United States Department of Energy

Savannah River Site

SRS savannah river site ®

Record of Decision
Remedial Alternative Selection for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C Operable Unit (OU) (formerly Site Evaluation Areas [SEAs]) (U)

CERCLIS Number: 22

SRNS-RP-2009-00072

Revision 1

December 2009

Prepared by:
Savannah River Nuclear Solutions, LLC
Savannah River Site
Aiken, SC 29808

Prepared for U.S. Department of Energy under Contract No. DE-AC09-08SR22470

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

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

ECOD L-1, N-2, P-2, and R-1A, -1B, -1C

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Aiken, South Carolina

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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 22

Savannah River Site

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

Aiken, South Carolina

United States Department of Energy

The Early Construction and Operational Disposal Site (ECODS) L-1, N-2, P-2, and R-1A, -1B, -1C are listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) unit in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS). This unit was formerly listed as individual site evaluation units on Appendix G.1 (Areas to be Investigated) of the FFA.

The FFA is a legally binding agreement between regulatory agencies [United States Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control (SCDHEC)] and regulated entities [United States Department of Energy (USDOE)] that establishes the responsibilities and schedules for the comprehensive remediation of SRS. The media associated with this operable unit is surface and subsurface soil.

Statement of Basis and Purpose

This decision document presents the selected remedy for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C, which was chosen in accordance with CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the information contained in the Administrative Record File for this site.

The USEPA, SCDHEC and USDOE concur with the selected remedy.

Assessment of the Site

There has been a release of polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and metals with potential friable asbestos at the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C into the environment. 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 selected remedy for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C is Institutional Controls (ICs). Although the conceptual site model (CSM) indicates there are no human health, ecological, or contaminant migration (CM) refined constituents of concern (RCOCs), based on an industrial or residential land use scenarios, there is the potential for friable asbestos exposure to human receptors should buried debris (> 1 ft depth) be brought to the surface. Therefore, ICs will be implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos. ICs will consist of signage and Site Use/Site Clearance restrictions. The RCRA permit will be revised to reflect selection of the final remedy using the procedures under 40 Code of Federal Regulations (CFR) Part 270, and South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.264.101; 270.

Statutory Determinations

Based on the risk evaluation conducted for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C, it was determined that the unit poses a potential friable asbestos threat to human health. Therefore, ICs, have been selected as the remedy for the ECODS pursuant to the *Framework for Investigating Asbestos-Contaminated Superfund Sites* (USEPA 2008). ECODS L-1, N-2, P-2, and R-1A, -1B, -1C future land use will remain industrial in accordance with the SRS Future Use Project Report (USDOE 1996).

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

In the long term, if the property is ever transferred to nonfederal ownership, the US Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the 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 reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended Record of Decision (ROD) with USEPA and SCDHEC review and approval.

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

The selected remedy for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C leaves hazardous substances in place (i.e., buried potential friable asbestos) that pose a potential future risk and will require land use restrictions. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a Land Use Control and Assurance Plan (LUCAP) to ensure that the Land Use Controls (LUCs) required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific Land Use Control Implementation Plan (LUCIP), incorporated by reference into this ROD, will provide details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is

responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this ROD. The LUCIP, developed as part of this action, will be submitted concurrently with the Corrective Measures Implementation/Remedial Action Implementation Plan, as required in the FFA for review and approval by USEPA and SCDHEC. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect unless and until modifications are approved by the USEPA and SCDHEC 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:

- Constituents of concern (COCs) and their respective concentrations (Section V)
- Baseline risk represented by the COCs (Section VII)
- Cleanup levels established for the COCs and the basis for the levels (Section VIII)
- Current and reasonably anticipated future land and groundwater use assumptions used in the Baseline Risk Assessment (BRA) and ROD (Section VI)
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section VI)
- Estimated capital, operation and maintenance, and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected (Section IX)
- Key decision factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) (Section X)
- How source materials constituting principal threats are addressed (Section VII, Section XI)

1-29-10
Date

Helen Belencan
Deputy Assistant Manager for Closure Project
U. S. Department of Energy
Savannah River Operations Office

3/2/2010
Date

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

3/16/10
Date

Daphne G. Neel
Bureau Chief
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

CERCLIS Number: 22

SRNS-RP-2009-00072
Rev. 1

December 2009

Savannah River Site
Aiken, South Carolina

Prepared By:

Savannah River Nuclear Solutions, LLC
for the
U. S. Department of Energy under Contract DE-AC09-96SR18500
Savannah River Operations Office
Aiken, South Carolina

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LIST OF ACRONYMS AND ABBREVIATIONS

ac	acre
ARAR	applicable or relevant and appropriate requirement
bgs	below ground 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 Regulation
CM	contaminant migration
COC	constituent of concern
COPC	constituent of potential concern
CSM	conceptual site model
dssl	default soil screening limits
ECODS	Early Construction Operation and Disposal Site
FFA	Federal Facility Agreement
ft	feet
GPR	ground penetrating survey
ha	hectare
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
K_d	soil-water partitioning coefficient
km	kilometer
km^2	square kilometer
L/kg	liter per kilogram
LLC	Limited Liability Company
LOAEL	Lowest observable adverse effects level
LUC	land use control
LUCIP	Land Use Control Implementation Plan
LUCAP	Land Use Control Assurance Plan
m	meter
mi	mile
mi^2	square mile
NBN	no building number
NCP	National Contingency Plan
NEPA	National Environmental Protection Act
NOEC	no observable adverse effect level
O&M	operations and maintenance
OU	operable unit
PAH	polycyclic aromatic hydrocarbon

LIST OF ACRONYMS AND ABBREVIATIONS *(Continued/End)*

PCB	polychlorinated biphenyl
PRG	preliminary remedial goals
PTSM	principal threat source material
RAO	remedial action objective
RCO	Radiological Control Operations
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RG	remedial goal
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
SE	Site Evaluation
SER	Site Evaluation Report
SGCP	Soil and Groundwater Closure Projects
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SSL	soil screening limit
SWMU	Solid Waste Management Unit
TRV	toxicity reference value
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WSRC	Washington Savannah River Company LLC

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

Unit Name, Location, and Brief Description

ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 22

Savannah River Site

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

Aiken, South Carolina

United States Department of Energy (USDOE)

Savannah River Site (SRS) occupies approximately 804 km^2 (310 mi^2) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 40.2 km (25 mi) southeast of Augusta, Georgia, and 32.2 km (20 mi) 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 and some wastes are associated with SRS construction activities. Hazardous substances, as defined by the CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists the Early Construction and Operational Disposal Site (ECODS) L-1, N-2, P-2, and R-1A, -1B, -1C as a Resource Conservation and Recovery Act (RCRA) Solid Waste Management Unit (SWMU)/CERCLA unit requiring further evaluation.

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

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 by-products 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 30, 2003. Module VIII of the Hazardous and Solid Waste Amendments portion of the RCRA permit mandates corrective action requirements for non-regulated SWMUs subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List. The inclusion created a need to integrate the established RCRA facility investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 United States Code Section 9620, USDOE has negotiated 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 4 and the SCDHEC.

Site Evaluation Area Operational and Compliance History

Between 1951 and 1955, the majority of the SRS production facilities and the related support facilities were constructed. The construction debris from the construction activities was buried in shallow (less than 3.65 m [12 ft] below ground surface [bgs]) land disposal pits. Any wood scraps left from either construction or from the pallets that remained when equipment was transported to the site were often burned in the disposal pits to reduce the volume of material and maximize the use of disposal space in the pit. Identification of these disposal pits in the last few years has led to the investigation of the pits under the Site Evaluation (SE) Program. Upon identification, these areas were added to Appendix G.1 (Areas to be Investigated) of the FFA.

SERs were developed for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C and contain detailed information and analytical data for all of the investigations conducted and all of the composite soil samples that were collected (WSRC 2000, WSRC, 2001, WSRC 2002, WSRC 2003). In addition, a Trenching Report (SGCP 2005) was prepared for ECODS P-2. The SE determined that the four ECODS were not likely to be viable candidates for a No Further Action remedial decision since they contained polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), minor amounts of metal contaminants, and a volatile organic compound (VOC), predominantly in the subsurface, that exceeded the USEPA Region 9 residential and/or industrial Preliminary Remediation Goals (PRGs). ECODS L-1, N-2, P-2, R-1A, -1B, and -1C were subsequently transferred to Appendix C of the FFA as a RCRA/CERCLA Operable Unit (OU) for further evaluation. (Note: For the SER, the analytical results were compared to the 2000 USEPA Region 9 residential and industrial PRGs. For the purpose of this document, the SE analytical results were reevaluated against the more recent 2004 USEPA Region 9 residential and industrial PRGs).

Due to the similar history and nature of the contaminants located at the subject ECODS, the four ECODS were addressed in a single decision document Statement of Basis/Proposed Plan (SB/PP) (WSRC 2007). The process that culminated in the SB/PP

used the standard methods of risk evaluation and contaminant transport modeling currently used in the SRS CERCLA program. As such an abbreviated RFI/Remedial Investigation (RI), Baseline Risk Assessment (BRA), and Corrective Measures Study/Feasibility Study (CMS/FS) were prepared for each of the ECODS and presented in the SB/PP.

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 ECODS L-1, N-2, P-2, and R-1A, -1B, -1C soils. The Administrative Record File must be established at or near the facility at issue.

The SRS FFA Community Involvement Plan (WSRC 2006a) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS FFA Community 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 SB/PP for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C (WSRC 2007), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C.

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

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

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

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

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

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

The public was notified of the public comment period through 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* newspaper. The public comment period was also announced on local radio stations.

The SB/PP 45-day public comment period began on June 25, 2009 and ended on August 8, 2009. A Responsiveness Summary, prepared to address any comments received during the public comment period, is provided in Appendix A of the Record of Decision (ROD). A Responsiveness Summary will also be available in the final RCRA permit.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT

Due to the complexity and size of multiple waste units in different areas, the SRS is divided into watersheds for the purpose of managing a comprehensive cleanup strategy. The SRS is segregated into six watersheds: Upper Three Runs, Lower Three Runs,

Fourmile Branch, Steel Creek, Pen Branch, and the Savannah River. In addition, the SRS also identifies six Integrator Operable Units (IOUs) which are the surface water bodies and associated wetlands that correspond to the six respective watersheds. Waste units within a watershed may be evaluated and remediated individually or grouped with other waste units and evaluated as part of a larger Area OU. Upon disposition of all the waste units within a watershed, a final comprehensive ROD for the corresponding IOU (i.e., surface water and associated wetlands) will be pursued with additional public involvement. ECODS L-1 and P-2 are located in the Steel Creek IOU. ECODS N-2 is located in the Pen Branch IOU. ECODS R-1A, -1B, and -1C is located in the Lower Three Runs IOU.

The scope of the ECODS remedial action is limited to the vadose zone. The final overall strategy for addressing the ECODS is to implement ICs to prevent human health exposure to friable asbestos. Periodic reporting (five-year statutory reviews) will document progress of the remediation effort.

V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

The conceptual site model (CSM) is an objective framework for assessing data pertinent to the investigation. The CSM identifies and evaluates suspected sources of contamination, contaminant release mechanisms, potentially affected media (secondary sources of contamination), potential exposure pathways, and potential human and ecological receptors.

Exposure pathways describe "the course a chemical or physical agent takes from the source to the exposed individual." The following five components comprise an exposure pathway:

- source (landfill, spill, etc.);
- exposure media (groundwater, air, etc.);

- exposure point (drinking water well, shower, etc.);
- exposure route (ingestion, dermal contact, inhalation, etc.); and
- receptor (resident, worker, etc.).

If any of these elements is missing, the pathway is incomplete and is not considered further in the risk assessment. A pathway is complete when all five components are present to permit potential exposure of a receptor to a source of contamination. As outlined in Figure 3, there are no complete pathways and, therefore, no refined constituents of concern (RCOCs).

Media Assessment and Results

ECODS L-1

ECODS L-1 is located in the southern portion of the SRS (see Figure 2), immediately east of L Area (Figure 4). ECODS L-1 was created during the construction of the L Reactor and associated support buildings for burning and/or burial of construction waste. Aerial photographs identify ECODS L-1 as being in use from November 1953 to June 1954 (WSRC 2003). The area is relatively flat, slopes gradually to the southwest (toward L Lake), and is covered with small pine trees.

During May 2002, a ground-penetrating radar (GPR) survey was conducted to determine the depth and boundaries of the trenches. The GPR survey revealed that ECODS L-1 consists of two trenches, and each trench is approximately 18.3 m (60 ft) wide by 45.7 m (150 ft) long. According to GPR, the bottom of both trenches is approximately 7.3 m (24 ft) bgs. However, examination of the direct push soil cores revealed that undisturbed soil was present at all sample locations at depths of 2.7 m (9 ft) or less. It was determined that the GPR equipment was not accurate in some environments because positive readings at depths would be inaccurately recorded where the soils types change. Therefore, it was the protocol of the SE Program to use the GPR survey depth as an estimated depth and to confirm the depth during field activities when undisturbed soil is

encountered. Because undisturbed soils were confirmed to be at depths of 2.7 m (9 ft) or less at ECODS L-1, soils borings were not advanced beyond 2.7 m (9 ft).

Nature and Extent of Contamination

During April 2002, a radiological control operations (RCO) survey was performed and no radiological contamination was identified in accordance with WSRC procedures.

During May 2002, the nature and extent of surface and subsurface contaminants at ECODS L-1 was determined under the SE Program. A ground-penetrating radar (GPR) survey was conducted to determine the depth and boundaries of the trenches. It was determined that the GPR equipment was not accurate in some environments because positive readings at depths would be inaccurately recorded where the soils types change. Therefore, it was the protocol of the SE Program to use the GPR survey depth as an estimated depth and to confirm the depth during field activities when undisturbed soil is encountered. The GPR survey revealed that ECODS L-1 consists of two trenches, and each trench is approximately 18.3 m (60 ft) wide by 45.7 m (150 ft) long. According to GPR, the bottom of both trenches is approximately 7.3 m (24 ft) bgs.

Composite soil sampling was performed at 20 locations, including five background locations, using direct push technology. The composite soil samples (including 8 duplicate samples) were collected at a depth of 0 to 1.2 m (4 ft). Examination of the direct-push soil cores revealed that undisturbed soil was present at all locations at depths of 2.7 m (9 ft) or less. This eliminated the need to sample at depths of up to 7.3 m (24 ft) within the trench. Additional samples were collected at various depths ranging from 1.2 m (4 ft) to 3.7 m (12 ft), due to the depths where native soil was encountered (samples were collected approximately 0.6 m (2 ft) below the depth of the trenches as indicated by examination of the soil samples. Glass, metal and rubber waste materials were found during the field investigation at depths ranging from 0.3 m (1 ft) to 2.4 m (8 ft) bgs. Under the SE screen, composite soil sampling analytical results revealed elevated concentrations of PAHs and metals that exceeded the 2004 USEPA Region 9 PRGs. The list includes arsenic, iron, thallium, vanadium, benzo(g,h,i)-perylene, benzo(a)anthracene,

benzo(a)-pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz-(ah)anthracene, and indeno(1,2,3-cd)pyrene.

The presence of these metals and PAHs is typical at sites used for disposal and burning of construction wastes. Sample results for metals exceeded PRGs both within and outside of the unit boundary. This indicated that arsenic, iron, vanadium, and thallium exist at SRS site-recognized background levels above their PRGs. The arsenic exceedances in background samples are believed to be naturally occurring and also a result of farming practices prior to the construction of SRS. Also, pesticides and weed killers containing arsenic were commonly used in agricultural activities during that period. The iron and vanadium exceedances are also believed to be naturally occurring. The SRS is located in the Upper Coastal Plan adjacent to the Piedmont. The Piedmont is known to contain relatively high concentrations of metals. Four locations throughout and in the vicinity of ECODS L-1 contain concentrations of PAHs in the 0.3 m (1 ft) to 1.2 m (4 ft) interval and may present a risk greater than 1.0E-06 to a future resident if brought to surface. No contaminants were present at levels that would pose a threat to groundwater.

ECODS N-2

ECODS N-2 is located in the central portion of the SRS (see Figure 2) near the southwestern edge of the N Area (Figure 5). Aerial photographs identify ECODS N-2 as being in use from January 1953 to May 1955 (WSRC 2000). Waste was buried in trenches and sections of the trenches may have been used as a burn pit or combustible waste disposal. The area is relatively flat and slopes gradually to the south and southwest. The area is lightly wooded with pine trees and underbrush.

During May 2000, a GPR survey was conducted to determine the depth and boundaries of buried trenches. The GPR survey revealed that ECODS N-2 consists of one trench approximately 160 m (525 ft) long by 45.7 m (150 ft) wide. According to GPR, the bottom of the trench is approximately 2.1 m (7 ft) bgs. The actual depth and size of the ECODS was confirmed during soil sampling activities.

Nature and Extent of Contamination

During April 2000, an RCO survey was performed and no radiological contamination was identified in accordance with WSRC procedures.

During May 2000, the nature and extent of surface and subsurface contaminants at ECODS N-2 was determined under the SE Program. Composite soil sampling was performed at 34 locations, including 3 background locations, using a hand auger. A total of 144 soil samples (including 13 duplicate samples) were collected from 0 to 2.4 m (8 ft) deep.

Composite soil sampling analytical results revealed elevated concentrations of PAHs, polychlorinated biphenyls (PCBs), and metals exceeding the 2004 USEPA Region 9 PRGs. The presence of these metals and PAHs is typical at sites used for the disposal and burning of construction wastes. Four locations down the middle of ECODS N-2 trench and one location on the north end contained PAHs and/or PCBs in concentrations in the 0.3 m (1 ft) to 2.0 m (6.5 ft) level that may present a risk greater than 1.0E-06 to a future resident if brought to the surface. Under the SE screen for the 0 to 2.4 m (8 ft) interval, the list includes arsenic, iron, thallium, vanadium, Aroclor 1254, benzo(a)-anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(ah)anthracene, and n-nitrosodipropylamine. Sample results for the metals exceeded PRGs both within and outside the unit boundary. This indicated that arsenic, iron, vanadium, and thallium exist at SRS site-recognized background levels above their PRGs. The presence of these metals and PAHs is typical at sites used for the disposal and burning of construction wastes. The arsenic exceedances in background samples are believed to be naturally occurring and also a result of farming practices prior to the construction of SRS. Also, pesticides and weed killers containing arsenic were commonly used in agricultural activities during that period. The iron and vanadium exceedances are also believed to be naturally occurring. The SRS is located in the Upper Coastal Plan adjacent to the Piedmont. The Piedmont is known to contain relatively high concentrations of metals. None of the contaminants were present in levels that would pose a threat to groundwater.

ECODS P-2

ECODS P-2 is located in the southeastern portion of the SRS (see Figure 2), immediately south of P Area (Figure 6). Aerial photographs identify the ECODS P-2 as being in use from approximately January 1953 to May 1955 (WSRC 2001).

The area is relatively flat and slopes gradually to the southeast. It is heavily wooded with pine trees and dense underbrush.

GPR equipment used prior to 2005 was attached to a truck and could not be maneuvered in the ECODS P-2 location. Therefore, a GPR survey was not conducted prior to soil sampling (November 2000). During 2000, 2002, and 2004, soil samples were collected to 4.3 m (14 ft) based on the estimated depth of the trench. The estimated depth was based on the maximum depth of the ECODS that had previously been sampled. In 2005, a new type of portable GPR equipment became available and a GPR survey was performed. The GPR survey revealed that ECODS P-2 was a single continuous trench that is 50.3 m (165 ft) by 15.2 m (50 ft). The bottom of the trench was estimated at 2.4 m (8 ft) bgs.

Nature and Extent of Contamination

During October 2000, an RCO survey was performed and no radiological contamination was identified in accordance with WSRC procedures.

During November 2000, September 2001, and January 2004, the nature and extent of surface and subsurface contaminants at ECODS P-2 was determined under the SE Program. Composite soil samples were collected at 31 locations, including four background locations. A hand auger and direct push technology were used to collect 102 samples at a depth of 0 to 4.3 m (14 ft). Pieces of metal and asbestos-containing building materials were discovered in the unit during field work. Composite soil sampling analytical results revealed elevated concentrations of PAHs, PCBs, and metals exceeding the 2004 USEPA Region 9 PRGs.

The presence of these metals and PAHs is typical at sites used for the disposal and burning of construction wastes. Under the SE screen, sample results for the metals exceeded PRGs both within and outside the unit boundary. Arsenic, chromium, copper, iron, lead, and vanadium are the metals that exist at SRS site-recognized background levels above their PRGs. The arsenic exceedances in background samples are believed to be naturally occurring and also a result of farming practices prior to the construction of SRS. Also, pesticides and weed killers containing arsenic were commonly used in agricultural activities during that period. The iron and vanadium exceedances are also believed to be naturally occurring. The SRS is located in the Upper Coastal Plan adjacent to the Piedmont. The Piedmont is known to contain relatively high concentrations of metals Four locations throughout ECODS P-2 contain concentrations of PAHs in the 0.3 m (1 ft) to 3.0 m (10 ft) level and may present a risk greater than 1.0E-06 to the future resident if brought to surface. None of the contaminants were present in levels that would pose a threat to groundwater.

During September 2005, a backhoe was used to excavate five observation trenches perpendicular to the ECODS P-2 trench. Details of the activities are included in the Site Evaluation for the Excavation of Observation Trenches at ECODS P-2 Report (WSRC 2006b). Prior to the beginning of these activities, it was agreed to with the USEPA and SCDHEC that if during the trenching activities any unusual field conditions occurred or if any debris other than the normal debris was found in the ECODS P-2, contingency samples would be taken. During the trenching activities, a strong odor of organic compound(s) such as solvent was noted in the vicinity of exhumed paint and roofing tar buckets approximately 6.1 m (20 ft) south of the northern boundary of Trench 5. A composite (grab) soil sample (EP2-29G) was collected in Trench #5 and analyzed for TAL (metals) and TCL with TICs (organics, pesticides, and PCBs). Analytical soil sample results only indicated an exceedance of the 2004 USEPA Region 9 industrial PRG for arsenic and residential PRG for iron. During June 2007, a composite soil sample (EP2-27) was collected at the request of the SCDHEC and the USEPA, to confirm the presence of lead (0 to 0.3m [1 ft]) depth. The analysis of the 0 to 0.3 m (1 ft) sample did not indicate an exceedance of the 2004 USEPA Region 9 residential PRG for lead.

ECODS R-1A, -1B, -1C

ECODS R-1A, -1B, and -1C are located in the southeastern portion of the SRS (see Figure 2) and immediately northeast of R Area (Figure 7). Aerial photographs identify ECODS R-1A, R-1B, and R-1C as being in use from approximately September 1951 to August 1952 (WSRC 2002). ECODS R-1A, -1B, and -1C are located in a relatively flat area that slopes gradually to the northwest and is covered with small pine trees and heavy underbrush. The center of the ECODS is approximately 91.4 m (300 ft) east of the southern end of the Old R-Area Discharge Canal (no building number [NBN]).

Also, during May 2001, a GPR survey was conducted at ECODS R-1A, -1B, and -1C. The GPR survey results indicated that ECODS R-1A, -1B, and -1C consist of three trenches. The trenches are within an area approximately 122 m (400 ft) wide by 61 m (200 ft) long. The trenches are approximately 2.4 m (8 ft) deep. During June 2001, a GPR survey as conducted to determine the depths and boundaries of buried trenches. The GPR survey revealed that ECODS R-1A is approximately 52 m (170 ft) long by 18.3 m (60 ft) wide. ECODS R-1B is approximately 18.3 m (60 ft) long by 9.1 m (30 ft) wide, and ECODS R-1C is approximately 27.4 m (90 ft) long by 9.1 m (30 ft) wide. The GPR survey also indicated that the depth of all three trenches is approximately 2.4 m (8 ft) bgs.

Nature and Extent of Contamination

In May 2001, a RCO survey was performed and no radiological contamination was identified in accordance with WSRC procedures.

During June 2001, the nature and extent of surface and subsurface contaminants at ECODS R-1A, -1B, -1C was determined under the SE Program. Composite soil samples were taken, using a hand auger, at 64 locations, including five background locations. A total of 187 soil samples were collected from 0 to 3.0 m (10 ft). Sampling personnel found evidence of waste materials such as wire and concrete.

During January 2004, 33 more composite direct-push soil samples were taken at locations where auger refusals occurred during the June 2001 sampling event. Under the SE screen, the analytical results for the two sampling events revealed that metals, a VOC and PAHs were detected in shallow soil samples at levels that exceeded 2004 USEPA Region 9 PRGs. The list includes arsenic, iron, lead, thallium, vanadium, tetrachloroethene, benzo(g,h,i)perylene, benzo(a)-anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(ah)anthracene, indeno-(1,2,3-cd)pyrene, and dibenz(ah)anthracene.

Sample results for the metals exceeded PRGs both within and outside the unit boundary. This indicated that arsenic, iron, vanadium, and thallium exist at SRS site-recognized background levels above their PRGs. The presence of these metals and PAHs is typical at sites used for the disposal and burning of construction wastes. The arsenic exceedances in background samples are believed to be naturally occurring and also a result of farming practices prior to the construction of SRS. Also, pesticides and weed killers containing arsenic were commonly used in agricultural activities during that period. The iron and vanadium exceedances are also believed to be naturally occurring. The SRS is located in the Upper Coastal Plan adjacent to the Piedmont. The Piedmont is known to contain relatively high concentrations of metals. None of the contaminants were present in levels that would pose a threat to groundwater.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

According to the Savannah River Site Future Use Project Report (USDOE 1996), residential uses of SRS land should be prohibited. The Savannah River Site Long Range Comprehensive Plan (USDOE 2000) designates the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C as being within a site industrial area (Figure 8). Therefore, industrial land use is the most likely future land use scenario.

VII. SUMMARY OF SITE EVALUATION AREAS RISKS

As a component of the RFI/RI, a BRA was performed to evaluate risks associated with the ECODS L-1, N-2, P-2, and R-1A, -1B, and -1C. The BRA estimates what risks the site poses if no action were taken. It provides the bases for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BRA includes human health and ecological risk assessments. This section of the ROD summarizes the results of the BRA, contaminant migration (CM), and principal threat source material (PTSM) for the ECODS.

The human health risk assessment (HHRA) was evaluated for COCs based upon both the future industrial and resident scenarios. As previously discussed, the SE program screens both the surface and subsurface intervals against USEPA Region 9 PRG values and does include a background screen. In comparison, the HHRA includes a background screen and evaluates risk for the surface soil interval only (0 – 0.3 m [1 ft]). All soil depths are considered for the PTSM and CM analysis. Source materials are those materials that include or contain hazardous substances, pollutants, or contaminants that act as a reservoir for migration to groundwater, surface water, or air, or that act as a source for direct exposure. PTSM is defined as those source materials that have a high toxicity or mobility and cannot be reliably contained or present a significant risk to human health or the environment (USEPA 1991). They include liquids and other highly mobile materials such as those released from surface soil due to volatilization or leaching, or materials having high concentrations of toxic compounds. No threshold level of toxicity/risk has been established to define "principal threat." However, treatment or removal alternatives should be considered for source materials when the cumulative risk for the future industrial worker exceeds 1×10^{-3} for carcinogens or a hazard index (HI) of 10 for noncarcinogens. The identification of PTSM based on mobility is evaluated under the CM analysis.

ECODS L-1

Principal Threat Source Material

Based on the PTSM evaluation, no constituents were identified as PTSM for soil media (HI = 1.7; cumulative risk for all depths = 2.0E-04) for the industrial worker.

Human Health Risk Assessment

No human health RCOCs (based on the residential or industrial scenario) were identified. Although arsenic is above 1E-06 for each scenario, unit concentrations are consistent with SRS background concentrations and were eliminated in the uncertainty evaluation. The uncertainty evaluation is an interpretive discussion that provides a recommendation of whether or not a constituent should be carried forward for further remedial evaluation based on a thorough analysis of each constituent of concern (COC). Uncertainty factors that may be considered in this evaluation include nature and extent of contamination, consistency with history of use, presence in background, analytical data quality, and risk assessment, including toxicity data.

Ecological Risk Assessment

No ecological RCOCs for the 0 to 0.3 m (1 ft) and 0.3 m (1 ft) to 1.2 m (4-ft) intervals were identified. Some PAHs are above a hazard quotient (HQ)>10 for the robin (insectivorous birds) in the subsurface interval. PAHs are not recommended for further evaluation as ecological RCOCs in surface and subsurface for the following reasons:

- Potential adverse ecological impact at the community level is negligible, especially given that the area of the unit is less than 1 acre.

- Ecological receptor access to potentially contaminated media in the 0.3 m (1 ft) to 1.2 m (4 ft) subsurface soil interval is very limited.

- No other receptors besides the robin are above the toxicity reference value (TRV), and the TRVs used in the calculations were obtained through a review of scientific literature and the source is a "Peer Review Draft" document that has not been finalized. This introduces an element of uncertainty into the risk calculation and serves as the basis for eliminating these constituents in the refinement of COC evaluation.

- Each constituent had a low frequency of detection, and the majority of the detections were "J" qualified.

Contaminant Migration

From the Tier 1 evaluation, 13 of the 50 detected constituents exceeded the default soil screening limit (dSSL) and are retained as Tier 1 CM constituents of potential concern (COPCs). Of these 13, 7 are present at concentrations that exceed their solubility limits (indicative of a saturated source for these compounds). No compounds are identified as Tier 2 CM COPCs from the comparison of the Tier 1 CM COPCs to SRS soil screening levels (SSLs). As a result, CM COCs are not identified for ECODS L-1.

Conclusion

No PTSM, human health, or ecological RCOCs are identified for ECODS L-1. No CM COCs were identified.

Although the CSM indicates there are no human health, ecological, or CM RCOCs, with the industrial and residential scenarios, should debris be brought up from the subsurface (> 0.3 m [1 ft] depth) there would likely be an exposure risk present. Soil, dust, or air samples were not taken for asbestos; however, DOE has exercised the option to proceed directly to a response because there is threat of release of asbestos (USEPA 2008). Therefore, ICs will be implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos.

ECODS N-2

Principal Threat Source Material

Based on the PTSM evaluation, no constituents were identified as PTSM or soil media (HI = 1.2; cumulative risk for all depths – 1.6E-05) for the industrial worker.

Human Health Risk Assessment

No human health RCOCs (based on either the residential or industrial scenario) were identified. No constituents are above any risk thresholds for either scenario.

Ecological Risk Assessment

No ecological RCOCs for the 0 to 0.3 m (1 ft) and 0.3 m (1 ft) to 1.2 m (4 ft) intervals were identified.

The risk calculation for copper is barely above the HQ threshold of 1 (HQ = 1.3) for the worm (soil invertebrates) in the subsurface interval. No other Lowest Observable Adverse Effects Level (LOAEL)-based HQs are >1 for any receptor. The earthworm HQ is based on a conservative No Observable Effects Concentration (NOEC)-based TRV; therefore the potential for community level impacts is negligible and copper was eliminated in the uncertainty evaluation.

Some PAHs are above a hazard quotient (HQ)>10 for the robin (insectivorous birds) in the subsurface interval. PAHs are not recommended for further evaluation as ecological RCOCs in surface and subsurface for the following reasons:

- Potential adverse ecological impact at the community level is negligible, especially given that the area of the unit is less than 1 acre.
- Ecological receptor access to potentially contaminated media in the 0.3 m (1 ft) to 1.2 m (4 ft) subsurface soil interval is very limited.

- No other receptors besides the robin are above the TRV, and the TRVs used in the calculations were obtained through a review of scientific literature and the source is a "Peer Review Draft" document that has not been finalized. This introduces an element of uncertainty into the risk calculation and serves as the basis for eliminating these constituents in the refinement of COC evaluation.

- Each constituent had a low frequency of detection, and the majority of the detections were "J" qualified.

Contaminant Migration

From the Tier 1 evaluation, 19 of the 76 detected constituents exceeded the dSSL and are retained as Tier 1 CM COPCs. None of the Tier 1 CM COPCs are present at concentrations that exceed solubility limits (indicative of a saturated source for these compounds). A comparison of the Tier 1 CM COPCs to SRS SSLs does not yield any Tier 2 CM COPCs. As a result, CM COCs are not identified for ECODS N-2.

Conclusion

No PTSM, human health or ecological RCOCs were identified for ECODS N-2. No CM COCs were identified.

Although the CSM indicates there are no human health, ecological, or CM RCOCs, with the industrial and residential scenarios, should debris be brought up from the subsurface (> 1 ft depth) there would likely be an exposure risk present. Soil, dust, or air samples were not taken for asbestos; however, DOE has exercised the option to proceed directly to a response because there is threat of release of asbestos (USEPA 2008). Therefore, ICs will be implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos.

ECODS P-2

Principal Threat Source Material

Based on the PTSM evaluation, no constituents were identified as PTSM for soil media (HI = 4.2; cumulative risk for all depths = 1.5E-04) for the industrial worker.

Human Health Risk Assessment

No human health RCOCs (based on the residential or industrial scenario) were identified. Although arsenic is above 1E-06 for each scenario, unit concentrations are consistent with SRS background concentrations (with the exception of a single high detection) and were eliminated in the uncertainty evaluation. The uncertainty evaluation is an interpretive discussion that provides a recommendation of whether or not a constituent should be carried forward for further remedial evaluation based on a thorough analysis of each COC. Uncertainty factors that may be considered in this evaluation include nature and extent of contamination, consistency with history of use, presence in background, analytical data quality, and risk assessment, including toxicity data.

Ecological Risk Assessment

No ecological RCOCs for the 0 to 0.3 m (1 ft) and 0.3 m (1 ft) to 1.2 m (4 ft) intervals were identified.

The risk calculation for chromium is above the HQ threshold of 1 (HQ = 2.4) for the worm (soil invertebrates) and (HQ = 3.4) for the robin (insectivorous birds) in the subsurface interval. The earthworm HQ is based on a conservative NOEC-based TRV. Conservative assumptions in the risk calculation (e.g., low-end body weights, high-end dietary inputs, small home range, etc.) for other receptors may tend to result in an overestimation of the risk when indeed there is no risk. Given these considerations, the potential for community level impacts was considered negligible, and chromium was eliminated in the uncertainty evaluation.

The risk calculation for copper equals the threshold value of 1 (HQ = 1.0) for the worm in the subsurface interval. Copper was eliminated in the uncertainty evaluation using the same reasoning.

The risk calculation for lead is barely above the HQ threshold of 1 (HQ = 2.0 surface interval, HQ = 4.1 subsurface interval) for the robin (insectivorous birds). Lead was eliminated in the uncertainty evaluation using the same reasoning described above.

The risk calculation for vanadium is barely above the HQ threshold of 1 (HQ = 1.7 surface interval, HQ = 3.8 subsurface interval) for the robin (insectivorous birds). Vanadium was eliminated in the uncertainty evaluation using the same reasoning described above.

The risk calculation for zinc is barely above the HQ threshold of 1 (HQ = 1.3 surface interval, HQ = 2.2 subsurface interval) for the shrew (insectivorous mammals). Zinc was eliminated in the uncertainty evaluation using the same reasoning described above.

Some PAHs are above a hazard quotient (HQ)>10 for the robin (insectivorous birds) in the subsurface interval. PAHs are not recommended for further evaluation as ecological RCOCs in surface and subsurface for the following reasons:

- Potential adverse ecological impact at the community level is negligible, especially given that the area of the unit is less than 1 acre.

- Ecological receptor access to potentially contaminated media in the 0.3 m (1 ft) to 1.2 m (4 ft) subsurface soil interval is very limited.

- No other receptors besides the robin are above the TRV, and the TRVs used in the calculations were obtained through a review of scientific literature and the source is a "Peer Review Draft" document that has not been finalized. This introduces an element of uncertainty into the risk calculation and serves as the basis for eliminating these constituents in the refinement of COC evaluation.

- Each constituent had a low frequency of detection, and the majority of the detections were "J" qualified.

Contaminant Migration

From the Tier 1 evaluation, 27 of the 62 detected constituents exceeded the dSSL levels and are retained as Tier 1 CM COPCs. Of these 27, 8 are present at concentrations that exceed their solubility limits (indicative of a saturated source for these compounds). A comparison of the Tier 1 CM COPCs to SRS SSLs yields the constituent cyanide as a Tier 2 CM constituent of potential concern (COPC). However, further analysis calls for the removal of cyanide biograde in soil, and cyanide compounds are adsorped as a result of the iron content and clay mineralogy of SRS soils. The sorption processes include surface complexation onto pH-dependent charge sites on iron and aluminum oxides and cation exchange. The reasons for eliminating cyanide as a CM COPC is that cyanide is detected at low levels, tends to biodegrade, and is expected to have low mobility in soil at SRS. Also, there is uncertainty associated with the soil-water partitioning coefficient (K_d) value used (9.9 L/kg). The K_d is a useful, simplified concept for describing migration and retention processes in subsurface environments. The K_d is a measure of the relative affinity of a chemical toward the liquid and solid phases; the K_d is defined as the ratio of sorbed chemical per gram of solid-phase material to the concentration of the chemical in solution. The K_d values can be empirically derived for site-specific subsurface media and geochemical conditions, but normally K_d values are taken from literature sources. The K_d values may cover a wide range (several orders of magnitude for some chemicals) and significantly contribute to the uncertainty of CM calculations. For cyanide, if the K_d value is raised by only a factor of 1.7, or if the total cyanide concentration is less than 2.0 mg/kg (without accounting for cyanide biodegradation), cyanide would no longer be considered a Tier 2 CM COPC. As a result, CM COCs are not identified for ECODS P-2.

Conclusion

No PTSM, human health or ecological RCOCs were identified for ECODS P-2. No CM COCs are identified.

Although the CSM indicates there are no human health, ecological, or CM RCOCs, with the industrial and residential scenarios, should debris be brought up from the subsurface (> 1 ft depth) there would likely be an exposure risk present. Soil, dust, or air samples were not taken for asbestos; however, DOE has exercised the option to proceed directly to a response because there is threat of release of asbestos (USEPA 2008). Therefore, ICs will be implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos.

ECODS R-1A, -1B, -1C

Principal Threat Source Material

Based on the PTSM evaluation, no constituents were identified as PTSM for soil media (HI = 3.7; cumulative risk for all depths = 2.8E-04) for the industrial worker.

Human Health Risk Assessment

No human health RCOCs (based on residential or industrial scenarios) were identified.

Benzo(a)pyrene and benzo-(b)fluoranthene were eliminated in the uncertainty evaluation based on levels typically found in urban soils (industrial scenario) that have been impacted by asphalt or fire. Additionally, these PAHs were eliminated under the residential scenario as RCOCs due to low detection frequency, high properties of "J" qualified (estimated) values, and the upper confidence limit calculation used in the risk calculation is biased high because there is not a large difference between the surrogate value (for nondetects) and the PRG.

Although arsenic is above 1E-06 for each scenario, unit concentrations are consistent with SRS background concentrations and were eliminated in the uncertainty evaluation. The uncertainty evaluation is an interpretive discussion that provides a recommendation of whether or not a constituent should be carried forward for further remedial evaluation based on a thorough analysis of each COC. Uncertainty factors that may be considered in this evaluation include nature and extent of contamination, consistency with history of use, presence in background, analytical data quality, and risk assessment, including toxicity data.

Ecological Risk Assessment

No ecological RCOCs for the 0 to 0.3 m (1 ft) and 0.3 m (1 ft) to 1.2 m (4 ft) intervals were identified.

The risk calculation for lead is barely above the HQ threshold of 1 (HQ = 1.3 surface interval, HQ = 2.1 subsurface interval) for the robin (insectivorous birds). Conservative assumptions in the risk calculation (e.g., low-end body weights, high-end dietary inputs, small home range, etc.) may tend to result in an overestimation of the risk when indeed there is no risk. Given these considerations, the potential for community level impacts was considered negligible and lead was eliminated in the uncertainty evaluation. The risk calculation for vanadium is barely above the HQ threshold of 1 (HQ = 1.8 surface interval, HQ = 2.3 subsurface interval) for the shrew (insectivorous mammals). Vanadium was eliminated in the uncertainty evaluation using the same reasoning.

Some PAHs are above a hazard quotient (HQ)>10 for the robin (insectivorous birds) in the subsurface interval. PAHs are not recommended for further evaluation as ecological RCOCs in surface and subsurface for the following reasons:

- Potential adverse ecological impact at the community level is negligible, especially given that the area of the unit is less than 1 acre.

- Ecological receptor access to potentially contaminated media in the 0.3 m (1 ft) to 1.2 m (4 ft) subsurface soil interval is very limited.

- No other receptors besides the robin are above the TRV, and the TRVs used in the calculations were obtained through a review of scientific literature and the source is a "Peer Review Draft" document that has not been finalized. This introduces an element of uncertainty into the risk calculation and serves as the basis for eliminating these constituents in the refinement of COC evaluation.

- Each constituent had a low frequency of detection, and the majority of the detections were "J" qualified.

Contaminant Migration

From the Tier 1 evaluation, 22 of the 55 detected constituents exceeded the dSSL and are retained as Tier 1 CM COPCs. Of these 22, 11 are present at concentrations that exceed their solubility limits (indicative of a saturated source for these compounds). A comparison of the Tier 1 CM COPCs to SRS SSLs yields the constituent cyanide as a Tier 2 CM COPCs

However, further analysis calls for the removal of cyanide from the CM COPC list. Normally, cyanides biodegrade in soil, and cyanide compounds are adsorped as a result of the iron content and clay mineralogy of SRS soils. The sorption processes include surface complexation onto pH-dependent charge sites on iron and aluminum oxides and cation exchange. The reasons for eliminating cyanide as a CM COPC is that cyanide is detected at low levels, tends to biodegrade, and is expected to have low mobility in soil at SRS. Also, there is uncertainty associated with the K_d value used (9.9 L/kg). If the K_d value is raised by a factor of 1.7, or if the total cyanide concentration is less than 2.0 mg/kg (without accounting for cyanide biodegradation), CM analysis shows that cyanide is no longer retained as a CM COPC. As a result of removing cyanide from the Tier 2 CM COPC list, CM COCs are not identified for ECODS R-1A, -1B, -1C.

Conclusion

No PTSM, human health or ecological RCOCs are identified for ECODS R-1A, -1B, and -1C. No CM COCs identified.

Although the CSM indicates there are no human health, ecological, or CM RCOCs, with the industrial and residential scenarios, should debris be brought up from the subsurface (> 1 ft depth) there would likely be an exposure risk present. Soil, dust, or air samples were not taken for asbestos; however, DOE has exercised the option to proceed directly to a response because there is threat of release of asbestos (USEPA 2008). Therefore, ICs will be implemented to prevent land disturbance activities and to prevent exposure to subsurface soils that may include friable asbestos.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

Remedial action objectives (RAOs) are medium- or OU-specific objectives for protecting human health and the environment. RAOs usually specify protection of potential receptors and exposure pathways. They are typically identified during the scoping process once the CSM is understood. The following RAO has been identified for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C:

- Prevent human exposure to contaminants including buried asbestos present in the subsurface soils that may present a risk to a future industrial worker or resident.

Remedial goal options (RGOs) represent the preliminary, media-specific goal for a selected remedial action that in turn provides an achievement benchmark for the RAO. RGOs can be qualitative statements or numerical values often expressed as concentrations in soils or groundwater, or actions (installation of engineered barriers, placement of caps and covers, etc.) that achieve the RAO. RGOs become finalized as remedial goals (RGs) after public comment and approval of the SB/PP and are documented in the ROD. As outlined in the risk assessment evaluation and CSM, there are no PTSM, human health and ecological RCOCs and exposure pathways under the industrial or residential scenario. However, if the ECODS areas are ever excavated to greater than a 1-ft depth, then a human health risk for potential exposure to friable asbestos would likely exist. Institutional controls will be implemented at the ECODS to prevent unrestricted release (i.e., residential scenario) based on PRG exceedances in the subsurface intervals (>1 ft) and the potential for exposure to friable asbestos.

Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws.

Specifically, remedies must consider "any promulgated standard, requirement, criteria, or limitation under a state environmental or facility citing law that is more stringent than any federal standard, requirement, criteria or limitation" if the former is an applicable or relevant and appropriate requirements (ARAR) for the site and associated remedial activities. SARA requires that the remedial action for a site meet all ARARs unless a waiver is invoked. In addition to ARARs, many federal and state environmental and public health programs include criteria, guidance, and proposed standards that are not legally binding but provide useful approaches or recommendations.

ARARs include action-specific, location-specific, and chemical-specific requirements.

Action-specific ARARs control or restrict the design, performance, and other aspects of implementation of specific remedial activities.

Location-specific ARARs reflect the physiographic and environmental characteristics of the unit or the immediate area, and may restrict or preclude remedial actions depending on the location or characteristics of the unit.

Chemical-specific ARARs are media-specific concentration limits promulgated under federal or state law. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires the development of health-based, site-specific levels for chemicals where such limits do not exist and where there is a concern with their potential health or environmental effects.

Potential ARARs for all alternatives are summarized in Table 1.

IX. DESCRIPTION OF ALTERNATIVES

This section summarizes the remedial alternatives for the ECODS. In accordance with the NCP, it is desirable, when practical, to offer a range of diverse alternatives to compare during the detailed analyses.

The range of alternatives includes options that (1) immobilize chemicals, (2) reduce the contaminant volume, or (3) reduce the need for long-term, onsite management. Some alternatives have been developed that involve little or no treatment yet provide protection to human health and the environment by preventing or controlling exposure to or migration of the contaminants through engineered or institutional controls. Remedial alternatives were developed to address contamination in surface and subsurface soils.

Three alternatives including No action, Institutional Controls, and Excavation and Offsite Disposal were evaluated for the ECODS.

SRS has the onsite Hazardous Waste Storage Facility which does accept hazardous wastes that contain asbestos; however, this facility is only an interim storage facility until waste shipments are made to an off-SRS facility. Therefore, on-site disposal was not considered.

In their current states, the ECODS do not have a complete exposure pathway to the friable asbestos threat. The existing soil layer over the ECODS presents sufficient protection against exposure risk and only institutional controls are necessary to maintain the incomplete exposure pathway. Due to the nature and extent of contamination at the ECODS, SRS believes that there is no appreciable risk with the levels of contaminants detected. Therefore, caps/covers were not considered. Asbestos containing material and media are difficult to treat due to asbestos variety and chemistries and due to the percent of asbestos present. It is even more difficult to treat asbestos in situ. The need for asbestos treatment and reuse technologies has just recently come to the forefront over the last several years, and the few innovative technologies under research such as vitrification and mechanochemical stabilization are too new and too immature for

feasibility study identification and screening. Asbestos does not present a CM issue and is best managed by elimination of the exposure pathway. Disposal (burial) and institutional controls are the recognized preferred technology for this material.

ECODS L-1, N-2, P-2, R-1A, -1B, and -1C

Alternative 1. No Action

The No Action alternative is required by the NCP to serve as a baseline for comparison to other alternatives. Under this alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume. This alternative would leave the four ECODS in their current condition with no additional controls. This alternative is not effective in achieving the RAOs, and there are no capital construction or system operation and maintenance costs. The No Action alternative is not sufficient in meeting the threshold criteria of protection of human health and environment and compliance with ARARs. This alternative does not include five-year remedy reviews.

Summary of Costs

Capital Cost	$0
Operations and Maintenance (O&M)	$0
Total Present-Worth Cost	$0

Alternative 2. Institutional Controls

The second alternative involves the use of land use controls (i.e., institutional controls) to limit access to the area. Physical barriers (i.e., signs and fences) and/or land-use restrictions (i.e., excavation permit restrictions and deed restrictions) will be used to restrict access to or activities that can be performed at the impacted areas. Institutional controls meet the threshold and balancing criteria requirements and is the least expensive alternative after the No Action alternative. Alternative 2 will require five-year remedy reviews.

L-1 Summary of Cost	
Capital	*$31,185*
O&M Cost	*$159,735*
Total Present-Worth Cost	*$190,920*
N-2 Summary of Cost	
Capital	$31,185
O&M Cost	$159,735
Total Present-Worth Cost	$190,920
P-2 Summary of Cost	
Capital	$31,185
O&M Cost	$159,735
Total Present-Worth Cost	$190,920
R-1A, -1B, -1C Summary of Cost	
Capital	$31,185
O&M Cost	$159,735
Total Present-Worth Cost	$190,920

The total cost of ICs for all ECODS is $763,680.

Alternative 3. Removal and Offsite Disposal

The third alternative is removal and offsite disposal. For L-1, soil between 0 and 1.2 m (4 ft) bgs would be excavated from an area of 0.06 ha (0.14 ac) and disposed of appropriately pending sampling and analysis results. This equates to an approximate volume of 898 m^3 (1,175 yd^3). For N-2, soil between 0 and 1.2 m (4 ft) bgs would be excavated from an area of 0.17 ha (0.41 ac) and disposed of appropriately pending sampling and analysis results. This equates to approximately a volume of 2,630 m^3 (3,440 yd^3). For P-2, soil between 0 and 1.2 m (4 ft) bgs would be excavated from an area of 0.1 ha (0.24) acres and disposed of appropriately pending sampling and analysis results. This equates to approximately a volume of 1,540 m^3 (2,014 yd^3). For R-1A, -1B, and -1C, soil between 0 and 1.2 m (4 ft) bgs would be excavated from an area of 0.12 ha (0.29 ac) and disposed of appropriately pending sampling and analysis results. This

equates to approximately a volume of 1,861 m^3 (2,434 yd^3). Confirmatory samples would be taken around the area of excavation to ensure soil contaminant concentration levels are below RGOs. The area would then be backfilled and compacted. Alternative 3, Removal and Offsite Disposal, meets the threshold and balancing criteria requirements but is more difficult to implement and is the most expensive alternative.

Given the nature and extent of the contamination, it is believed that Alternative 3, Removal and Offsite Disposal, is not warranted. Additionally, disposal of asbestos containing waste is not acceptable at the SRS Hazardous Waste Storage Facility and this facility serves as an interim storage facility.

L-1 Summary of Costs	
Capital:	$841,282
O&M:	$0
Present Worth:	$841,282
N-2 Summary of Costs	
Capital:	$1,564,598
O&M:	$0
Present Worth:	$1,564,598
P-2 Summary of Costs	
Capital:	$1,219,925
O&M:	$0
Present Worth:	$1,219,925
R-1A, -1B, -1C Summary of Costs	
Capital:	$1,232,638
O&M:	$0
Present Worth:	$1,232,638

Total cost of removal and offsite disposal for all ECODS is $4,858,443.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

The NCP [40 CFR 300.430(e)(9)] requires that potential remedial alternatives undergo detailed analysis using relevant evaluation criteria that will be used by decision makers to select a final remedy. The results of the detailed analysis are then examined to compare alternatives and identify key tradeoffs among alternatives.

The statutory requirements that guide the evaluation of remedial alternatives in a CERCLA Feasibility Study (FS) state that a remedial action must:

- Be protective of human health and the environment
- Attain ARARs or define criteria for invoking a waiver
- Be cost effeetive
- Use permanent solutions to the maximum extent

USEPA has established nine evaluation criteria to address these statutory requirements under CERCLA. The criteria fall into the categories of threshold criteria, primary balancing criteria, and modifying criteria. Modifying criteria (i.e., state or support agency acceptance and community acceptance) was evaluated after the public comment period on the SB/PP. Evaluation criteria categories and the nine evaluation criteria are listed and explained in the following discussion.

Threshold Criteria

Each alternative must meet the following threshold criteria to be selected as a permanent remedy under CERCLA.

1) **Overall protection of human health and the environment** - The overall protection of human health and the environment is evaluated for each alternative on the basis of how the alternative reduces the risk of exposure to contaminants from potential exposure pathways through engineered or ICs. Each alternative is examined as to whether it creates any unacceptable short-term risks to human health. In addition, the RCRA criterion specifying control of source releases is evaluated.

2) **Compliance with ARARs** - Remedial actions under CERCLA are required to attain all ARARs. ARARs are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal, state, or local environmental law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Three types of ARARs (chemical-, action-, and location-specific) have been developed to simplify identification and compliance with environmental requirements. Chemical-specific requirements are media-specific and health-based concentration limits developed for site-specific levels of constituents in specific media.

   These limits establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Action-specific requirements set controls on the design, performance, and other aspects of implementation of specific remedial activities. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. Location-specific ARARs are restrictions placed on the concentration of hazardous substances for the conduct of activities solely because they occur in special locations. Location-specific ARARs must consider federal, state, and local requirements that reflect the physiographical and environmental characteristics of the unit or the immediate area.

Primary Balancing Criteria

Primary balancing criteria are factors that identify key tradeoffs among alternatives.

3) **Long-term effectiveness and permanence** - Long-term effectiveness and permanence are evaluated for each alternative on the basis of the magnitude of residual risk and the adequacy and reliability of controls used to manage remaining waste after response objectives have been achieved. Alternatives that offer long-term effectiveness and permanence halt or otherwise mitigate any potential for offsite

contaminant transport and minimize the need for future engineered controls. The degree of uncertainty with regard to treatment effectiveness is also evaluated.

4) **Reduction of mobility, toxicity, or volume through treatment** - The statutory preference is to select a remedial action that employs treatment to reduce the toxicity, mobility, or volume of hazardous substances. The degree to which alternatives employ recycling or treatment is assessed, including how treatment is used to address the principal threats posed by the unit.

5) **Short-term effectiveness** - Evaluation of alternatives for short-term effectiveness takes into account protection of remedial workers, members of the community, and the environment during implementation of the remedial action and the time required to achieve RAOs/RGs. Schedule estimates are based on projected availability of materials and labor and may have to be updated at the time of remediation.

6) **Implementability** - Each alternative is evaluated with respect to the technical and administrative feasibility of implementing the alternatives as well as the availability of necessary equipment and services. This criterion includes the ability to obtain services, capacities, equipment, and specialists necessary to construct components of the alternatives; the ability to operate the technologies and monitor their performance and effectiveness; and the ability to obtain necessary approvals from other agencies.

   Construction schedules are based on good weather, the ability to create and receive adequate and authorized access, and the availability of required utilities. All time estimates assume that the selected remedial design, including construction drawings, has been approved, and all negotiations with contractors and regulators have been concluded.

7) **Cost** - Accuracy of present-worth costs is +50/-30 percent according to USEPA guidance. Detailed cost estimates are derived from current information including vendor quotes, conventional cost-estimating guides (e.g., Means Site Work Cost Data), and costs associated with similar projects. Indirect cost percentages for capital

and O&M costs are based upon estimating guidance, technical judgment, site overhead, and regulatory guidance considering the range of scope for an alternative. The cost estimates are included for comparison only and are not intended to forecast actual budgetary expenditures. The actual costs of the project depends on labor and material costs, site conditions, competitive market conditions, final project scope, and implementation schedule at the time that the remedial activities are initiated. In estimating the present-worth costs, a discount rate of 3.9% is used and inflation is assumed to be 0%. Present-worth costs for review of the site remedy every five years are given for each alternative for which residuals remain at the site. Present-worth costs for these items are based on an estimated time frame of operation.

Modifying Criteria

Modifying criteria (i.e., state or support agency acceptance; community acceptance) will be considered during remedy selection.

8) **State or support agency acceptance** – The selected alternative should be acceptable to state and support agencies. Acceptance was evaluated based on scoping meetings held between USDOE, USEPA, and SCDHEC, and based on comments received on the final SB/PP. USEPA and SCDHEC approval of the proposed action in the SB/PP constitutes acceptance of the Selected Remedy.

9) **Community Acceptance** - The concerns of the community should also be considered in presenting alternatives that would be acceptable to the community. Community acceptance is evaluated based on comments on the SB/PP received during the public comment period. A public comment period was held between June 25, 2009 and August 8, 2009; no comments were received. Had SRS received public comments concerning the proposed remedy, the comments and responses would have been incorporated in the Responsiveness Summary in Appendix A of this ROD.

All of the alternatives have been evaluated against the seven CERCLA evaluation criteria that provide the basis for evaluating the alternatives and selecting a remedy (Tables 2 and

3). The purpose of this section is to identify key advantages and disadvantages of each alternative relative to one another and in relation to the two threshold criteria and five primary balancing criteria. Emphasis is placed on the two threshold criteria: overall protection of human health and the environment and compliance with ARARs. However, key tradeoffs between alternatives are identified through a comparative evaluation against the five primary balancing criteria: long-term effectiveness and permanent reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The five primary balancing criteria were assigned values based on technical judgment to support the comparative analyses. The final two modifying criteria – state or support agency acceptance and community acceptance – were evaluated following the comment period for the SB/PP.

Overall Protection of Human Health and the Environment

With the exception of Alternative 1 (No Action) all of the alternatives are protective of human health and the environment. Alternative 2 (Institutional Controls) addresses the soil contamination with land-use restriction, and Alternative 3 (Removal Action) removes the soil contamination from the areas for offsite disposal.

Compliance with ARARs

Chemical-Specific ARARs. With the exception of Alternative 1 (No Action) all of the alternatives will comply with protection of surface water and groundwater ARARs. Alternative 2 (Institutional Controls) would not have any chemical-specific ARARs and Alternative 3 (Removal Action) would be the most effective for all of the facilities in complying with the chemical ARARs.

Action-Specific ARARs. With the exception of Alternative 1 (No Action) all of the alternatives would comply with their pertinent ARARs. Alternative 3 would meet air emission requirements, fugitive dust requirements, stormwater management, and sanitary waste management requirements.

Location-Specific ARARs. With the exception of Alternative 1 (No Action), all of the alternatives will comply with protection of endangered species, fish and wildlife, and migratory birds.

Long-Term Effectiveness and Permanence

Alternatives 2 (Institutional Controls) and 3 (Removal Action) are effective in the long term and protect human health. Alternative 3 has the greatest degree of risk reduction, long-term effectiveness, and permanence since all contamination is removed from the unit. Alternative 1 (No Action) has no long-term effectiveness or permanence since no action is taken to mitigate the residential risk.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives reduce toxicity, mobility, or volume through treatment. However, Alternative 3 (Removal Action) reduces the volume of contamination at the site by removal and offsite disposal.

Short-Term Effectiveness

Alternative 2 (Institutional Controls) achieves RAOs in significantly less time than Alternative 3 (Removal Action). Alternative 2 (Institutional Controls) has lower risk to workers and the public than Alternative 3. Alternative 3 poses more risk due to the earthwork, handling, packaging, and transportation involved in the remedy. Short-term effectiveness is not applicable to Alternative 1 since it does not involve any remedial activities.

Implementability

Alternative 2 can be readily implemented due to its simplicity. Alternative 3 is more difficult to implement due to more involved construction and operations associated with earthwork, packaging, and transportation. Alternative 1 (No Action) involves no implementation.

Cost

Alternative 1 (No Action) is the least expensive alternative of all the three alternatives for the ECODS ($0). The next least costly alternative is Alternative 2 (Institutional Controls) ($190,920 for each ECOD; total for all four ECODS is $763,680). The most expensive alternative is Alternative 3 (Removal Action) (L-1 $841,282, N-2- $1,561,598, P-2 - $1,219,925, and R-1A, -1B, -1C - $1,232,638; total for all 4 ECODS is $4,858,443).

XI. THE SELECTED REMEDY

Detailed Description of the Selected Remedy

The selected alternative for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C is Alternative 2 - Institutional Controls. There are no PTSM or RCOCs identified for the industrial and residential scenarios, but if debris is brought up from the subsurface there would likely be a friable asbestos exposure risk present. Soil, dust, or air samples and analysis was not performed for asbestos; however, DOE is exercising the option to proceed directly to a response action because there is threat of release of asbestos (USEPA 2008). This alternative was selected because it effectively protects against residential and industrial exposure and provides the best balance of tradeoffs between no action and removal and offsite disposal. Table 4 shows the type of control, purposes of control, duration, implementation method, and affected areas.

Institutional controls will be implemented by:

- Access controls to prevent exposure to 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 located at the waste unit boundaries.
- Access controls to prevent exposure to trespassers, as described in the 2000 RCRA Part B Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary and at the ECODS.

In the long term, if the property is ever transferred to nonfederal ownership, the US Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the 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. The deed shall expressly prohibit activities inconsistent with the remedial goals and objectives in this ROD upon any and all transfers. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with USEPA and SCDHEC review and approval.

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

The selected remedy for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C leaves hazardous substances in place (i.e., buried potential friable asbestos) that pose a potential future risk and will require land use restrictions. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a Land Use Control and Assurance Plan (LUCAP) to ensure that the Land Use Controls (LUCs) required by numerous remedial decisions at SRS are properly maintained and periodically verified. Figures 9 through 12 depict the approximate land use control boundary for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C. The unit-specific LUCIP referenced in this ROD will provide details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring,

reporting upon, and enforcing the LUCs selected under this ROD. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA and the *SRS Federal Facility Agreement*. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect unless and until modifications are approved as needed to be protective of human health and the environment. The deed shall expressly prohibit activities inconsistent with the remedial goals and objectives in this ROD upon any and all transfers. The LUCs shall be maintained until the concentration of hazardous substances associated with the unit (i.e., buried potential friable asbestos) no longer pose an unacceptable risk under unlimited exposure and unrestricted use. Approval by EPA and DHEC is required for any modification or termination of the ICs.

USDOE has recommended that residential use of SRS land be controlled; therefore, future residential use will be restricted to ensure long-term protectiveness. Land use controls, including institutional controls, will restrict the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C to future industrial use and will prohibit residential use of the area. Unauthorized excavation will also be prohibited and the waste unit will remain undisturbed. Land use controls selected as part of this action will be maintained for as long as they are necessary to meet the RAO and termination of any land use controls will be subject to CERCLA requirements for documenting changes in remedial actions.

The LUC objectives necessary to ensure the protectiveness of the selected remedy are:

- prevent contact, removal, or excavation of subsurface soils
- prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds
- Cost Estimate for the Selected Remedy

Institutional Controls for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

Total Capital Cost:	$124,740
Present-Worth O&M Cost:	$638,940
Total Present-Worth Cost:	$763,680

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record File, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost. A detailed cost estimate is presented in Appendix B of this document.

Estimated Outcomes of Selected Remedy

The expected condition after the selected alternative is implemented is the ICs will prevent access by human receptors. The ECODS would be available for SRS use as an industrial area with land use restrictions.

Waste Disposal and Transport

There will be no waste streams generated during the remedial action.

XII. STATUTORY DETERMINATIONS

Based on the BRA evaluations performed on the ECODS, the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C have been determined not to contain PTSM; however, these ECODS pose a potential friable asbestos threat to human health. Therefore, Alternative 2 - Institutional Controls, has been selected as the remedy. The future land use of the ECODS is assumed to be industrial land use.

This alternative was selected because it effectively prevents industrial worker and future residents against potential exposure to buried friable asbestos. It provides the best balance of tradeoffs between alternatives because it offers adequate protection at a minimal cost. The selected remedy is protective of human and the environment, complies with federal and state requirements that are legally ARARs to the remedial action, and is cost-effective. The remedy does not satisfy the preference for treatment as a principal element of the remedy because there is no practicable remedial technology capable of reducing the toxicity, mobility, or volume of asbestos in the subsurface.

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

XIII. EXPLANATION OF SIGNIFICANT CHANGES

The remedy selected in this ROD does not contain any significant changes from the preferred alternative presented in the SB/PP (WSRC 2007).

XIV. RESPONSIVENESS SUMMARY

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

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

Institutional controls will be undertaken at ECODS L-1, N-2, P-2, and R-1A, -1B, -1C. The post-ROD schedule is presented in Figure 13.

XVI. REFERENCES

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

SGCP, 2005. *Sampling and Analysis Plan for ECODS P-2 Trenching (U)*, Rev. 0, June 15, 2005

USDOE, 1996. *SRS Future Use Project Report, Stakeholder Preferred Recommendations for SRS Land Use Facilities*, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USDOE, 2000. *Savannah River Site Long Range Comprehensive Plan*, United States Department of Energy, Savannah River Operations Office, Aiken, SC

USEPA, 1991. *A Guide to Principal Threat and Low-Level Threat Wastes*, United States Department of Energy, Office of Emergency and Remedial Response, Superfund Publication 9380.3-06FS, Washington, DC

USEPA, 2008. *Framework for Investigating Asbestos-Contaminated Superfund Sites*, Office of Solid Waste and Emergency Response, OSWER Directive #9200.0-68, September 2008

WSRC, 1999. *Land Use Control Assurance Plan for the Savannah River Site*, WSRC-RP-98-4125, Rev. 1.1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2000. *Site Evaluation Report for ECODS N-2 (NBN) (U),* WSRC-RP-2000-4166, Rev. 0, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2001. *Site Evaluation Report for Early Construction and Operational Disposal Site (ECODS) P-2 (NBN)*, WSRC-RP-2001-4272, Rev. 0, Westinghouse Savannah River Site, Aiken, SC

WSRC, 2002. *Site Evaluation Report for Early Construction and Operational Disposal Site (ECODS) R-1A, R-1B, and R-1C (NBN)*, WSRC-RP-2002-4077, Rev. 0), Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2003. *Site Evaluation Report for the Early Construction and Operational Disposal Site (ECODS) L-1*, WSRC-RP-2003-4047, Rev. 0, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2006a. *Savannah River Site Federal Facility Agreement Community Involvement Plan (U)*, Revision 5, WSRC-RP-96-120, Washington Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2006b. *Site Evaluation for the Excavation of Observation Trenches at ECODS P-2,* April 24, 2006, ARF #013446, Washington Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2007. *Statement of Basis/Proposed Plan for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C Site Evaluation Areas (SEAs) (U),* Revision 1.2, WSRC-RP-2007-4067, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

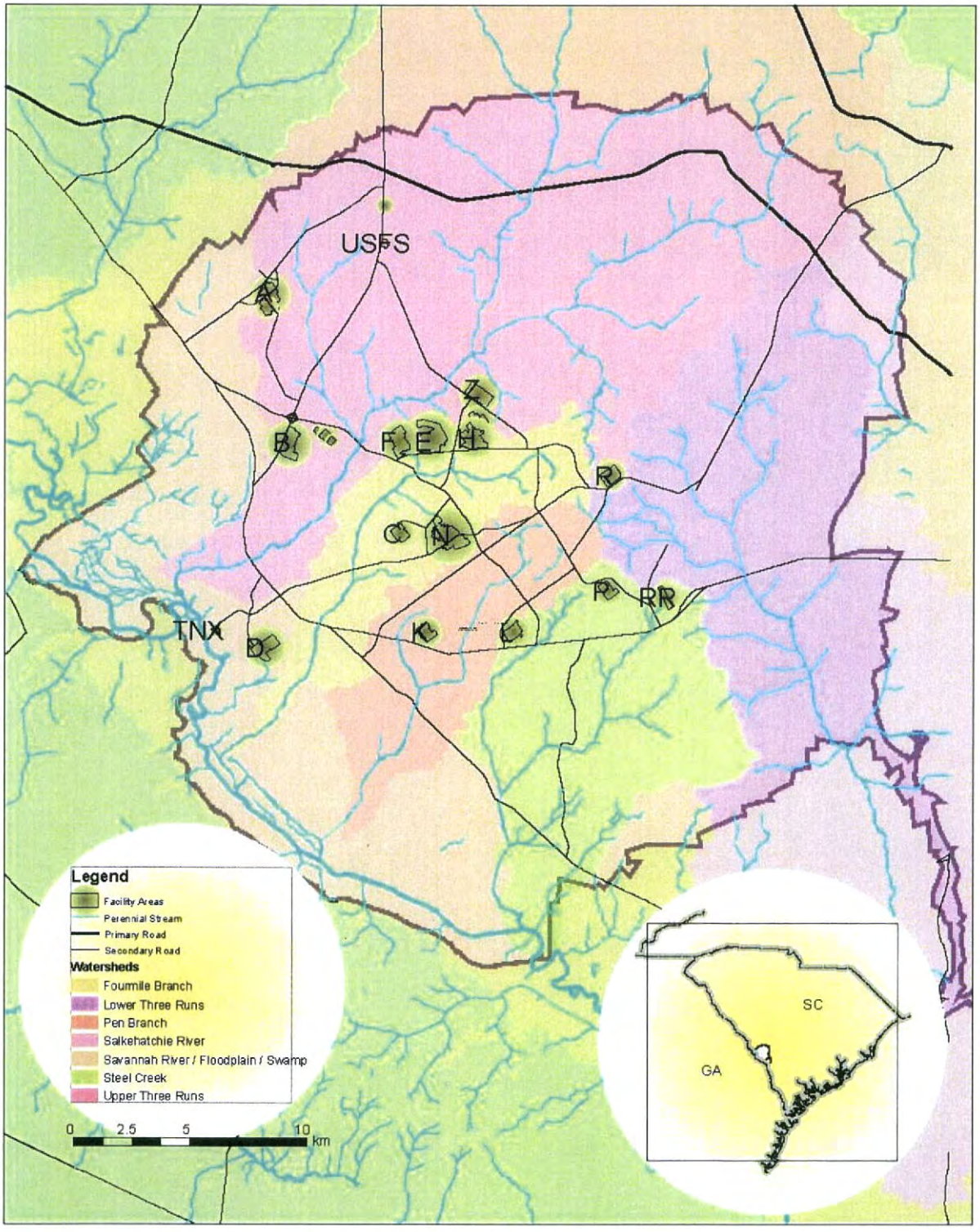


Figure 1. Location of the Savannah River Site

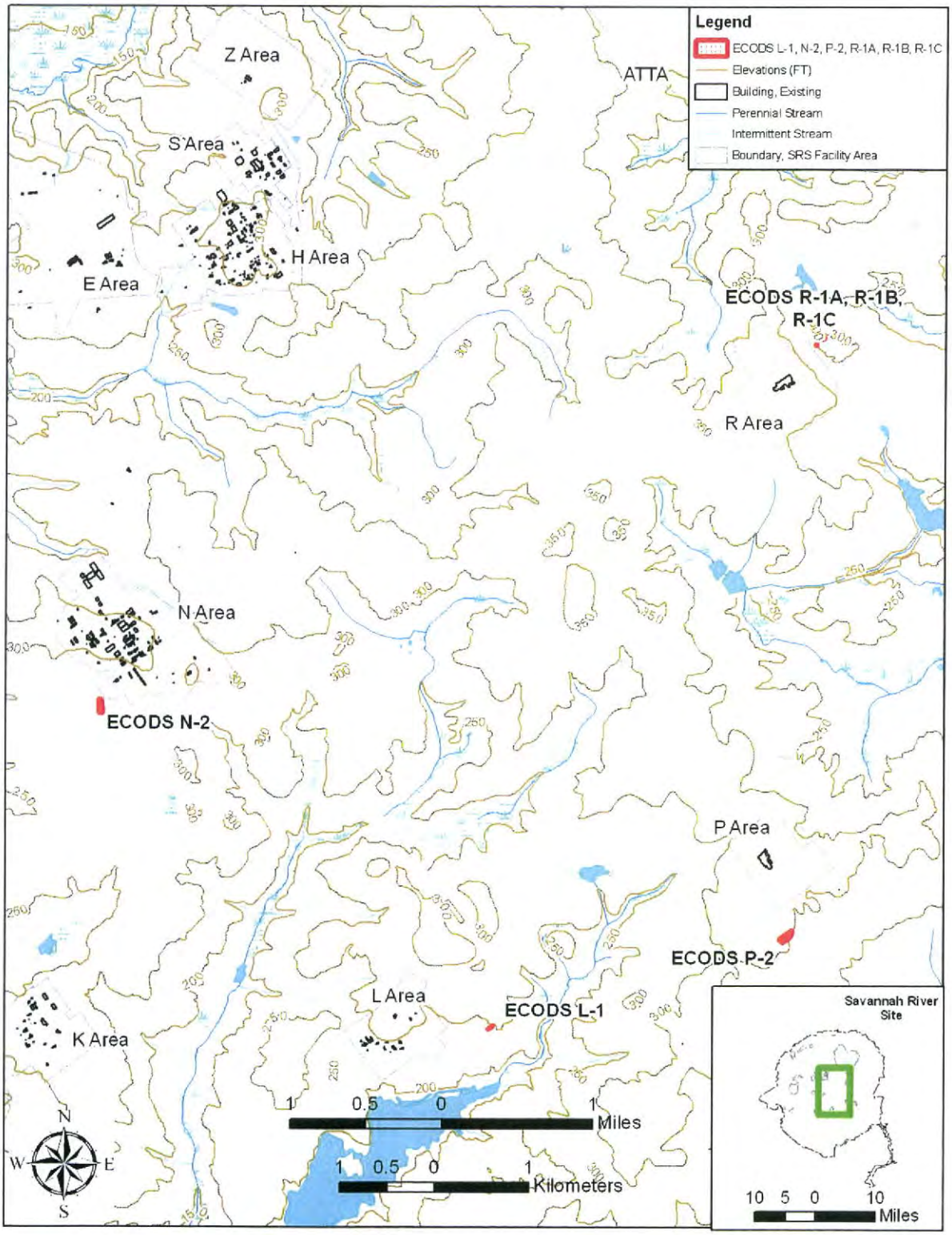
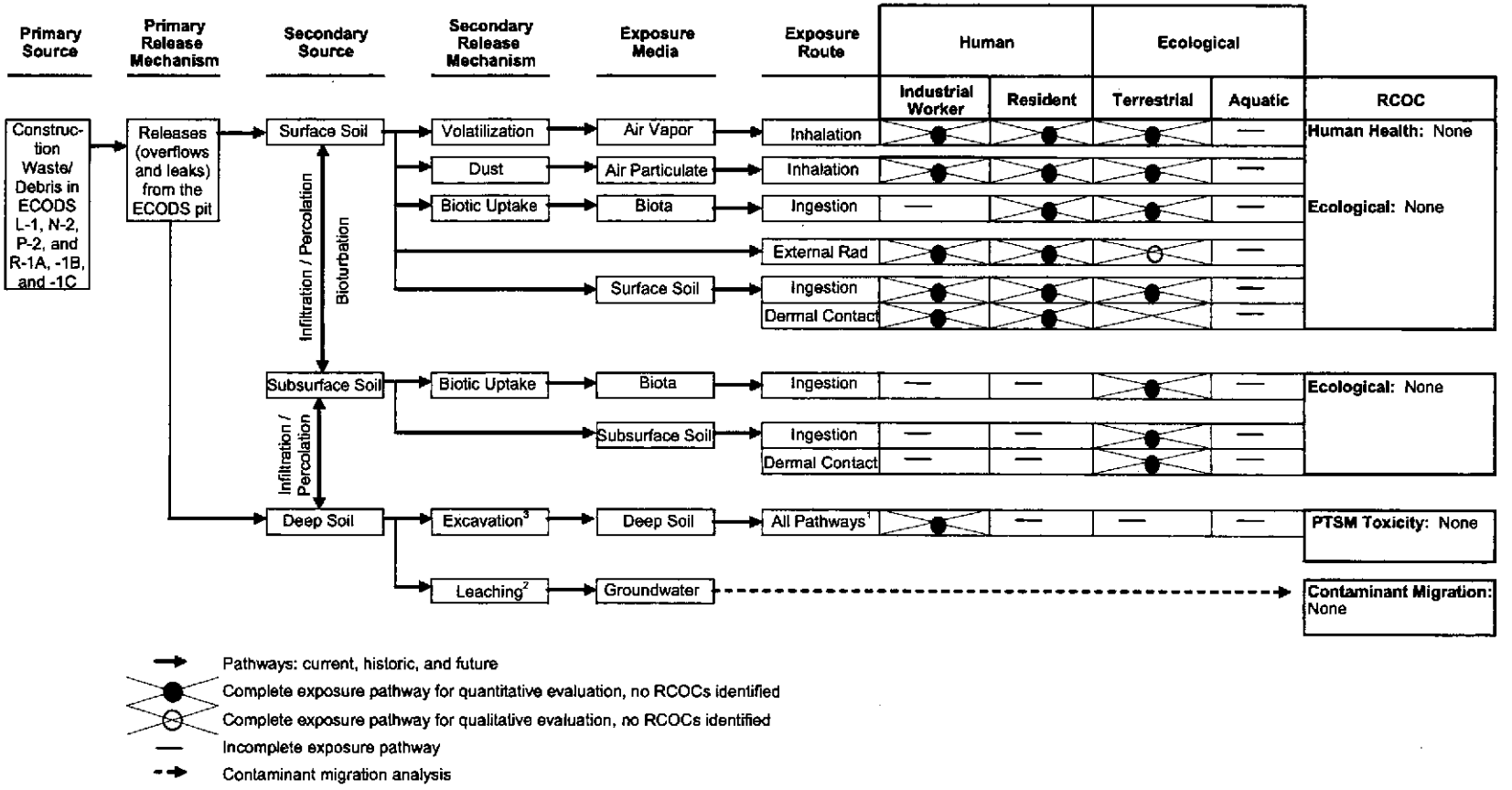


Figure 2. **Location of the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C within the Savannah River Site**



[1] All pathways represent ingestion, inhalation, dermal contact, and external radiation exposure for a PTSM evaluation for toxicity
[2] Leaching represents the potential of a contaminant in soil to migrate to groundwater above maximum contaminant levels per the contaminant migration analysis and does not represent a human or ecological exposure route
[3] There is potential for friable asbestos exposure to human receptors should buried debris be exposed or brought to the surface under an excavation scenario. This pathway was not quantitatively evaluated in the risk assessment.

Figure 3. Conceptual Site Model for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

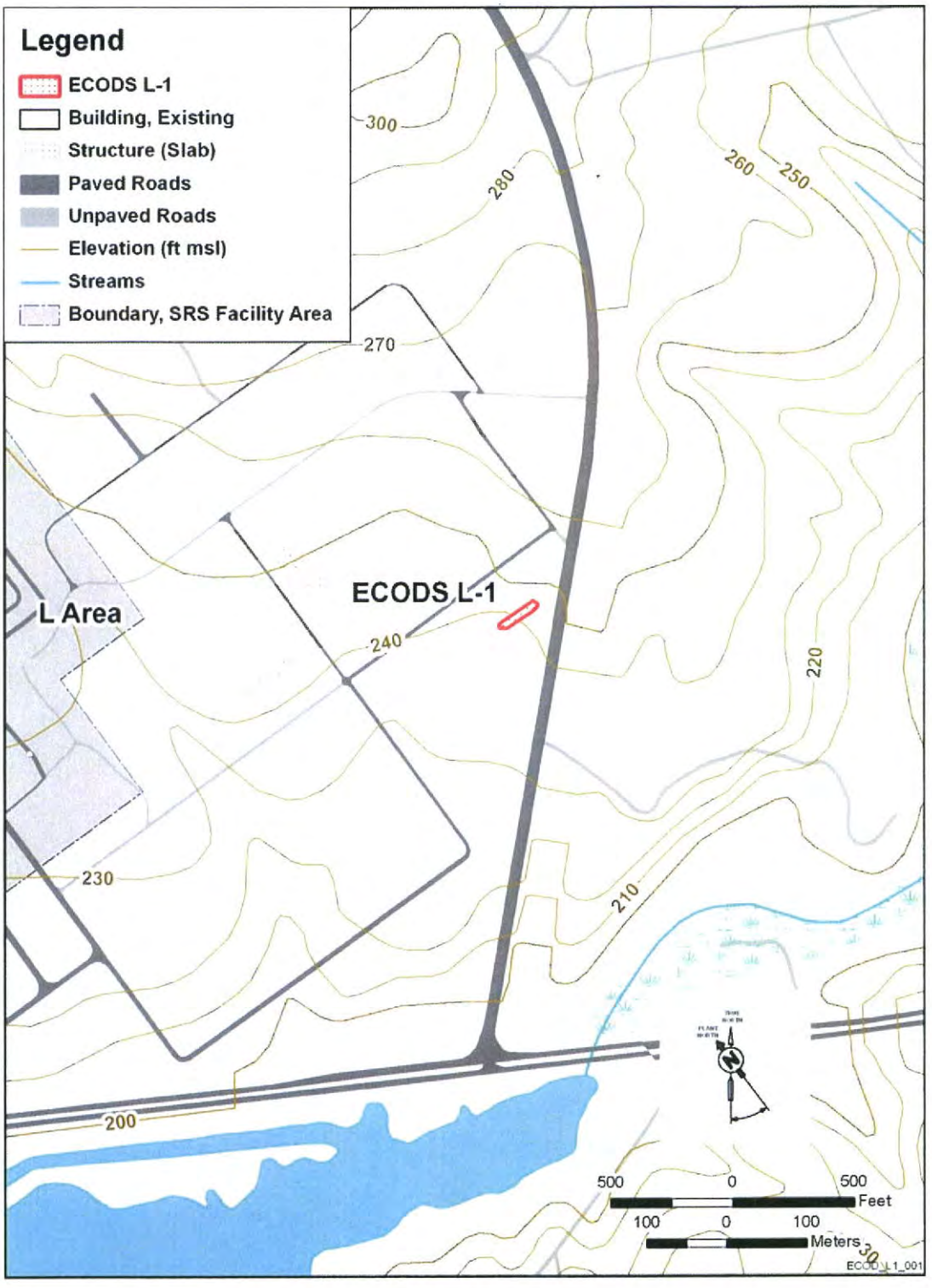


Figure 4. Location of ECODS L-1

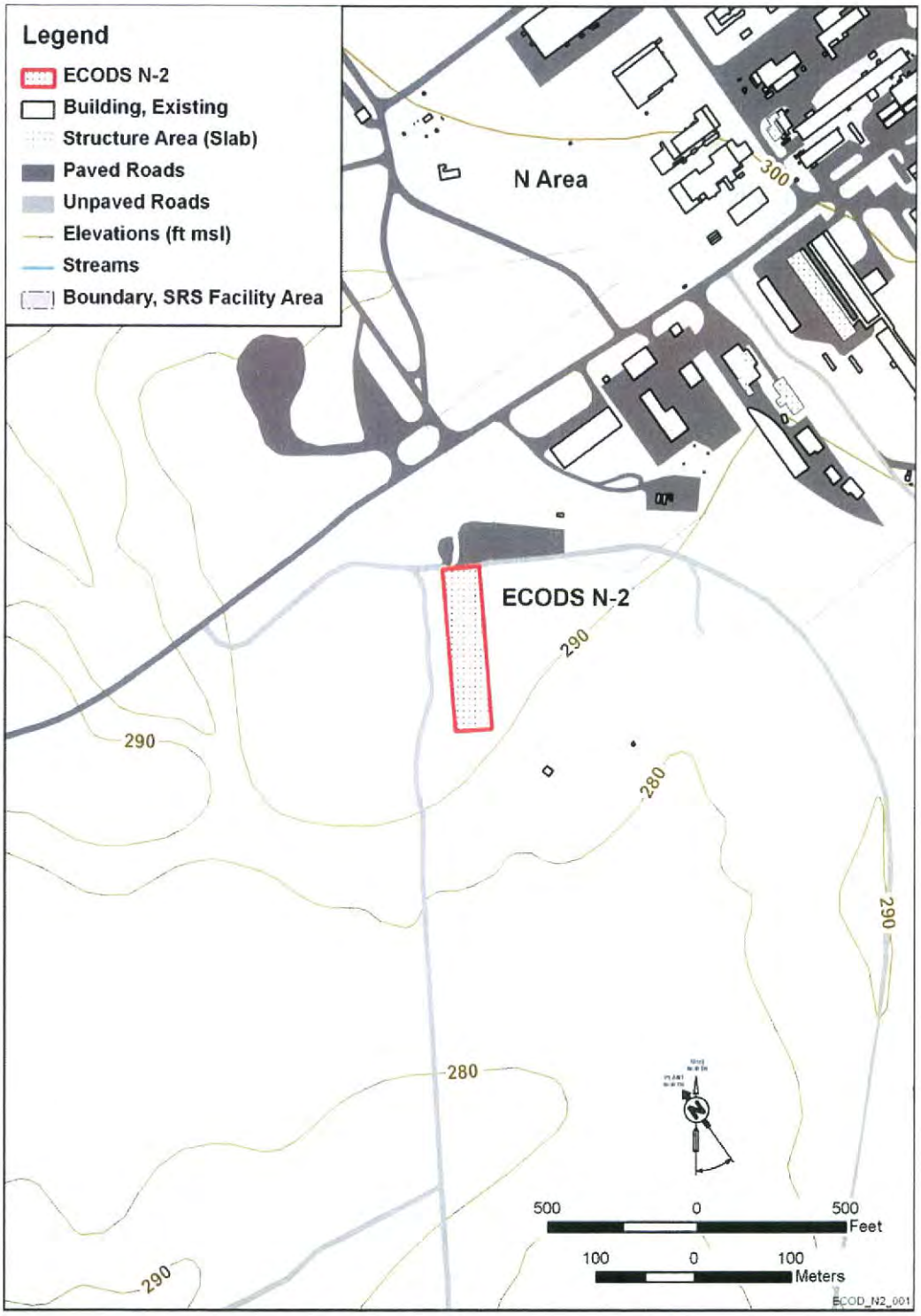


Figure 5. Location of ECODS N-2

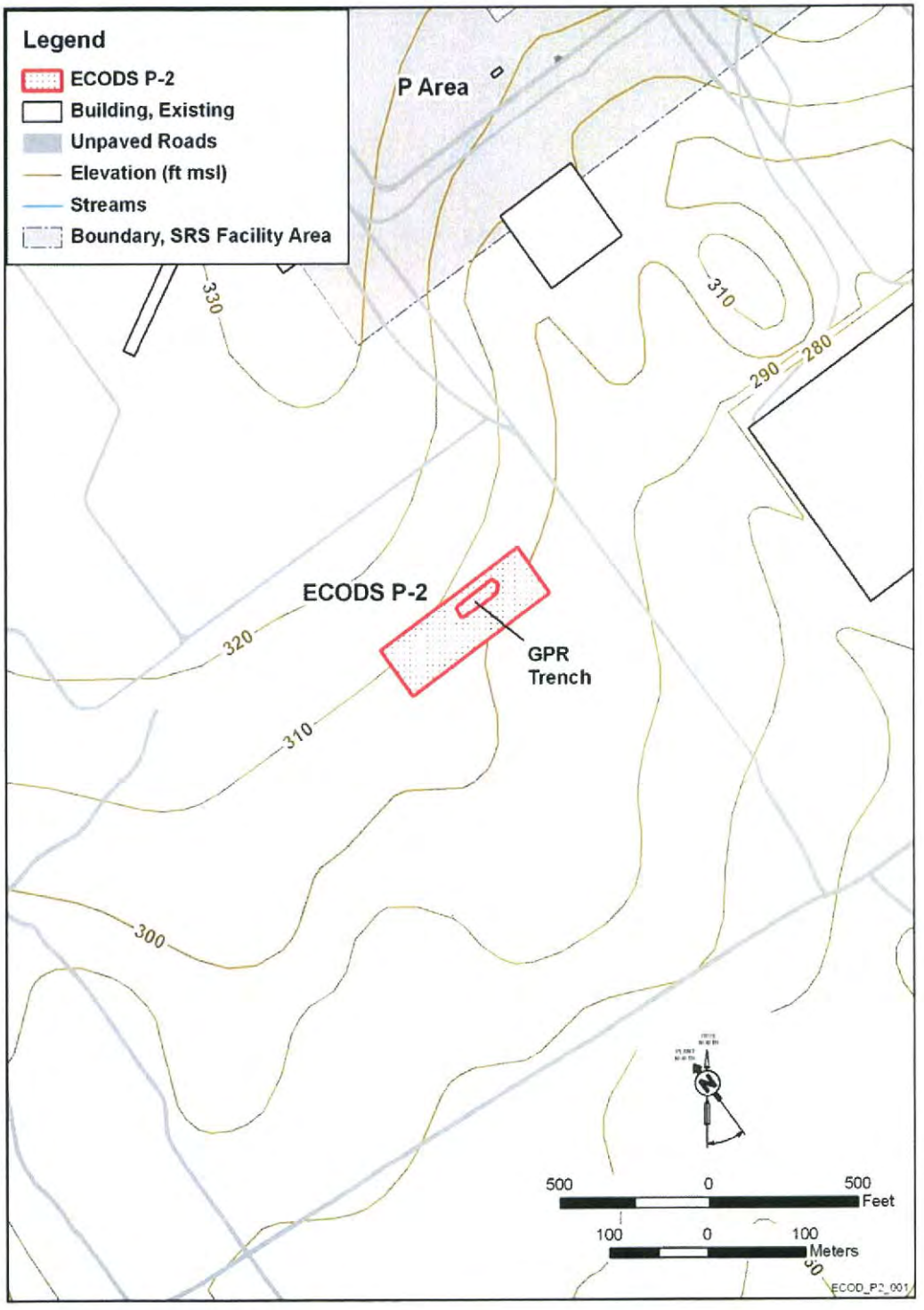


Figure 6. Location of ECODS P-2

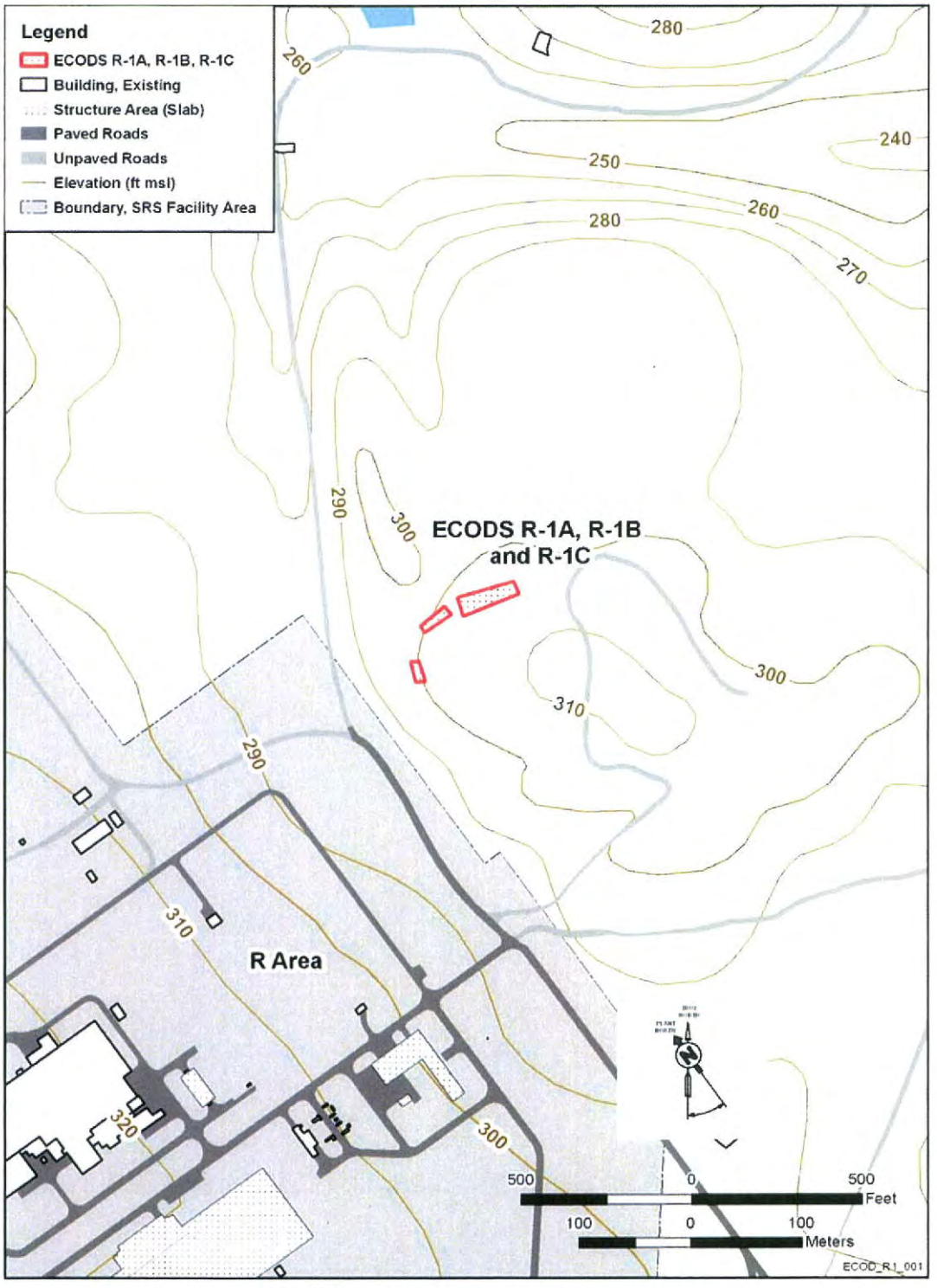


Figure 7. Location of ECODS R-1A, -1B, and 1-C

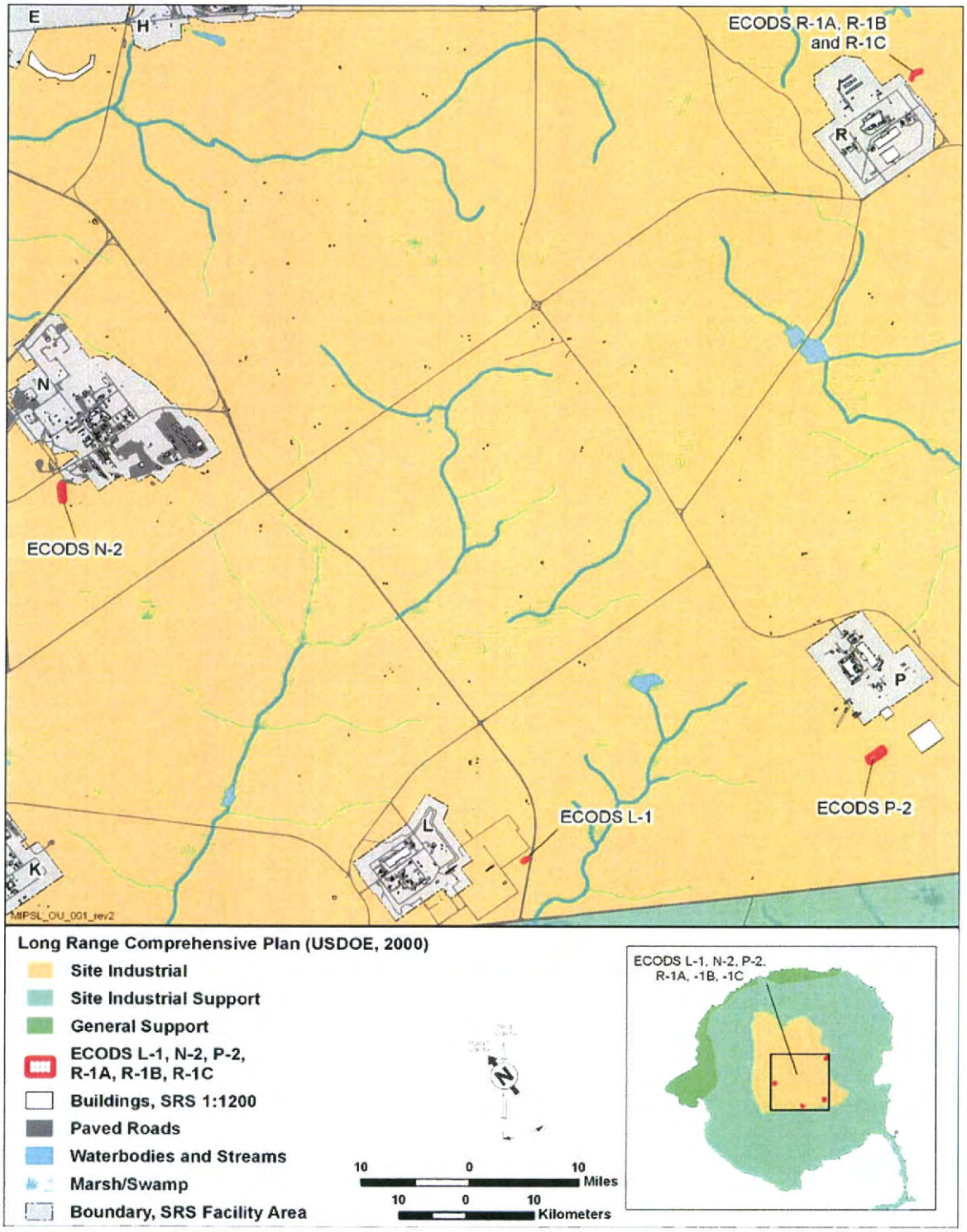


Figure 8. Land Use Map for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

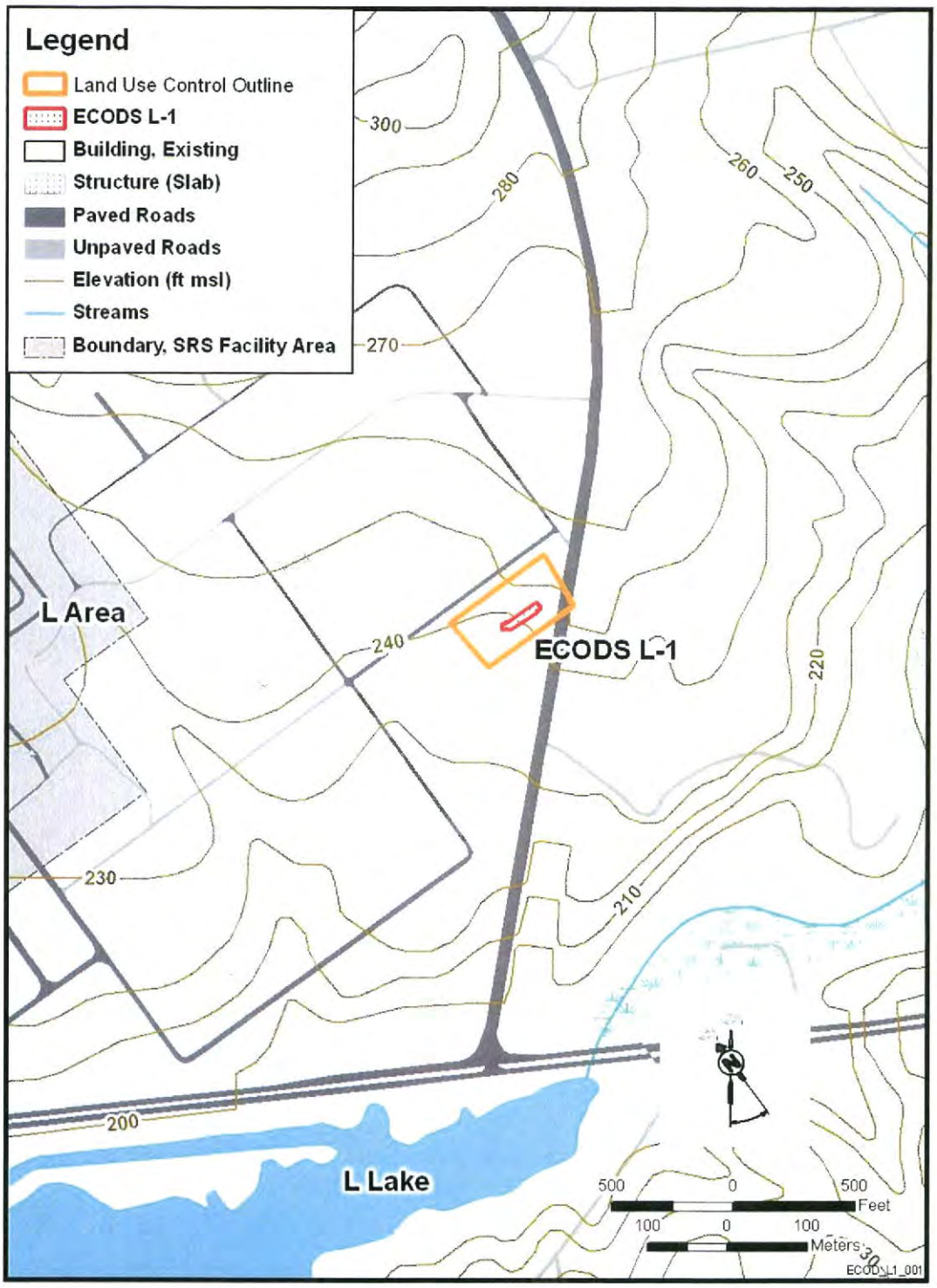


Figure 9. Approximate Land Use Control Boundary for ECODS L-1

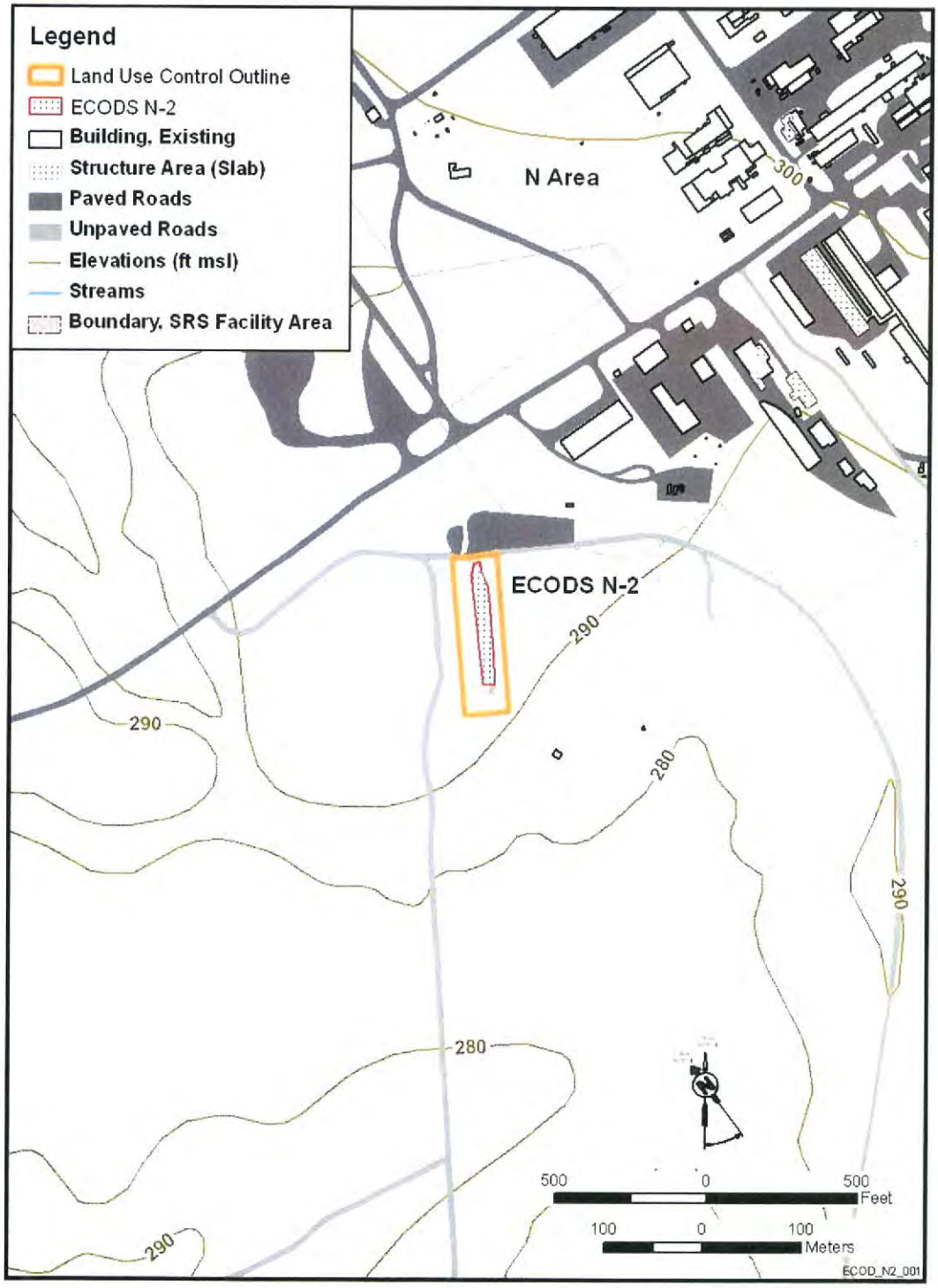


Figure 10. Approximate Land Use Control Boundary for ECODS N-2

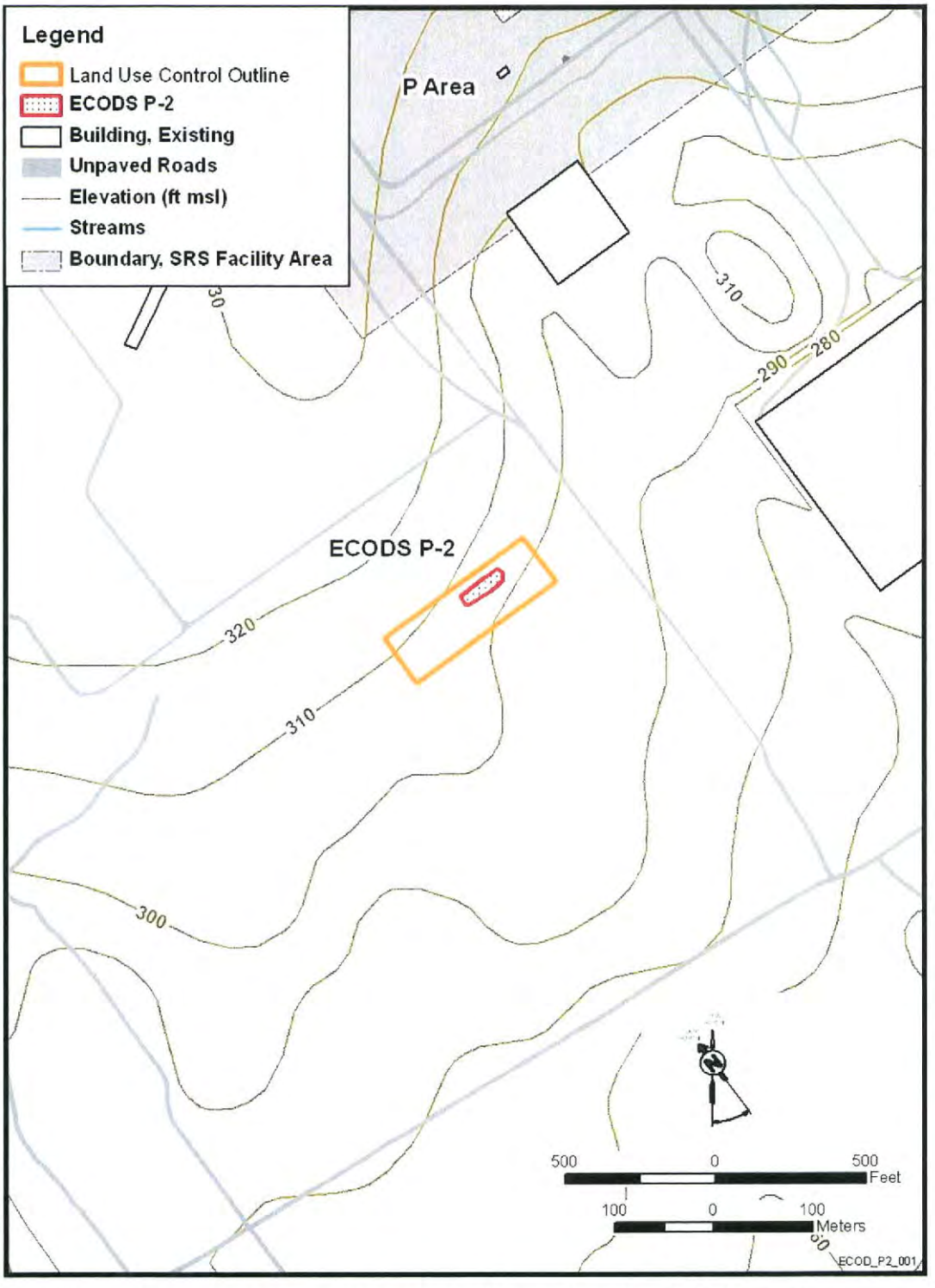


Figure 11. Approximate Land Use Control Boundary for ECODS, P-2

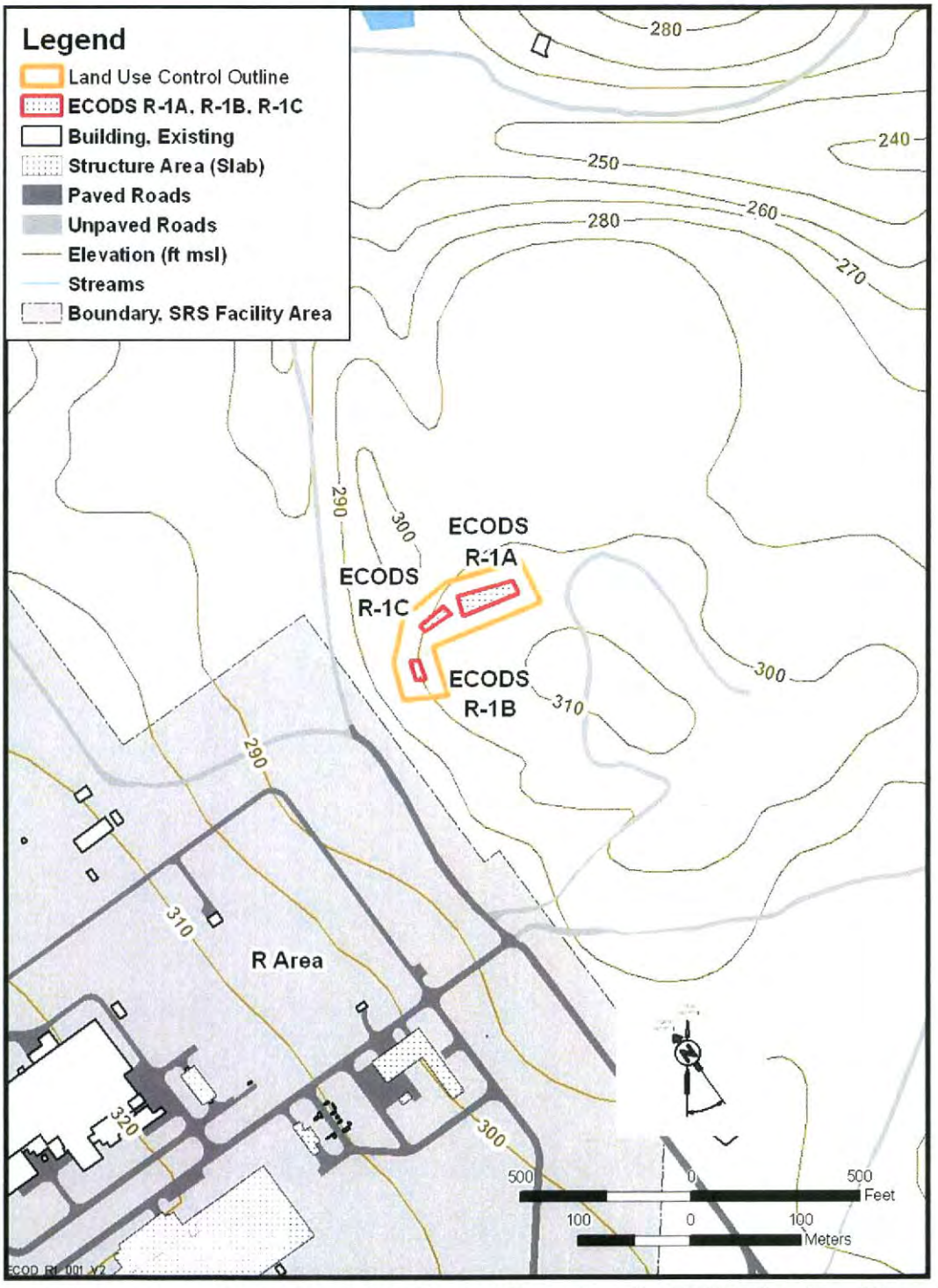
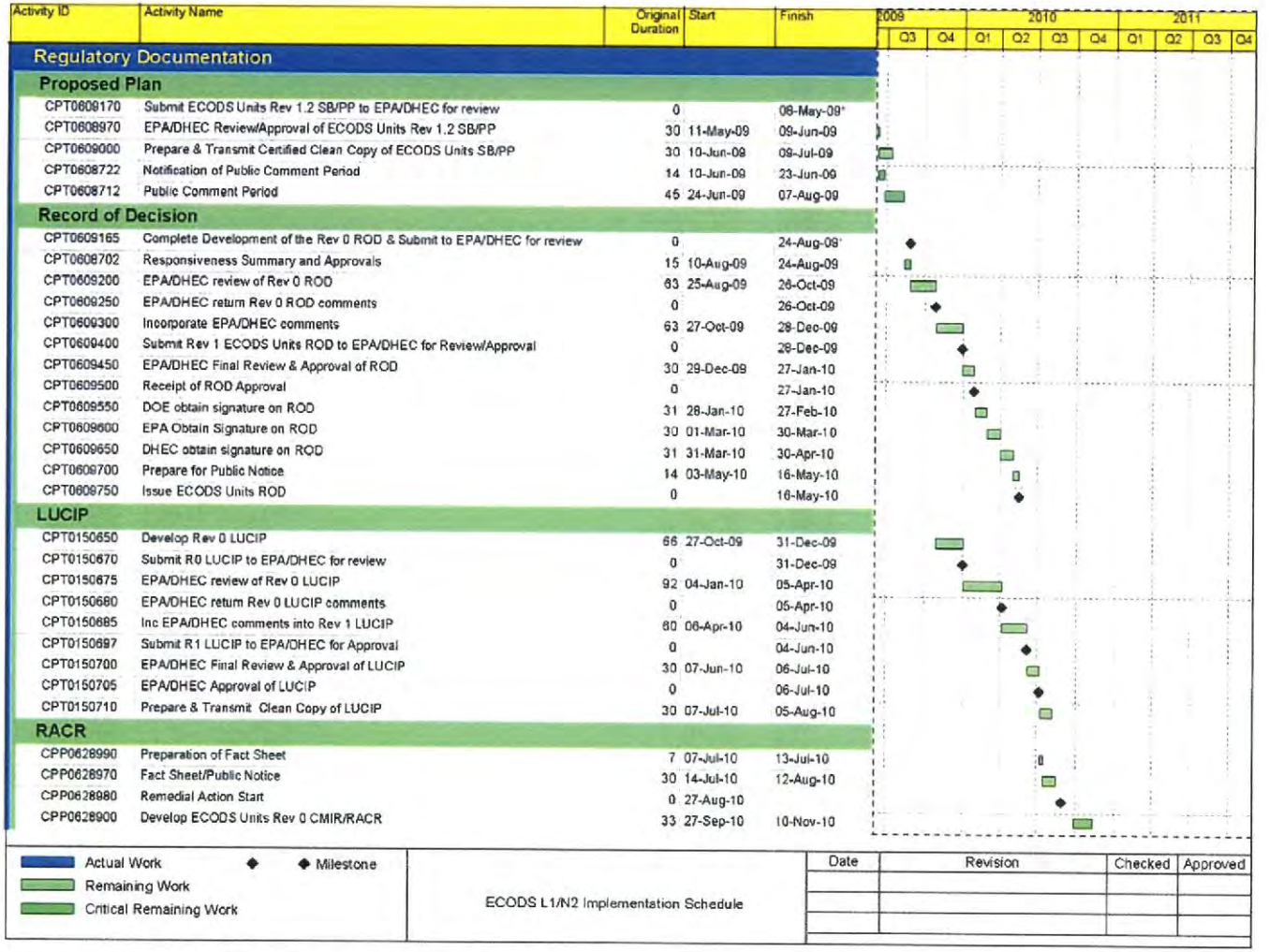


Figure 12. Approximate Land Use Control Boundary for ECODS R-1A, -1B, and -1C



Activity ID	Activity Name	Original Duration	Start	Finish
Regulatory Documentation				
Proposed Plan				
CPT0609170	Submit ECODS Units Rev 1.2 SB/PP to EPA/DHEC for review	0		06-May-09*
CPT0608970	EPA/DHEC Review/Approval of ECODS Units Rev 1.2 SB/PP	30	11-May-09	09-Jun-09
CPT0609000	Prepare & Transmit Certified Clean Copy of ECODS Units SB/PP	30	10-Jun-09	09-Jul-09
CPT0608722	Notification of Public Comment Period	14	10-Jun-09	23-Jun-09
CPT0608712	Public Comment Period	45	24-Jun-09	07-Aug-09
Record of Decision				
CPT0609165	Complete Development of the Rev 0 ROD & Submit to EPA/DHEC for review	0		24-Aug-09*
CPT0608702	Responsiveness Summary and Approvals	15	10-Aug-09	24-Aug-09
CPT0609200	EPA/DHEC review of Rev 0 ROD	63	25-Aug-09	26-Oct-09
CPT0609250	EPA/DHEC return Rev 0 ROD comments	0		26-Oct-09
CPT0609300	Incorporate EPA/DHEC comments	63	27-Oct-09	28-Dec-09
CPT0609400	Submit Rev 1 ECODS Units ROD to EPA/DHEC for Review/Approval	0		28-Dec-09
CPT0609450	EPA/DHEC Final Review & Approval of ROD	30	29-Dec-09	27-Jan-10
CPT0609500	Receipt of ROD Approval	0		27-Jan-10
CPT0609550	DOE obtain signature on ROD	31	28-Jan-10	27-Feb-10
CPT0609600	EPA Obtain Signature on ROD	30	01-Mar-10	30-Mar-10
CPT0609650	DHEC obtain signature on ROD	31	31-Mar-10	30-Apr-10
CPT0609700	Prepare for Public Notice	14	03-May-10	16-May-10
CPT0609750	Issue ECODS Units ROD	0		16-May-10
LUCIP				
CPT0150650	Develop Rev 0 LUCIP	66	27-Oct-09	31-Dec-09
CPT0150670	Submit R0 LUCIP to EPA/DHEC for review	0		31-Dec-09
CPT0150675	EPA/DHEC review of Rev 0 LUCIP	92	04-Jan-10	05-Apr-10
CPT0150680	EPA/DHEC return Rev 0 LUCIP comments	0		05-Apr-10
CPT0150685	Inc EPA/DHEC comments into Rev 1 LUCIP	60	06-Apr-10	04-Jun-10
CPT0150697	Submit R1 LUCIP to EPA/DHEC for Approval	0		04-Jun-10
CPT0150700	EPA/DHEC Final Review & Approval of LUCIP	30	07-Jun-10	06-Jul-10
CPT0150705	EPA/DHEC Approval of LUCIP	0		06-Jul-10
CPT0150710	Prepare & Transmit Clean Copy of LUCIP	30	07-Jul-10	05-Aug-10
RACR				
CPP0628990	Preparation of Fact Sheet	7	07-Jul-10	13-Jul-10
CPP0628970	Fact Sheet/Public Notice	30	14-Jul-10	12-Aug-10
CPP0628980	Remedial Action Start	0	27-Aug-10	
CPP0628900	Develop ECODS Units Rev 0 CMIR/RACR	33	27-Sep-10	10-Nov-10

Figure 13. Post-ROD Implementation Schedule

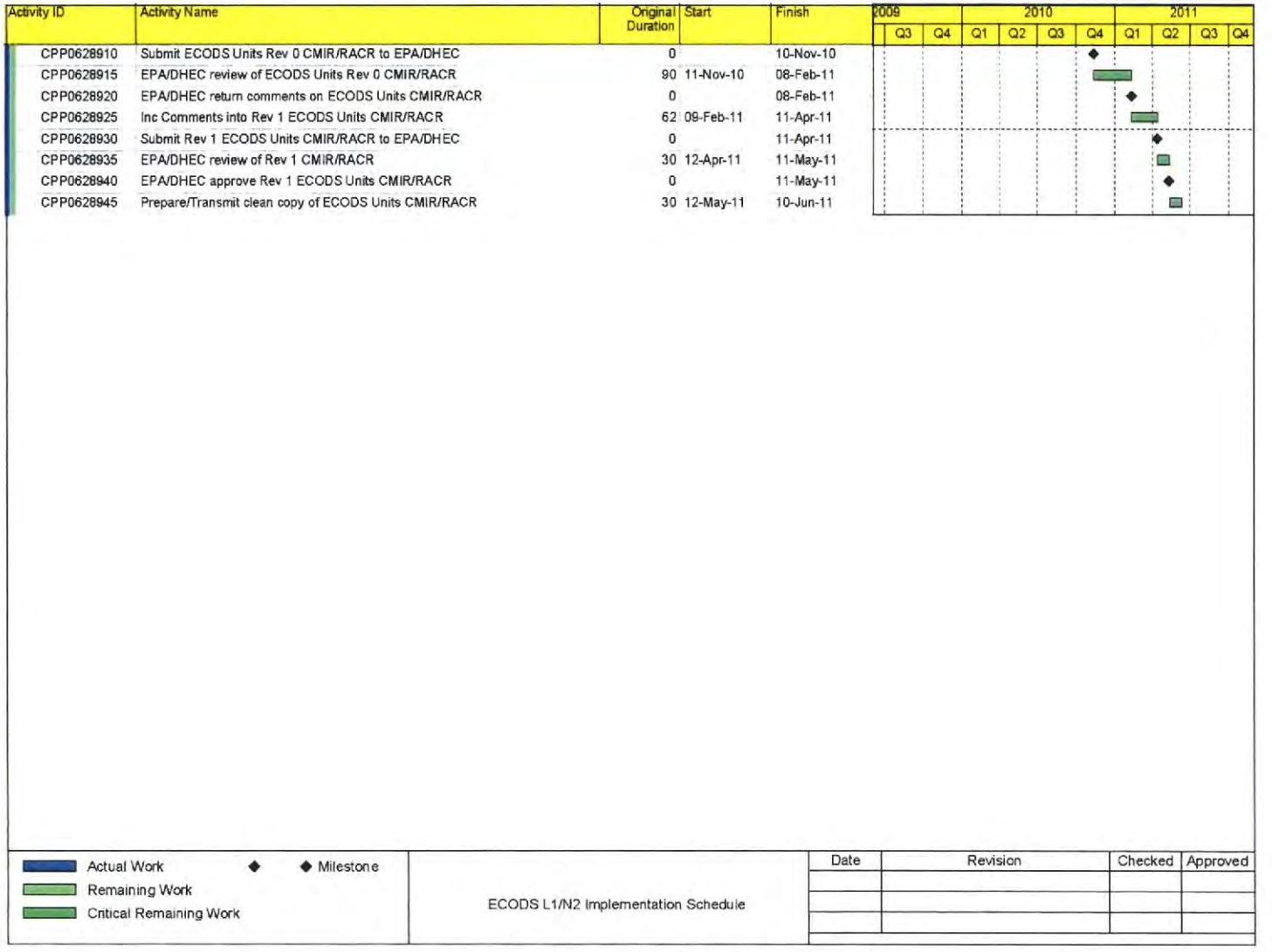


Figure 13. Post-ROD Implementation Schedule *(Continued/End)*

Table 1. Summary of ARARs for ECODS L-1, N-2, P-2, and R-1A, -1B, and -1C

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Chemical			
40 Code of Federal Regulations (CFR) 122 National Pollutant Discharge Elimination System (NPDES) or SC R.61-9 Water Pollution Control Permits SC R.61-9	Applicable	Regulates discharges of pollutants from any point source into waters of the U.S. and SC.	Applicable if water from the site will be discharged onto land or into streams, rivers, or lakes
40 CFR 268 Land Disposal Regulations	To Be Considered	Identifies land disposal restrictions and specifies treatment standards for specified waste.	Applicable to hazardous waste if discharged outside of the site.
Action			
40 CFR 50.6 National Primary and Secondary Ambient Air Quality Standards	Applicable	The concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 $\mu g/m^3$ (annual arithmetic mean) or 150 $\mu g/m^3$ (24-hour average concentration)	Dust suppression will likely be required to minimize dust emissions during construction/remedial action.
SC R.61-62.6 Control of Fugitive Dust or Particulate Matter	Applicable	Regulates fugitive particulate emissions.	Dust suppression will likely be required to minimize dust emissions during construction/remedial action.
SC R 72-300 Standards for Stormwater Management and Sediment Reduction	Applicable	Stormwater management and sediment control plan for land disturbances.	Approximately 25 acres of land will be disturbed during the action.
40 CFR 257-258 Disposal of Nonhazardous Waste	Applicable	Governs the management of (sanitary and construction/demolition) non-hazardous waste	Sanitary waste may be produced from remedial action
Location			
16 USC 460 Endangered Species Act of 1973	Applicable	The remedial action must be conducted in a manner to conserve endangered or threatened species.	There are threatened and endangered species at the SRS.
16 USC 2901 to 2911 Fish and Wildlife Conservation Action	Applicable	The remedial action must be conducted in a manner to protect fish or wildlife.	This remedial action has the potential to affect wildlife in the vicinity of the ECODS.
16 USC 703-712 Migratory Bird Treaty Act	Applicable	The remedial action must be conducted in a manner that minimizes impacts to migratory birds and their habitats.	Migratory bird populations may be present in the vicinity of the ECODS.

Table 2. Summary of Comparative Analysis Against the Nine Criteria

Criterion	Alternative 1	Alternative 2	Alternative 3
	No Action	Institutional Controls	Removal and Offsite Disposal
Overall Protection of Human Health and the Environment			
Protection of Human Health	Not Protective	Protective	Protective; Protects human receptors by removing contaminant sources
Protection of the Environment	Not Protective	Protective	Protective; Protects ecological receptors by removing contaminant sources
Compliance with ARARs			
Chemical-Specific	Not Applicable	Achieves Chemical-Specific ARARs	Achieves Chemical-Specific ARARs
Location-Specific	Not Applicable	Achieves Location-Specific ARARs	Achieves Location-Specific ARARs
Action-Specific	Not Applicable	Achieves Action-Specific ARARs	Achieves Action-Specific ARARs
Long-Term Effectiveness and Permanence			
Magnitude of Residual Risks	Risks remain unchanged, not protective	Risks are reduced to acceptable levels by controlling exposure.	No residual risk
Adequacy of Controls	Not Adequate	Adequate	Adequate
Permanence	Not Permanent	Permanent	Permanent
Reduction of Toxicity, Mobility, or Volume Through Treatment			
Treatment Process	None	None	None; removal and disposal
Degree of Expected Reduction in Toxicity, Mobility, or Volume	None	No reduction through treatment	No reduction through treatment
Short-Term Effectiveness			
Risk to Remedial Workers	Not applicable; no remedial action involved.	None	Moderate; Risks from excavation and transportation; controlled through safety plans
Risk to Community	Not applicable; no remedial action involved.	None	Minimal risks associated with waste handling and transportation
Risk to Environment	Not applicable; no remedial action involved.	None	Land disturbance controlled through permit, requiring runoff and erosion control
Estimated Time Frame to Achieve RAOs or concentration-based RGs	Does not achieve RAOs/RGs	1 month	6 months

Table 2. Summary of Comparative Analysis Against the Nine Criteria *(Continued/End)*

Criterion	Alternative 1	Alternative 2	Alternative 3
Implementability			
Availability of Materials, Equipment, and Skilled Labor	Not Applicable	Straightforward; no specialized materials, equipment, and labor required	Straightforward; standard earthwork equipment available
Ability to Construct and Operate the Remedial Technology	Not Applicable	Not Applicable	Straightforward
Ability to Obtain Permits/Approvals from Agencies	Not Applicable	Readily implemented	Permits readily obtained
Ease of Undertaking Additional Actions	Compatible	Compatible	Compatible
Time to Implement	Readily implementable	1 month	6 months
Cost each ECOD			
Total Present-Worth Costs (L-1)	**$0**	**$190,920**	**$841,282**
Total Present-Worth Costs (N-2)	**$0**	**$190,920**	**$1,564,598**
Total Present-Worth Costs (P-2)	**$0**	**$190,920**	**$1,219,925**
Total Present-Worth Costs (R-1A, -1B, -1C)	**$0**	**$190,920**	**$1,232,638**
Total Cost for OU	**$0**	**$763,680**	**$4,858,443**

Table 3. Comparative Ranking of Alternatives against the Nine Criteria

Alternative	Overall Protection of Human Health and the Environment	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost	Overall Ranking (range 1 - 20)
1 - No Action	No	No	NA	1	NA	1	5	$0	7
2 - Institutional Controls (each ECODS)	Yes	4	Yes	4	1	5	5	$190,920	19
2 - Total Cost for Entire OU								$763,680	
3 - Removal and Offsite Disposal (L-1)	Yes	5	Yes	5	5	3	4	$841,282	22
3 - Removal and Offsite Disposal (N-2)	Yes	5	Yes	5	5	3	4	$1,564,598	22
3 - Removal and Offsite Disposal (P-2)	Yes	5	Yes	5	5	3	4	$1,219,925	22
3 - Removal and Offsite Disposal (R-1A, -1B, -1C)	Yes	5	Yes	5	5	3	4	$1,232,638	22
3 - Total Cost for Entire OU								$4,858,443	
Note: Numeric range 1 - 5, where 1 = worst and 5 = best									

Table 4. Land Use Controls for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C

Type of Control	Purpose of Control	Duration	Implementation	Affected Areas[a]
1. Property Record Notices[b]	Provide notice to anyone searching records about the existence and location of contaminated areas.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	All waste management areas and other areas where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
2. Property record restrictions[c]: A. Land Use B. Groundwater	Restrict use of property by imposing limitations. Prohibit the use of groundwater.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Drafted and implemented by USDOE upon any transfer of affected areas. Recorded by USDOE in accordance with state law at County Register of Deeds office.	All waste management areas and other areas where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
3. Other Notices[d]	Provide notice to city &/or county about the existence and location of waste disposal and residual contamination areas for zoning/planning purposes.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	All waste management areas and other areas where hazardous substances are left in place at levels requiring land use and/or groundwater restrictions.
4. Site Use Program[e]	Provide notice to worker/developer (i.e., permit requestor) on extent of contamination and prohibit or limit excavation/penetration activity.	As long as property remains under USDOE control	Implemented by USDOE and site contractors Initiated by permit request	Remediation systems, all waste management areas, and areas where levels requiring land use and / or groundwater restrictions.
5. Physical Access Controls[f] (e.g., fences, gates, portals)	Control and restrict access to workers and the public to prevent unauthorized access.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Controls maintained by USDOE.	At select locations throughout SRS.
6. Warning Signs[g]	Provide notice or warning to prevent unauthorized uses.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Signage maintained by USDOE.	At select locations throughout SRS

Table 4. Land Use Controls for the ECODS L-1, N-2, P-2, and R-1A, -1B, -1C *(Continued/End)*

Type of Control	Purpose of Control	Duration	Implementation	Affected Areas[a]
7. Security Surveillance Measures	Control and monitor access by workers/public.	Until the hazardous substances associated with the unit no longer pose an unacceptable risk under unlimited exposure and unrestricted use.	Established and maintained by USDOE Necessity of patrols evaluated upon completion of remedial actions.	Patrol of selected area throughout SRS, as necessary.

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

APPENDIX A — Responsiveness Summary

Responsiveness Summary

The 45-day public comment period for the Statement of Basis/Proposed Plan for ECODS L-1, N-2, P-2, and R-1A, -1B, -1C began on June 25, 2009 and ended on August 8, 2009. No comments were received from the public.

APPENDIX B — Detailed Cost Estimate

Alternative 2
Institutional Controls
For Each ECOD L-1, N-2, P-2, R-1A, -1B, -1C
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost	
Direct Capital Costs					
Institutional Controls					
Posting of Warning Signs	10	ea	$50	$500	
Land Use Control Implementation Plan	1	ea	$5,000	$5,000	
Deed Restrictions	1	ea	$5,000	$5,000	
Subtotal - Direct Capital Cost				$10,500	*
Mobilization/Demobilization	25%	of subtotal direct capital		$2,625	*
Site Preparation/Site Restoration	25%	of subtotal direct capital		$2,625	*
Total Direct Capital Cost	(sum of * items)			**$15,750**	
Indirect Capital Costs					
Engineering & Design	18%	of direct capital		$2,835	
Project/Construction Management	25%	of direct capital		$3,938	
Health & Safety	5%	of direct capital		$788	
Overhead	30%	of direct capital		$4,725	
Contingency	20%	of direct capital		$3,150	
Total Indirect Capital Cost				**$15,435**	
Total Estimated Capital Cost				**$31,185**	
Direct O&M Costs	3.9% discount rate for costs > 30 years duration[1]				
Annual Costs	30 years O&M			*Years 2008 - 2038*	
Access Controls	1	ea	$500	$500	
Annual Inspections / Maintenance	1	ea	$2,000	$2,000	
Subtotal - Annual Costs				$2,500	
Present Worth Annual Costs (3.9% Discount Rate)				$43,760	
Five Year Costs	6				
Remedy Review	1	ea	$15,000	$15,000	
Subtotal - Five Year O&M Costs				$15,000	
Present Worth Five Year Costs				$48,572	
Total Present Worth Direct O&M Cost				**$92,332**	
Indirect O&M Costs					
Project/Admin Management	26%	of direct O&M		$24,006	
Health & Safety	2%	of direct O&M		$1,847	
Overhead	30%	of direct O&M		$27,700	
Contingency	15%	of direct O&M		$13,850	
Total Present Worth Indirect O&M Cost				**$67,403**	
Total Estimated Present Worth O&M Cost				**$159,735**	
TOTAL ESTIMATED COST				**$190,920**	

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

Total Cost for All ECODS is $763,680