal	LBRP	Removed principal threat waste (batteries) and other debris
	Soil	LBRP	9 screening-level samples (subsequently removed) and 16 definitive-level samples (3 subsequently removed) from excavation floor
		GCDF	3 samples within the excavation footprint, excavation backfilled 7/98
		LRP	8 borings in LRP
	Groundwater	Wells LRP-1,-2, -3, -4, -5, -6R	Each sampled 3 times in March 1998. LRP-6R also sampled twice in Nov. 1998
		CPTs	12 pushes, groundwater samples collected
	Surface Water	LRP Ditch	3 samples
	Soil	LRP Ditch	3 samples
Phase III: 1999	Groundwater	CPTs	10 pushes, groundwater samples analyzed for VOCs
		Wells LRP-1,-2, -3, -4, -5, -6R	Old pumps in wells LRP-1,-2, -3, -4, refurbished and wells re-developed in May 1999. One round of sampling from each well.

All work was performed per the FFA. The removal actions were done under USDOE lead agency authority.

and from characterization of similar burning/rubble pits at SRS indicate that materials such as wood, cardboard, paper, plastics, rubber, rags, waste oils, degreasers, and organic liquids of unknown use and origin were disposed in the pit and burned on a monthly basis. Waste burning was discontinued in 1973, and a soil layer was placed over the pit contents. The pit continued to receive non-salvageable wastes such as lumber, wood, concrete, scrap metal, cable, electrical wiring, zinc-mercury and lead-acid batteries, non-returnable empty drums, wallboard, brick, asphalt, tile, cans and bottles, rubber and plastic items, a transformer which did not contain polychlorinated biphenyls (PCBs), and other debris. Historical records indicate that LBRP was the only rubble pit at SRS to receive batteries. When the pit reached capacity in 1978, it was filled to grade with clean soil.

Investigation of LBRP began in 1988 with a ground penetrating radar survey (to delineate the pit boundaries) and pre-Work Plan soil sampling (discussed in Section V). In 1991, a soil gas survey was performed. In May and June 1996, another phase of investigation was performed that included more soil samples (see Section V). In April 1998, exploratory trenching began at LBRP as part of standard characterization activities for burning/rubble pits at SRS. Numerous zinc-mercury and lead-acid batteries and other debris were found in one trench near the northwest end of the pit.

A time-critical removal action at LBRP was implemented in 1998 with the primary objective of removing all principal threat source materials (PTSM) from the pit. For this specific operable unit, PTSM was assumed to be source material that presents a potential human health risk of 1×10^{-3} or greater to an industrial worker if exposure should occur; or source material that will migrate to groundwater at levels that will exceed maximum contaminant levels (MCLs), or risk-based concentrations (RBCs) if MCLs do not exist for a particular contaminant, within 10 years. The contents of LBRP were removed and sorted for suspect hazardous materials. Approximately 450 zinc-mercury batteries, 870 lead-acid batteries, a non-PCB transformer, and other miscellaneous debris were removed from the northwestern half of the pit. In addition to the batteries and pit debris, one to two feet of soil was removed from the floor of the northwest end of the pit. Table 2 lists

Table 2. Summary of Waste Generated During the Time-Critical Removal Actions

WASTE TYPE	STORAGE AND DISPOSAL FACILITY
LBRP (131-L)	
Mercury-zinc batteries	Intact batteries delivered to Solid Waste for recycling
Lead-acid batteries	Intact batteries delivered to Solid Waste for recycling
Lead battery plates	Delivered to the Doe Run Resource Recycle Facility in Boss, Missouri for recycling
Soil	Delivered to Solid Waste for burning and disposal in hazardous waste landfill
Ballast (no PCBs)	Delivered to Solid Waste for disposal
Wood (hazardous)	Delivered to Solid Waste for disposal at hazardous waste facility
Wood (non-hazardous)	Three Rivers Landfill
Scrap metal	Three Rivers Landfill
Concrete	Three Rivers Landfill
GCDF (131-2L)	
Cylinders, concrete, soil, and asphalt	Disposed as Special Waste (from CERCLA Facility) at Three Rivers Landfill
LRP (131-3L)	
Ballasts	Delivered to Solid Waste for disposal in PCB facility
PCB soil	Delivered to Solid Waste for disposal
Paint (hazardous)	Delivered to Solid Waste for disposal in hazardous waste facility
Paint (non-hazardous)	Jasper County Landfill
Railroad ties, poles	Jasper County Landfill
Scrap metal	Jasper County Landfill

the wastes removed from LBRP and where these wastes were dispositioned. The resulting final excavation was approximately 11 ft deep and approximately 18 ft wide at grade and 10 ft wide at the bottom. The floor of the excavation was sampled to verify that all hazardous waste had been removed. After confirmatory sampling determined that no contaminated soil that represents a future residential human health risk > 10^{-6} remained, the excavation was backfilled with clean soil and returned to grade.

GCDF

GCDF is 14 ft wide by 27 ft long. GCDF was used until the mid- to late-1970s as a location for venting gas cylinders. Partially full gas cylinders were placed upright in a shallow trench about 3 ft deep. Concrete was poured around the base of the cylinders for stability, and the cylinders were vented to the atmosphere. The pit was then backfilled, and a soil and asphalt cover was placed over the area. Records indicate that 28 gas cylinders had been placed in GCDF in 1977 which contained hazardous gases such as hydrogen fluoride, fluorine, chlorine, ammonia, nitrogen dioxide, and hydrogen sulfide.

Investigation of GCDF began in 1992 with a soil gas survey. In 1997, a ground penetrating radar survey was conducted to confirm that the cylinders were not completely encased in concrete.

In 1997, a time-critical removal action was performed at GCDF with the primary objective of removing the gas cylinders. There were 29 cylinders at the unit. Visual inspection revealed puncture holes in the cylinders, and confirmed that the cylinders were empty and that no PTSM (e.g., hazardous gases) remained inside. All of the cylinders, as well as concrete, asphalt, and approximately 1 ft of soil from the footprint of GCDF, were removed and dispositioned as non-hazardous solid waste.

Soil samples collected from the excavation footprint confirmed that there is no problem warranting further action (WSRC 2000a). The excavated area was backfilled to grade with clean soil in July 1998.

LRP

LRP is approximately 500 ft long by 120 ft wide. LRP originally consisted of 15 rubble and soil piles randomly scattered throughout the area. It is not known exactly when disposal activities at LRP occurred or what types and volumes of wastes were disposed there. Based on the sizes and shapes of the rubble piles, disposal practices at LRP likely consisted of dumping truckloads of waste on the land surface. There is no visible evidence of past excavations at LRP and historical records provide no indication of waste burial. Individual piles may have been leveled or reworked with heavy machinery. LRP is overgrown with trees, suggesting that it has been inactive for many years.

Investigation of LRP began in 1991 with a soil gas survey. In 1996, soil sampling was conducted at LRP to confirm past soil gas analyses and identify potential unit-specific contaminants.

In 1997, a time-critical removal action was performed at LRP to recover assorted cans, bottles, incandescent and fluorescent lights, light ballasts, railroad ties, electrical wiring, and scrap metal. Approximately 200 cubic yards of non-hazardous waste (paper, plastic, metal, wood, etc.), 1.7 cubic yards of hazardous waste (miscellaneous paint), and 47 cubic yards of Toxic Substances Control Act (TSCA) waste (PCB-contaminated soil) were removed, transported, and disposed of at CERCLA Off-Site-Rule-approved facilities (Table 2). About 250 cubic yards of soil and debris remain stockpiled at LRP.

Soil sampling was performed at LRP during and after the 1997 removal action to confirm that the extent of contamination had been defined (see Section V).

At LRP, stockpiles of soil/debris remain. In addition, there is contamination in the soil at the footprints of the original piles.

LRP Ditch

LRP Ditch in the vicinity of LRP is generally dry. Approximately 650 ft downgradient of LRP, LRP Ditch intersects the water table and is a perennial stream below that point (WSRC 1999).

No waste was placed in LRP Ditch. The ditch was assessed as part of this OU because it could have received stormwater runoff from LRP, and therefore could have been contaminated.

Sampling of soil and surface water in the LRP Ditch occurred in 1997 and 1998 (see Section V). Results demonstrate that LRP Ditch has not been impacted by the OU because no constituents warranting remedial action (RCOCs) were identified in the RFI/RI/BRA. (WSRC 2000a).

Groundwater

Groundwater was assessed because it may have been impacted by leaching from one or more of the source units (LBRP, GCDF, and/or LRP). Groundwater has been assessed through monitoring wells, piezometers, and cone penetrometer technology (CPT) pushes (see Section V).

Groundwater is contaminated by a small, diffuse plume of carbon tetrachloride and chloroform (WSRC 2000a).

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require the public to 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 the LBRP, GCDF, and LRP OU. 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 Burning/Rubble Pit (131-L), Gas Cylinder Disposal Facility (131-2L), and L-Area Rubble Pile (131-3L) (U)* (WSRC 2001), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the selected action for addressing the LBRP, GCDF, and LRP 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
8901 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

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

The SB/PP 45-day public comment period began on August 1, 2001 and ended on September 14, 2001. A Responsiveness Summary, prepared to address any comments received during the public comment period, is provided in Appendix A of this Record of Decision (ROD). It is also available in the final RCRA permit modification.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT WITHIN THE SITE STRATEGY

RCRA/CERCLA Programs at SRS

RCRA/CERCLA units (including the LBRP, GCDF, and LRP OU) at SRS are subject to a multi-stage RI process that integrates the requirements of RCRA and CERCLA as outlined in the FFA (FFA 1993). The RCRA/CERCLA processes are summarized below:

- investigation and characterization of potentially impacted environmental media (such as soil, groundwater, and surface water) comprising the waste site and surrounding areas
- evaluation of risk to human health and the local ecological community
- screening of possible remedial actions to identify the selected technology which will protect human health and the environment
- implementation of the selected alternative
- documentation that the remediation has been performed competently
- evaluation of the effectiveness of the technology

The steps of this process are iterative in nature, and include decision points which require concurrence between USDOE as owner/manager, USEPA and SCDHEC as regulatory oversight agencies, and the public (see Figure 5).

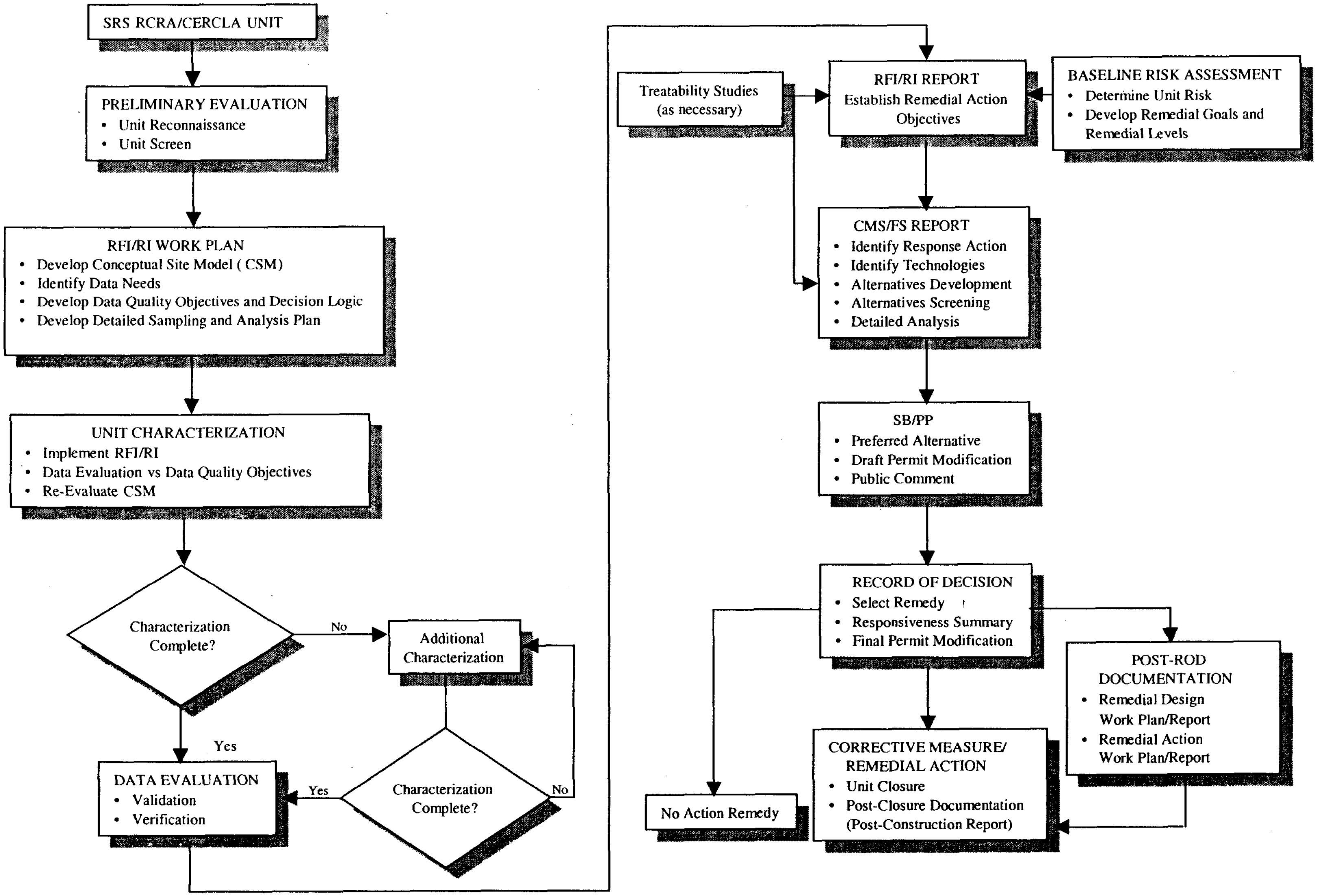


Figure 5. RCRA/CERCLA Logic and Documentation

Operable Unit Remedial Strategy

The overall strategy for addressing the OU was to (1) characterize each subunit of the OU, delineating the nature and extent of contamination and identifying the media of concern (perform the RFI/RI); (2) perform a BRA to evaluate media of concern and exposure pathways and to characterize potential risks and identify refined constituents of concern (RCOCs); and (3) identify and perform a final action to remediate, as needed, the identified media of concern.

The OU remedial strategy consists of time-critical removal actions (already performed, see Section II for details), and this final action. The scope of the problem remaining to be addressed by this final action is residual contamination in soil at LRP and a VOC plume in groundwater. The LBRP, GCDF, and LRP Ditch do not pose a threat to human health or the environment that increases the excess cancer lifetime risk > 10^{-6}, adversely affect human health or the environment, or contain constituent concentration levels above ARAR action levels.

The LBRP, GCDF, and LRP OU is within the Pen Branch watershed in the Pen Branch integrator operable unit (IOU). In addition to this OU, there are many other OUs within this watershed. Under the overall site management strategy, all source control and groundwater OUs within this watershed will be evaluated to determine their impacts, if any, on the associated streams and wetlands. SRS will manage all OUs to mitigate impact to the watershed. Upon disposition of all OUs, a final comprehensive ROD for the watershed comprising the Pen Branch IOU will be pursued. The response action for this OU will not impact the response actions of other OUs at SRS.

V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model (CSM) for the LBRP, GCDF, and LRP OU

To better understand the risks posed against current and future receptors, a CSM of the unit was developed. The CSM illustrates the sources of contamination, potential exposure pathways, and exposure media relevant to the unit. The CSM is provided as Figures 6, 7, and 8. A detailed explanation of the CSM is provided in Chapter 2 of the RFI/RI/BRA (WSRC 2000a).

Media Assessment

The RFI/RI/BRA (WSRC 2000a) contains detailed information and analytical data for the media assessment. This document is available in the Administrative Record File (see Section III). The investigations are summarized below and in Table 1.

Soil Investigation

The source unit investigation consisted of ground penetrating radar (GPR) surveys (LBRP and GCDF), soil gas surveys (LBRP, GCDF, and LRP), soil sampling (LBRP, GCDF, LRP, LRP Ditch), exploratory trenching (LBRP), and surface water sampling (LRP Ditch).

LBRP

Investigation of LBRP began in 1988 with a ground penetrating radar survey (to delineate the pit boundaries) and pre-Work Plan soil sampling. During pre-Work Plan sampling, two soil borings were advanced through the pit and two soil borings were advanced adjacent to the pit. In 1991, a soil gas survey was performed. Twenty-nine soil gas samples were collected from locations in and around the pit.

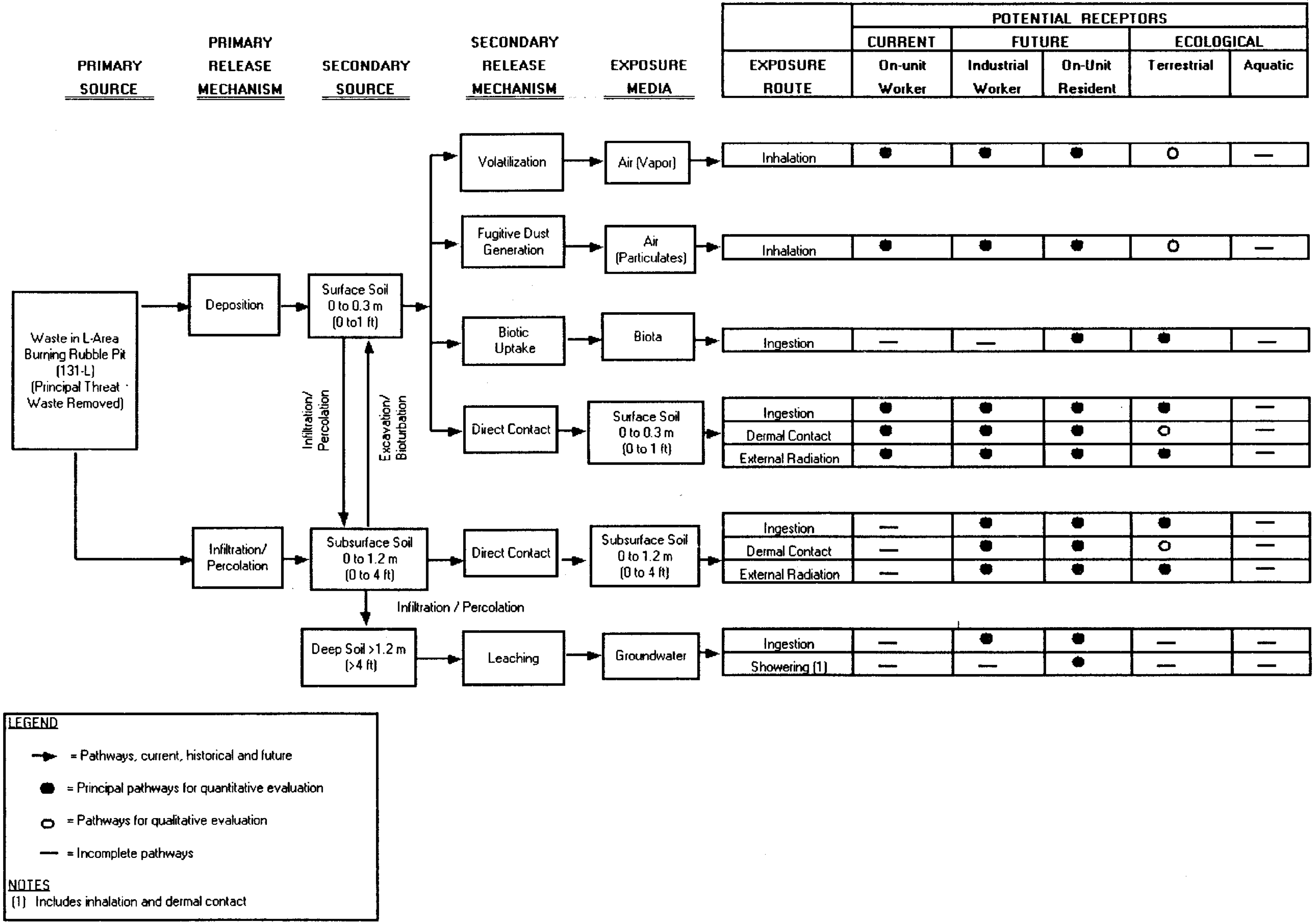


Figure 6. CSM for the LBRP (131-L)

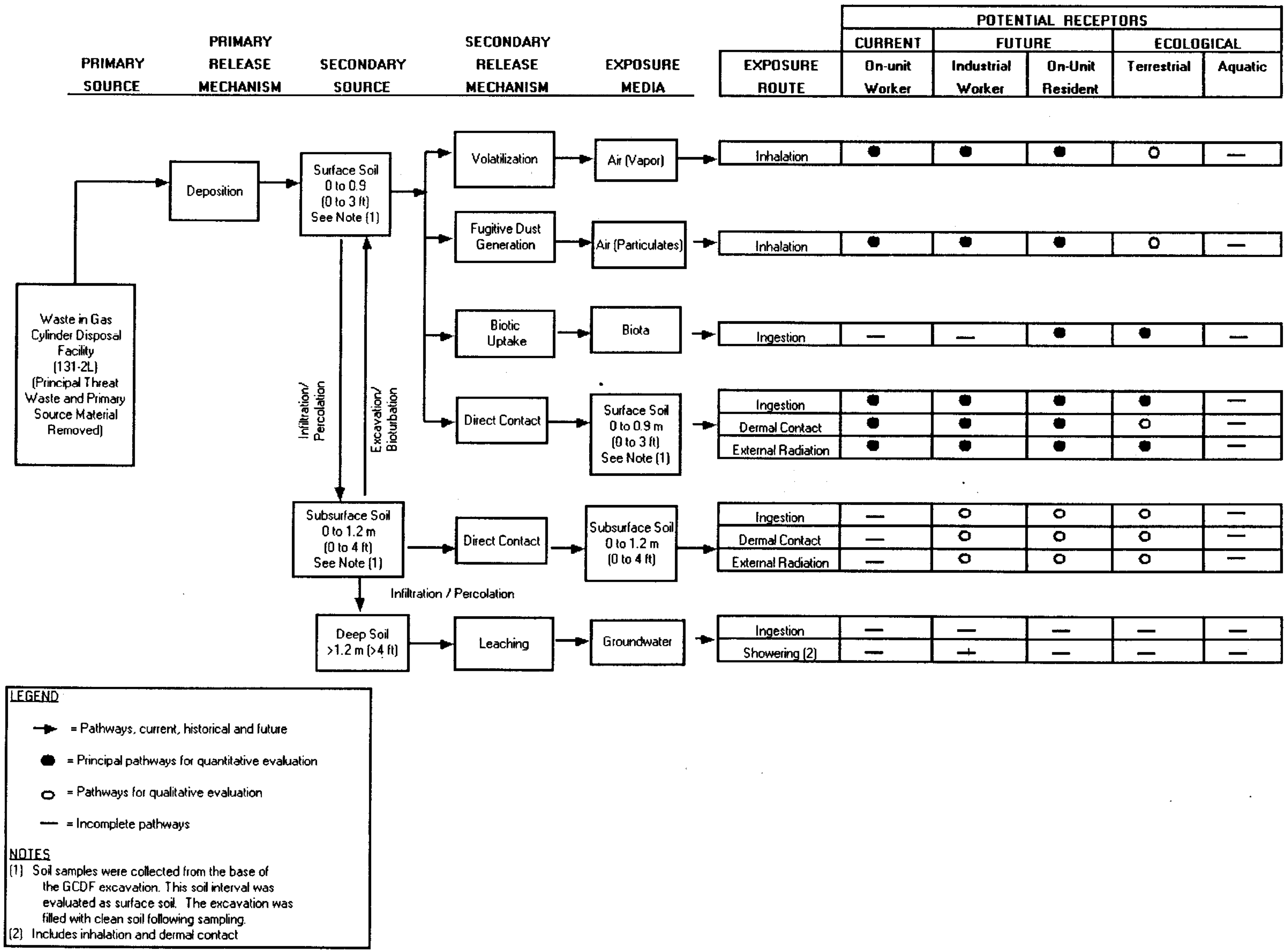


Figure 7. CSM for the GCDF (131-2L)

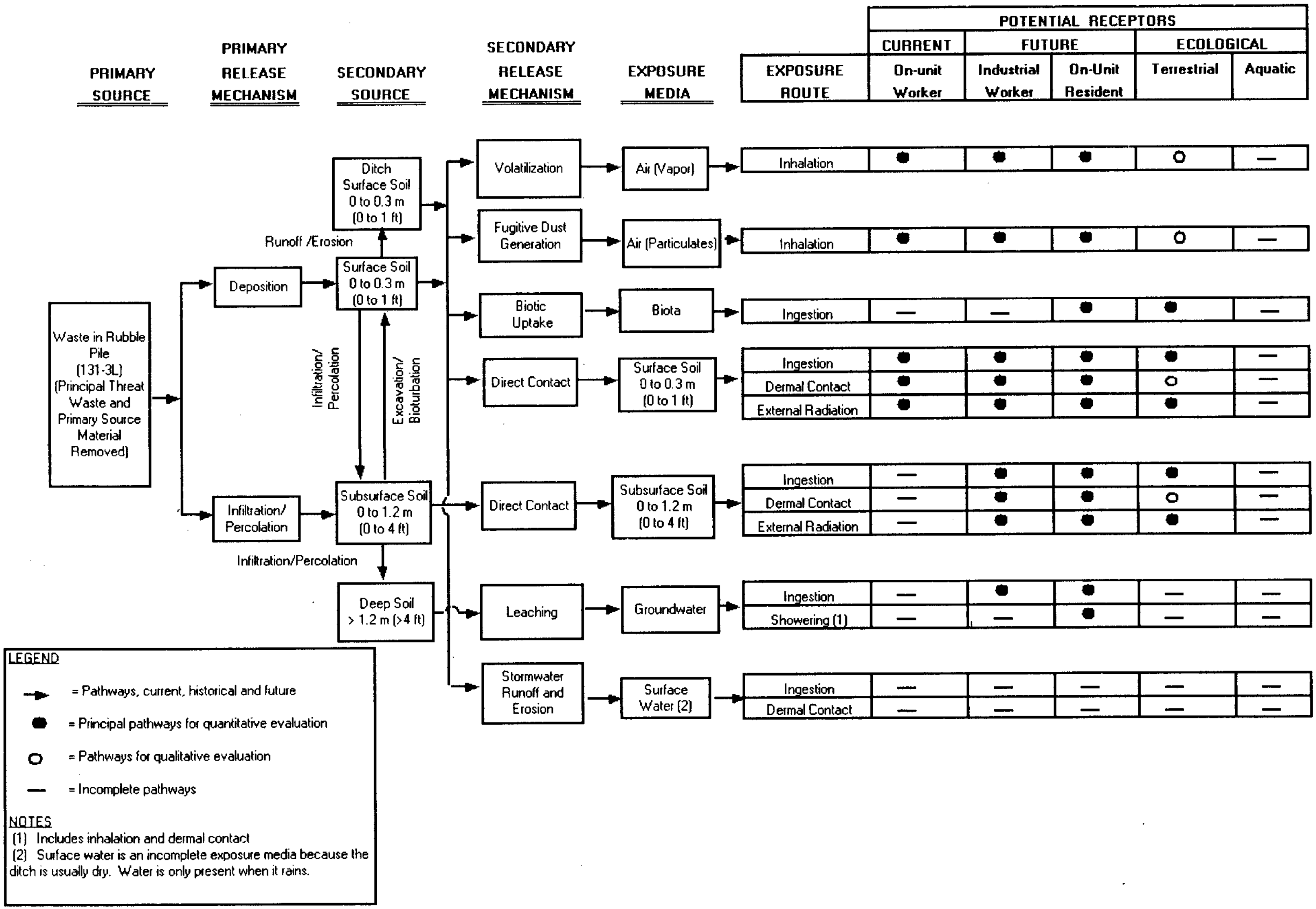


Figure 8. CSM for the LRP (131-3L) and LRP Ditch

In May and June 1996, another phase of investigation was performed that included additional soil sampling. Three soil borings were advanced through the pit (LBRP-01 through LBRP-03) and 15 soil samples were collected at depths of up to 15 ft below grade. The locations of the borings were selected based on the results of the 1991 soil gas survey to target the areas exhibiting the highest volatile organic contamination. In 1998, three soil borings, two of which were slant hole soil borings, were advanced to sample the soils beneath the pit. In addition, six vertical soil borings were advanced in perimeter areas around the pit to determine if perimeter areas have been impacted. The soil samples were analyzed for target analyte list (TAL) inorganics, target compound list (TCL) semivolatile organic compounds (SVOCs), TCL volatile organic compound (VOCs), TCL pesticides/PCBs, and radionuclides. Samples from the bottom of the pit were also analyzed for dioxins/furans.

In April 1998, exploratory trenching began at LBRP as part of standard characterization activities for burning/rubble pits at SRS. Numerous zinc-mercury and lead-acid batteries and other debris were found in one trench near the northwest end of the pit. A time-critical removal action at LBRP was implemented in 1998 to remove the batteries and other miscellaneous debris. In addition to the batteries and pit debris, one to two feet of soil was removed from the floor of the northwest end of the pit. The resulting final excavation was approximately 11 ft deep and approximately 18 ft wide at grade and 10 ft wide at the bottom. The floor of the excavation was sampled to verify that all hazardous waste had been removed. Soil samples, collected from the base of the excavation, were analyzed for TAL inorganics with cyanide, TCL SVOCs, TCL VOCs, and pesticides/PCBs. After confirmatory sampling determined that no contaminated soil that represents a future residential human health risk > 10^{-6} remained, the excavation was backfilled with clean soil and returned to grade.

GCDF

Investigation of GCDF began in 1992 with a soil gas survey. Seven locations were surveyed. In 1997, a ground penetrating radar survey was conducted to confirm that the cylinders were not completely encased in concrete.

In 1997, a time-critical removal action was performed to remove the gas cylinders. In addition to the gas cylinders, concrete, asphalt, and approximately 1 ft of soil from the footprint of GCDF were removed. Following removal of the gas cylinders and associated asphalt and soil, soil samples were collected from three soil borings in the excavation footprint. The samples were obtained from 0 to 3 ft below the base of the excavation and were analyzed for TAL inorganics, TCL SVOCs, TCL VOCs, TCL pesticides/PCBs, and radionuclides. The excavated area was backfilled to grade with clean soil in July 1998.

LRP

Investigation of LRP began in 1991 with a soil gas survey. A total of 121 locations were sampled. In 1996, soil sampling was conducted at LRP to confirm past soil gas analyses and identify potential unit-specific contaminants. The sampling and analysis plan was biased to target potential high-contamination areas identified by the soil gas survey.

In 1997, a time-critical removal action was performed at LRP to recover debris. Soil sampling was performed at LRP during and after the removal action to confirm that the extent of contamination had been defined. This included samples from former pile locations, locations immediately adjacent to the remaining stockpiles, and locations around the perimeter of LRP. Forty-one samples from 13 soil borings received definitive-level data analysis (comprehensive data validation), and 130 samples from 76 soil borings received screening-level data analysis (analyzed at an on-SRS laboratory using USEPA-approved methodologies but not subjected to comprehensive data validation or review). Most samples were obtained from the 0 to 1 ft and 1 to 4 ft depth intervals. The deepest samples were up to 32 ft deep. Samples were analyzed for TAL inorganics, TCL SVOCs, TCL VOCs, TCL pesticides/PCBs, and radionuclides. Contamination remains in stockpiles at the unit (Figure 9).

LRP Ditch

Sampling of soil and surface water in the LRP Ditch occurred in 1997 and 1998. Three soil samples and three surface water samples were collected from the LRP Ditch. The samples were analyzed for TAL inorganics, TCL SVOCs, TCL VOCs, TCL pesticides/PCBs, and radionuclides.

Groundwater Investigation

Investigation of groundwater began in 1983 with construction of four monitoring wells, LRP-1 through LRP-4. Two additional monitoring wells, LRP-5 and LRP-6R were installed in 1998. The wells are screened in the water table aquifer. The water table aquifer is the "upper aquifer zone" of the Upper Three Runs Aquifer (above the "tan clay" confining zone) and is composed of silt and clay. In relation to LBRP, wells LRP-2 and -5 are up gradient, and wells LRP-1, -3, -4, and -6R are downgradient (Figure 10). The wells have been periodically sampled since installation. In 1999, the older wells were refurbished with lead-free pumps because the old pumps were suspected as the source of elevated lead observed in all of the 1983 wells. Subsequently, lead was not detected in two of the downgradient wells and decreased to 20% of previous levels in the other two wells. Samples have been analyzed for TAL inorganics, TCL SVOCs, TCL VOCs, pesticides/PCBs, and radionuclides. Five temporary piezometers were installed around the OU to establish groundwater flow direction.

Twenty-two CPT pushes were advanced around the OU (12 locations in 1998, and 10 locations in 1999) to define the extent of contamination in groundwater.

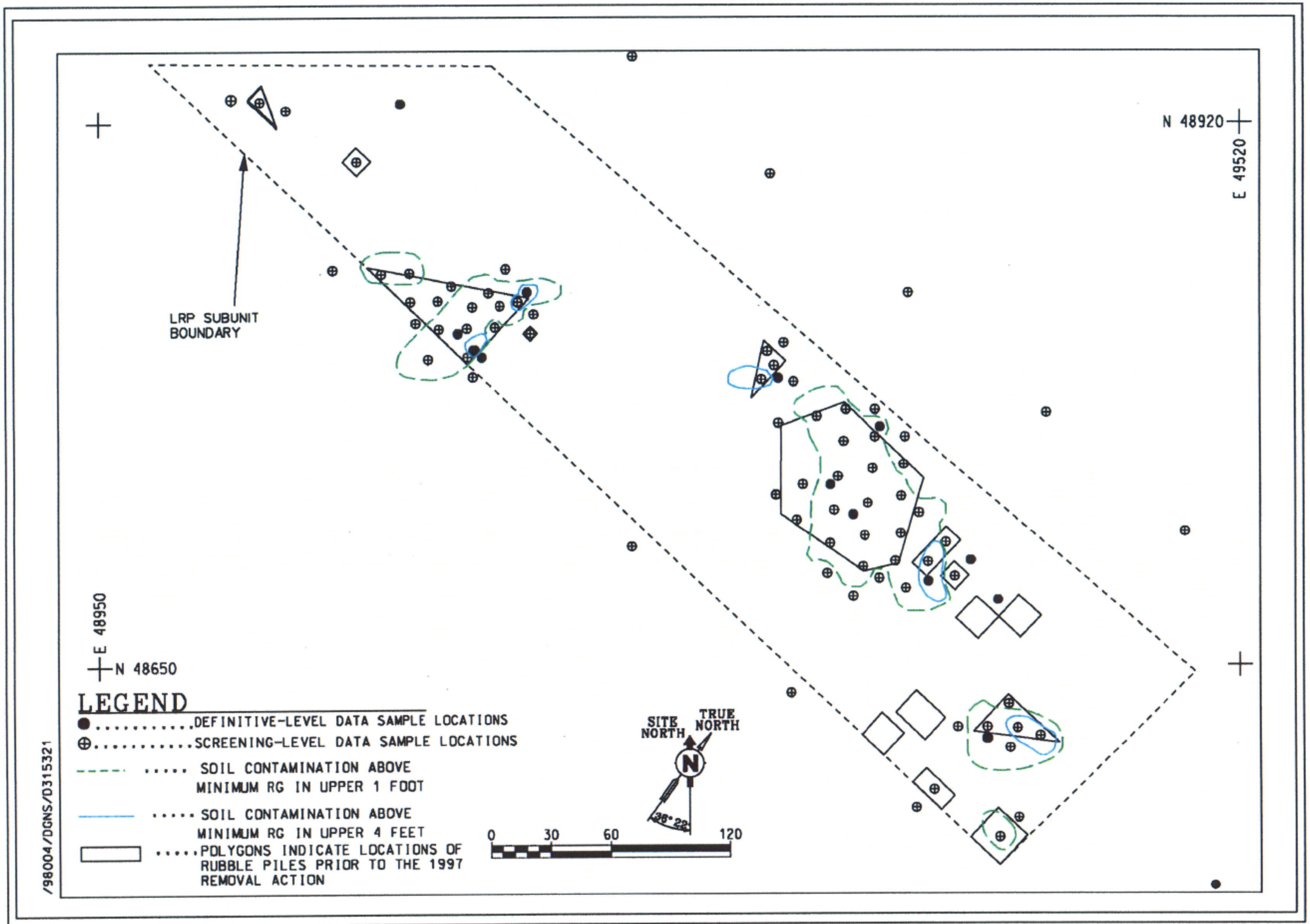


Figure 9. Map of Soil Contamination at LRP

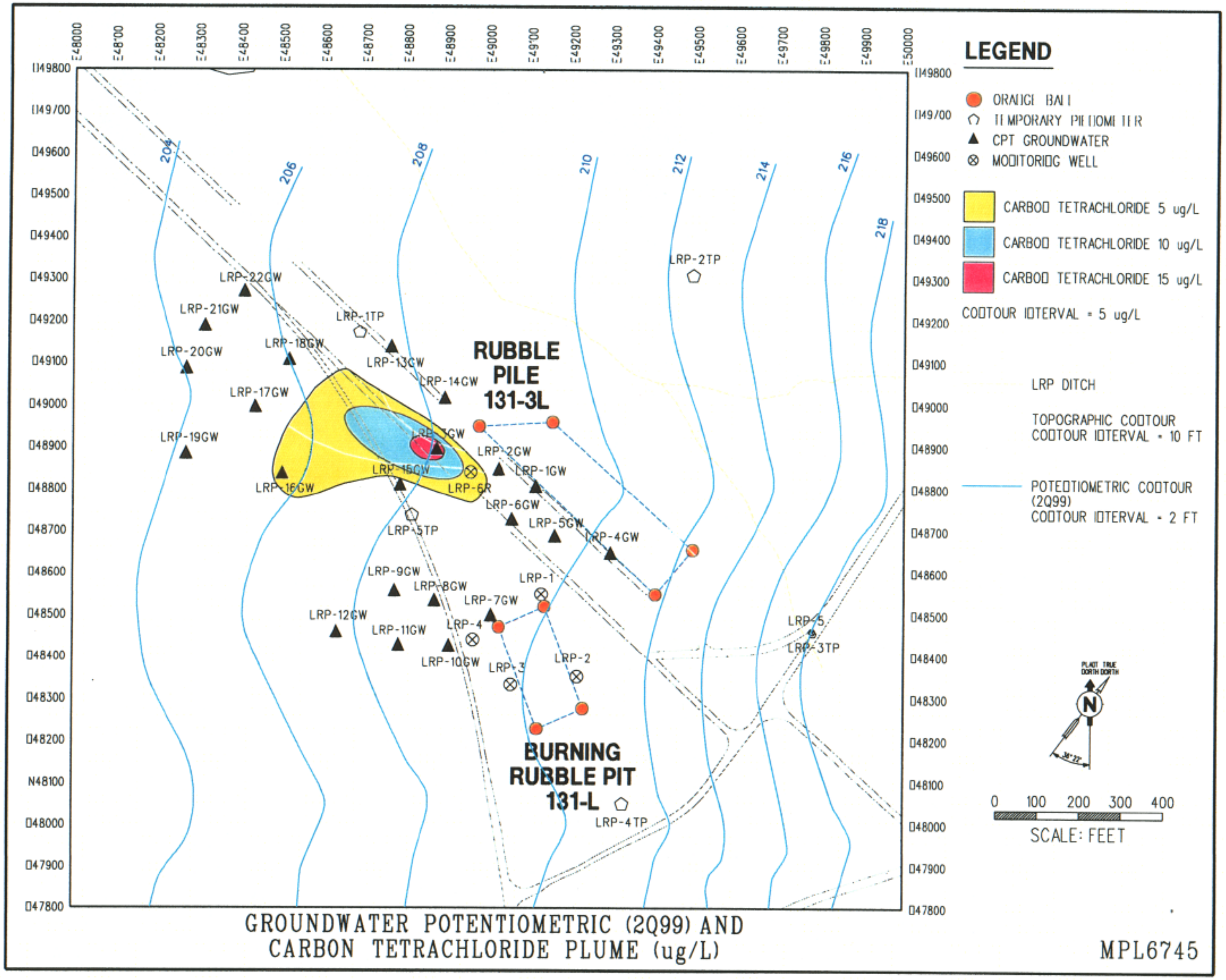


Figure 10. Groundwater Sample Locations and Plume Map (Carbon Tetrachloride)

Media Assessment Results

The sampling data were evaluated in the RFI/RI/BRA to identify RCOCs (constituents warranting remedial action). RCOCs were identified using the SRS protocols for data processing, human health and ecological risk assessment, and contaminant migration modeling. Table 3 lists the types and concentrations of contaminants that remain at the unit. The key findings of the RFI/RI/BRA are discussed below.

Soil

LRP

At LRP, several inorganic constituents (barium, cadmium, chromium, copper, lead, mercury, and zinc), a SVOC (dibenzo[a,h]anthracene), and a PCB (PCB-1254) remain after the time-critical removal action. The contamination is present in the soil/debris stockpiles as well as in soil at the footprints of the original piles. Figure 9 shows the extent of contamination. Most contamination in the footprint soils is in the upper 1 ft of the soil profile, although locally the contamination is present at depths of up to 4 ft (WSRC 2000a).

There is no PTSM (highly-mobile or highly-toxic source materials that require a bias toward treatment alternatives) at LRP. The contamination that is present consists of only residual low-mobility and low-toxicity soils that remain after the removal action; these residual materials are categorized as a low-level threat.

LBRP, GCDF, and LRP Ditch

The investigation determined that there are no constituents at LBRP, GCDF, or LRP Ditch that pose a threat to human health or the environment that increases the excess cancer lifetime risk > 10^{-6}, adversely affects human health or the environment, or contains constituent concentration levels above ARAR action levels.

Table 3. Summary of Risks and Hazards

RCOC	Impacted Media/ Type of RCOC	Frequency of Detects (All Depths)	Unit Max. (All Depths)	RME (0-1 ft)	RME (0-4 ft)	Scenario/Route	Summary of Risks
LRP Soil (mg/kg)							
Barium	Surface Soils/Eco Subsurface Soils/Eco	41/41	6,160	3,840	779	Ecological – Insectivorous Mammal (shrew), Birds (robin)	Ecological HQs up to 16.4
Cadmium	Surface Soils/Eco &HH_{res} Subsurface Soils/Eco	21/41	23.7	23.7	4.07	Ecological – Soil Dwelling Invertebrates (earthworm), Insectivorous Mammal (shrew), Birds (robin)	Ecological HQs up to 13.7
						Future On-Unit Resident - ingestion	Human health HQs up to 0.303
Chromium	Surface Soils/Eco Subsurface Soils/Eco	41/41	75.6	55.4	27.3	Ecological – Soil Dwelling Invertebrates (earthworm), Birds (robin)	Ecological HQs up to 139
Copper	Surface Soils/Eco Subsurface Soils/Eco	41/41	1,130	1,130	473	Ecological – Soil Dwelling Invertebrates (earthworm), Insectivorous Mammal (shrew), Birds (robin)	Ecological HQs up to 18.8
Lead	Surface Soils/Eco & $HH_{res, ind}$ Subsurface Soils/Eco & $HH_{res, ind}$ ARAR	41/41	7,830	7,830	1,460	Ecological – Soil Dwelling Invertebrates (earthworm)	Ecological HQs up to 15.7
						Future On-Unit Resident/Future Industrial Worker – ingestion	Modeled resident child blood lead concentrations up to 3.5x benchmark level
							Modeled fetal blood lead concentrations (for mother in industrial setting) up to 4x benchmark level
							Exceeds OSWER screening value (400 mg/kg) by 20x
Mercury	Surface Soils/Eco &HH_{res} Subsurface Soils/Eco	38/41	29.4	29.4	4.10	Ecological – Birds (robin)	Ecological HQs up to 8.3
						Future On-Unit Resident - ingestion and dermal	Human health HQs up to 3.76
Zinc	Surface Soils/Eco Subsurface Soils/Eco	41/41	5,420	5,420	931	Ecological – Soil Dwelling Invertebrates (earthworm), Insectivorous Mammal (shrew), Birds (robin)	Ecological HQs up to 50.5
Dibenzo(a,h) anthracene	Subsurface Soils/HH_{res}	2/41	1.76	ND	0.217	Future On-Unit Resident – ingestion and dermal	Carcinogenic risks up to 2.48×10^{-6}
PCB-1254	Surface Soils/Eco &HH_{res}	10/41	1.23	1.23	0.206	Ecological – Insectivorous Mammal (shrew), Birds (robin)	Ecological HQs up to 5.6
						Future On-Unit Resident - ingestion	Carcinogenic risks up to 3.85×10^{-6}

Table 3. Summary of Risks and Hazards (Continued)

RCOC	Impacted Media/ Type of RCOC	Frequency of Detects (All Depths)	Unit Max. (All Depths)	RME (0-1 ft)	RME (0-4 ft)	Scenario/Route	Summary of Risks
Groundwater (ug/L)							
Carbon tetrachloride	ARAR $HH_{res,\ ind}$	2/9	8.55 (well) 13.4 (CPT)	3.26		Future Industrial Worker (Ingestion)	Exceeds MCL by 3x
						Future On-Unit Resident – ingestion, inhalation	Carcinogenic risks up to 6.30×10^{-6} and HQs up to 0.365
Chloroform	HH_{res}	2/9	5.4 (well) 10.8 (CPT)	2.64		Future On-Unit Resident - inhalation	Carcinogenic risks up to 3.18×10^{-6} and HQs up to 1.96

ARAR = ARAR RCOC
HH_{res} = Human health RCOC for the future on-unit resident
$HH_{res,\ ind}$ = Human health RCOC for the future on-unit resident and the future industrial worker
Eco = Ecological RCOC
HQ = hazard quotient
ND = not detected

Analytical statistics (frequency of detection, unit maximum, and reasonable maximum exposure [RME]) are based on unit-specific definitive-level data.

Total Aggregate Risks for RCOCs

Human Health:

LRP Surface Soil: Total media risk for future on-unit resident adult = 3.85×10^{-6}; hazard index for resident child = 4.2.

LRP Subsurface Soil: Total media risk for future on-unit resident adult = 3.54×10^{-6}.

Groundwater: Total media risk for future industrial worker = 1.48×10^{-6}.

Groundwater: Total media risk for future on-unit resident adult = 1.21×10^{-5}; hazard index = 1.1.

Groundwater: Hazard index for future on-unit resident child = 2.6.

Ecological:

LRP Surface Soil: Hazard quotient for soil-dwelling invertebrates = 202

LRP Surface Soil: Hazard quotient for insectivorous mammals = 66

LRP Surface Soil: Hazard quotient for birds = 76

LRP Subsurface Soil: Hazard quotient for soil-dwelling invertebrates = 84

LRP Subsurface Soil: Hazard quotient for insectivorous mammals = 14

LRP Subsurface Soil: Hazard quotient for birds = 12

Groundwater

Groundwater is contaminated by carbon tetrachloride and chloroform, but only carbon tetrachloride was reported above its MCL, 5.0 micrograms per liter (ug/L) (8.55 ug/L in well LRP-6R in May 1999, and 13.4 ug/L at CPT station LRP 3GW at 57-60 ft below land surface (bls). The plume also contains chloroform, but chloroform results (up to 5.4 ug/L in well LRP-6R in May 1999, and 10.8 ug/L at CPT station LRP 3GW at 57 - 60 ft bls) do not exceed the MCL for total trihalomethanes (100 ug/L).

The plume is small (approximately 2 acres), and concentrations are only slightly elevated above risk-based levels (Figures 10 and 11).

There is no PTSM in groundwater. There is no free product (non-aqueous phase liquids).

Site Specific Factors

There are no site-specific factors that may affect the response action at the OU. There are no areas of archaeological or historical importance in the vicinity of the OU.

Contaminant Transport Analysis

The vadose zone is approximately 40 ft thick at LRP and GCDF and 30 ft thick below the floor of LBRP. The water table aquifer is known as the Upper Three Runs Aquifer. It is approximately 113 ft thick; it extends from the water table to a locally continuous clay layer (Gordon confining unit, informally referred to as the green clay) at a depth of approximately 155 ft bls. Within the Upper Three Runs Aquifer at a depth of approximately 90 ft bls is an 8-ft-thick clay layer known as the tan clay. The tan clay restricts vertical groundwater flow within the Upper Three Runs Aquifer, and subdivides the Upper Three Runs Aquifer into an upper aquifer zone and lower aquifer zone. The groundwater flow direction is to the northwest.

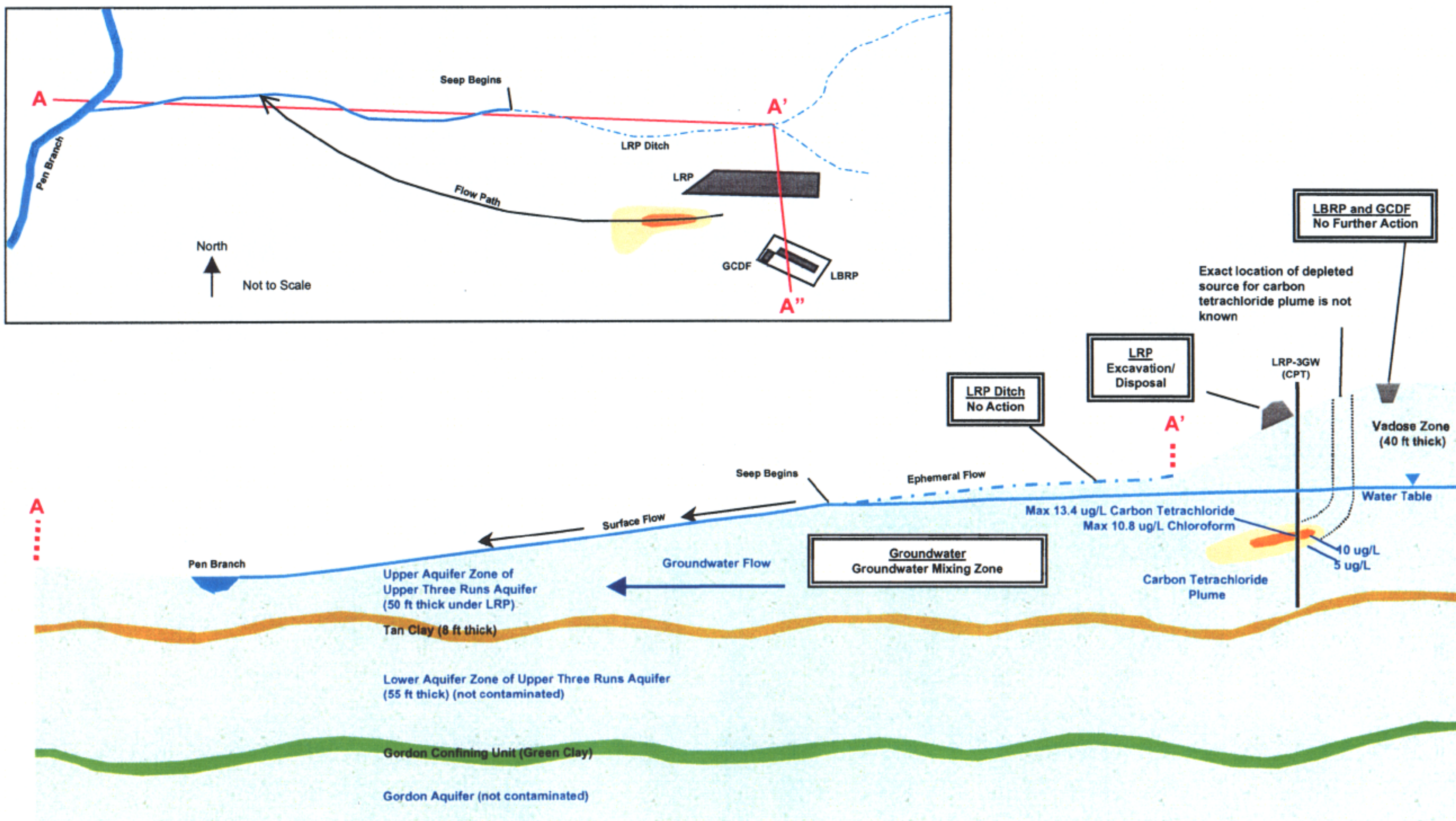


Figure 11. Schematic Cross-Section of the LBRP, GCDF, and LRP OU

Soil

Contaminant fate and transport modeling (WSRC 2000a) was performed to determine if any constituents in soil will leach through the vadose zone and impact groundwater above MCLs within 1,000 years. The modeling indicates no constituents at LRP present a contaminant migration (leachability) threat to groundwater. Future leaching of residual contamination in soils is not predicted to impact groundwater above target groundwater concentrations (MCLs) within the 1,000-year modeling period.

Groundwater

Monitoring indicates the plume of carbon tetrachloride and chloroform is moving to the northwest (relative to SRS plant coordinates), with local groundwater flow toward LRP Ditch and Pen Branch.

Groundwater flow and transport modeling (WSRC 1999) was performed to predict future concentrations of contaminants, to support evaluation of remedial alternatives, and to aid in the selection of sampling locations for continued monitoring of the plume.

The groundwater flow and transport modeling indicates that the likely source of the contamination was a point source near LRP or LBRP (WSRC 1999). Soil sampling in the area and fate and transport modeling indicate that the source has been depleted (i.e., is no longer providing additional contaminants to the groundwater plume). Modeling predicts that within 5 years, the maximum concentration of carbon tetrachloride as well as chloroform will each decrease to less than 5.0 ug/L. (WSRC 1999). Neither carbon tetrachloride nor chloroform is predicted to reach surface water at any measurable concentration.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

The OU is located in the interior of SRS approximately 6 miles from the nearest SRS boundary (Figure 1). SRS is a secured government facility with no residents. General public access to SRS is prohibited, with access limited by security personnel and fences. The OU is located close to the industrially developed area of L-Reactor Area, one of several inactive nuclear reactor areas at SRS. LBRP and GCDF are approximately 1,320 ft northwest of L-Reactor Area (Figure 1); LRP is located approximately 1,700 ft northwest of the L Area perimeter fence.

In the *Savannah River Site Future Use Project Report* (USDOE 1996a), the USDOE has taken steps to prohibit residential use of SRS, including land in the vicinity of the L-Reactor Area, through its plan for current and future use of the SRS. Therefore, future residential use and potential residential water usage in the area are not anticipated. Future industrial land use is anticipated.

Groundwater Uses/Surface Water Uses

Groundwater is approximately 40 ft bls at the OU. It flows to the northwest and seeps to surface water in the downslope end of the LRP Ditch approximately 650 ft northwest of the OU. Surface water is generally not present in the vicinity of the OU. Stormwater runoff flows down LRP Ditch when it rains, but the segment of LRP Ditch in the vicinity of LRP is generally dry. Approximately 650 ft downgradient of LRP, the LRP Ditch intersects the water table and is a perennial stream below that point. The LRP Ditch feeds into Pen Branch approximately 3,400 ft to the west.

Neither groundwater nor surface water is used for human consumption, irrigation, or any other use. USDOE controls surface water use and drilling through SRS's Site Use and Site Clearance Programs, therefore as long as USDOE maintains control of SRS, neither surface water not groundwater will be used as a potential drinking water source or for irrigation.

VII. SUMMARY OF OPERABLE UNIT RISKS

As a component of the RFI/RI process, a BRA (WSRC 2000a) was performed to evaluate risks associated with the LBRP, GCDF, and LRP OU. The BRA included human health and ecological risk assessments. A summary of risks and hazards is presented in Table 3.

At LBRP, GCDF, and LRP Ditch, no RCOCs were identified that necessitate remediation. RCOCs are identified for LRP and groundwater. The results of the risk assessments for LRP and groundwater are summarized in the following paragraphs.

LRP

At LRP, contamination is present in the remaining soil/debris stockpiles as well as in footprint soils of the original piles.

Human health risk calculations indicate lead would pose an unacceptable risk to a future industrial worker. Modeled fetal blood lead concentrations (assuming an expectant mother working in an industrial setting) are up to 4 times the benchmark level. If future land use was unrestricted, cadmium, lead, mercury, dibenzo(a,h)-anthracene, and PCB-1254 would pose an unacceptable risk to a hypothetical future resident. For a hypothetical future resident, carcinogenic risks of up to 4×10^{-6} and noncarcinogenic hazard quotients of up to 3.76 exceed the benchmark levels of 1×10^{-6} and 0.1, respectively. Modeled blood lead concentrations for the future resident child are up to 3.5 times the benchmark level (10 ug/dL), i.e., generally a level at which steps would be taken by health officials to treat a patient to try and reduce the body burden of lead.

Ecological risk calculations indicate that barium, cadmium, chromium, copper, lead, mercury, zinc, and PCB-1254 may pose an unacceptable risk to ecological receptors. Ecological hazard quotients of up to 139 exceed the benchmark level of 1.0.

The assessments conclude that no principal threat source material is present in the soil. However, LRP soil poses risk to human health and the environment. Hence, actual or threatened releases of hazardous substances, pollutants or contaminants from LRP, if not addressed by the Selected Alternative or another active measure, would present a current or potential threat to public health, welfare, or the environment.

Groundwater

In groundwater, a small plume consisting of low concentrations of carbon tetrachloride (Figure 10) and chloroform are present.

Carbon tetrachloride would pose an unacceptable risk to a future industrial worker. If future land use was unrestricted, carbon tetrachloride and chloroform would pose an unacceptable risk to a hypothetical future resident. Carbon tetrachloride has been detected up to 3 times its MCL. For a hypothetical future resident, carbon tetrachloride and chloroform present carcinogenic risks of up to 6×10^{-6} and noncarcinogenic hazard quotients of up to 1.96, which exceed the benchmark levels of 1×10^{-6} and 0.1, respectively.

The assessments conclude that no principal threat source material is present in the groundwater. However, groundwater poses risks to human health and the environment. Hence, actual or threatened releases of hazardous substances, pollutants or contaminants in the groundwater, if not addressed by the Selected Alternative or another active measure, would present a current or potential threat to public health, welfare, or the environment.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

The RFI/RI/BRA (WSRC 2000a) concluded that only the LRP and groundwater subunits have RCOCs and need remedial action. Remedial action objectives (RAOs) are developed for these subunits. No RCOCs were identified for LBRP, GCDF, or LRP Ditch, therefore RAOs are not developed for these subunits.

RAOs are based on the anticipated future land use. Because the anticipated future land use is industrial, the RAOs are designed to protect human and ecological receptors under an industrial scenario. As such, RAOs specify protection against industrial RCOCs instead of residential RCOCs.

The RAOs for LRP are:

- Prevent exposure of industrial workers to lead above minimum remedial goals (RGs) (Table 4).

- Prevent exposure of ecological receptors to barium, cadmium, chromium, copper, lead, mercury, zinc, and PCB-1254 above minimum RGs (Table 4).

The RAOs for groundwater are:

- Prevent human exposure to carbon tetrachloride in groundwater above the MCL of 5 ug/L.

- Prevent or limit discharge of carbon tetrachloride to surface water at levels above the MCL of 5 ug/L.

- Reduce carbon tetrachloride concentrations in groundwater to below the MCL of 5 ug/L.

In the RFI/RI/BRA, remedial goal options (RGOs) were calculated for each RCOC. RGOs are concentration goals for individual chemicals for specific media and land use combinations. They are designed to provide conservative, long-term targets for the selection and analysis of remedial alternatives. Human health RGOs are estimates of protective remedial levels for RCOCs based on risk to human receptors, and ecological RGOs are based on risk to ecological receptors. Final RGs are selected from the RGOs to be protective of both human health and ecological receptors, as well as to comply with

Table 4. Remedial Goals

		Background Benchmarks		**Minimum (Industrial) Cleanup Level**		**Anticipated (Residential) Cleanup Level**	
RCOC (Type of RCOC)	**Unit Max.**	**Unit-Specific Max. Bkgrd.**	**SRS 95th Percentile**	**RG**	**Basis**	**RG**	**Basis**
LRP (mg/kg)							
Barium Eco$_{shrew, robin}$	6,160	48.7	53.42	235	*Lowest LOAEL-based RGO*	235	*Lowest LOAEL-based RGO*
Cadmium Eco$_{worm, shrew, robin}$ HH$_{res}$	23.7	0.699	1.459	1.73	*Lowest LOAEL-based RGO*	1.73	Lower of (1) *lowest LOAEL-based RGO*, and (2) lowest residential RGO
Chromium Eco$_{worm, robin}$	93	28.5	35.22	(a)	see footnote a	(a)	See footnote a
Copper Eco$_{worm, shrew, robin}$	3,040	6.7	N/A	60	*Lowest LOAEL-based RGO*	60	*Lowest LOAEL-based RGO*
Lead Eco$_{worm}$ HH$_{res, ind}$ ARAR	7,830	9.7	15.08	500	Lower of (1) *lowest LOAEL-based RGO*, and (2) lowest RGO from industrial worker blood lead modeling	400	Lower of (1) lowest LOAEL-based RGO, and (2) *OSWER guidance [USEPA 1994]*
Mercury Eco$_{robin}$ HH$_{res}$	29.4	0.065	0.156	3.54	*Lowest LOAEL-based RGO*	0.748	Lower of (1) lowest LOAEL-based RGO, and (2) *lowest residential RGO*
Zinc Eco$_{worm, shrew, robin}$	5,420	9	20.475	107	*Lowest LOAEL-based RGO*	107	*Lowest LOAEL-based RGO*
Dibenzo(a,h)anthracene HH$_{res}$	1.76	ND	N/A	(b)	see footnote b	0.0613	*Lowest residential RGO*
PCB 1254 Eco$_{shrew, robin}$ HH$_{res}$	24.4	ND	N/A	0.219	Lower of (1) *lowest LOAEL-based RGO*, and (2) TSCA guidance for low occupancy areas	0.141	Lower of (1) lowest LOAEL-based RGO, (2) *lowest residential RGO*, and (3) TSCA guidance for high occupancy areas
Groundwater (ug/L)							
Carbon tetrachloride HH$_{res, ind}$ ARAR	13.4	ND	N/A	5	*MCL*	5	*MCL*
Chloroform HH$_{res}$	10.8	ND	N/A	100	*MCL*	100	*MCL*

ARAR = ARAR RCOC

HH$_{res}$ = Human health RCOC for the future on-unit resident

HH$_{res, ind}$ = Human health RCOC for the future on-unit resident and the future industrial worker

Eco$_{worm, shrew, robin}$ = Ecological RCOC for earthworm, shrew, and/or robin.

Minimum cleanup level is based on protection of future industrial workers and the ecological community.
Anticipated cleanup level is based on protection of hypothetical future residents and the ecological community.
The source of the selected cleanup level is indicated in *italicized text* under the Basis column.

Unit Max: Maximum result in unit-specific screening- and definitive-level data from LRP.
Unit-Specific Max Bkgrd: Maximum result observed in background samples at this OU.
SRS 95th percentile: Calculated 95th percentile of unimpacted SRS background soils (USDOE 1996b).

ND = Not detected.
N/A = No data available.

(a) Calculated risk-based RG for chromium (0.4 mg/kg) is less than natural background concentrations. Because the calculated RG is not attainable, and because the unit concentrations are comparable to background soils, chromium is not identified as a driver for the selected remedial action.
(b) Not identified as a RCOC based on future industrial exposure assumptions.

federal and state applicable or relevant and appropriate requirements (ARARs). ARARs and to-be-considered (TBC) criteria are identified in Table 5.

The RFI/RI/BRA presents a range of human health RGOs. RGOs were calculated for various land use/receptor scenarios including future industrial workers and hypothetical on-unit residents. A range of RGOs is provided, corresponding to target hazard quotients (HQs) of 0.1, 1, and 3 as well as target cancer risks of 1×10^{-6}, 1×10^{-5}, and 1×10^{-4}. In situations where both noncarcinogenic and carcinogenic toxicity values are available, potential human health RGOs were calculated using both values. The most restrictive human health RGO for each land use scenario is determined by selecting the lowest RGO (i.e., based on either noncancer or cancer targets) for a target HQ of 0.1 or a risk of 1×10^{-6}.

Ecological RGOs to protect organisms are calculated by methods similar to those used for risk assessment for soil. The method calculates the highest environmental concentrations at which exposure to contaminants in soil is not harmful to biological individuals, ecological populations, or communities. Ecological RGOs are derived for the receptors for which unacceptable, medium-specific risks (HQs > 1) were calculated. RGOs are calculated for both No Observed Adverse Effects Level (NOAEL) and Lowest Observed Adverse Effects Level (LOAEL) toxicity benchmarks for each receptor at risk (e.g., earthworm, shrew, or robin).

To be protective of both human health and the ecological community, the RG is selected as the lower of the (1) most restrictive human health RGO for the expected future land use, and (2) the lowest LOAEL-based RGO. If available, additional information such as chemical-specific ARARs and other guidance (e.g., TSCA cleanup levels, USEPA - Office of Solid Waste and Emergency Response [OSWER] guidance, and MCLs) may also be considered in selecting RGs.

Table 5. ARARs and TBC Criteria

Citation(s)	Status	Requirement Summary	Reason for Inclusion	Alternative
Chemical				
40 CFR 141 – MCLs and MCLGs	Relevant and Appropriate	MCLs and MCLGs for groundwat0er that may be a source of drinking water	Mandates meeting MCLs for groundwater unless a Mixing Zone is established. Groundwater Mixing Zone guidance allows developing alternative compliance levels for groundwater.	GW 1, GW 2
SC R.61-58.5 – MCLs and MCLGs	Relevant and Appropriate	MCLs and MCLGs for groundwater that may be a source of drinking water	State regulations implementing MCLs.	GW 1, GW 2
SC R.61-68 Water Classification	Relevant and Appropriate	States official classified water uses for all surface and groundwater in South Carolina	Mandates meeting MCLs for groundwater unless a Mixing Zone is established. Groundwater Mixing Zone guidance allows developing alternative compliance levels for groundwater.	GW 1, GW 2
40 CFR 143.3 Secondary Drinking Water Standards	Relevant and Appropriate	Establishes levels for contaminants that affect the aesthetic qualities of drinking water.	Relevant and appropriate to verify that cleanup goals meet federal standards.	GW 1, GW 2
40 CFR 761 (TSCA)	Relevant and Appropriate	Identifies cleanup levels and disposal requirements for cleaning, decontaminating, or removing PCB remediation waste	Applicable for disposal of PCBs in soil.	LRP 1, LRP 2
40 CFR 260-268 and SC R.61-79.260-268 Federal and State Hazardous Waste Regulations	Applicable	Defines criteria for determining whether a waste is RCRA hazardous waste and provides treatment, storage and disposal requirements.	Applicable for management and disposal of hazardous wastes.	LRP 1, LRP 2
OSWER Guidance (USEPA 1994)	Relevant and Appropriate	Benchmark levels for residential lead uptake scenarios	Benchmark levels are basis for residential remediation goals	LRP 1, LRP 2
Action				
40 CFR 50.6 National Primary and Secondary Ambient Air Quality Standards	Potentially Applicable	The concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 ug/m^3 (annual arithmetic mean) or 150 ug/m^3 (24-hour average concentration).	Dust suppression will likely be required to minimize dust emissions during construction/remedial action.	LRP 2
SC R.61-62.6 Fugitive Dust	Applicable	Fugitive particulate material shall be controlled.	Construction/remedial action required for dust suppression.	LRP 2

Table 5. ARARs and TBC Criteria (Continued)

Citation(s)	Status	Requirement Summary	Reason for Inclusion	Alternative
Action (Continued)				
SC R.61-71 Well Construction Standards	Applicable	Prescribes minimum standards for the construction of groundwater wells.	Standards for installation and abandonment of groundwater wells.	GW 2
SC R.72-300 Standards for Stormwater Management and Sediment Reduction	Potentially Applicable	Stormwater management and sediment control plan for land disturbances.	Construction/remedial action may require an erosion control plan.	LRP 2

At this OU, the objective of the remediation is to cleanup to industrial standards. However, because contamination above residential risk-based standards is generally co-located with contamination above industrial risk-based standards, it is anticipated that the selected remedy will also cleanup the OU to residential standards. Therefore, two RGs are presented: a minimum cleanup level (based on industrial standards) and an anticipated cleanup level (based on residential standards) (Table 4). The minimum (industrial) RG is the cleanup level and is the basis for assessing successful completion of the remedial action.

Because of the generally conservative assumptions used in the RGO calculations, it is possible for a risk-based RGO to be less than what occurs naturally in unimpacted background soils. This RG would not be technically possible to achieve. To avoid this, the RGs are compared to one or more background benchmarks to confirm that the RGs are reasonable and attainable. Table 4 presents two benchmarks: the maximum result in the unit-specific background soil, and the 95th percentile for unimpacted background soils at SRS (USDOE 1996b).

A comparison of the RGs to background benchmarks (the maximum result in the unit-specific background soil and the 95th percentile for unimpacted background soils at SRS) indicates that all of the calculated risk-based RGs except for chromium are greater than background benchmarks. The ecological risk assessment determined that for chromium, the calculated risk-based RG is 0.4 milligram per kilogram (mg/kg). This value is less than the unit-specific background maximum (28.5 mg/kg) and the 95th percentile of SRS background soils (35.22 mg/kg) (USDOE 1996b). In addition, it is less than the average (14.5 mg/kg) and the minimum (3.4 mg/kg) of unit-specific background samples. Because the calculated risk-based RG is less than what is present in natural background soil, it is technically impractical to meet this RG.

Review of the data for chromium indicates that this constituent does not require remediation beyond that which will be performed to remediate the other RCOCs. The unit concentrations are within the range of values expected under natural soil conditions. The unit concentrations (up to 75.6 mg/kg in the definitive-level samples and up to 93 mg/kg in the screening-level samples) are comparable to the range of concentrations observed in unit-specific background soils (up to 29 mg/kg) and unimpacted SRS background soils (up to 116 mg/kg) (USDOE 1996b). This indicates that the constituent may not be unit-related. This premise is supported by the fact that the distribution of chromium does not match the pattern of contamination exhibited by the other RCOCs. Because the calculated risk-based RG is not attainable, and because the unit concentrations are comparable to background soils, chromium is not identified as a driver for the selected remedial action.

Table 4 presents the minimum and anticipated RGs, and the basis for each.

IX. DESCRIPTION OF ALTERNATIVES

Throughout the RFI/RI process, USDOE, SCDHEC, and USEPA have evaluated a range of possible response actions for the subunits that require remediation (LRP and groundwater). For LRP, containment and treatment technologies were eliminated because there is a preference to remove the remaining stockpiles and contaminated footprints rather than leave this waste in place. Furthermore, containment and treatment technologies would require long-term care of the waste and would not be significantly less costly. Containment, active treatment, and removal technologies were eliminated for local groundwater because modeling results (WSRC 1999) indicate that the plume will decrease to levels below Safe Drinking Water Act MCLs before these types of robust remedies could be implemented.

Remedial alternatives were developed for those subunits requiring remediation (LRP and groundwater). Remedial alternatives were not developed for LBRP, GCDF, or LRP Ditch subunits because they do not pose a threat to human health or the environment that increases the excess cancer lifetime risk > 10^{-6}, adversely affect human health or the environment, or contain constituent concentration levels above ARAR action levels and there are no RCOCs.

Two alternatives were identified for LRP (No Further Action and Removal/Disposal with institutional controls contingent on confirmatory sampling), and two alternatives were identified for groundwater (No Action and Groundwater Mixing Zone with institutional controls until the MCL is attained).

The alternatives are briefly summarized in the following paragraphs. For additional information on the development and evaluation of alternatives, refer to Appendix A of the SB/PP.

LRP

LRP 1: No Further Action

Total Present Value Cost: $32,000

Construction Time to Complete: 0 years

No Further Action would consist of no additional remedial activities at LRP. Institutional controls would not be implemented. The No Further Action alternative is required by the National Oil and Hazardous Substances Contingency Plan (NCP) to serve as a baseline for comparison with other remedial alternatives. The No Further Action alternative would not be protective of human health and the environment. The key ARARs for this alternative are TSCA, Federal and State Hazardous Waste Regulations, and USEPA OSWER guidance. There would be no reduction of risk, and potential exposure pathways would remain. The Five-Year Review Requirement, a CERCLA ROD review, would be conducted every five years to determine whether the remedy is meeting RAOs. The time to construction would be 0 months; the time until protection is achieved is not applicable because RAOs are not met. The total present value cost is $32,000.

For consistency in the comparative analysis, this cost includes the cost for the Five-Year Review Requirement, which is also presented with the groundwater alternative cost. However, this cost is an OU-wide cost that is not duplicated for each subunit (LRP and groundwater). If this alternative were selected, the expected outcome would be that contamination would remain in the soil above ecological and industrial risk-based standards.

LRP 2: Removal/Disposal, with institutional controls contingent on confirmation sampling

Total Present Value Cost: $1,095,000

Construction Time to Complete: 2 years

Under this alternative, the soil/debris mixture that remains at LRP in stockpiles and the contaminated soil that remains at the location of the original pile footprints would be removed. Once the visible contamination has been removed, confirmatory soil samples would be collected. The analytical results will be compared to RGs to determine if contamination remains. If contamination above minimum RGs remains, removal and confirmatory sampling would be repeated until the contamination has been removed or an excavation depth of 4 ft is reached (human health and ecological risk assessment is performed for the 0 to 4 ft interval). After removal, any excavations would be filled to grade with clean soil and the segregated wastes would be disposed at appropriate treatment/storage/disposal facilities. Institutional controls would be contingent on the confirmatory sampling results. If no contamination above anticipated (residential) RGs remains at LRP, unit-specific land use controls will not be implemented (Table 4). If contamination above anticipated (residential) RGs does remain, institutional controls would be implemented. Institutional controls would consist of long-term site maintenance (repair of erosion damage and maintaining warning signs) and site controls (SRS Site Use/Site Clearance Programs). The key ARARs for this alternative are TSCA, Federal and State Hazardous Waste Regulations, and USEPA OSWER guidance. The

Five-Year Review Requirement, a CERCLA ROD review, would be conducted every five years to determine whether the remedy is meeting RAOs. The time to the start of construction would be approximately 1 year after the ROD is approved; the time until protection is achieved would be approximately 2 years after the ROD is approved. The total present value cost is $1,095,000.

For consistency in the comparative analysis, these costs include the costs for the Five-Year Review Requirement and Institutional Controls, which are also presented with the groundwater alternative costs. However, these costs are OU-wide costs that are not duplicated for each subunit (LRP and groundwater). If this alternative were selected, the expected outcome would be that no contamination would remain in the soil above ecological or industrial risk-based standards.

Groundwater

GW 1: No Action

Total Present Value Cost: $32,000

Construction Time to Complete: 0 years

No Action would consist of no remedial activities to groundwater. The No Action alternative is required by the NCP to serve as a baseline for comparison with other remedial alternatives. The No Action alternative would not be protective of human health and the environment. The key ARAR for this alternative is the Safe Drinking Water Act, which establishes MCLs (used in the selection of RGs, Table 4). There would be no reduction of risk, and potential exposure pathways would remain. The Five-Year Review Requirement, a CERCLA ROD review, would be conducted every five years to determine whether the remedy is meeting RAOs. The time to construction would be 0 months; the time until protection is achieved is not applicable because RAOs are not met. The total present value cost is $32,000.

For consistency in the comparative analysis, this cost includes the cost for the Five-Year Review Requirement, which is also presented with the LRP subunit alternative costs. However, this cost is an OU-wide cost that is not duplicated for each subunit (LRP and groundwater). If this alternative were selected, the expected outcome would be that groundwater contamination will attenuate and not exceed MCLs within 5 years. Use of groundwater would not be controlled.

GW 2: Groundwater Mixing Zone, with institutional controls until the MCL is attained

Total Present Value Cost: $460,000

Construction Time to Complete: <5 years

Under this alternative, the groundwater plume would be treated in-situ by natural processes. A groundwater model has been generated to estimate contaminant concentrations over time in the groundwater and to predict contaminant flow paths (WSRC 1999). The results of this modeling indicate that, through the natural transport processes of advection and dispersion, contaminant concentrations in the groundwater will decrease below MCLs within 5 years and will not be released to surface water above regulatory standards (WSRC 1999). Under an approved Groundwater Mixing Zone Application (WSRC 2000b), monitoring would be performed to confirm the model predictions, within the plume and at the compliance boundary. Plume monitoring wells would consist of one existing well and one new well. The new well would be installed at the CPT location where the highest carbon tetrachloride concentration was detected. In addition to the plume wells, three point-of-compliance wells would be installed within about 450 ft downgradient of the known area of the plume as determined by existing CPT data. Additional CPT data may be collected as necessary to guide placement and installation of the wells and to monitor the evolution of the plume through time. In addition, samples of a seep where groundwater discharges to surface water will be collected annually. Monitoring would continue until sampling demonstrates that concentrations are below MCLs. Institutional controls would be implemented as long as groundwater concentrations exceed MCLs. Institutional controls would consist of the environmental monitoring discussed above, site maintenance, posting of signs, and land use controls to prevent unauthorized groundwater usage. The key ARAR for this alternative is the Safe Drinking Water Act, which establishes MCLs (used in the selection of RGs, Table 4). The Five-Year Review Requirement, a CERCLA ROD review, would be conducted every five years to determine whether the remedy is meeting RAOs. The time to construction would be 0 months; the time until protection is achieved is anticipated to be less than 5 years. The total present values cost is $460,000.

For consistency in the comparative analysis, these costs include the costs for the Five-Year Review Requirement and Institutional Controls, which are also presented with the LRP subunit alternative costs. However, these costs are OU-wide costs that are not duplicated for each subunit (LRP and groundwater). If this alternative were selected, the expected outcome would be that groundwater contamination will alternate and will not exceed MCLs within 5 years. Use of groundwater would be controlled until concentrations attenuate to levels below MCLs.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

Description of the Nine Evaluation Criteria

Each of the remedial alternatives is evaluated against the nine criteria established by the NCP 40 Code of Federal Regulations (CFR) 300. The criteria are derived from the statutory requirements of CERCLA Section 121. The criteria provide the basis for evaluating the alternatives and selecting a remedy. The nine criteria are:

Threshold criteria:

1. Overall protection of human health and the environment
2. Compliance with ARARs

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
9. Community acceptance

Tables 6 and 7 present a summary of this evaluation. The results of the evaluations are briefly summarized below.

LRP

Overall Protection of Human Health and the Environment: Removal/Disposal would be protective because no contamination above minimum RGs would remain. No Further Action is not protective because RCOCs would remain at the unit and would pose an unacceptable risk to human health and the environment under the industrial land use scenario.

Compliance with ARARs: Removal/Disposal would comply with ARARs. Soil removal allows this remedy to fully meet 40 CFR 761 (TSCA) for treatment of soils contaminated with PCBs. No Further Action would not comply with TSCA because PCBs would remain at the unit above standards.

Long-term Effectiveness and Permanence: Removal/Disposal offers greater long-term effectiveness compared to No Further Action. Whereas the residual risk associated with No Further Action would be the same as current conditions, the residual risk associated with Removal/Disposal would be less than the target risk range. An assessment of permanence for No Further Action is not applicable because RAOs are not met. Removal/disposal is permanent because the contaminants are permanently removed from the unit.

Table 6. Comparative Analysis of Alternatives – LRP

EVALUATION CRITERIA	Alternative LRP 1 No Further Action	Alternative LRP 2 Removal/Disposal, with institutional controls contingent on confirmation sampling
Overall Protection of Human Health and the Environment		
Human Health	Not Protective. RCOCs remaining at unit would pose an unacceptable risk to human health if exposure were not restricted.	Protective. Removal will eliminate RCOCs. If residual contamination above RGs remains after removal, institutional controls would protect against unrestricted land use.
Environment	Not Protective. RCOCs remaining at unit would pose an unacceptable risk to ecological receptors if exposure were not restricted. Also, erosion of stockpiles could spread contamination.	Protective. Removal will eliminate RCOCs. Removal will eliminate threat of redistribution of pile contents by erosion.
Compliance with ARARs		
Chemical-Specific	Does not comply. Constituents such as PCBs would remain on site above standards.	Complies.
Location-Specific	None.	None.
Action-Specific	None.	Complies with all ARARs if standard construction practices are followed during remediation.
Long-Term Effectiveness and Permanence		
Magnitude of Residual Risks	High. Several constituents would pose an unacceptable risk to a future resident if exposure were to occur. Also, lead would pose an unacceptable risk to a future industrial worker.	Low. Removal will eliminate RCOCs from the unit. Exposure to any residual contamination would be prevented by contingent institutional controls, including land use controls.
Permanence	Not Applicable. Does not meet RAOs, and there are no remedy components.	Removal will permanently meet RAOs. Land use controls are generally considered permanent, but there is some uncertainty with the ability to maintain them in the very long-term (>100 years).
Reduction in Toxicity, Mobility, or Volume Through Treatment		
Degree of Expected Reduction in Toxicity	None.	High. Toxicity of soil/debris transferred to the receiving facility.
Degree of Expected Reduction in Mobility	None.	High. Mobility of soil/debris transferred to the receiving facility.

Table 6. Comparative Analysis of Alternatives – LRP (Continued)

EVALUATION CRITERIA	Alternative LRP 1 No Further Action	Alternative LRP 2 Removal/Disposal, with institutional controls contingent on confirmation sampling
Reduction in Toxicity, Mobility, or Volume Through Treatment (Continued)		
Degree of Expected Reduction in Volume	None.	Volume of waste at the unit will decrease. Volume of waste at the receiving facility will increase because the soil will swell during excavation. In addition, new waste will be generated as materials and equipment become contaminated during removal, handling, staging, transportation, and disposal.
Short-Term Effectiveness		
Risk to Workers	None. No onsite activity.	Manageable exposure risk associated with removal of the stockpiles, handling, staging, transportation, and disposal. Minimal risk associated with heavy equipment use.
Risk to Community	None. No onsite activity.	No exposure concerns; unit is located several miles from the nearest SRS boundary. Negligible increase in off-SRS vehicular traffic.
Time until Protection is Achieved	Protection not achieved.	18-24 months after ROD is approved (time required to implement removal).
Implementability		
Availability of Materials, Equipment, Contractors	No materials, equipment, or contractors required.	Receiving facilities are available to receive the types of wastes that could be generated by removal. Removal uses standard construction equipment. Qualified contractors for removal are available.
Administrative Feasibility/ Regulatory Requirements	None.	Waste characterization and evaluation of regulatory and waste acceptance requirements at the receiving facility will be necessary, but do not pose administrative constraints to implementation.
Technical Feasibility	Implementable. There are no remedy components to implement.	Implementable. The techniques used for removal are well understood. There is some uncertainty with the extent of contamination in soils under the stockpiles, but this uncertainty is manageable through a phased approach to removal, confirmatory sampling, and contingent institutional controls (if all contamination is not readily removable).

Table 6. Comparative Analysis of Alternatives – LRP (Continued)

EVALUATION CRITERIA	**Alternative LRP 1** **No Further Action**	**Alternative LRP 2** **Removal/Disposal, with institutional controls contingent on confirmation sampling**
Implementability (Continued)		
Monitoring Considerations	None.	Minor confirmatory sampling to determine if all contamination has been removed. No long-term monitoring requirements at the unit.
Cost		
Total Present Value Cost	Five-Year Review Requirement: $32,000	Removal/disposal: $998,000 Institutional Controls: $65,000 Five-Year Review Requirement: $32,000

Table 7. Comparative Analysis of Alternatives – Groundwater

EVALUATION CRITERIA	GW 1 No Action	GW 2 GMZ, with institutional controls until the MCL is attained
Overall Protection of Human Health and the Environment		
Human Health	Not Protective. Groundwater contamination above MCLs would be left unmonitored.	Protective. Monitoring would track the evolution of the plume. Institutional controls would prohibit groundwater use until concentrations drop below MCLs.
Environment	Not Protective. It would be unknown if the groundwater plume concentrations actually decreased below standards before reaching surface water.	Protective. Monitoring would track the evolution of the plume.
Compliance with ARARs		
Chemical-Specific	Does not comply. Groundwater contamination above MCLs would be left unmonitored.	Complies with all ARARs.
Location-Specific	None.	None.
Action-Specific	None.	Complies with all ARARs if standard construction practices are followed.
Long-Term Effectiveness and Permanence		
Magnitude of Residual Risks	Moderate. Although concentrations are generally low and the plume concentrations are predicted to decrease below standards within 5 years, there would be some uncertainty with the magnitude of residual risk if monitoring was not performed.	Low. After remediation, the residual risk would be indistinguishable from background risks.
Permanence	Permanent. There are no remedy components to fail.	Permanent. After remediation, there would be no remedy components to fail.
Reduction in Toxicity, Mobility, or Volume Through Treatment		
Degree of Expected Reduction in Toxicity	High. Toxicity would decrease with time through natural processes.	High. At completion of GMZ, the plume would decrease to concentrations below standards.
Degree of Expected Reduction in Mobility	None.	None.
Degree of Expected Reduction in Volume	High. The volume of groundwater contaminated above standards would decrease as the plume attenuates.	High. At completion of GMZ, the volume of groundwater contamination above MCLs would decrease to zero.

Table 7. Comparative Analysis of Alternatives – Groundwater (Continued)

EVALUATION CRITERIA	**GW 1** **No Action**	**GW 2** **GMZ, with institutional controls until the MCL is attained**
Short-Term Effectiveness		
Risk to Workers	None. No onsite activity.	Negligible. Exposure risk during sampling managed through standard health and safety procedures. Negligible risk associated with construction equipment (e.g, during well installation and CPT sampling).
Risk to Community	None. No onsite activity.	None. No exposure concerns; unit is located several miles from the nearest SRS boundary.
Time until Protection is Achieved	Predicted to be less than 5 years. It would be unknown when protection is actually achieved.	Predicted to be less than 5 years. Monitoring would establish when protection is actually achieved.
Implementability		
Availability of Materials, Equipment, Contractors	No materials, equipment, or contractors required.	Materials and construction equipment are standard. Qualified contractors for modeling and monitoring are available.
Administrative Feasibility/ Regulatory Requirements	None.	GMZ Application would need to be approved by SCDHEC, but this does not present a barrier to implementation.
Technical Feasibility	Implementable. There are no remedy components to implement.	Implementable. The techniques for modeling and monitoring are well understood.
Monitoring Considerations	None.	Detailed groundwater modeling will be required, and monitoring will be required until concentrations drop below standards.
Cost		
Total Present Value Cost	Five-Year Review Requirement: $32,000*	GMZ: $362,000 Institutional Controls: $65,000 Five-Year Review Requirement: $32,000

Reduction of Toxicity, Mobility, or Volume: Removal/Disposal offers greater reduction of toxicity, mobility, and volume at the OU compared to No Further Action. Whereas No Further Action offers no reduction, Removal/Disposal eliminates the toxicity, mobility, and volume of contaminated material from the unit.

Short-term Effectiveness: Removal/Disposal offers greater short-term effectiveness compared to No Further Action. Although Removal/Disposal presents greater exposure risks to remedial workers, No Further Action does not achieve protection and is therefore not effective. Risks to remedial workers performing the removal action can be managed using standard health and safety measures, such as personal protective equipment. There are no exposure concerns for the community.

Implementability: Both alternatives are implementable. No Further Action does not involve any action; therefore, it is readily implementable. Removal/Disposal will require additional waste characterization and evaluation of regulatory and waste acceptance requirements for the receiving facility, but there are no significant implementability restrictions.

Cost: No Further Action is less expensive than Removal/Disposal.

State Acceptance: Approval of the ROD by SCDHEC and USEPA constitutes acceptance of the selected alternative.

Community Acceptance: The SB/PP provided for community involvement through a document review process and a public comment period. Public input is documented in the Responsiveness Summary section of this ROD (Appendix A).

Groundwater

Overall Protection of Human Health and the Environment: Groundwater Mixing Zone is protective because monitoring would track the evolution of the plume as it attenuates. No Action is not protective because the groundwater plume would be unmonitored.

Compliance with ARARs: Groundwater Mixing Zone would comply with ARARs. The Groundwater Mixing Zone remedy is designed to monitor the natural *in situ* remediation process to ensure that the groundwater will not exceed MCLs (40 CFR 141 and SC R.61-58.5) at the compliance point. No Action would not comply with the Safe Drinking Water Act because groundwater contamination above MCLs would be left unmonitored and without institutional controls to prevent unauthorized (residential) use.

Long-term Effectiveness and Permanence: Although the rate at which the groundwater plume attenuates will be the same under both alternatives, Groundwater Mixing Zone offers greater long-term effectiveness because monitoring will reduce uncertainty with the magnitude of residual risks. Both alternatives are permanent remedies in that the remedy components will not fail to perform as designed.

Reduction of Toxicity, Mobility, or Volume: The rate at which the groundwater plume attenuates will be the same under both alternatives.

Short-term Effectiveness: Groundwater Mixing Zone offers greater short-term effectiveness compared to No Action. Although Groundwater Mixing Zone presents some minor exposure risks to remedial workers, this is offset by the fact that the time until No Action achieves protection is unknown. Therefore, the short-term effectiveness of No Action is unknown. Risks to remedial workers performing Groundwater Mixing Zone (groundwater sample crews, CPT/well installation crews) can be managed using standard health and safety measures. There are no exposure concerns for the community.

Implementability: Both alternatives are implementable. No Action does not involve any action; therefore, it is readily implementable. Groundwater Mixing Zone is also readily implementable, as modeling and monitoring use standard equipment and techniques.

Cost: No Action is less expensive than Groundwater Mixing Zone.

State Acceptance: Approval of the ROD by SCDHEC and USEPA constitutes acceptance of the selected alternative.

Community Acceptance: The SB/PP provided for community involvement through a document review process and a public comment period. Public input is documented in the Responsiveness Summary section of this ROD (Appendix A).

XI. THE SELECTED REMEDY

Detailed Description of the Selected Remedy

Based upon the characterization data and risk assessments in the RFI/RI/BRA (WSRC 2000a), the RAOs, and the detailed evaluation of alternatives, the selected alternative for LRP is Alternative LRP 2, Removal/Disposal with institutional controls contingent on confirmation sampling. The selected alternative for groundwater is Alternative GW 2, Groundwater Mixing Zone, with institutional controls until the MCL is attained.

These alternatives were selected because they provide overall protectiveness of human health and the environment and they comply with ARARs. The other alternatives considered fail to meet the threshold criteria of overall protectiveness of human health and the environment and compliance with ARARs.

LRP 2 meets the RAOs for LRP through removal of contaminants; this will prevent exposure of industrial workers and ecological receptors to contaminants above RGs. GW 2 meets the RAOs for groundwater by preventing human exposure to groundwater until concentrations attenuate below MCLs.

The remedy may change as a result of the remedial design or construction processes. Changes to the remedy described in the ROD will be documented in the Administrative Record File utilizing a memo, an Explanation of Significant Difference (ESD), or a ROD Amendment.

LRP: Removal/Disposal, with institutional controls contingent on confirmation sampling (Alternative LRP 2)

The soil/debris mixture that remains at LRP in stockpiles, and the contaminated soil that remains at the location of the original pile footprints, will be removed. During removal, the waste will be segregated into suspect hazardous waste and non-hazardous solid waste. Removal will generate approximately 750 cubic yards of non-hazardous solid waste and 320 cubic yards of suspect hazardous waste. After removal, the soil in the excavation will be visually inspected and any soil having visible evidence of contamination (e.g., discoloration) will be removed. Once the visible contamination has been removed, confirmatory soil samples will be collected. At least one sample will be collected from each area where soil was removed. The samples will be collected from the 0 to 1 ft depth interval relative to the base of the excavation and will be analyzed for the RCOCs. Inorganics will be analyzed at the locations of the original pile footprints; dibenzo(a,h)anthracene and PCB-1254 will be analyzed at those areas where they have been detected. The analytical results will be compared to RGs to determine if contamination remains. If contamination above minimum RGs remains, soil from that area will be removed in 6-inch lifts and the area re-sampled. Removal and confirmatory sampling will be repeated until the contamination has been removed or an excavation depth of 4 ft is reached (human health and ecological risk assessment is performed for the 0 to 4 ft interval). After removal, any excavations will be filled to grade with clean soil and the site restored by seeding. The segregated wastes will be stored and disposed at appropriate treatment/storage/disposal facilities.

Institutional controls will be contingent on the confirmatory sampling results. If no contamination above anticipated (residential) RGs remains at the LRP, unit-specific land use controls will not be implemented (Table 4). If soil contamination above anticipated (residential) RGs does remain, institutional controls will be implemented by:

- providing access controls for on-site workers via the Site Use Program, Site Clearance Program, work control, worker training, worker briefing of health and safety requirements, and identification signs posted at the waste unit access points

- notifying the USEPA and SCDHEC in advance of any changes in use or disturbance of waste

- providing access controls against trespassers via the 1992 RCRA Part B Permit Renewal Application 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.

If implemented, institutional controls will consist of long-term site maintenance and site controls. Long-term environmental monitoring will not be a component of institutional controls at the LRP source unit because the types and levels of contaminants present in the soil will not change over time and do not require additional characterization.

Site maintenance will consist of maintenance of drainage features to minimize the formation of large gullies and minor earthwork to repair any erosion damage that may occur. Site maintenance will also include maintaining signs around the LRP.

Access controls will include site security measures such as warning signs. Signs will be posted around the facility with a legend warning of the hazard. They will be posted at each entrance to the restricted portion of the subunit and at other appropriate locations in sufficient numbers to be seen from any approach.

Administrative controls (land use restrictions) will also be implemented to restrict human exposure to contaminants remaining at the unit. The level of administrative controls will be dependant on the levels of residual contamination left at the unit. If contamination is above action levels or risk levels for an industrial worker and resident, administrative controls will prohibit both industrial and residential use of the subunit. If residual contamination is above residential levels but below industrial levels, administrative controls will prohibit residential use of the subunit, but would allow industrial land use.

Per the USEPA – Region IV LUCs Policy, a LUCAP for SRS has been developed and approved by the regulators. In addition, a LUCIP for the LBRP, GCDF, and LRP OU will be developed and submitted to the regulators for their approval with the post-ROD documentation. The LUCIP will detail how SRS will implement, maintain, and monitor the land use control elements of the LBRP, GCDF, and LRP OU selected alternative to ensure that the remedy remains protective of human health and the environment.

In the long-term, if the property is ever transferred to non-federal 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, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of waste. 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 the property. However, the need for these deed restrictions may be re-evaluated 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 re-evaluation 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 non-federal 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 Five-Year Review Requirement, a CERCLA ROD review, will be conducted every five years to determine whether the remedy is meeting RAOs.

Groundwater: Groundwater Mixing Zone, with institutional controls until the MCL is attained (Alternative GW 2)

The groundwater plume will be treated in-situ by natural processes. Groundwater modeling (WSRC 1999) indicates that natural processes of advection and dispersion will reduce contaminant concentrations below regulatory standards before potential exposure pathways are completed (concentrations will drop below MCLs within 5 years and will not seep to surface water above standards).

Monitoring will be performed to confirm that groundwater concentrations are decreasing consistent with the model predictions and the cleanup objectives. Monitoring will consist of sampling of the wells within the plume (one existing well and one well to be installed). In addition to the plume wells, three new point-of-compliance wells will be installed within about 450 ft downgradient of the known area of the plume as determined by existing CPT data. Sampling will be done quarterly for the first year, then semi-annually thereafter until the plume has been demonstrated to be less than MCLs. Details of the compliance monitoring strategy are described in the Groundwater Mixing Zone Application (WSRC 2000b), which was approved by SCDHEC in January 2001 and by USEPA in April 2001. Additional CPT data may be collected as necessary to guide placement and installation of the wells and to monitor the evolution of the plume through time. In addition, samples of a seep where groundwater discharges to surface water will be collected annually. All samples will be analyzed for carbon tetrachloride, chloroform, methylene chloride, and chloromethane.

Institutional controls will be implemented as long as groundwater concentrations exceed MCLs. institutional controls will be implemented by:

- providing access controls for on-site workers via the Site Use Program, Site Clearance Program, work control, worker training, worker briefing of health and safety requirements, and identification signs posted at the waste unit access points

- notifying the USEPA and SCDHEC in advance of any changes in use or disturbance of waste

- providing access controls against trespassers via the 1992 RCRA Part B Permit Renewal Application 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.

Institutional controls will consist of the environmental monitoring discussed above, site maintenance, posting of signs, and land use controls to prevent unauthorized groundwater usage. Environmental monitoring will confirm groundwater plume attenuation and will be performed quarterly for the first year, then semi-annually thereafter. Site maintenance will ensure that site conditions for which the remedial action has been implemented do not change and will be performed on a frequency to be determined in the LUCIP. Posting of signs will provide the worker with a visible indication of the presence of hazardous material to prevent human exposure to carbon tetrachloride in groundwater above MCLs. Site Use/Site Clearance Program land use restrictions will prevent unauthorized groundwater usage. Institutional controls (for the groundwater mixing zone) will be implemented for the area subject to the mixing zone until the plume has been demonstrated to be less than MCLs. The operation and maintenance duration is expected to last less than 5 years.

The Five-Year Review Requirement, a CERCLA ROD review, will be conducted every five years to determine whether the remedy is meeting RAOs.

Cost Estimate for the Selected Remedy

The present value costs for this remedy are as follows:

Total Capital Cost:	$1,388,000
Total Operations and Maintenance (O&M) Cost:	$70,000
Total Present Value Cost:	$1,458,000

These costs include the cost for removal and disposal of LRP soil and debris ($998,000), modeling and monitoring associated with Groundwater Mixing Zone ($362,000), Institutional Controls ($65,000), and the Five-Year Review Requirement ($32,000). Cost estimates for each alternative were generated using a 7% interest rate and a 30-year time period. For five-year CERCLA ROD reviews and institutional controls, the 30-year time period was used for cost estimating purposes, however, there is no time limit on the five-year review requirement or institutional controls. For more details on cost estimates, refer to Tables 8 through 11. Because the waste unit is owned by USDOE, the source of the cleanup monies will be USDOE.

Estimated Outcomes of Selected Remedy

The objective of the remediation is to cleanup to industrial standards. However, it is possible that the selected remedy may also cleanup the site to residential standards. Because contamination above residential risk-based standards is generally co-located with contamination above industrial risk-based standards, removal of soil exceeding industrial standards may also result in the removal of soil exceeding residential standards.

The minimum expected condition after the selected remedy for soil is implemented is that no soil will remain at the OU above ecological or industrial risk-based standards (minimum RGs). The OU will be available for industrial land use after the contaminated soil/debris is removed.

Table 8. Cost Estimate for Five-Year Review Requirement (CERCLA ROD Reviews)

		Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs					$0
Total Direct Capital Costs					$0
Indirect Capital Costs					
Engineering and design (15% of total direct capital cost)					$0
Project/construction management (30% of total direct capital cost)					$0
Health and safety (10% of total direct capital cost)					$0
Overhead and profit (30% of total direct capital cost)					$0
Contingency (30% of total direct capital cost)					$0
Total Indirect Capital Costs					$0
TOTAL ESTIMATED CAPITAL COSTS					$0
O&M Costs					
ROD Reviews (every five years for 30 years)		6	ea	15,000	
Interest Rate (i)	0.07				
O&M Present Worth					$32,367
TOTAL ESTIMATED O&M COSTS					$32,367
TOTAL ESTIMATED COST					$32,367

Table 9. Cost Estimate for Institutional Controls

		Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs					
Miscellaneous Control Items					
Documentation		1	ea	10,000	$10,000
Final Survey		0	ea	25,000	$0
Acess Restrictions					
Furnish and Install Signs		15	ea	90	$1,350
Deed Restrictions					
Deed Restrictions		1	ea	5,000	$5,000
Total Direct Capital Costs					$16,350
Indirect Capital Costs					
Engineering and design (0% of total direct capital cost)					$0
Project/construction management (25% of total direct capital cost)					$4,088
Health and safety (0% of total direct capital cost)					$0
Overhead and profit (30% of total direct capital cost)					$4,905
Contingency (15% of total direct capital cost)					$2,453
Total Indirect Capital Costs		-			$11,445
TOTAL ESTIMATED CAPITAL COSTS					$27,795
O&M Costs					
Inspection		1	/yr	1,000	
Maintain Signs		1	ls/yr	500	
Repairs (erosion control, reseeding, etc.)		1	ac/yr	1,500	
Subtotal Annual O&M Costs				$3,000	
Interest Rate (i)	0.07				
Number of Years (n)	30				
Present Worth Factor = {[(1+i)^n])-1} / {[i(1+i)]^n}	12.409				
O&M Present Worth (Annual O&M x PWF)					$37,227
TOTAL ESTIMATED O&M COSTS					$37,227
TOTAL ESTIMATED COST					$65,022

Table 10. Cost Estimate for Removal/Disposal of Contaminated Soil and Debris at LRP

Direct Capital Costs	Quantity	Units	Unit Cost	Total Cost
Site Preparation				
Soil Erosion & Sediment Control Plan	1	ls	15,000	$15,000
Erosion control (silt fence and hay bales)	840	lf	4	$3,251
Clearing & Grubbing	1	ac	2,800	$2,800
Initial Survey	1	ac	1,400	$1,400
Temporary stormwater management	1	ls	10,000	$10,000
Access road upgrade	1	ls	10,000	$10,000
Borrow area development/management	1	ls	15,000	$15,000
Non-Hazardous Waste Removal				
Excavate, load, haul to staging area	750	cy	10	$7,500
Survey, stake non-hazardous and hazardous	1	ac	1,400	$1,400
Sample for disposal (TCLP metals)	75	ea	250	$18,750
Load, haul to non-hazardous landfill	750	cy	10	$7,500
Disposal at non-hazardous landfill	750	cy	25	$18,750
Suspect Hazardous Waste Removal				
Excavate, load, haul to staging area	320	cy	10	$3,200
Sample for disposal (TCLP metals)	31	ea	250	$7,750
Package for shipment (lift liners = 8.33 cy)	40	ea	950	$38,000
Load, haul to hazardous waste landfill (Emelle, Al)	362	ton	130	$47,060
Disposal soil and liners at hazardous waste landfill	362	ton	470	$170,140
Backfill				
Survey after excavation for verification sampling	1	ac	1,400	$1,400
Verification sampling (TAL on 20' centers)	40	ea	540	$21,600
Excavate, load, haul to unit, place backfill	590	cy	19	$11,210
Survey after backfill	1	ac	1,400	$1,400
Vegetative layer, topsoil purchase	480	cy	56	$26,880
Survey as-built, office computation	1	ls	5,000	$5,000
Grading, mulching, and seeding	1	ac	10,000	$10,000
Subtotal Direct Capital Costs				$454,991
Mobilization/demobilization (2% of subtotal direct capital cost)				$9,100
Total Direct Capital Costs				$464,091
Indirect Capital Costs				
Engineering and design (15% of total direct capital cost)				$69,614
Project/construction management (30% of total direct capital cost)				$139,227
Health and safety (10% of total direct capital cost)				$46,409
Overhead markups (30% of total direct capital cost)				$139,227
Contingency (30% of total direct capital cost)				$139,227
Total Indirect Capital Costs				$533,704
TOTAL ESTIMATED CAPITAL COSTS				$997,795
Direct O&M Costs				$0
Indirect O&M Costs				$0
TOTAL ESTIMATED O&M COSTS				$0
TOTAL ESTIMATED COST				$997,795

Assumptions and Comments:

All soil volumes are shown fluffed 130%, all soils are considered Vaucluse soils: fluffed weight 1.12 tons/ cy.

Total replacement soils comprise about 775 cy fluffed (750 cy 0-1' interval + 25 cy 1-4' interval).

Surveying is performed periodically, including (1) initially, the stockpiled soil is staked to separate non-hazardous and hazardous soils, (2) after the stockpiled soil is removed to the staging area, footprint soils are staked to separate non-hazardous and hazardous soils, (3) after footprint soils are removed to staging area, (4) after backfill is placed, and (5) as-built, after vegetative layer is placed.

Table 11. Cost Estimate for Groundwater Mixing Zone

Direct Capital Costs	Quantity	Units	Unit Cost	Total Cost
GMZ report				
Report preparation	1	ea	65,000	$65,000
Cone penetrometer investigation				
Surveying/GPR	5	ea	320	$1,600
Site preparation	5	ea	675	$3,375
Cone penetrometer installation	5	ea	5,000	$25,000
Sample analysis (VOC) + validation	15	ea	700	$10,500
Technical oversight & reporting	5	ea	550	$2,750
Point of compliance monitoring well installation				
Surveying/GPR	4	ea	320	$1,280
Installation of 85 ft monitoring wells	4	ea	7,900	$31,600
Technical oversight & reporting	4	ea	2,415	$9,660
Groundwater monitoring				
Well sampling (5 wells, 2 events)	10	ea	150	$1,500
Technical oversight	10	ea	400	$4,000
Sample analysis (VOC) + validation	10	ea	700	$7,000
Data review and interpretation	1	ea	2,000	$2,000
Subtotal Direct Capital Costs				$165,265
Mobilization/demobilization (2% of subtotal direct capital cost)				$3,305
Total Direct Capital Costs				$168,570
Indirect Capital Costs				
Engineering and design (15% of total direct capital cost)				$25,286
Project/construction management (30% of total direct capital cost)				$50,571
Health and safety (10% of total direct capital cost)				$16,857
Overhead markup (30% of total direct capital cost)				$50,571
Contingency (30% of total direct capital cost)				$50,571
Total Indirect Capital Costs				$193,856
TOTAL ESTIMATED CAPITAL COSTS				$362,426
Direct O&M Costs				$0
Indirect O&M Costs				$0
TOTAL ESTIMATED O&M COSTS				$0
TOTAL ESTIMATED COST				$362,426

The expected condition after the selected remedy for groundwater is implemented is that groundwater will not contain contaminants above MCLs within 5 years. Upon attenuation of groundwater contamination to levels below MCLs, groundwater would be available for unrestricted use.

Waste Management

Contamination in the LRP area is limited to the soil and possibly small quantities of debris. Based upon process history and soil sampling results, the vegetation is not considered contaminated. Therefore the trees are not considered to be waste material. Merchantable trees will be harvested and sold. All other trees will be removed from the OU and shipped to an offsite landfill. Primary and secondary waste will be managed consistent with Table 12.

The approach to remediation will be to work (with machinery, etc.) from clean areas toward contaminated areas, thus avoiding contact with the contaminated soils. Wheels, tracks, blades, etc. will always be in contact with clean soil. If a vehicle should come in contact with contaminated soil, it will be decontaminated by brushing until clean. The soil removed during equipment decontamination will be managed with other contaminated soils. The remaining work will be performed in clean medium. Spoil material brought to the unit that cannot be used as clean backfill in the soil cover will be disposed of as clean material.

Table 12. Primary and Secondary Waste Disposition

Primary Waste Stream	Waste Type	Description	Method of Disposal
Soil	> RCRA TCLP	Contaminated media	Soils exceeding RCRA characteristically hazardous limits will be managed as hazardous waste.
Soil	< RCRA TCLP and > HBLs	Contaminated media	Soils exceeding HBLs but below RCRA characteristically hazardous limits will be managed as CERCLA sanitary waste.
Debris	> RCRA TCLP	Contaminated debris	Debris found onsite will be managed in accordance with appropriate regulation.
Soil/debris	>TSCA	Contaminated soil and debris	PCB-contaminated debris found onsite will be managed in accordance with appropriate regulation.
Secondary Waste Stream	**Waste Type**	**Description**	**Method of Disposal**
Soils	> RCRA TCLP	Contaminated media	Soils exceeding RCRA characteristically hazardous limits will be managed as hazardous waste.
Point-of-compliance well installation, development water, and CPT waste	IDW	Aqueous and non-aqueous	All aqueous and non-aqueous waste will be land applied based on the approved Groundwater Mixing Zone Application.
Plume monitoring well installation, development water, and CPT waste	IDW	Aqueous and non-aqueous	All aqueous and non-aqueous waste will be managed and disposed of in accordance with the approved IDW Management Plan (WSRC 1994).
Job control waste	Nonhazardous	Disposable personal protective equipment (PPE)	PPE will be managed as CERCLA sanitary waste.

HBLs = health-based limits
IDW = investigation-derived waste
TCLP = toxicity characteristic leaching procedure

XII. STATUTORY DETERMINATIONS

Based on the unit RFI/RI/BRA report, the LBRP, GCDF, and LRP OU poses a threat to human health and the environment. Therefore, Alternative LRP 2 (Removal/Disposal, with institutional controls contingent on confirmation sampling) has been selected as the remedy for the LRP soil, and Alternative GW 2 (Groundwater Mixing Zone, with institutional controls until the MCL is attained) has been selected as the remedy for the groundwater.

There is no PTSM at the OU. The contamination that is present is categorized as a low-level threat.

Based on information currently available, USDOE, USEPA, and SCDHEC believe the Selected Alternative provides the best balance of tradeoffs among the other alternatives with respect to the evaluation criteria. USDOE, USEPA, and SCDHEC expect the Selected Alternative to satisfy the statutory requirements in CERCLA Section 121(b) to: (1) be protective of human health and the environment, (2) comply with ARARs (or justify a waiver), (3) be cost-effective, (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element.

Section 300.430(f)(ii) of the NCP requires that a 5-year remedy review of the ROD be performed if hazardous substances, pollutants, or contaminants above levels that allow for unlimited use and unrestricted exposure remain in the OU. The three parties, SCDHEC, USEPA, and USDOE, have determined that a 5-year review of the ROD for the LBRP, GCDF, and LRP OU will be performed to ensure that the remedy continues to provide adequate protection of human health and the environment.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

There were no significant changes made to the ROD based on the comments received during the public comment period for the SB/PP. Comments that were received during the public comment period are addressed in the Responsiveness Summary included in Appendix A of this document.

XIV. RESPONSIVENESS SUMMARY

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

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

Table 13 is an implementation schedule for the OU showing the post-ROD document submittals and the remedial action start date. Major milestones are as follows:

- After the ROD is signed, SRS will submit a corrective measures implementation/ remedial action implementation plan (CMI/RAIP) to SCDHEC and USEPA.

- Approval of the CMI/RAIP is expected in February 2003.

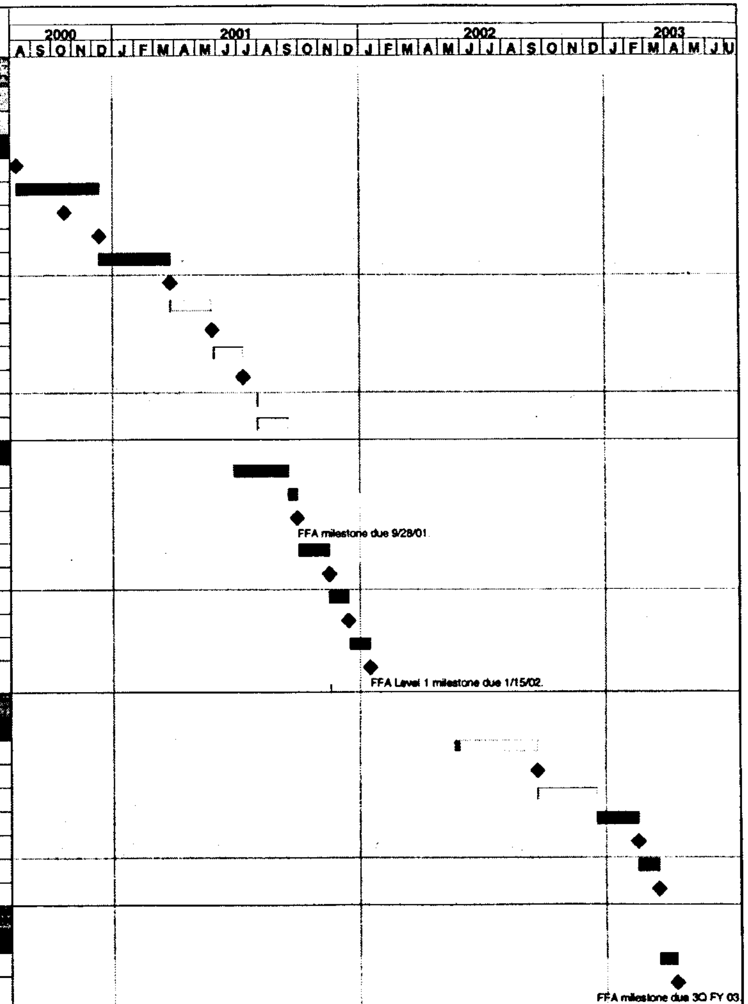
- The remedial action start date will be March 2003.

- SRS will submit a post-construction report 90 days after construction is complete.

009395

Table 13. Implementation Schedule for the LBRP, GCDF, and LRP OU

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
CA 1212 L-AREA RUBBLE PILE (131-3L)				
LCS 14 - REGULATORY REQUIREMENTS				
Proposed Plan				
BCP0401570	PP SCOPING MTG	0		09AUG00
BCP0401040	DEVELOP SB/PP w/MZA REV.0	85	10AUG00	11DEC00
BCP0401250	TECHNICAL SCOPING MTG GW MIXING ZONE(MZA)	0		19OCT00*
BCP0401060	SRS SUBMITTAL OF REV.0 SB/PP w/MZA	0		11DEC00
BCP0401080	EPA/SCDHEC REVIEW REV.0 SB/PP w/MZA	105	12DEC00	26MAR01
BCP0401590	EPA/SCDHEC RETURNS REV.0 COMMENTS ON SB/PP	0		26MAR01
BCP0401910	SRS INCORP EPA/SCDHEC COMMENTS SB/PP REV.1	60	27MAR01	25MAY01
BCP0401280	SRS SUBMITTTAL SB/PP REV.1	0		25MAY01
BCP0401290	EPA/SCDHEC FINAL REVIEW REC APPROV SB/PP	44	28MAY01	10JUL01
BCP0401330	RECEIPT OF EPA/SCDHEC APPROVAL SB/PP	0		10JUL01
BCP0401120	NOTIFICATION OF PUBLIC COMMENT	1	01AUG01	01AUG01
BCP0401140	PUBLIC COMMENT PERIOD	45	01AUG01	14SEP01
Record of Decision				
BCP0401340	DEVELOP REV.0 ROD	56	27JUN01	14SEP01
BCP0401160	RESPONSIVENESS SUMMARY & APPROVAL	14	15SEP01	28SEP01
BCP0401220	SUBMIT Rev. 0 ROD	0		28SEP01
BCP0401200	EPA/SCDHEC REVIEW REV.0 ROD	45	01OCT01	14NOV01
BCP0401610	EPA/SCDHEC RETURNS REV.0 COMMENTS FOR ROD	0		14NOV01
BCP0401210	SRS INCORPORATES EPA/SCDHEC COMMENTS/ROD	30	15NOV01	14DEC01
BCP0401180	SRS SUBMITTAL OF REV.1 ROD	0		14DEC01
BCP0401190	EPA/SCDHEC FINAL REVIEW & APPROVAL/ROD	30	17DEC01	15JAN02
BCP0401230	SUBMIT FINAL SIGNED ROD	0		15JAN02
LCS 15 - DETAILED ENG & PRECONST ACTIVITIES				
BCP0401950	DEVELOP CMI/RAIP	85	21MAY02*	19SEP02
BCP0401970	SRS SUBMITTAL OF REV.0 CMI/RAIP	0		19SEP02
BCP0401980	EPA/SCDHEC REVIEW REV.0 CMI/RAIP	90	20SEP02	18DEC02
BCP0401990	SRS INCORPORATE EPA/SCDHEC COMMENTS REV.1	61	19DEC02	17FEB03
BCP0402000	SRS SUBMITTAL OF REV.1 CMI/RAIP	0		17FEB03
BCP0402010	EPA/SCDHEC FINAL REVIEW& APP REV.1 CMI/RAIP	30	18FEB03	19MAR03
BCP0402020	EPA/SCDHEC FINAL APPROVAL OF CMI/RAIP	0		19MAR03
LCS 16 - CONSTRUCTION				
BCP0401600	MOBILIZATION FOR SUBCONTRACTOR	17	20MAR03	14APR03
BCP0401580	REMEDIAL ACTION (RA) START DATE	0	15APR03	



Start Date	01OCT92
Finish Date	11MAY09
Data Date	01JUL00
Run Date	22AUG01 14:15

Early Bar
Progress Bar
Critical Activity

BCP3 Sheet 1 of 1

Environmental Restoration
CA1212 L BRP,Pile,GCDF(131-L,3L,2L)
RCRA/CERCLA Implementation Schedule

Date	Revision	Checked	Approved
11JUL00	Omit CMS/FS document and proceed to PP/ROD		
29MAR01	90 day extension of ROD		
03JUL01	Revise CMI/RAIP description		
06AUG01	Extend Rev.0 ROD, signed ROD & RA start mlstn	JDG3	MDS

XVI. REFERENCES

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APPENDIX A -

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

The 45-day public comment period for the Statement of Basis/Proposed Plan for LBRP, GCDF, and LRP OU began on August 1, 2001 and ended on September 14, 2001.

No comments were received.