008913

United States Department of Energy
Savannah River Site

Record of Decision
Remedial Alternative Selection for the Central Shops Sewage Sludge Lagoon (CSSL) (080-24G) Operable Unit (U)

WSRC-RP-2000-4189

Revision 1

January 2002

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

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

DISCLAIMER

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

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

CENTRAL SHOPS SEWAGE SLUDGE LAGOON (CSSL) (080-24G)
OPERABLE UNIT (U)

WSRC-RP-2000-4189
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Savannah River Site
Aiken, South Carolina

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Westinghouse Savannah River Company LLC
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Savannah River Operations Office
Aiken, South Carolina

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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

Central Shops Sewage Sludge Lagoon (CSSL) (080-24G) Operable Unit (OU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU-68

Savannah River Site

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Identification Number: SC1890008989

Aiken, South Carolina

United States Department of Energy

The Central Shops Sewage Sludge Lagoon (CSSL) Operable Unit (OU) is 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). The media associated with CSSL OU are soil and groundwater.

Statement of Basis and Purpose

This decision document presents the selected remedy for the CSSL OU located at the SRS in Barnwell County, South Carolina. The remedy was chosen in accordance with CERCLA, as amended by Superfund Amendments Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record File for this site.

The State of South Carolina concurs with the selected remedy.

Description of the Selected Remedy

The selected remedy for the CSSL OU is No Action. Although contamination was identified, the contaminant concentrations do not pose risk to human health and the environment. The CSSL OU is capable of supporting unrestricted use without any remedial actions.

The South Carolina Department of Health and Environmental Control (SCDHEC) has modified the Savannah River Site RCRA Permit to incorporate the No Action remedy for the CSSL OU.

Statutory Determination

The Selected Remedy of No Action is protective of human health and the environment because contaminant concentrations are such that the site can support unrestricted use. The only Federal and State requirements that are applicable or relevant and appropriate (ARARs) to the site are those promulgated standards against which a cleanup determination is made. Since contaminant concentrations at the site fall below levels requiring action for unrestricted use, the No Action remedy satisfies ARARs. The No Action remedy does not require any cost expenditure since it is already protective. Further, permanent solutions to contamination or alternative treatment technologies do not require consideration since the site is capable of supporting unrestrictive use in its current condition.

Section 300.430(f)(ii) of the NCP requires that five-year reviews of the Record of Decision (ROD) be performed if the remedial action results in hazardous substances, pollutants, or contaminants remaining at the OU. Since no remedial action is required to support unrestricted use, five-year reviews are not required at this site. Since the selected remedy for the CSSL OU is No Action, a Certification Checklist is unnecessary.

1/30/02
Date

Greg Rudy
Manager
US Department of Energy, Savannah River Operations Office
Owner and Co-Operator

6/11/02
Date

Richard D. Green
Division Director
Waste Management Division
US Environmental Protection Agency - Region IV

7/10/02
Date

R. Lewis Shaw
Deputy Commissioner
Environmental Quality Control
South Carolina Department of Health and
Environmental Control

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION

CENTRAL SHOPS SEWAGE SLUDGE LAGOON (CSSL) (080-24G)
OPERABLE UNIT (U)

WSRC-RP-2000-4189
Revision 1
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Savannah River Site
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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
bls	below land surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CMCOC	contaminant migration constituent of concern
COC	constituent of concern
CSSL	Central Shops Sewage Sludge Lagoon
COPC	constituent of potential concern
CSM	conceptual site model
FFA	Federal Facility Agreement
ft	feet
gal	gallon
HSWA	Hazardous and Solid Waste Amendments
in	inch
km	kilometer
L	liter
m	meter
MCL	maximum contaminant level
mi	mile
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
OU	operable unit
PCB	polychlorinated biphenyl
PCi/g	picocurie per gram
PCi/L	picocurie per liter

PTSM	principal threat source material
RAO	remedial action objective
RBC	risk-based concentrations
RCRA	Resource Conservation and Recovery Act, 1976
RGO	remedial goal options
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments Reauthorization Act
SB/PP	Statement of Basis/Proposed Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulation
SRS	Savannah River Site
SVOC	semi-volatile organic constituent
TAL	target analyte list
TCL	target compound list
TIC	tentatively identified compound
USC	unit specific constituent
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
VOC	volatile organic constituent
WSRC	Westinghouse Savannah River Company LLC

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

Unit Name, Location, and Brief Description

Central Shops Sewage Sludge Lagoon (CSSL) (080-24G) Operable Unit (OU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU-68

Savannah River Site

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Identification Number: SC1890008989

Aiken, South Carolina

United States Department of Energy

Savannah River Site (SRS) occupies approximately 800 square km (310 square mi) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 40 km (25 mi) southeast of Augusta, Georgia, and 32 km (20 mi) south of Aiken, South Carolina.

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

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists CSSL (080-24G) operable unit (OU) as a Resource Conservation and Recovery Act (RCRA)/ Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit requiring further evaluation. The CSSL OU required further evaluation through an investigation process that integrates and combines the

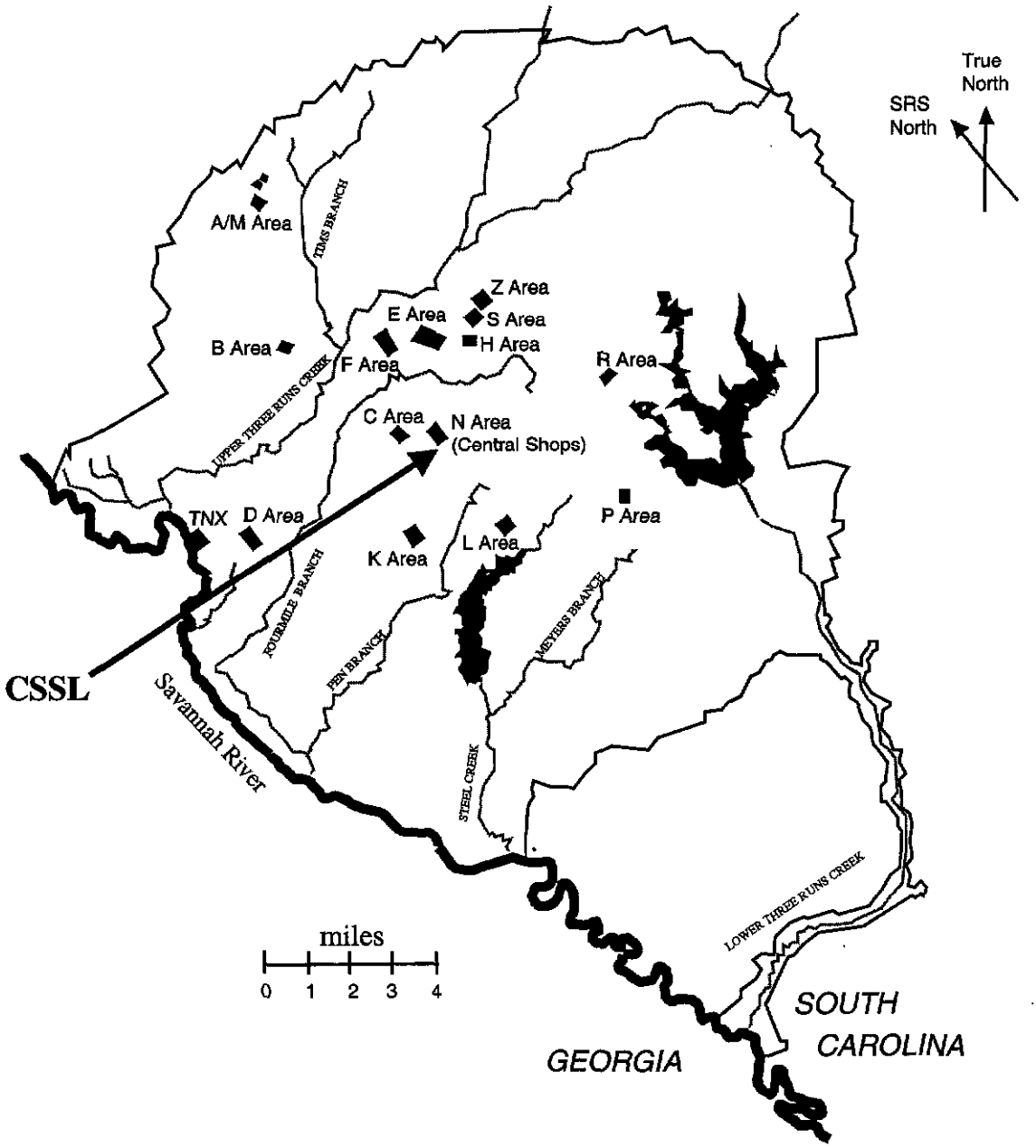


Figure 1. **Location of the Central Shops Sewage Sludge Lagoon (080-24G) at the Savannah River Site**

RCRA Facility Investigation (RFI) process with the CERCLA Remedial Investigation (RI) process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

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

Hazardous waste materials handled at SRS are managed under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities require South Carolina Department of Health and Environmental Control (SCDHEC) operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from SCDHEC, which was most recently renewed on September 5, 1995. Module IV of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List (NPL). The inclusion created a need to integrate the established RFI program with CERCLA requirements to provide for a focused environmental program.

In accordance with Section 120 of CERCLA 42 USC Section 9620, US DOE has negotiated an FFA (FFA 1993) with the United States Environmental Protection Agency (US EPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. US DOE functions as the lead agency for remedial activities at SRS, with concurrence by the US EPA - Region IV and the SCDHEC.

Operable Unit Operational and Compliance History

The CSSL and its associated components (see Figures 2 and 3) are located less than 0.4 km (0.25 mi) southwest of the industrial area of Central Shops (N Area) in the central portion of SRS. Initially, the CSSL OU included a buried sanitary sewer line (used to deliver sanitary waste to the lagoon), the lagoon, and an overflow ditch. The lagoon was an unlined earthen pit with approximate dimensions of 18.3 m (60 ft) by 12.2 m (40 ft) by 3.0 m (10 ft) deep. The lagoon was surrounded by an earthen berm and was equipped with an overflow pipe that fed into an asphalt-lined overflow ditch to the south. The overflow ditch led to a Carolina Bay approximately 213 m (700 ft) away. From the early 1950s to the mid 1970s, the lagoon was used as an oxidation pond for the treatment of sanitary waste from Central Shops facilities delivered via the sanitary sewer line (du Pont 1985). From the mid-1970s until closure in 1988, the lagoon was used as a sewage sludge disposal location. At peak operation, the lagoon received approximately 378,500 L (100,000 gal) of sludge per year with a typical solids content of two to five percent. The lagoon received mostly digester sludge from package wastewater treatment plants from across SRS, as well as some miscellaneous wastewater and septic tank cleanouts. The underground sewer line that was used to deliver sanitary waste to the lagoon was equipped with three manholes located at various points along its length as shown in Figure 2. An

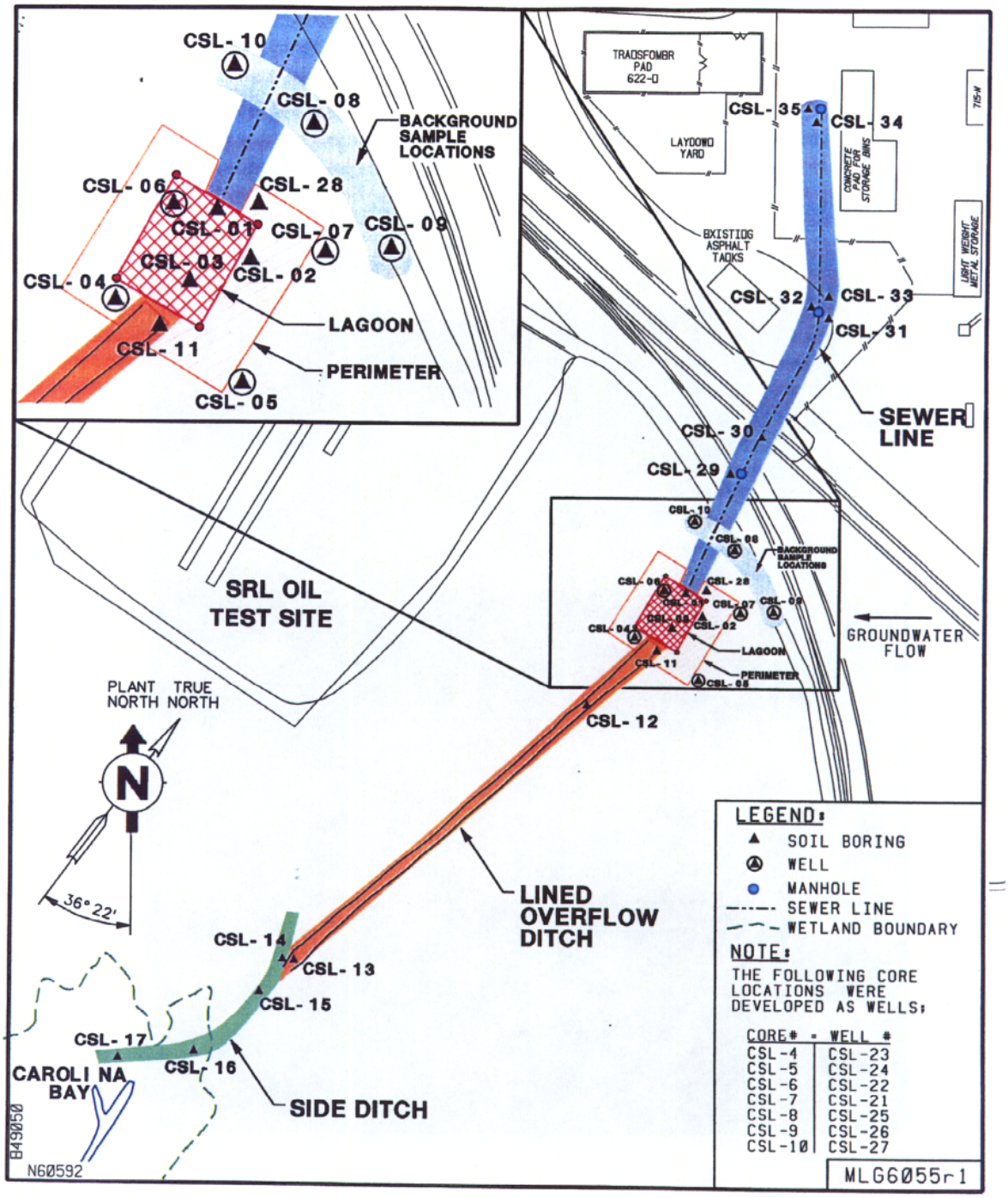


Figure 2. Map of the CSSL

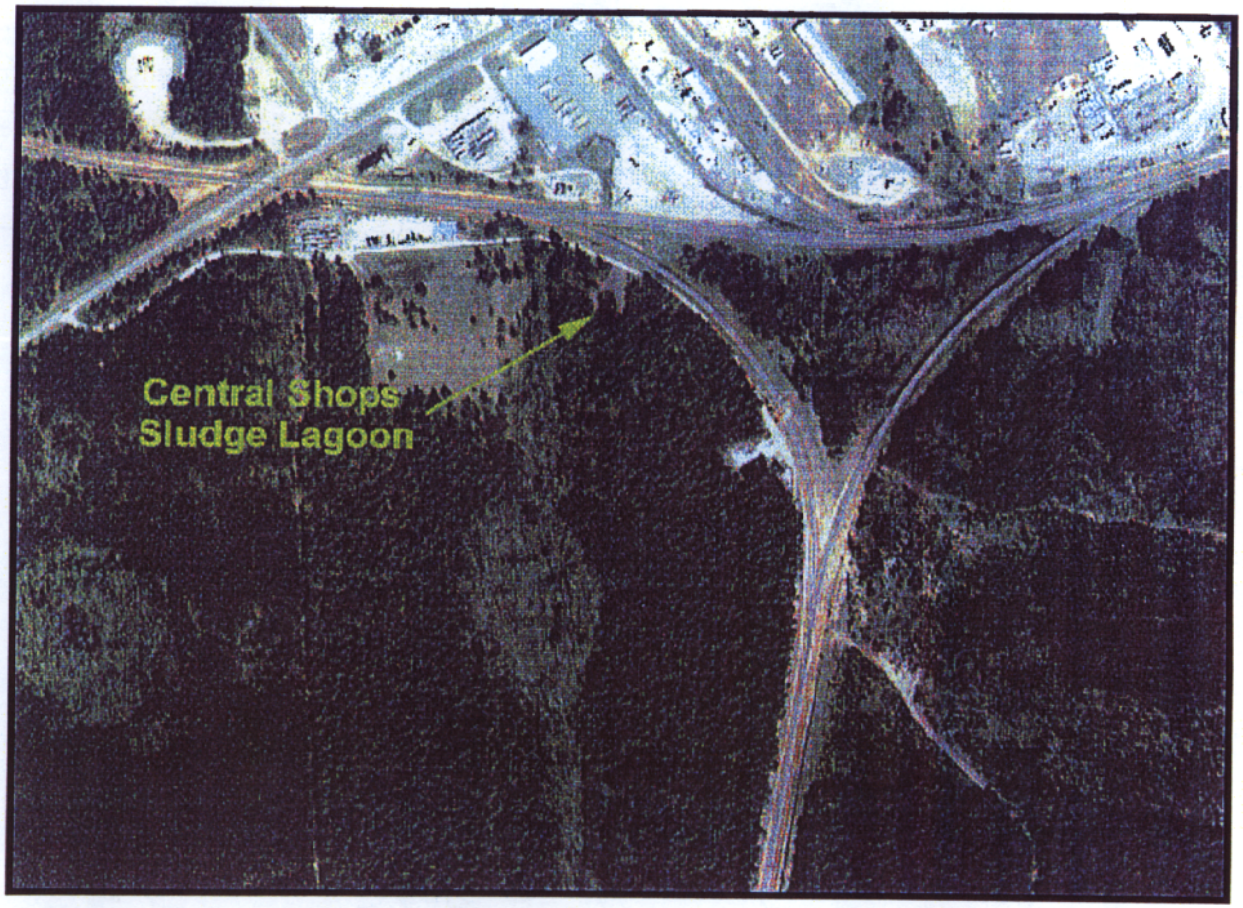


Figure 3. Historical Aerial Photograph of the CSSL

asphalt spill totaling approximately 760 L (200 gal) is reported to have occurred near the central manhole located near the existing asphalt tanks (see Figure 2) in the early 1970s. However, inspection of the manhole and visual reconnaissance of the sewer line conducted during field investigations of February 12, 1998, revealed no traces of asphalt.

The lagoon was closed in October 1988. All primary source material in the lagoon and 0.6 m (2 ft) of underlying soil were removed from the unit at the time of closure. The earthen berm was pushed into the lagoon, and the unit was backfilled to grade and seeded to establish vegetative cover. The underground sewer line was capped at both ends after removal of two manholes and abandoned in place. The third manhole located adjacent to the asphalt storage area was filled with grout in June 2000.

The Carolina Bay located approximately 213 m (700 ft) away from the lagoon, received runoff from other sources as shown in Figure 4 in addition to overflows from the lagoon.

Currently, the following six subunits are associated with CSSL OU (Figure 2):

- Sewer Line, approximately 183 m (600 ft) long
- Lagoon, 18.3 m (60 ft) by 12.2 m (40 ft) by 3.0 m (10 ft) deep
- Lagoon Perimeter, approximately a 30 m (100 ft) wide strip, from the edge of the lagoon, along its periphery
- Overflow Ditch, approximately 213 m (400 ft) long
- Carolina Bay area downgradient of the Savannah River Laboratory Oil Test Site Ditch and CSSL overflow ditch confluence

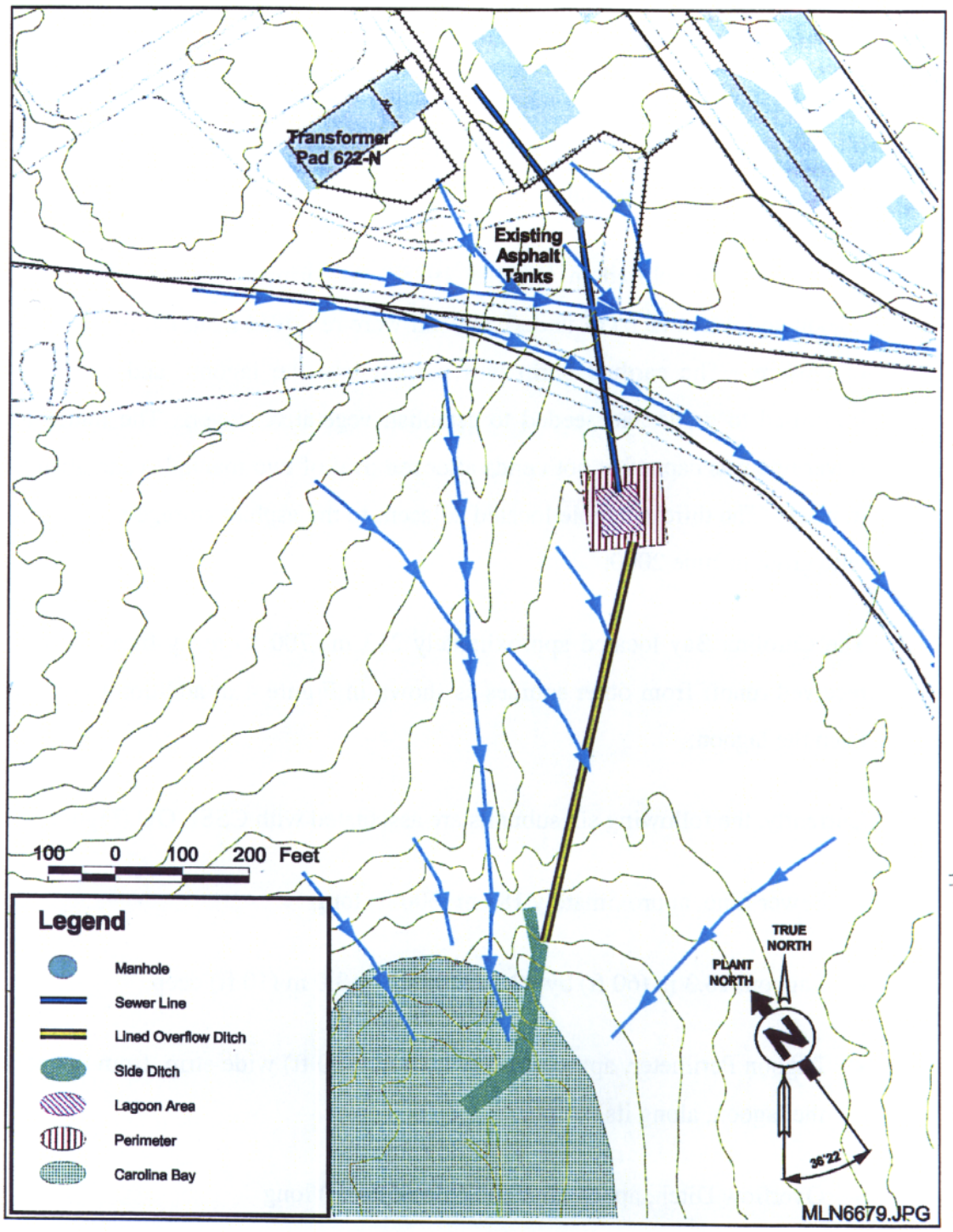


Figure 4. Stormwater Drainage Pathways at the CSSL

- Groundwater

The groundwater flows to the west as shown in Figure 2.

The lagoon and its perimeter and the area overlying the abandoned sewer line to the north are covered by grass. Adjacent areas around and beyond the lagoon perimeter along the overflow ditch and in the Carolina Bay are wooded areas as is apparent from Figure 3.

An unimproved dirt road and two railroad spurs are located approximately 22.9, 30.5, and 61.0 m (75, 100, and 200 ft), respectively, to the northeast of the lagoon. The abandoned sewer line leads from the north and runs south under the railroad tracks and road to the northern corner of the lagoon. Facilities that are near the sewer line include an asphalt tanks area, a road maintenance equipment storage area, and a transformer storage area.

The overflow ditch leading from the lagoon to the Carolina Bay is approximately 1.8 m (6 ft) deep and 3.0 m (10 ft) wide at the upper part and decreases in size and depth downstream. Trees and leaf litter are present in the overflow ditch. The length of the overflow ditch was originally covered by asphalt. Several fire breaks used in controlled forest burns intersect the overflow ditch and act as small channels for stormwater runoff that feeds into the overflow ditch.

Central Shops and the CSSL are on a nearly flat and broad interfluvial area. The land surface in the vicinity of the CSSL slopes gently to the south (Figure 5). Ground surface elevations range from approximately 87.8 m (288 ft) above msl at the upper part of the sewer line to approximately 85.6 m (281 ft) above msl at the lagoon, to approximately 83.8 m (275 ft) above msl at the Carolina Bay. The lagoon was restored to grade in 1988, but subsequent subsidence has resulted in a

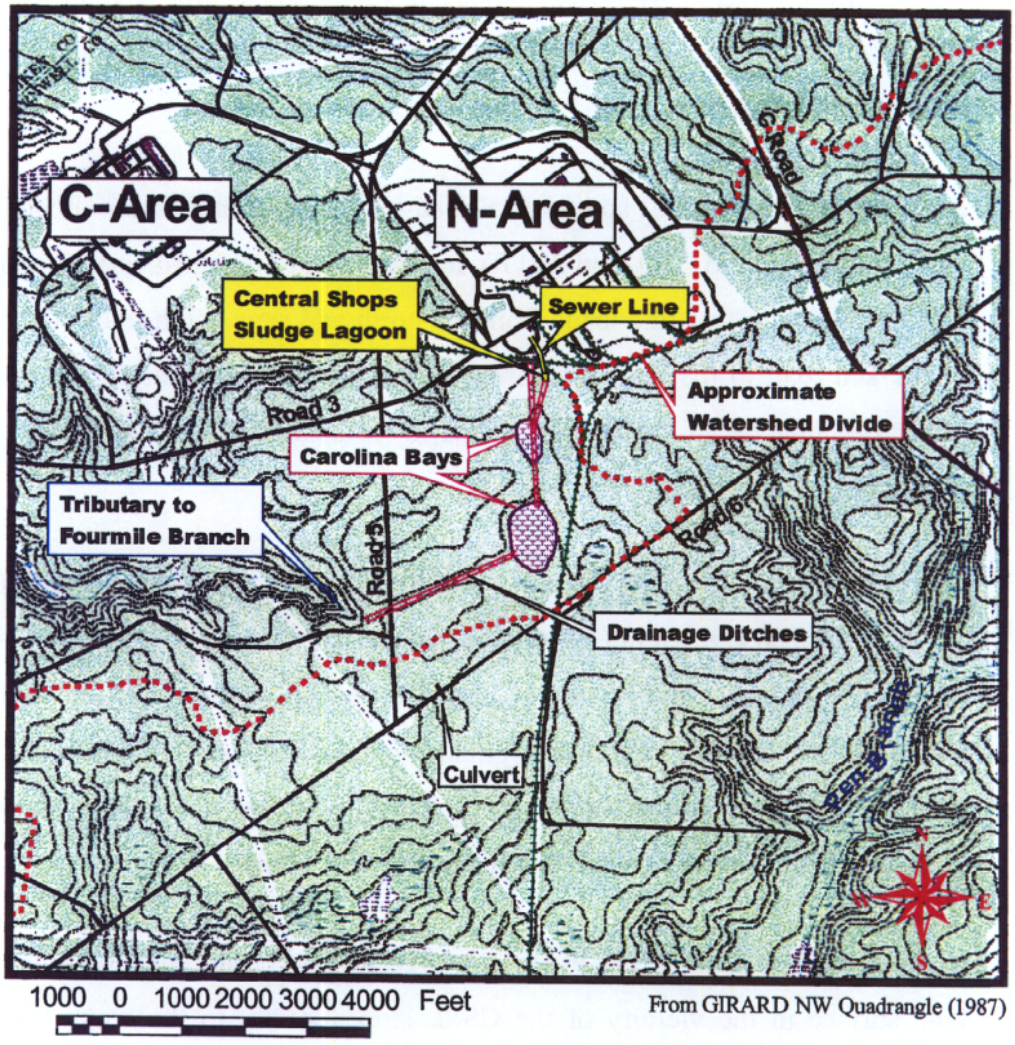


Figure 5. Topographic Map

slight depression. The surface depression is approximately 0.3 m (1 ft) deep at the center.

The CSSL is within the Fourmile Branch watershed to the northwest (Figure 6). There is no surface water at the CSSL or in the overflow ditch except during rainfall events when stormwater runoff is present. There are no aquatic or semiaquatic habitats at the CSSL or in the associated overflow ditch. Drainage ditches along the road and railroads upgradient of the CSSL prevent stormwater runoff generated in the industrial area of Central Shops from flowing over the CSSL. Little surface water runoff is generated within the boundaries of the CSSL because subsidence that occurred after the lagoon was filled to grade in 1988 has resulted in a shallow depression approximately 0.3 m (1 ft) deep. As a result, most rainwater at the CSSL infiltrates the ground, particularly during light rainfall events. The small amount of surface water runoff that is generated at the CSSL generally occurs during heavy rainfall events when the depression overflows. This water flows down the overflow ditch south of the unit where it mixes with surface water runoff from adjacent areas before emptying into a Carolina Bay approximately 213 m (700 ft) downstream of the CSSL. At the uppermost extent of the overflow ditch, all runoff in the overflow ditch originates from the CSSL. With increasing distance down the overflow ditch, the fraction of runoff from other areas increases as small drainages along fire breaks feed into the overflow ditch. Figure 4 illustrates the drainage pathways at CSSL.

The Carolina Bay is dry for much of the year, but up to 0.5 m (1.5 ft) of water may accumulate during wet periods of the year. The Carolina Bay was dry during field visits in December 1998 and September 1999. Another Carolina Bay is approximately 427 m (1,400 ft) downgradient; it typically contains water throughout the year.

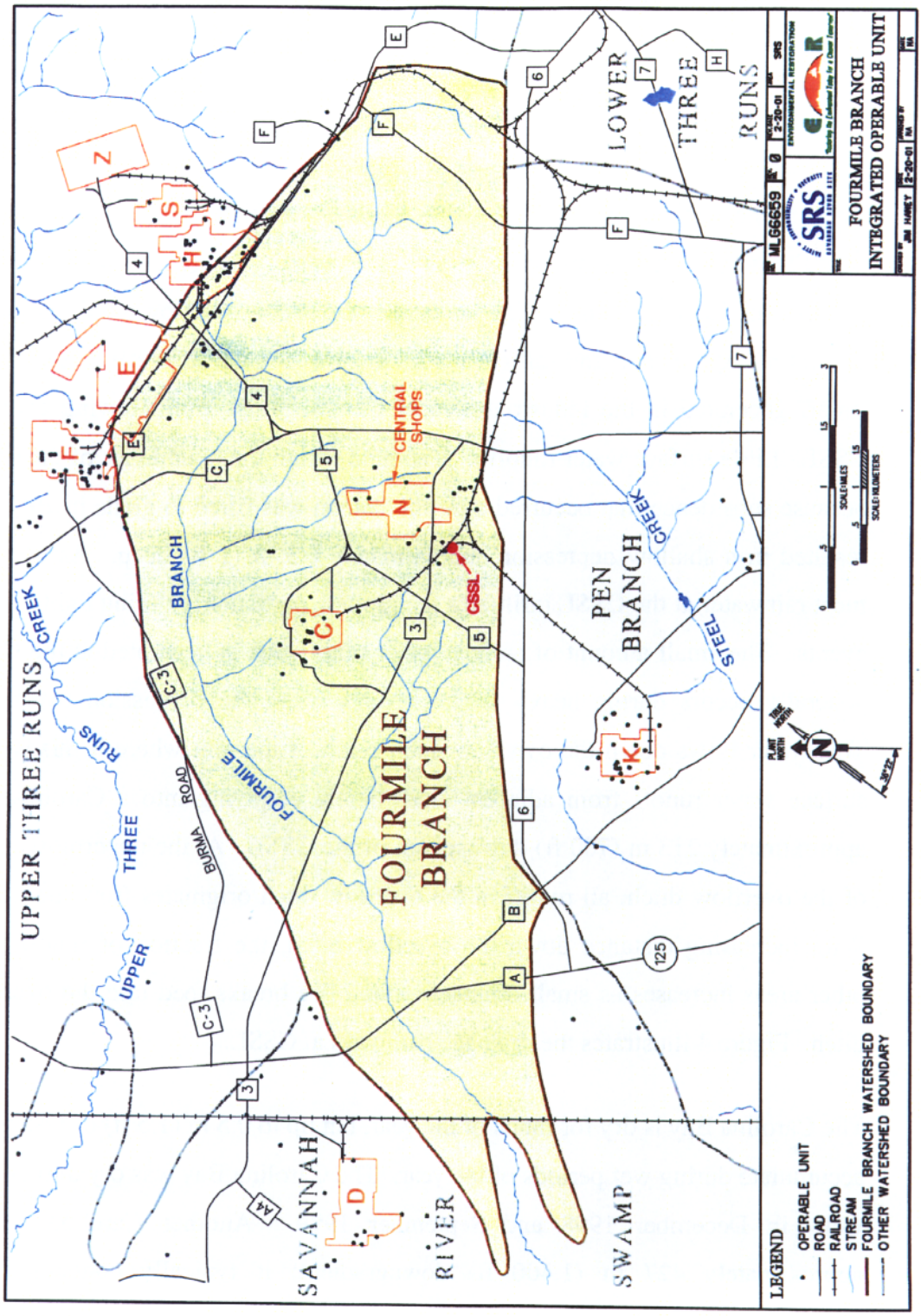


Figure 6. Integrated Operable Unit Map

Figure 7 depicts the land use for the CSSL and its vicinity. It also shows the locations of the major roads, railroad tracks, buildings and land use features of the CSSL and the surrounding areas including SRS Areas C and N. As is apparent from Figure 7, the Central Shops Area (N Area) consists of an active industrial area surrounded by an industrial buffer zone. The Savannah River Site Future Use Project Report (US DOE 1996) presents SRS stakeholders-preferred future land use recommendations. Although contaminant concentrations are at levels such that the property can support unrestricted land use, the site remains non-nuclear industrial. The CSSL is located approximately 229 m (750 ft) outside of the active industrial area of the Central Shops. It is within the industrial land use buffer zone near its outer boundary.

There exists no wetlands and no water wells at or near the vicinity of CSSL OU that can be used as a drinking water source.

No threatened or endangered and sensitive species exist in the vicinity of the CSSL OU.

Removal Action

The lagoon was closed in 1988. During closure, all primary source material (sludge), as well as 0.6 m (2 ft) of underlying soil, was removed from the lagoon and disposed of at two land application sites in accordance with the SCDHEC Construction Permit #13,173. The surrounding berm was used as backfill. As part of the lagoon closure, the sewer line was capped at both ends, and abandoned in place. Two of the three manholes were also removed. In June 2000, the third manhole (the manhole located adjacent to the existing asphalt storage area) was grouted for safety purposes and abandoned in place. Consequently, no primary source material is present in the sewer line.

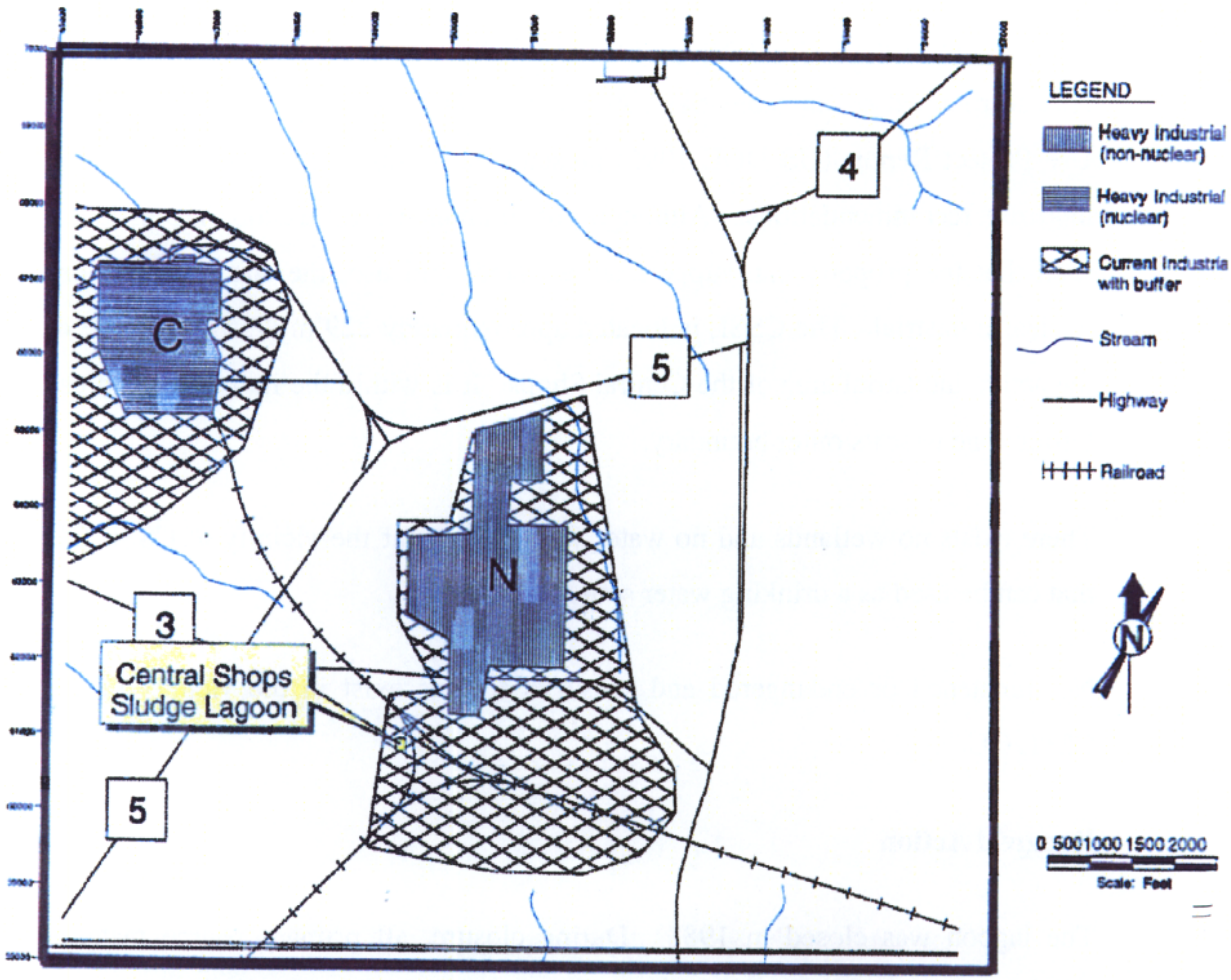


Figure 7. Land Use Map

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require that the public be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA 42 USC Sections 9613 and 9617. These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternatives for addressing the CSSL OU soil and groundwater. The Administrative Record File must be established at or near the facility at issue. The SRS Public Involvement Plan (US DOE 1994) is designed to facilitate public involvement in the decision-making process for permitting, closure, and selection of remedial alternatives. The SRS Public Involvement Plan addresses requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969 (NEPA). SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. The Statement of Basis/Proposed Plan (SB/PP) for the Central Shops Sewage Sludge Lagoon (CSSL) Operable Unit, Revision 0 (WSRC 2000), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the CSSL OU.

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

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

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

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

The South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
8901 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

Lower Savannah District Environmental Quality Control Office
218 Beaufort Street, Northeast
Aiken, South Carolina 29802
(803) 641-7670

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

The SB/PP 45-day public comment began on August 8, 2001, and ended on September 21, 2001. A Responsiveness Summary, prepared to address any comments received during the public comment period, is provided in Appendix A of this Record of Decision (ROD). It will also be available in the final RCRA permit.

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

RCRA/CERCLA Programs at SRS

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

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

The steps of this process are iterative in nature and include decision points which require concurrence between US DOE as owner/manager, US EPA and SCDHEC as regulatory oversight agencies, and the public (see Figure 8).

Operable Unit Remedial Strategy

The overall strategy for addressing the CSSL OU was to (1) characterize the waste unit, delineating the nature and extent of contamination and identifying the media

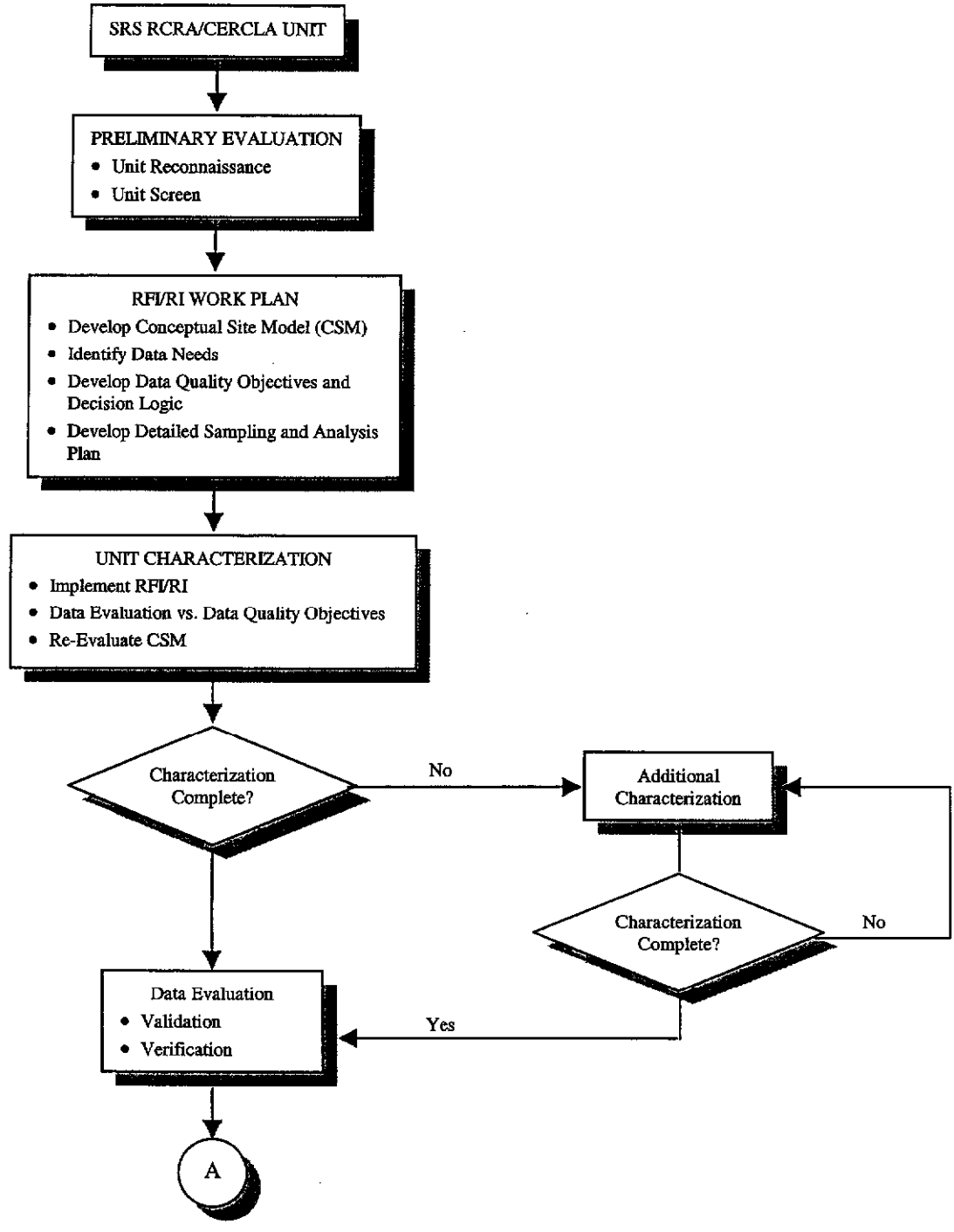


Figure 8. RCRA/CERCLA Logic and Documentation

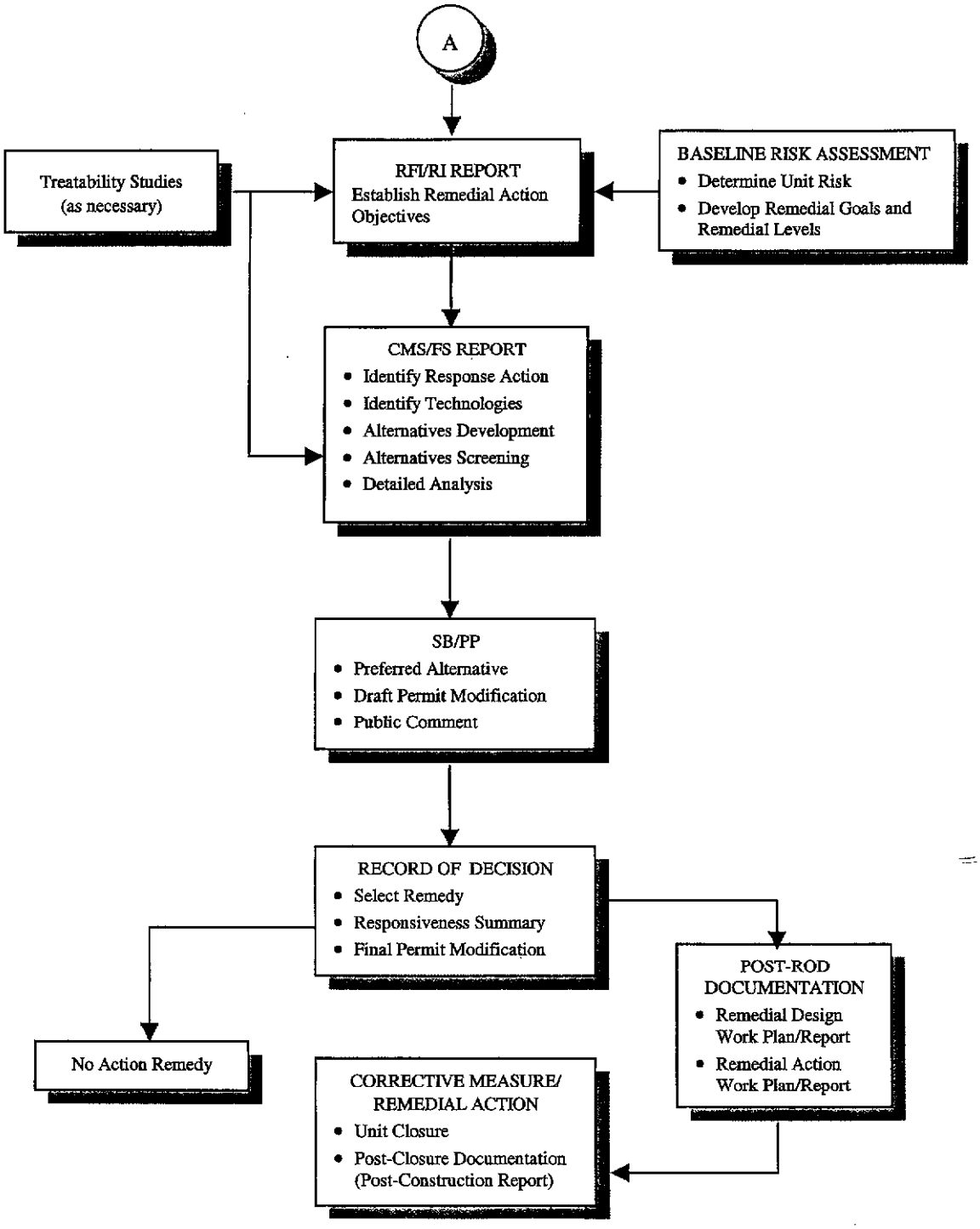


Figure 8. RCRA/CERCLA Logic and Documentation (Cont'd.)

of concern (perform the RFI/RI); (2) perform a Baseline Risk Assessment (BRA) to evaluate media of concern, constituents of concern (COCs), exposure pathways, and characterize potential risks; and (3) evaluate and perform a final action to remediate, as needed, the identified media of concern.

The CSSL is an OU located within the Fourmile Branch Watershed that is not a "source control" unit (i.e., the unit does not contain contaminated soil that may act as a source of future contamination to the groundwater through leaching). In addition to the CSSL unit, there are many OUs within the watershed. All the source control and groundwater OUs located within the watershed will be evaluated to determine their impacts, if any, to the associated streams and wetlands.

SRS will manage all source control units to prevent impact to the watershed. Upon disposition of all source control and groundwater OUs within the watershed, a final comprehensive ROD for the Fourmile Branch Watershed will be pursued.

The previous field investigations and soil sampling conducted in the 1980s and 1998/1999 during the development of the RFI/RI with BRA for the CSSL OU (WSRC 2001) have indicated that the groundwater has not been impacted by the CSSL OU. The results of the contaminant fate and transport analysis also did not reveal any potential for impact to the groundwater. The groundwater does not outcrop in the vicinity of the CSSL OU.

The risk assessments have also documented that there is no unacceptable risk to human health and the environment associated with the CSSL OU. There is no principal threat source material (PTSM) present at the unit requiring cleanup activities.

Hence, a No Action remedy is recommended for the unit. This means no further action will be taken and the CSSL OU will remain in its present condition. Therefore, the CSSL will have no impact on the response actions of other OUs at SRS.

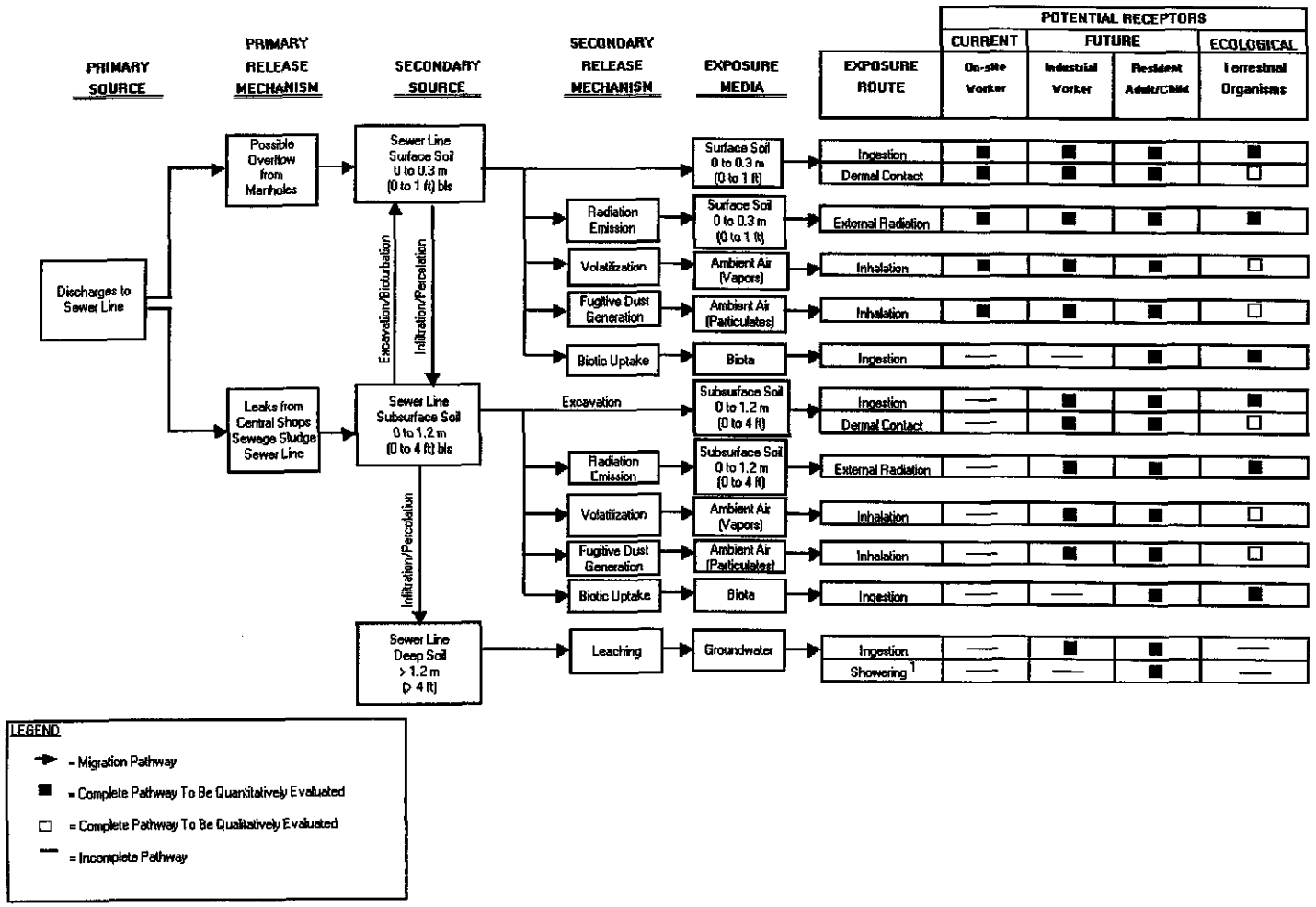
V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model for the CSSL OU

The review of the historical data and lagoon's operational history, discussed in Section II, revealed that the primary source of contamination associated with the CSSL OU included sanitary wastewater and wastewater sludge disposed of in the lagoon. The field observation and preliminary characterization conducted in the 1980s further revealed that at the CSSL OU, the secondary sources of contamination included surface, subsurface, and deep soils along the sewer line, within the lagoon boundaries, and at the area surrounding the lagoon; and surface and subsurface soil in the overflow ditch and Carolina Bay. The secondary sources are the materials contaminated by contact or mixing with wastewater or sludge as they are contiguous with the primary contamination source areas but contain lower levels of unit-related constituents. For the purpose of developing Conceptual Site Models (CSMs), the secondary sources of contamination have been grouped with subunits and are referred to as the Sewer Line, Lagoon, Lagoon Perimeter, Overflow Ditch, and Carolina Bay. Figures 9 through 13 show the CSMs for these subunits, respectively.

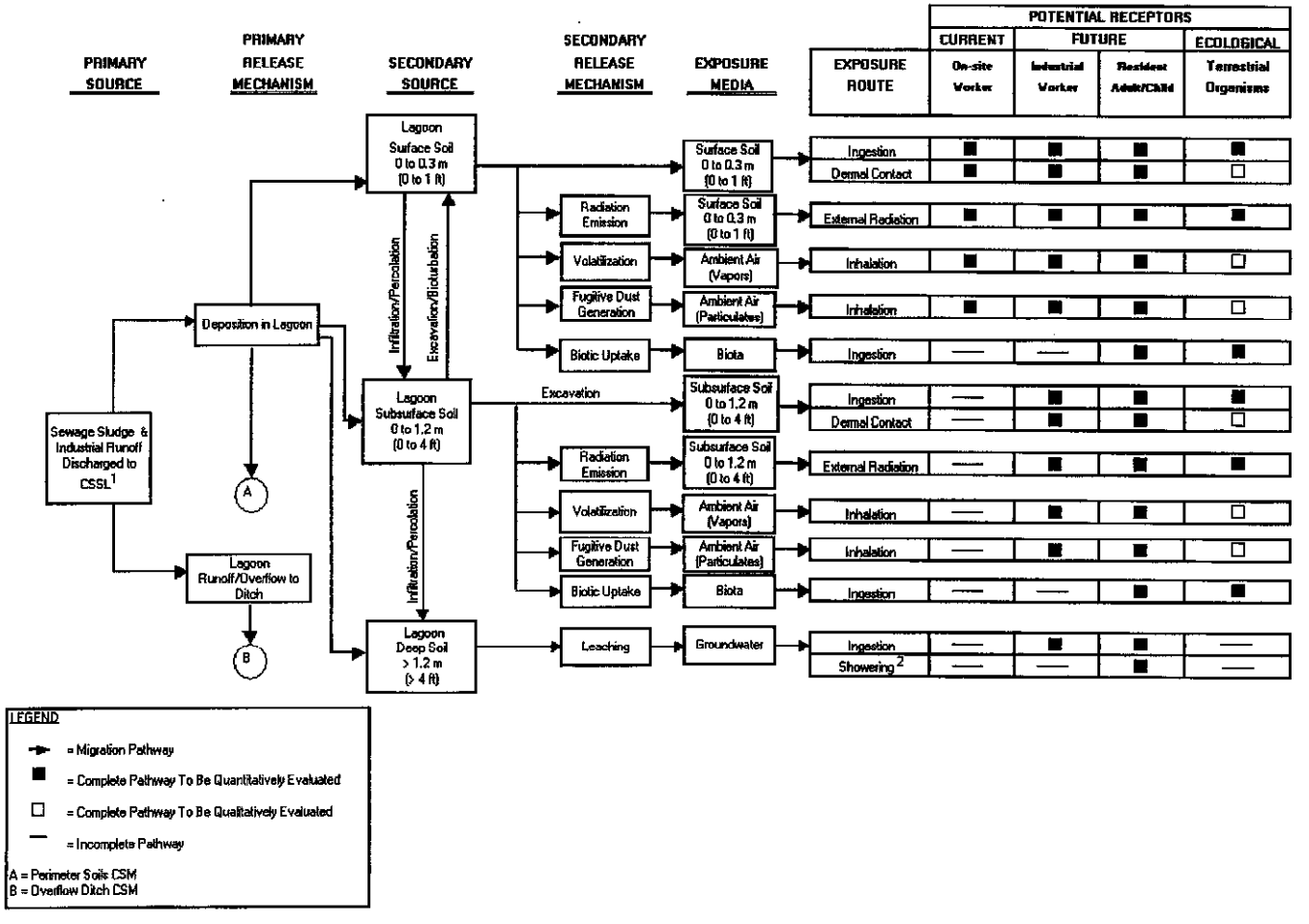
Primary Source and Release Mechanisms

The primary release mechanisms for the CSSL OU are presented in Figures 9 through 13. Wastes may have been released from the primary sources of contamination by the following mechanisms:



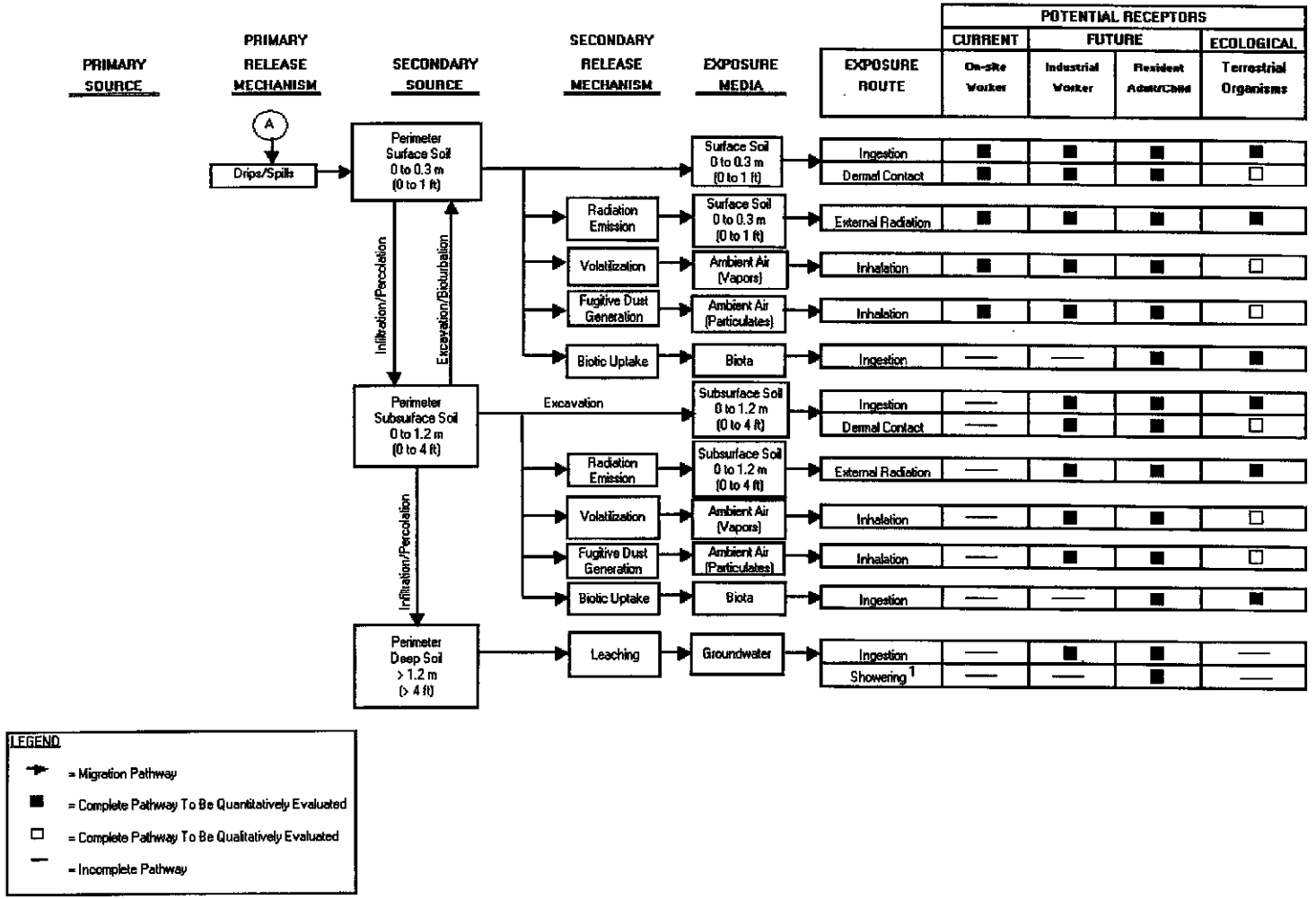
1. The showering scenario includes both dermal contact and inhalation pathways.

Figure 9. Conceptual Site Model for CSSL Sewer Line Subunit



1. All primary source material and 2 ft of underlying soil was removed from the lagoon in 1988. The lagoon was subsequently backfilled with berm/fill.
2. The showering scenario includes both dermal contact and inhalation pathways.

Figure 10. Conceptual Site Model for CSSL Lagoon Subunit



1. The showering scenario includes both dermal contact and inhalation pathways.

Figure 11. Conceptual Site Model for CSSL Lagoon Perimeter Subunit

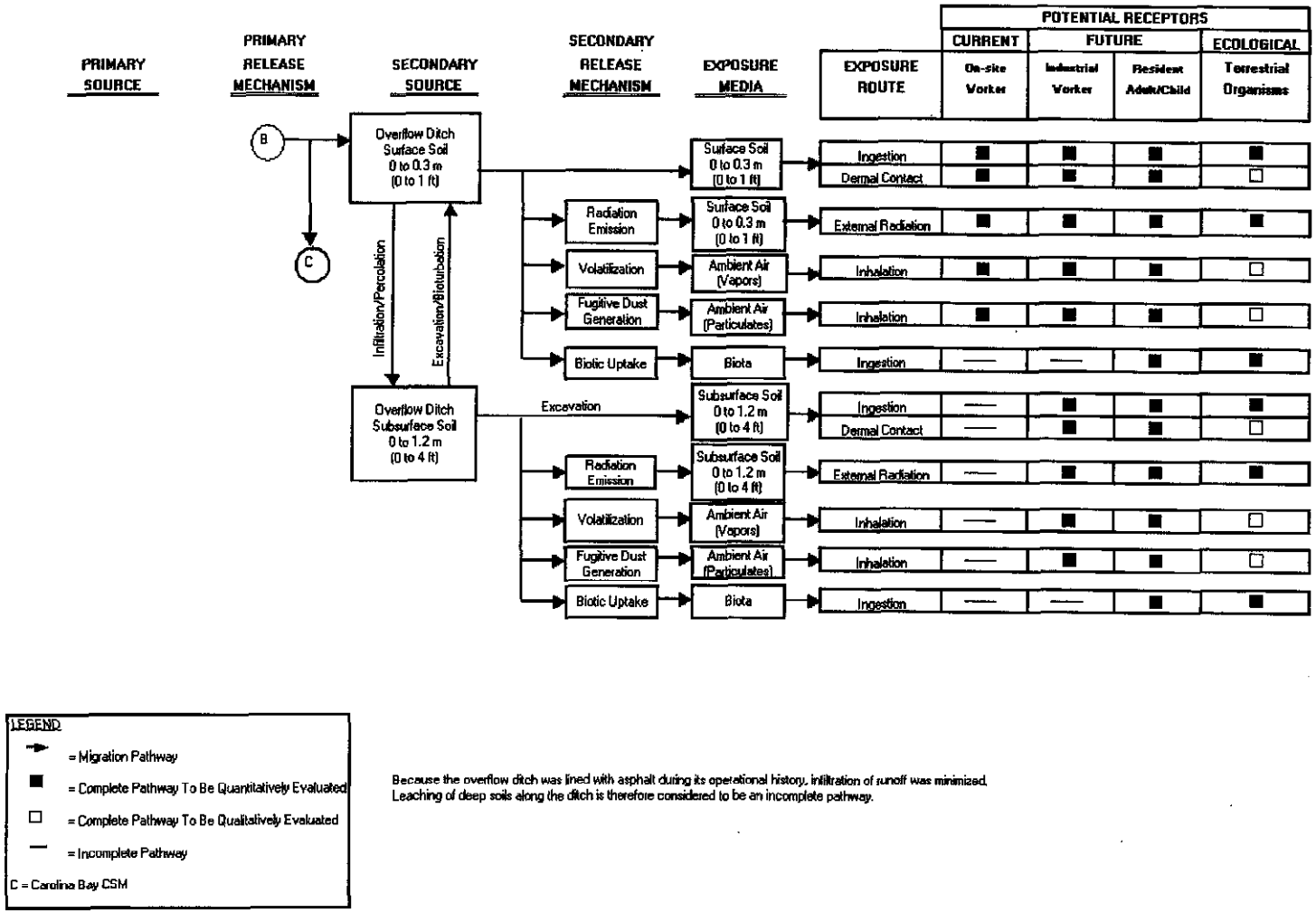
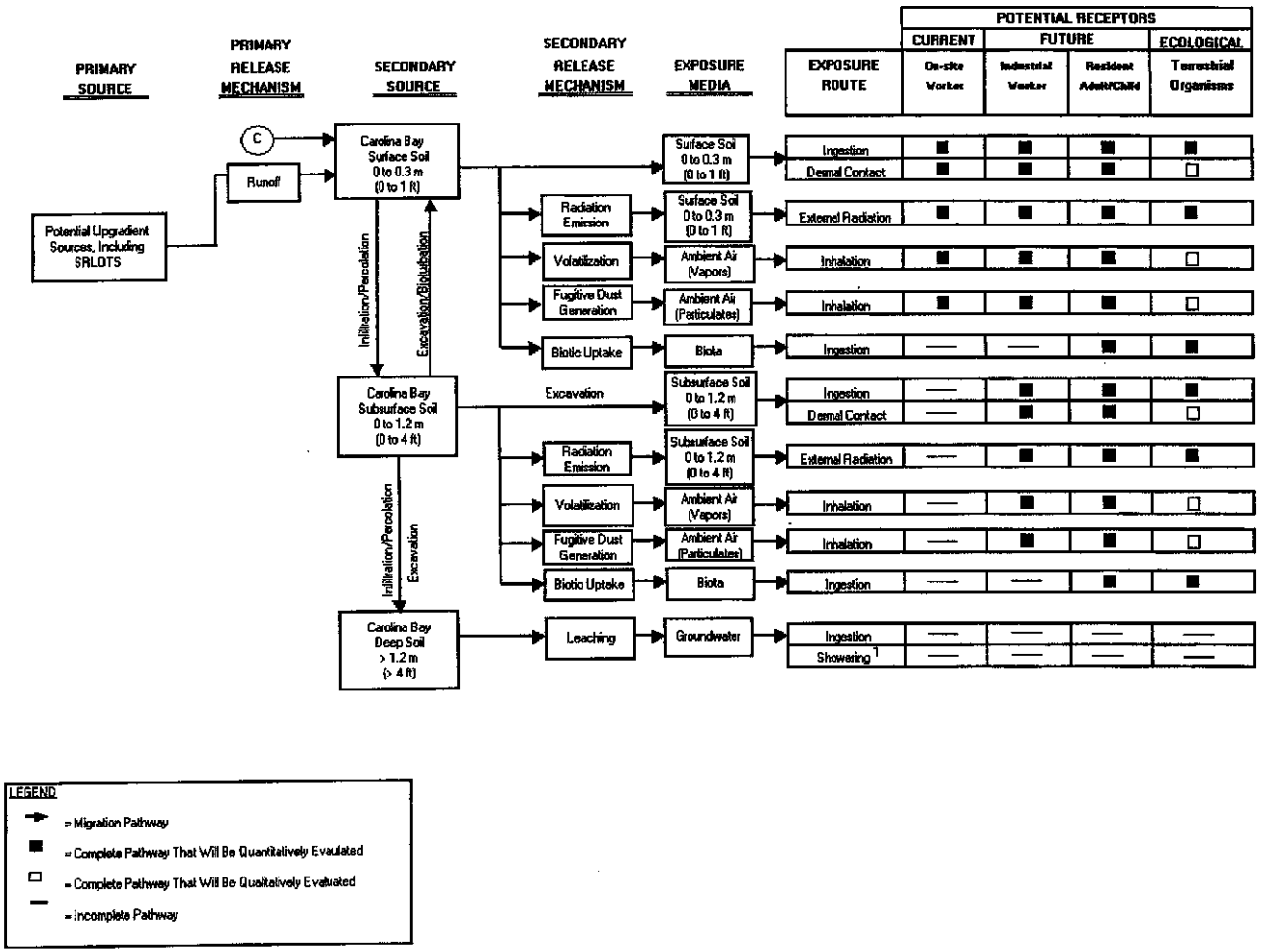


Figure 12. Conceptual Site Model for CSSL Lagoon Overflow Ditch Subunit



1. The showering scenario includes both dermal contact and inhalation pathways.

Figure 13. Conceptual Site Model for CSSL Carolina Bay Subunit

- leakage from the sewer line
- overflow of the sewer line through a manhole
- deposition within the lagoon
- deposition from spills on the berm and on soil surrounding the CSSL (the berm was subsequently placed into the lagoon during closure activities)
- overflow discharge of lagoon/stormwater runoff from the CSSL to the overflow ditch during operation
- runoff from the CSSL or other upgradient sources to the Carolina Bay

Secondary Source and Release Mechanisms

Environmental media impacted by release of source contamination may include the following:

- surface (0 to 0.3 m [0 to 1 ft]) below land surface (bls), subsurface (0.3 to 1.2 m [1 to 4 ft]) bls, and deep soil (>1.2 m [>4 ft]) bls along the sewer line
- surface, subsurface, and deep soil within the lagoon
- surface, subsurface, and deep soil at the perimeter of the lagoon
- surface and subsurface soil in the overflow ditch
- surface and subsurface soil at the Carolina Bay

There is no surface water in the vicinity of the CSSL OU; therefore, surface water and sediment sampling were not conducted as part of this investigation.

Infiltration/percolation and excavation/bioturbation allow for contaminant transfer between surface and subsurface soil. Infiltration/percolation allows for contaminant transfer from surface/subsurface to deep soil.

Because the overflow ditch was lined with asphalt during its operational history, infiltration of runoff was minimized. Deep soils along the ditch are therefore not identified as a secondary source. The overflow ditch terminates at a Carolina Bay which also receives runoff from other areas as shown in Figure 4.

Environmental media may serve as a reservoir via chemical bonding and biotic uptake. Contaminants may be released from secondary sources by the following mechanisms:

- infiltration/percolation
- excavation/bioturbation
- radiation emissions
- release of volatile constituents from the soil at the sewer line, within the lagoon, at the perimeter of the lagoon, in the overflow ditch, and at the Carolina Bay
- generation of contaminated fugitive dust by wind or other surface soil disturbance at the sewer line, within the lagoon, the perimeter of the lagoon, in the overflow ditch, and at the Carolina Bay
- biotic uptake occurring at the sewer line, within the lagoon, the perimeter of the lagoon, in the overflow ditch, and at the Carolina Bay

Exposure Pathways, Exposure Routes, and Receptors

Contact with contaminated environmental media creates the exposure pathways to human health and ecological receptors that are evaluated in the BRA. These include contact with some or all of the following at the sewer line, within the lagoon, at the perimeter of the lagoon, in the overflow ditch and at the Carolina Bay:

- ambient air (vapors and particulates)
- surface, subsurface, and deep soil
- groundwater
- biota

The exposure route is the way a receptor comes into contact with a contaminant. Exposure routes for human and ecological receptors at the CSSL OU include the following:

- inhalation of volatile emissions and particulate emissions from soil
- ingestion of contaminated media, including soil and homegrown produce
- dermal contact with soil
- ingestion of and/or showering with groundwater
- exposure to external radiation from soil

Human and ecological receptors are identified based on physical and operational knowledge of the site, local demographics, and known and hypothetical land uses. Human receptors may include the following:

- current on-unit workers occasionally in the area
- future industrial workers
- future on-unit residents (adult and child)

Ecological receptors may include the following:

- terrestrial receptors (soil-dwelling invertebrates, herbivorous mammals, worm-eating and insectivorous birds/mammals, and top predators)

Media Assessment

The RFI/RI with BRA for the Central Shops Sewage Sludge Lagoon (U), WSRC-RP-99-4068, Revision 1.1 (WSRC 2001), contains the detailed information and analytical data for all the investigations conducted and samples taken in the media assessment of the CSSL OU. This document is available in the Administrative Record File (see Section III of this document).

The investigations conducted to characterize CSSL OU soils and groundwater are briefly described in the following sections:

Soil Investigations

The soil investigations of the CSSL OU were conducted in several stages. Table 1 summarizes all the environmental activities conducted at the CSSL OU. The activities include the following:

- Background Investigation

Table 1. History of Environmental Activities Performed at the CSSL

Investigation Dates	Media Sampled	Location	Number of Borings or Samples
May 1980	EP TOX analysis of sludge	Within CSSL	6 samples
November 3, 1983	EP TOX analysis of sludge	Within CSSL at inlet and on opposite side of lagoon	4 samples
November 1, 1986	Sludge and soil	Within the CSSL	2 locations (5 depths/ location, up to 1.2 m [4 ft] below bottom of lagoon)
October 1987	Sludge, soil, and groundwater (temporary piezometers)	Within the CSSL and downgradient	• 1 boring within CSSL (at 0.6 m [2 ft] intervals to 3.2 m [10.5 ft]) • 3 downgradient borings (at 1.5 m [5 ft] intervals to 12.1 to 15.2 m [45-50 ft])
August 1988	Sludge/soil	Within CSSL	3 borings (at surface and at 2-ft intervals to 8 ft)
September/ October 1988	Lagoon closed and backfilled to grade with berm and clean fill. Prior to lagoon's closure sludge and 0.6 m (2 ft) of underlying soil were removed. Two of the three manholes (except the central manhole located adjacent to the asphalt storage area) were removed. The sewer line was capped at both ends and abandoned in place.		
February 6-7, 1989 (post-closure)	Soil	Within former CSSL location	2 borings (8 depth intervals/boring)
August 3, 1992	Soil gas	CSSL site and surrounding area	42 samples
November 18, 1997	Ecological field survey	CSSL	none
February 12, 1998	Visual reconnaissance of sewer line	Sewer line	none
December, 1998	GPR Survey	Along sewer Line	none
December 21, 1998-April 15, 1999	Soil and groundwater	Sewer line, CSSL and surrounding vicinity, overflow ditch, Carolina Bay and associated ditch, groundwater	• 8 borings along sewer line • 3 borings within CSSL • 4 borings around perimeter of CSSL • 3 background borings • 7 borings in overflow ditch, Carolina Bay and associated ditch • 7 wells installed
September 2, 1999	Ecological field survey	CSSL, overflow ditch, Carolina Bay	none
November 1999	Groundwater	Groundwater monitoring wells at CSSL	7 wells sampled
June 2000	The central manhole located adjacent to the asphalt storage area was grouted and its accessibility restricted.		

- 1999, three background soil borings were advanced; each location was sampled from 0 to 0.3 m (0 to 1 ft) bls; 0.3 to 1.2 m (1 to 4 ft) bls; and

- every 0.9 m (3 ft) continuously to 4 m (13 ft) bls. Beyond the 4 m (13 ft) depth, samples were collected at 1.5 m (5 ft) intervals to the water table at approximately 11.2 m (37 ft) bls.

- Primary Source Investigation

  - May 1980, six lagoon sludge samples were collected for Extraction Procedure Toxicity Test (EP TOX) analysis of sludge

  - November 1983, four sludge samples were collected within the lagoon for EP TOX analysis of sludge

  - September/October 1988, the lagoon was closed and backfilled. Prior to closure, all primary source material (sludge) as well as underlying soil (down to 0.6 m [2 ft]) was removed.

- Secondary Source Investigation

  - November 1986, two soil sludge samples within the lagoon were collected at a depth of 1.2 m (4 ft) below the bottom of the lagoon.

  - October 1987, four borings (for sludge soil sample analysis) were sampled, one boring within CSSL at 0.6 m (2 ft) intervals to 3.2 m (10.5 ft) bls and three downgrade borings at 1.5 m (5 ft) intervals to 13.7 to 15.2 m (45 to 50 ft) interval bls

- August 1988, three borings for sludge/soil samples within CSSL sampled; samples were collected at the surface and at 0.6 m (2 ft) intervals down to 2.4 m (8 ft) bls

- February 1989 (post-closure), four months after the lagoon's closure and backfilling (the lagoon was closed and backfilled in September/October 1988), two locations were sampled below the former location of the bottom of the lagoon. Split-spoon samples were collected from 2.7 to 13.7 m (9 to 45 ft) bls at eight depth intervals for each boring

- 1998/1999 Investigation, soil and groundwater samples were collected from the sewer line (eight borings); CSSL (three borings); lagoon perimeter (four borings); overflow ditch (two borings); and Carolina Bay and associated ditch (five borings)

Along the sewer line, a hand auger was used to collect samples at depths of 0 to 0.3 m (0 to 1 ft) and 0.3 to 1.2 m (1 to 4 ft) bls at eight locations. After that, a split spoon was used to collect samples every 1.5 m (5 ft) until two consecutive samples screened below the US EPA soil screening levels (CSSLs) for pesticides and/or two times (2x) the SRS background for metals or to the water table.

At the CSSL, samples were collected from 0 to 0.3 m (0 to 1 ft) bls and every 0.9 m (3 ft) continuously to a depth of 4 m (13 ft) bls at three locations. Below 4 m (13 ft), samples were collected every 1.5 m (5 ft) down to the water table 11.6 m (38 ft) bls.

At the perimeter of the CSSL, boring samples were collected from 0 to 0.3 m (0 to 1 ft) bls and every 0.9 m (3 ft) continuously to a depth of 4 m (13 ft) bls at four locations. Below 4 m (13 ft), samples were collected every 1.5 m (5 ft) down to the water table. After sampling, these borings were then completed as groundwater monitoring wells.

At the overflow ditch leading from the CSSL (see Figure 2), samples were collected from 0 to 0.3 m (0 to 1 ft) bls and 0.3 to 1.2 m (1 to 4 ft) bls at two locations. All samples were collected by hand auger.

At the Carolina Bay and the adjoining Savannah River Laboratory Oil Test Site ditch soil samples were collected from 0 to 0.3 m (0 to 1 ft) bls and 0.3 to 1.2 m (1 to 4 ft) bls at four locations.

The 1998/1999 investigation also included radiological screenings using radionuclide indicators including gross alpha, nonvolatile beta, and gamma spectroscopy.

- Additional Investigations

  - August 3, 1992, soil gas survey of the CSSL and the surrounding area (42 samples)

  - November 18, 1997, ecological field survey

  - February 12, 1998, visual reconnaissance of sewer line

  - December 1998, ground penetrating radar (GPR) survey along sewer line

  - September 2, 1999, ecological field survey of CSSL, overflow ditch, and Carolina Bay

All the soil samples collected (including the background samples) were analyzed for target compound list (TCL) volatile organic compounds (VOCs) with tentatively identified compounds (TICs); TCL semivolatile organic compounds (SVOCs) with TICs; target analyte list (TAL) inorganics (including cyanide); TCL pesticides and polychlorinated biphenyls (PCBs); and radiological indicators (gross alpha, nonvolatile beta, and gamma spectroscopy).

For radionuclide analyses, speciation was completed in accordance with the RFI/RI Work Plan for the Central Shops Sewage Sludge Lagoon (U), WSRC-RP-98-00044, Revision 1.1 (WSRC, 1999).

Groundwater Investigation

The groundwater was characterized through collection of samples from seven water table monitoring wells present in the CSSL. For well locations, see Figure 2. These wells were installed during 1998/1999 investigations at the locations of each background and lagoon perimeter soil boring. The wells were screened in the water table aquifer. One sample was collected from each well in April 1999. In addition, one sample of perched water was collected from a temporary well at well location CSL 21, see Figure 2. The samples were analyzed for the following: TAL inorganics (including cyanide); hexavalent chromium locations (CSL23 and 24 only); TCL volatiles and semivolatiles with TICs; TCL pesticides/PCBs; and radionuclide indicators (gross alpha, nonvolatile beta, gamma spectroscopy).

For radionuclide analyses, speciation was completed in accordance with the Work Plan (WSRC 1999).

Geotechnical Investigation

Six geotechnical samples were collected to evaluate the physical properties of the natural soil at the CSSL and to estimate seepage and percolation properties for contaminant transport modeling.

Geotechnical samples were collected at locations CSSL-04, -05, -06, -07, -09 and -10 (see Figure 2) at various depth intervals ranging from 5.1 to 14.6 m (17 to 48 ft) bls. The geotechnical samples were collected with a Shelby tube and were analyzed for the following physical parameters: porosity, falling head (horizontal

and vertical) permeability, moisture content, dry soil bulk density, soil particle density, cation exchange capacity, sieve analysis/hydrometer, total organic carbon, and pH.

Media Assessment Result

Soils

COCs associated with the CSSL OU soils were determined using standard SRS risk assessment protocols for the surface, subsurface, and deep soil exposure groups. Contaminant migration COCs (CMCOCs) were identified through contaminant fate and transport analyses using CSMs to assess the potential for adverse health effects to humans and the environment (for CSMs see Figures 9 through 13). The results of the characterization and assessment have been summarized in the RFI/RI/BRA report (WSRC 2001). Tables 2 through 6 provide the results from the screening process employed in determining the refined COCs to be retained for further remedial action for the Sewer Line, Lagoon, Lagoon Perimeter, Overflow Ditch, and Carolina Bay, respectively. The process involved the following steps. First, from the detected constituents, unit-specific constituents (USCs) were identified. USCs were determined by comparing each constituent concentration found in the soil against its respective twice average background concentration for all depth intervals. Secondly, the USCs were screened to reflect risk to human health or the environment and thereby determine preliminary COCs. The preliminary COCs, in addition to risk-based COCs also included applicable or relevant and appropriate requirements (ARAR)-based COCs, and CMCOCs. Risk based COCs were identified by CERCLA guidance. Finally, the preliminary COCs were carried into a formal uncertainty analysis and hence refined COCs were determined.

Table 2. Overview of the COC Screening Process-Sewer Line

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
		None		None			None	None	None
TAL Inorganics									
Aluminum	X								
Arsenic	X				X	X			
Barium	X								
Beryllium	X								
Chromium	X								
Cobalt	X								
Lead	X								
Magnesium	X								
Manganese	X		X		X				
Mercury	X								
Nickel	X								
Potassium	X								
Selenium	X								
Sodium	X								
Zinc	X								
TCL Semivolatiles									
2-Methylnaphthalene	X								
Acenaphthene	X								
Anthracene	X								
Benzo(a)anthracene	X				X				
Benzo(a)pyrene	X				X	X			
Benzo(b)fluoranthene	X				X				
Benzo (g,h,i)perylene	X								
Benzo(k)fluoranthene	X				X				
Bis(2-ethylhexyl) phthalate	X								
Chrysene	X				X				
Di-n-butylphthalate	X								
Dibenzo(a,h)anthracene	X				X				
Dibenzofuran	X								
Fluorathene	X								
Fluorene	X								
Indeno(1,2,3-c,d)pyrene	X				X				
N-Nitrosodiphenylamine	X								
Naphthalene	X								
Phenanthrene	X								
Pyrene	X								
TCL Volatiles									
2-Butanone(MEK)	X								
Carbon disulfide	X								
Vinyl acetate	X								

Table 2. Overview of the COC Screening Process-Sewer Line (Cont'd.)

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X								
gamma-chlordane	X								
p,p'-DDD	X								
p,p'-DDE	X								
p,p'-DDT	X								
Radionuclides									
Cesium-137	X				X	X			
Potassium-40	X				X	X			

USC Unit Specific Constituent
COC Constituent of Concern
ARAR COC Applicable or Relevant and Appropriate Requirement COC
CMCOPC Contaminant Migration Constituent of Potential Concern
COPC Constituent of Potential Concern
TAL Target Analyte List
TCL Target Compound List
PCBs Polychlorinated biphenyls

Table 3. Overview of the COC Screening Process-Lagoon

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
		None					None	None	None
TCL Inorganics									
Antimony	X								
Barium	X								
Beryllium	X								
Calcium	X								
Chromium	X								
Iron	X								
Lead	X								
Manganese	X		X	X	X				
Mercury	X								
Nickel									
Potassium									
Silver	X		X						
Sodium									
Vanadium	X								
Zinc	X								
TCL Semivolatiles									
Benzo(a)pyrene	X								
Benzo(k)fluoranthene									
Bis(2-ethylhexyl) phthalate	X								
Di-n-octylphthalate	X								
Fluorathene	X								
Phenanthrene	X								
Pyrene	X								
TCL Volatiles									
2-Butanone(MEK)	X								
Acetone	X								
Chlorobenzene	X								
Dichloromethane	X								
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X				X				
gamma-benzene	X								
gamma Chlordane	X								
hexachloride (Lindane)									
Radionuclides									
Cesium-137	X				X	X			
gross alpha	X								
Potassium-40	X				X	X			

USC	Unit Specific Constituent
COC	Constituent of Concern
ARAR COC	Applicable or Relevant and Appropriate Requirement COC
CMCOPC	Contaminant Migration Constituent of Potential Concern
COPC	Constituent of Potential Concern
TAL	Target Analyte List
TCL	Target Compound List
PCBs	Polychlorinated biphenyls

Table 4. Overview of the COC Screening Process- Lagoon Perimeter

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
		None				None	None	None	None
TAL Inorganics									
Arsenic	X								
Barium	X								
Beryllium	X								
Calcium	X								
Cobalt	X								
Copper	X								
Manganese	X		X	X	X				
Mercury	X								
Potassium	X								
Sodium	X								
Zinc	X								
TCL Semivolatiles									
Bis(2-ethylhexyl) phthalate									
TCL Volatiles									
2-Butanone(MEK)	X								
Acetone	X								
Dichloromethane	X								
Toluene	X								
Xylenes (total)									
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X								
Radionuclides									
Cesium-137	X				X				
gross alpha	X								
non-volatile beta	X								

USC	Unit Specific Constituent
COC	Constituent of Concern
ARAR COC	Applicable or Relevant and Appropriate Requirement COC
CMCOPC	Contaminant Migration Constituent of Potential Concern
COPC	Constituent of Potential Concern
TAL	Target Analyte List
TCL	Target Compound List
PCBs	Polychlorinated biphenyls

Table 5. Overview of the COC Screening Process-Overflow Ditch

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
		None	None	None			None	None	None
TAL Inorganics									
Aluminum	X				X				
Arsenic	X				X	X			
Barium	X								
Beryllium	X								
Cadmium	X								
Calcium	X								
Chromium	X								
Cobalt	X								
Copper	X								
Lead	X								
Cyanide	X								
Hexavalent Chromium	X								
Magnesium	X								
Mercury	X								
Potassium	X								
Selenium	X								
Silver	X								
Sodium	X								
Vanadium	X				X				
Zinc	X								
TCL Volatiles									
Acetone	X								
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X								
gamma-chlordane	X								
p,p' DDE	X								
Radionuclides									
Cesium-137	X				X	X			
Potassium-40	X				X	X			

USC	Unit Specific Constituent
COC	Constituent of Concern
ARAR COC	Applicable or Relevant and Appropriate Requirement COC
CMCOPC	Contaminant Migration Constituent of Potential Concern
COPC	Constituent of Potential Concern
TAL	Target Analyte List
TCL	Target Compound List
PCBs	Polychlorinated biphenyls

Table 6. Overview of the COC Screening Process-Carolina Bay

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
		None	None	None			None	None	None
TAL Inorganics									
Aluminum	X				X				
Arsenic	X				X	X			
Barium	X								
Beryllium	X								
Cobalt	X								
Copper	X								
Lead	X								
Cyanide	X								
Magnesium	X								
Manganese	X				X				
Mercury	X								
Potassium	X								
Sodium	X								
Zinc	X								
TCL Volatiles									
Acetone	X								
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X								
p,p'-DDE	X								
Radionuclides									
Carbon-14	X								
Cesium-137	X				X	X			
gross alpha	X								
nonvolatile beta	X								
Potassium-40	X				X	X			
Radium-226	X				X	X			
Radium-228	X				X	X			
Thorium-228	X				X	X			
Uranium-238	X								
Thorium-230	X				X				

USC	Unit Specific Constituent
COC	Constituent of Concern
ARAR COC	Applicable or Relevant and Appropriate Requirement COC
CMCOPC	Contaminant Migration Constituent of Potential Concern
COPC	Constituent of Potential Concern
TAL	Target Analyte List
TCL	Target Compound List
PCBs	Polychlorinated biphenyls

The key findings pertaining to the five CSSL OU soil subunits are described below:

- No PTSM or low-level threat wastes are present at any of the CSSL OU subunits.

- The nature and extent indicates that, in general, all the COCs associated with CSSL OU soils are present at low concentrations and show no apparent trends in distribution to suggest that they are related to unit disposal activities. No soil constituents related to any subunit associated with CSSL OU exceed any ARARs.

- No refined CMCOCs, no refined human health COCs, and no refined ecological COCs associated with any of the CSSL OU subunits are identified. The refined COCs are those constituents that are retained to be further evaluated for remedial action.

Additional key findings pertaining to two individual CSSL OU subunits (Sewer Line and Lagoon) are summarized below:

- Since the field investigation conducted on February 12, 1998, did not reveal any traces of asphalt in the manhole located near the active asphalt facility (see Figure 2), benzo(a)pyrene present near the asphalt facility is related to the active asphalt storage facility and is not related to the CSSL OU operations. Hence, no refined COCs are identified for the Sewer Line subunit.

- Although the presence of chlordane at the lagoon initiated the original investigation under RCRA/CERCLA requirements, concentrations of this constituent are of such levels that chlordane is not identified as a refined COC

due to health or ecological risks or leachability to groundwater; hence, no refined COCs are identified for the lagoon subunit.

In summary, the results of the CSSL OU waste characterization analyses show that no refined COCs are associated with the CSSL OU soils.

Groundwater

Table 7 provides an overview of the process employed in determining the refined COCs for the groundwater associated with the CSSL OU. The results of the groundwater analyses have revealed no refined COCs for CSSL OU groundwater.

Site-Specific Factors

There are no site-specific factors that can affect the No Action cleanup decision.

Table 7. Overview of the COC Screening Process-Groundwater

	Nature & Extent		Fate & Transport		Human Health		Ecological		Summary
Directed Constituent in Soil	**USC**	**ARAR COC**	**CM COPC**	**CM COC**	**COPC**	**COC**	**COPC**	**COC**	**Refined COC**
			None	None			None	None	None
TAL Inorganics									
Aluminum	X								
Iron	X								
Manganese	X								
TCL Semivolatiles									
Bis(2-ethylhexyl) phthalate	X	X			X	X			
TCL Volatiles									
Toluene	X								
Pesticides/PCBs/Dioxins/Furans									
alpha-chlordane	X								
gamma-chlordane	X								
Radionuclides									
gross alpha	X								

USC	Unit Specific Constituent
COC	Constituent of Concern
ARAR COC	Applicable or Relevant and Appropriate Requirement COC
CMCOPC	Contaminant Migration Constituent of Potential Concern
COPC	Constituent of Potential Concern
TAL	Target Analyte List
TCL	Target Compound List
PCBs	Polychlorinated biphenyls

Contaminant Transport Analysis

Figure 14 presents the conceptual model for the contaminant migration analysis performed for the CSSL OU. The analysis of contaminant fate and transport was based on the data collected from soil sampling investigations conducted in 1980s and in 1998 and 1999. The analysis was performed (1) to determine each USC's potential for leaching to groundwater, (2) to predict the migration data for each USC, and (3) to project concentrations delivered to the receptor location via vadose zone pore water and groundwater. The results of the analysis revealed that concentrations of constituents detected in the CSSL OU soils will not exceed their maximum contaminant levels (MCLs) within the 1,000-year modeling period. MCL is the maximum concentration of a substance allowed in water that is delivered to any user of a public water supply as required by the Safe Drinking Water Act. The contaminant migration analysis identified no refined CMCOCs. Therefore, the CSSL OU soils do not pose a migration threat to groundwater.

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

Current Land Use

Currently, the CSSL is inactive and consists of a small field that is periodically mowed. It is situated less than 0.4 km (0.25 mi) south of the Central Shops Area and is adjacent to and east of the Savannah River Laboratory Oil Test Site. Access to SRS is controlled by the US DOE. Access to the CSSL is not restricted within the SRS boundaries. An unimproved dirt road leads directly to the unit.

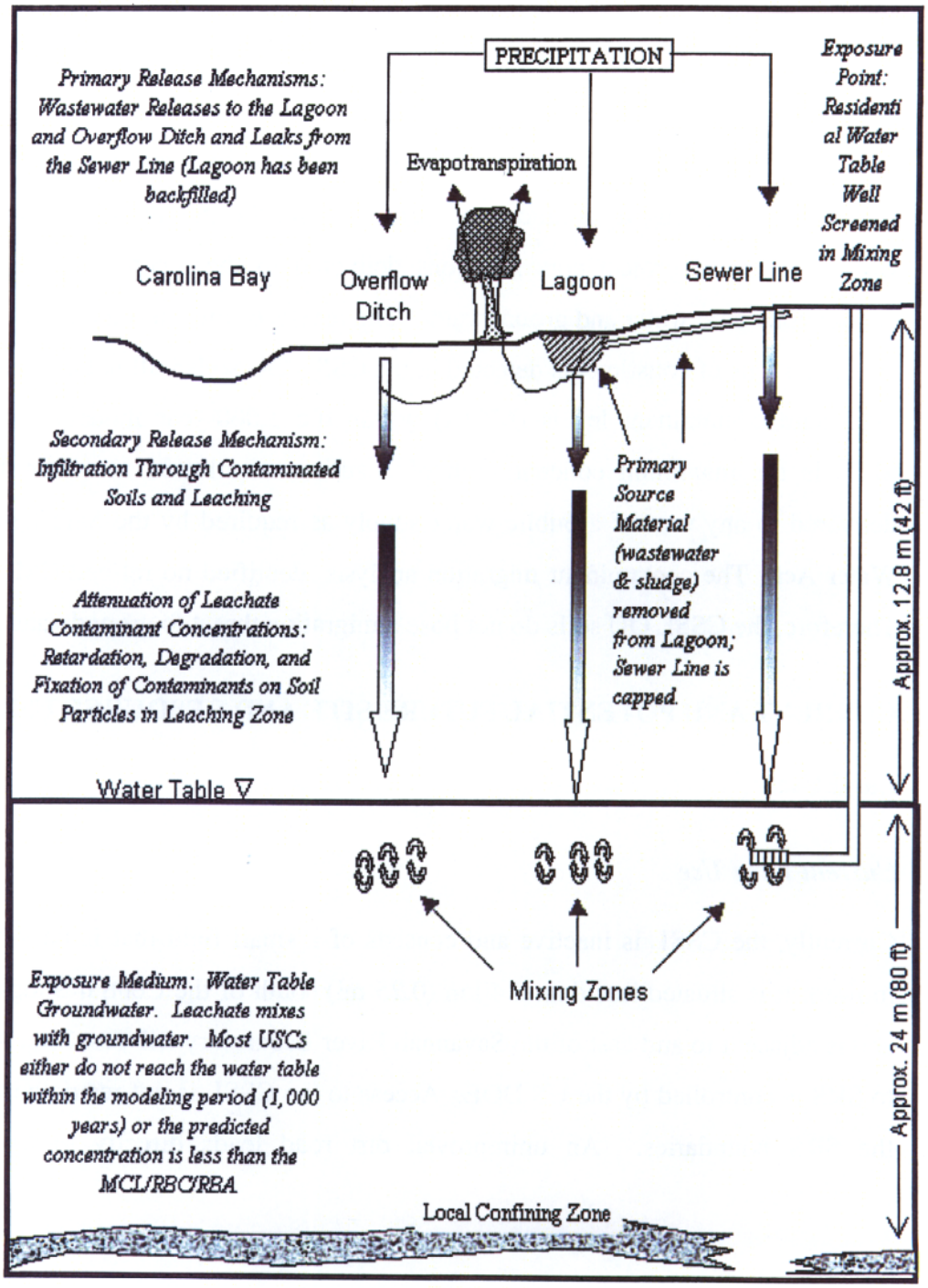


Figure 14. Contaminant Migration Conceptual Model

Access on foot is easy and unrestricted. The unit is not fenced. The area surrounding the CSSL is an industrial area to the north and undeveloped/wooded areas to the south. An unimproved road and a railroad border the CSSL to the north. To the north of the road and railway the facilities located include an asphalt storage area, equipment maintenance area, and transformer storage area. The wooded areas to the south are undeveloped and include a Carolina Bay approximately 229 meters (760 ft) south and downgradient. No evidence of casual trespassing (e.g., people, litter, etc.) was observed during a unit visit. Groundwater near the CSSL is not currently used for consumption by on-unit workers. The potentially exposed receptors that are evaluated for the current land use scenario are the known on-unit workers.

The potential receptor for exposure to constituents associated with the CSSL OU is the known on-unit worker who comes to the area on an infrequent or occasional basis. Known on-unit workers are defined as SRS employees who work at or in the vicinity of the CSSL OU under current land use conditions. A known on-unit worker may be a researcher, environmental sampler, an employee who mows the unit, or other SRS personnel in close proximity to the unit. Although these receptors may be involved in the excavation or collection of contaminated media, they would be using SRS procedures and protocols to minimize exposure to potential contaminants.

Future Land Use

According to the *Savannah River Site: Future Use Project Report* (US DOE 1996), "residential uses of SRS land should be prohibited." In this report, the CSSL OU is identified as "current industrial (with buffer)" area. The future use recommendation contained in the report is for "future industrial (non-nuclear)". The site can support unrestricted land use; however, the anticipated future land use is non-nuclear industrial. Therefore, if land use conditions remain industrial,

the only future human receptors are considered to be industrial workers. The hypothetical on-unit industrial worker is an adult who works in an outdoor industrial setting that is in direct proximity to the contaminated media for the majority of the time.

Groundwater Uses/Surface Water Uses

Currently, groundwater beneath the CSSL OU is not being used for any type of human consumption. The groundwater that flows beneath the CSSL OU discharges into the Upper Three Runs Aquifer.

There are no distinct surface water features on the unit, nor are there any drainage or surface runoff features that indicate that the surface runoff is being used for irrigation or any other beneficial uses.

VII. SUMMARY OF OPERABLE UNIT RISKS

As a component of the RFI/RI process, a BRA was performed for the CSSL OU. The BRA included human health risk and ecological risk assessments. The results of the risk assessments are summarized in the following paragraphs.

Summary of the Human Health Risk Assessment

A review of the analytical data contained in the RFI/RI with BRA for the CSSL OU report (WSRC 2001) indicates that the data are of sufficient quality for use in the risk assessment evaluation.

Based on the existing analytical data, an evaluation was conducted to estimate the human health and environmental problems that could result from the current physical and waste characteristics of the CSSL OU. The results of the assessment indicated that the concentrations of all the constituents analyzed were below US EPA risk-based concentrations (RBCs) and the calculated risks were below the

US EPA target risk range of 1.0×10^{-4} to 1.0×10^{-6} (or HQs less than 0.1 for non-cancer constituents); hence, there are no refined human health COCs. Consequently, no health risks, that warrant remedial action, are posed by the CSSL OU soils and groundwater to current or future industrial workers as well as future residents at the unit. The CSSL OU is suitable for unrestricted use.

Summary of Ecological Risk Assessment

The purpose of the ecological risk assessment component of the BRA is to evaluate the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to unit-related constituents based on a lines-of-evidence approach. The ecological risk assessment has concluded that there are no final COPCs, associated with CSSL OU. Hence no COCs or refined COCs are associated with the CSSL OU and therefore, the unit does not pose an unacceptable risk to the ecological receptors.

Risk Assessment Summary

The risk assessments and contaminant fate and transport analysis establish that the risk associated with the CSSL OU is within the acceptable range such that the unit can support unrestricted land use. From this, it can reasonably be concluded that no PTSM exists at the unit. There are no mobile or highly toxic materials associated with the CSSL OU.

Conclusion

Contaminant concentrations at the unit are below levels that require a remedial action even for unrestricted use. No refined COCs are identified as a result of RFI/RI/BRA investigation into any subunit of the CSSL OU, including groundwater. There are no problems warranting action associated with ARARs, PTSM, human health analysis, ecological analysis, or contaminant migration

analysis at any subunit within the CSSL OU. Therefore, no remedial action is necessary at the CSSL OU to ensure protection of human health and the environment.

The USDOE expects the proposed action to satisfy the statutory requirements in CERCLA Section 121(b) to (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost-effective, (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element. The proposed action is protective of human health and the environment, complies with ARARs (as there were none for this action), and is cost-effective. The proposed action does not provide treatment since there were no refined COCs; therefore, no remedial action is required.

As stated earlier, the USEPA, SCDHEC, and USDOE have determined that the five-year reviews of the ROD for the CSSL OU will not be required.

VIII. EXPLANATION OF SIGNIFICANT CHANGES

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

IX. RESPONSIVENESS SUMMARY

The Responsiveness Summary is provided in Appendix A of this document.

X. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

No remedial action will be performed at the CSSL OU; therefore, a schedule for post-ROD cleanup activities is not provided.

XI. REFERENCES

du Pont, 1985. *Closure Plan for Sanitary Sludge Lagoon, Building Number 080-42G,* E.I Du Pont de Nemours and Co., Aiken, SC

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

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

US DOE, 1996. *Savannah River Site: Future Use Project Report,* Stakeholder Recommendations for SRS Land and Facilities, January 1996.

WSRC, 1999. RCRA Facility Investigation/Remedial Investigation Work Plan for the Central Shops Sewage Sludge Lagoon (U), WSRC-RP-98-00044, Revision 1.1, September 1999, Westinghouse Savannah River Company, Aiken, SC

WSRC, 2000. RCRA Facility Investigation/Remedial Investigation *with Baseline Risk Assessment for the Central Shops Sewage Sludge Lagoon, WSRC-RP-99-4068, (U),* Revision 1.1, March 2001, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2001. *Statement of Basis/Proposed Plan for the Central Shops Sewage Sludge Lagoon (CSSL) (080-24G) Operable Unit (OU),* WSRC-RP-2000-4155 (U), Revision 0, April 2001, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

APPENDIX A: RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

The 45-day public comment period for the *Statement of Basis/Proposed Plan for the Central Shops Sewage Sludge Lagoon (080-24G) Operable Unit* began on August 8, 2001 and ended on September 21, 2001,

Public Comments

There were no comments received from the public.