007363

United States Department of Energy

Savannah River Site

Interim Record of Decision
Remedial Alternative Selection for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) Operable Unit (U)

WSRC-RP-98-4031
Revision 1.1
December 1999

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

SAFETY · RESPONSIBILITY · SECURITY
SRS
SAVANNAH RIVER SITE

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

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

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REMEDIAL ALTERNATIVE SELECTION FOR THE MISCELLANEOUS CHEMICAL BASIN/METALS BURNING PIT (731-4A/5A) OPERABLE UNIT (U)

WSRC-RP-98-4031
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Savannah River Site
Aiken, South Carolina

Prepared by:

Westinghouse Savannah River Company
for the
U. S. Department of Energy Under Contract DE-AC09-96-SR18500
Savannah River Operations Office
Aiken, South Carolina

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DECLARATION FOR THE INTERIM RECORD OF DECISION

Unit Name and Location

Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A)
Savannah River Site
Aiken, South Carolina

The Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) operable unit, referred to as the MCB/MBP 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) (FFA 1993). The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) identification number for this operable unit is OU-28 and the CERCLA identification number is SC1890008989. In this Interim Record of Decision, final remedies have been selected for the MCB soil unit, the MBP soil unit, and the vadose zone. An interim action is proposed to allow an early start of remedial activities focused on volatile organic compounds (VOC) secondary source control in the vadose zone and VOC "hot spot" cleanup in the groundwater plume, while generating additional data on the nature and extent of the groundwater interactions between the MCB/MBP, the A-Area Burning/Rubble Pit (ABRP), and the Administration and Manufacturing (A/M) Area. These data will aid in determination of the final groundwater remedial goal.

Statement of Basis and Purpose

This decision document presents the selected remedial action for the MCB/MBP located at the SRS in Aiken, South Carolina which was chosen in accordance with CERCLA, as amended by the Superfund Amendments and 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.

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The State of South Carolina concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Interim Record of Decision (IROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The MCB/MBP OU includes soil, the vadose zone, and groundwater located within the Upper Three Runs watershed. The United States Department of Energy (US DOE) will manage the OU to prevent impact to the watershed.

The overall strategy for addressing the MCB/MBP is to perform actions to address the known areas of contamination in the soils, vadose zone and groundwater, while further investigating the groundwater and considering additional alternatives for the groundwater that will achieve final remedial objectives. The early actions to address the soils and vadose zone are final actions, while the early actions to address groundwater contamination are interim.

This interim action for the MCB/MBP groundwater is proposed to minimize the impact of the MCB/MBP on the Upper Three Runs watershed. Upon agreement between the United States Environmental Protection Agency (US EPA), the South Carolina Department of Health and Environmental Control (SCDHEC), and US DOE on the disposition of all source control and groundwater operable units within this watershed, a final comprehensive Record of Decision (ROD) for the watershed will be pursued with further public involvement.

Soil at the MCB unit is contaminated with polychlorinated biphenyl (PCB) compounds known as Aroclor-1254 and Aroclor-1260. The levels of Aroclor-1254 exceed limits in applicable or relevant and appropriate requirements (ARARs). The levels of Aroclor-1260 pose unacceptable risks to potential ecological receptors. Although the soil at the MCB is contaminated with octachlorodibenzo-p-dioxin (OCDD), the contamination does not pose a risk to future industrial workers. Soil at the MBP unit is contaminated with aluminum, resulting in significant potential ecological risk.

VOCs (tetrachloroethylene (PCE), trichloroethylene (TCE)) are present in the vadose zone beneath the MCB at levels that will exceed maximum contaminant levels (MCLs) upon entering the groundwater.

Groundwater beneath the MCB/MBP is contaminated with levels of TCE, PCE, carbon tetrachloride and lead in excess of the MCLs. It is apparent that the VOC contamination is attributable to past disposal practices at this operable unit. SRS has determined that lead concentrations in soil and groundwater are due to natural geologic conditions. SRS proposes to sample and monitor wells which exhibit random elevations in lead concentrations above the MCL of 15 µg/L. The monitoring well lead sampling data will be trended and compared to other wells in A/M Area that exhibit similar fluctuations in lead levels but have no known source (other than natural geologic conditions) for the lead. Results from this data will be used to formulate a final groundwater strategy.

The selected interim actions at the MCB/MBP OU are:

- **Surface and subsurface soils:** Soil Excavation and Off-Site Disposal (Alternatives 4S(b) and 4S(d)) with Institutional Controls (Alternative 2S). MCB surface soils contaminated with Aroclor-1260 greater than the ecological remedial goal (RG) of 215 µg/kg will be excavated to a maximum depth of 1-foot. Excavation of this 1-foot interval will also remove all soil contaminated with Aroclor-1260 above the ARAR-based limit of 1000 µg/kg. Soil contaminated with Aroclor-1254 above the ARAR limit of 1000 µg/kg will be excavated to a maximum depth of 4 feet. MBP soils containing levels of aluminum in excess of 11,000 mg/kg will be excavated to a maximum depth of 4 feet. Confirmation sampling will be performed during excavation to verify the lateral extent of contamination. The plan is to excavate soil as needed until the remedial goal is reached. The excavated soil will be disposed in an off-unit facility licensed to receive CERCLA waste. The cost of Alternatives 4S(b) and 4S(d) totals $461,000, and the cost of Alternative 2S is $32,800.

- **Vadose zone soils**: Active Soil Vapor Extraction (SVE)/Passive SVE (Alternative 2SVZ). VOCs will be extracted as vapor through a series of vertical extraction wells. Active SVE wells (equipped with blowers to draw air through the soil to remove VOCs) will be located where the concentration of VOCs is highest. Passive SVE wells (wells that take advantage of natural barometric pressure changes to draw air through the soil to remove VOCs) will be located in lower concentration areas. The offgas would be exhausted to the atmosphere at levels not to exceed the air permit limits. The cost of Alternative 2SVZ is $969,000.
- **Groundwater:** In Situ Air Stripping and Monitoring (Alternative 3GW). In situ air stripping consists of recirculation wells that would set up a groundwater recirculating cell within the contaminated aquifer. As the air passes through the groundwater within the wells, the VOCs volatilize within the well and are vented to the surface. SRS plans to monitor groundwater lead concentrations and to demonstrate that elevated lead concentrations are a result of natural processes and do not warrant any cleanup measure. The cost of Alternative 3GW is $3,375,000.

Institutional controls at both the MCB and MBP soil units will require both short and long term actions. For the short term, signs will be posted indicating that this area was used to manage hazardous materials. In addition, existing SRS access controls will be used to maintain this site for industrial use only.

The combination of alternatives for soil removal, active/passive SVE, groundwater remediation, and institutional controls is intended to be an interim action for the MCB/MBP

OU as a whole, to reduce risk to human health and the environment. However, the selected alternatives for the soils and vadose zone represent final actions because they meet final Remedial Action Objectives (RAOs) and final RGs for these unit components. The proposed interim groundwater action may be sufficient to reduce VOC levels to less than MCLs if there is no interaction between the MCB/MBP and the upgradient waste units ABRP and/or A/M Area. However, due to the uncertainties in the interaction between the contaminated groundwater plumes associated with these upgradient units, the proposed early groundwater action will be taken on an interim basis to allow for further determination of the regional VOC groundwater contamination.

Statutory Determinations

Based on the MCB/MBP RCRA Facility Investigation/Remedial Investigation with Baseline Risk Assessment (RFI/RI/BRA) Report (WSRC 1998a), the MCB/MBP OU poses significant risk to human health and the environment.

Per the US EPA-Region IV Land Use Controls (LUC) Policy, a LUC Assurance Plan (LUCAP) for SRS has been developed and submitted to the regulators for their approval. In addition, a LUC Implementation Plan (LUCIP) for the MCB/MBP OU will be developed and submitted to the regulators for their approval with the post-IROD document, the Interim Corrective Measures Implementation/Remedial Design Report/Remedial Action Work Plan (CMI/RDR/RAWP). The LUCIP will detail how SRS will implement, maintain, and monitor the land use control elements of the MCB/MBP OU selected alternative to ensure that the remedies remain protective of human health and the environment.

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

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

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

This interim action is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements for this limited-scope action (unless justified by a waiver), and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action utilizes treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the MCB/MBP OU, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at this operable unit. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this operable unit and of this remedy will be continuing as US DOE continues to develop remedial alternatives for the MCB/MBP OU.

Effectiveness monitoring of the interim remedial system will continue on a quarterly basis. Annual reports, providing remediation data and analysis, will be submitted up to five years from the interim remedial start but prior to final remedial implementation.

An ARARs waiver under § 300.430(f)(1)(ii)(C) of the NCP for all groundwater COCs has been invoked because the selected remedy is an interim measure that will become part of a total remedial action that will ultimately attain ARARs.

Data Certification Checklist

This IROD provides the following information:

- Contaminants of concern (COCs) and their respective concentrations
- Baseline risk represented by the COCs
- Cleanup levels established for the COCs and the basis for the levels
- Current and future land and ground water use assumptions used in the Baseline Risk Assessment and IROD
- Land and groundwater use that will be available at the site as a result of the Selected Remedy
- Estimated capital, operation and maintenance (O&M), and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected
- Decision factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria).

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12/15/99
Date

Thomas F. Heenan
Assistant Manager for Environmental Programs
U. S. Department of Energy, Savannah River Operations Office

8/3/00
Date

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

12/7/00
Date

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

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INTERIM DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION FOR THE MISCELLANEOUS CHEMICAL BASIN/METALS BURNING PIT (731-4A/5A) OPERABLE UNIT (U)

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Savannah River Site
Aiken, South Carolina

Prepared by:

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

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/kg	microgram per kilogram
µg/L	microgram per liter
A/M	Administration and Manufacturing
ABRP	A-Area Burning Rubble Pit
ARAR	applicable or relevant and appropriate requirements
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	constituent of concern
CSM	Conceptual Site Model
DQO	Data Quality Objective
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
IAPP	Interim Action Proposed Plan
IRAO	Interim Remedial Action Objectives
IROD	Interim Record of Decision
LUC	Land Use Controls
LUCAP	Land Use Controls Assurance Plan
LUCIP	Land Use Controls Implementation Plan
m	meters
MBP	Metals Burning Pit
MCB	Miscellaneous Chemical Basin
MCL	maximum contaminant level
MCLG	maximum contaminant level goals
mg/kg	milligram/kilogram
mg/L	milligram/Liter
msl	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OCDD	octachlorodibenzo-p-dioxin
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PP	Proposed Plan
ppb	parts per billion
PSVE	Passive Soil-Vapor Extraction

RAO	remedial action objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RDR	Remedial Design Report
RFI	RCRA Facility Investigation
RG	remedial goal
RGO	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SB	Statement of Basis
SCDHEC	South Carolina Department of Health and Environmental Control
SESOIL	Seasonal Soil (computer code)
SRS	Savannah River Site
SVE	soil vapor extraction
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethylene
US DOE	U. S. Department of Energy
US EPA	United States Environmental Protection Agency
USC	Unit-Specific Constituent
VOC	Volatile Organic Compound
WSRC	Westinghouse Savannah River Company

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

Savannah River Site Location and Description

Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is a secured U.S. Government facility with no permanent residents. SRS is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina.

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

Operable Unit Name, Location, and Description

The Federal Facility Agreement (FFA) (FFA 1993) lists the Miscellaneous Chemical Basin/Metals Burning Pit (MCB/MBP) (731-4A/5A) as a Resource Conservation and Recovery Act (RCRA)/CERCLA unit requiring further evaluation. The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) identification number for this operable unit is OU-28 and the CERCLA identification number is SC1890008989. The evaluation requires an investigation/assessment process that integrates and combines the RCRA Facility Investigation (RFI) process with the CERCLA Remedial Investigation (RI) to determine the actual or potential impact to human health and the environment and the environment of releases of hazardous substances to the environment..

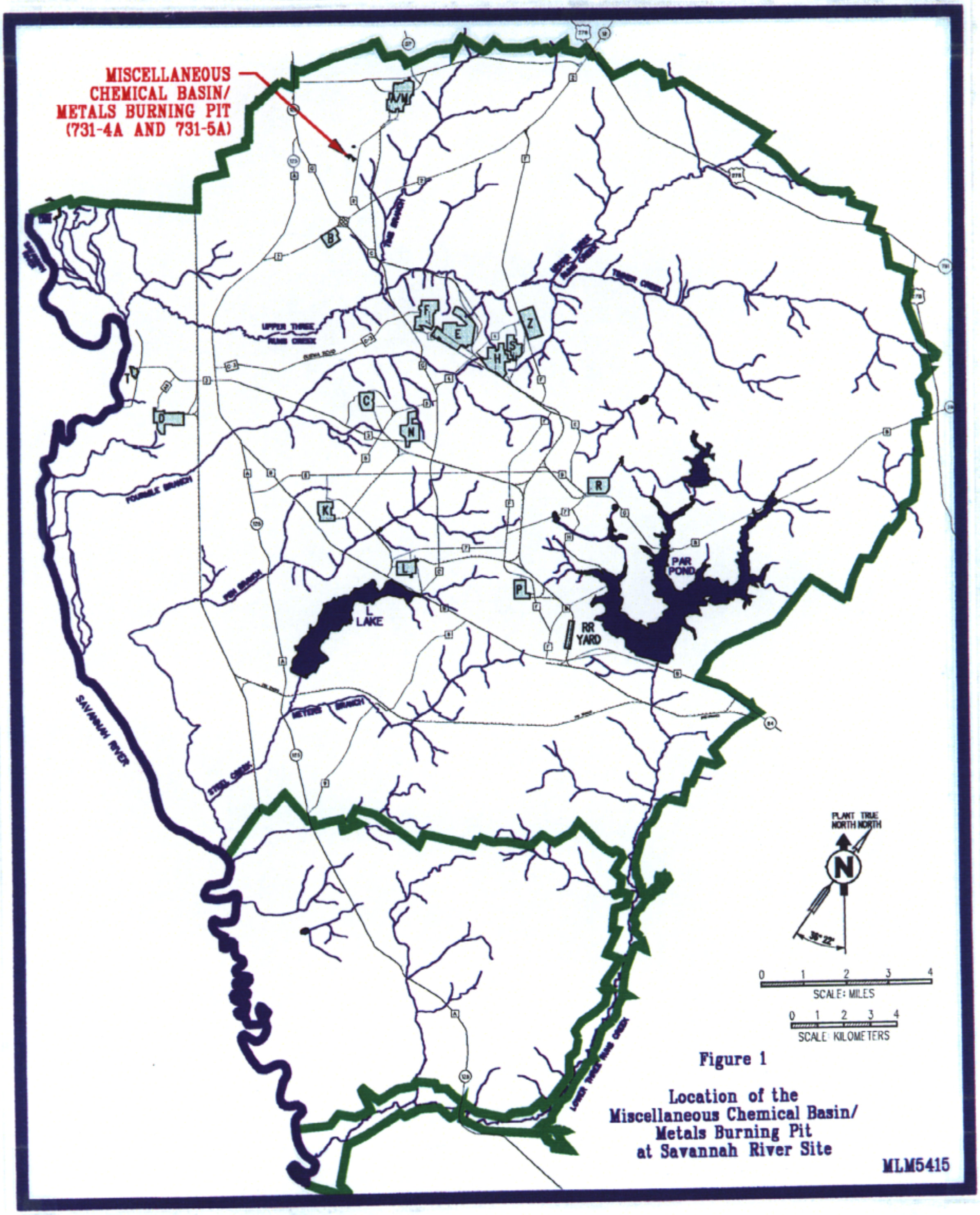

Figure 1. Location of Miscellaneous Chemical Basin/Metals Burning Pit at SRS

II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

The primary mission of SRS has been to produce tritium, plutonium-239, 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 hazardous waste permit from the SCDHEC, which was most recently renewed on September 5, 1995. Module IV 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 a FFA (FFA 1993) with 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

United States Environmental Protection Agency (US EPA) - Region IV and SCDHEC.

Operable Unit Operational and Compliance History

The MBP and the MCB are located in the northwest portion of the SRS, approximately 2.4 kilometers (1.5 miles) south of the administration and manufacturing (A/M) Area operations and 4.8 kilometers (3 miles) east of the SRS boundary (Figure 1). The MBP and MCB are located in the Upper Three Runs Creek Watershed and are situated on the west and east sides, respectively, of Road C-1, a dirt road (Figure 2). Due to their close proximity to each other and their receipt of waste from the A/M Area, the MBP and the MCB are being addressed together in the SRS RCRA/CERCLA program.

The MBP is irregular in shape with approximate dimensions of 122 meters (m) by 122 m (400 feet by 400 feet). Waste materials were piled 0.9 - 2.7 m (3 – 6 feet) high within the MBP. A review of file material does not indicate the existence of any excavation as the word "pit" implies. The MBP is actually a cleared area that was used for burning lithium-aluminum alloys, scrap, and cuttings from the A/M Area operations. Unit photographs show what is thought to be typical disposal of metal shavings, pieces of aluminum, plastic pipe, metal drums, and other miscellaneous scrap. Wastes were primarily contained in two discrete areas, one large pile and a series of small piles oriented in a semi-circular arc. The pit was reportedly placed into service in 1960 and taken out of service in 1974. At that time, the waste piles were regraded and the area was allowed to revegetate. Weeds, grasses, and pine trees currently grow at the unit. The slope of the unit was and is from the semi-circular arc toward the larger pile. The western half of the unit has a slope of approximately 6 percent, and the eastern half of the unit has a slope of approximately 2.5 percent (WSRC 1994)

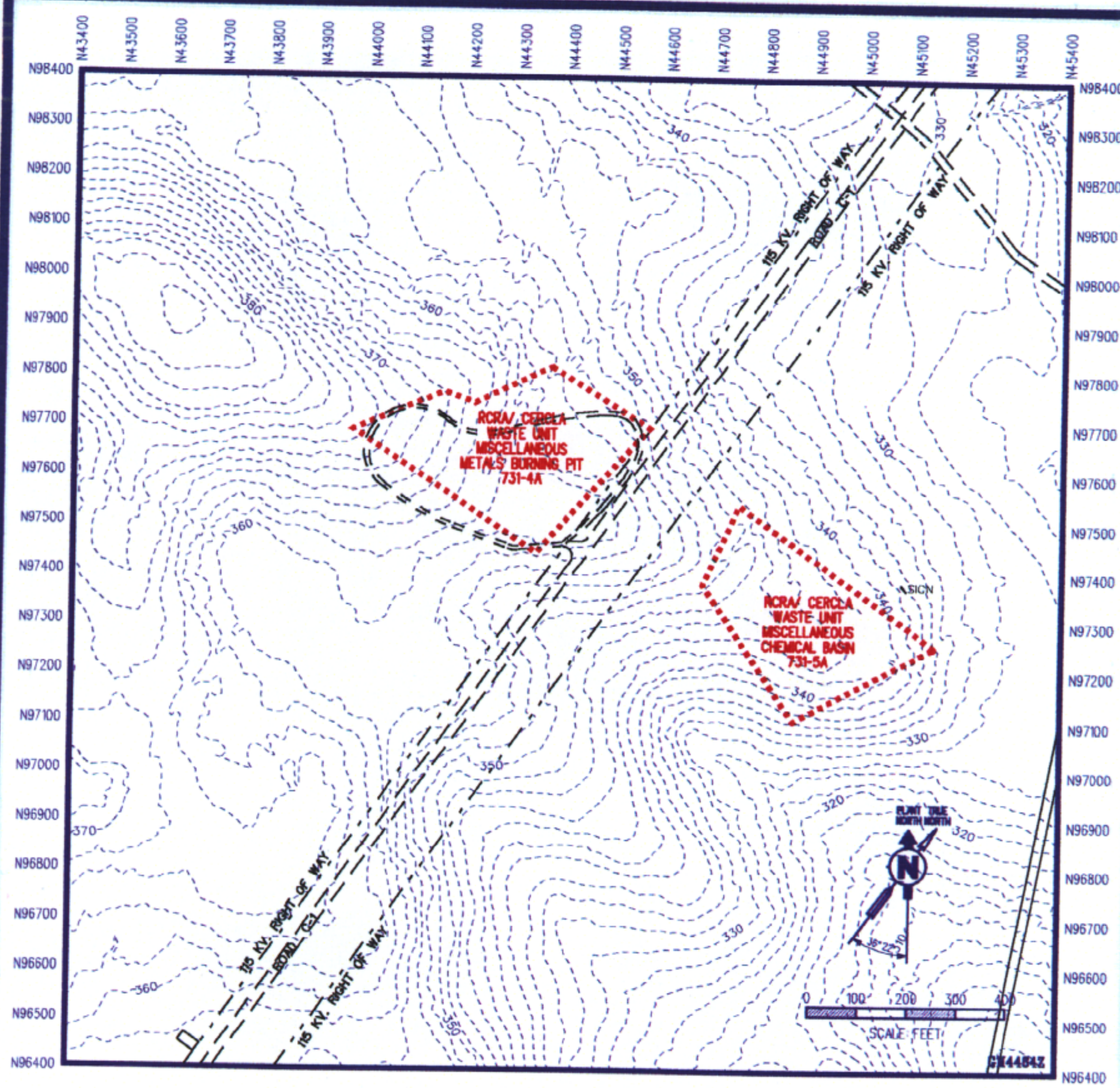

FIGURE 2
MISCELLANEOUS CHEMICAL BASIN AND METALS BURNING PIT
(731-4A AND 731-5A)

Figure 2. Miscellaneous Chemical Basin and Metals Burning Pit (731-4A and 731-5A)

The MCB received liquid chemical wastes and is located in an old borrow pit. It was approximately 6 m (20 feet) wide by 6 m (20 feet) long and approximately 0.3 m (1 foot) deep, although exact basin boundaries have not been determined. No construction records exist for the borrow pit. No records of specific materials disposed were kept.

As previously stated, the MCB/MBP is listed in the FFA as a RCRA/CERCLA unit requiring further evaluation to determine the actual or potential impact to human health and the environment. The RFI/RI Work Plan, Revision 0, was submitted to US EPA and SCDHEC in June 1992. The RI field start began in August 1994. The results of the RFI/RI/BRA were presented in the *RCRA Facility Investigation/Remedial Investigation with Baseline Risk Assessment for the Miscellaneous Chemical Basin/Metals Burning Pit* (WSRC 1998a). The RFI/RI/BRA Report and the Corrective Measures Study/Focused Feasibility Study (CMS/FFS) were submitted in accordance with the FFA and the approved implementation schedule. The US EPA and SCDHEC approved the RFI/RI/BRA in July 1998.

An interim action is proposed to allow an early start of remedial activities focused on VOC secondary source control in the vadose zone and VOC "hot spot" cleanup in the groundwater plume, while generating additional data on the nature and extent of the groundwater interactions between the MCB/MBP, the A-Area Burning/Rubble Pit (ABRP), and the A/M Area. These data will aid in determination of the final groundwater remedial goal.

An Interim Action Proposed Plan (IAPP) (WSRC 1998b) was submitted in accordance with the FFA and the approved implementation schedule, and was approved by US EPA on January 14, 1999 and SCDHEC on January 18, 1999.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

CERCLA requires that the public be given an opportunity to review and comment on the proposed remedial alternative. Public participation requirements are listed in 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 MCB/MBP soils, vadose zone, 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 the selection of remedial alternatives. The SRS Public Involvement Plan addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act. Section 117(a) of CERCLA, as amended, requires the notice of any proposed remedial action and provides the public an opportunity to participate in the selection of the remedial action. The *Interim Action Proposed Plan for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) Operable Unit (U)* (WSRC 1998b), which is part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the MCB/MBP.

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available for review by the public at the US EPA Atlanta Office and 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

Hardcopies of the *Interim Action Proposed Plan for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) Operable Unit (U)* (WSRC 1998b) are available at the following locations:

Reese Library
Augusta State University
2500 Walton Way
Augusta, Georgia 30910
(706) 737-1744

Asa H. Gordon Library
Savannah State University
Tompkins Road
Savannah, Georgia 31404
(912) 356-2183

An SRS RCRA permit modification is not required at this time since this is an interim action. However, the final permit modification will (1) include the final selection of remedial alternatives under RCRA, (2) be sought for the entire MCB/MBP Operable Unit with the final Statement of Basis/Proposed Plan (SB/PP) and (3) will include the necessary public involvement and regulatory approvals. This Interim Record of Decision (IROD) also satisfies the RCRA requirements for an Interim Measures Work Plan.

The public was notified of the public comment period through mailings of the *SRS Environmental Bulletin*, a newsletter sent to approximately 3500 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 IAPP 30-day public comment period began on January 29, 1999 and ended on February 27, 1999. The IAPP was presented to the Savannah River Site Citizens Advisory Board Environmental Restoration and Waste Management Subcommittee in an open public meeting on February 17, 1999. A Responsiveness Summary, prepared to address comments received during the public comment period, is provided in Appendix A of this IROD.

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

RCRA/CERCLA Programs at SRS

RCRA/CERCLA units (including the MCB/MBP) at SRS are subject to a multi-stage remedial investigation process that integrates the requirements of RCRA and CERCLA as outlined in the RFI/RI Program Plan (WSRC 1993). The RCRA/CERCLA processes are summarized below:

- the investigation and characterization of potentially impacted environmental media (such as soil, groundwater, and surface water) comprising the waste site and surrounding areas
- the evaluation of risk to human health and the local ecological community
- the 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 3).

Operable Unit Remedial Strategy

Upper Three Runs Interim Remedial Strategy

The RFI/RI process provides a method of managing the steps to ultimate remediation of a specific waste unit. It is often preferable to group waste unit components and actions to expedite characterization and remediation of the components that pose the most significant risks. These groupings are typically designated as OUs.

It is the intent of US DOE, US EPA, and SCDHEC to manage these OUs to minimize impact to the watershed. To effectively manage the impact to the Upper Three Runs Watershed (groundwater, streams, and wetlands), a comprehensive characterization and regulatory process plan for the waste units in the vicinity of the MCB/MBP OU was developed. This characterization and regulatory process plan provides a programmatic method of promoting continuous characterization, risk assessment, remedial assessment, and remedial action.

This interim action is not a final action, but will be pursued to minimize the impact of the MCB/MBP to the Upper Three Runs watershed. However, this document describes final actions for the surface/subsurface soil and the vadose zone soil. Due to incomplete understanding of the possible interaction between the contaminated groundwater plumes from the ABRP and the A/M Area, located upgradient of the MCB/MBP, early interim action will be taken to control MCB/MBP plume growth. Concurrently, the potential for commingling of groundwater plumes associated with these waste units will be defined.

Subsequently, a final SB/PP for the groundwater will be issued for public comment. Ultimately, upon agreement between US EPA, SCDHEC, and US DOE on the disposition of all source control and groundwater operable units within this watershed, a final comprehensive ROD for the watershed will be pursued with further public involvement.

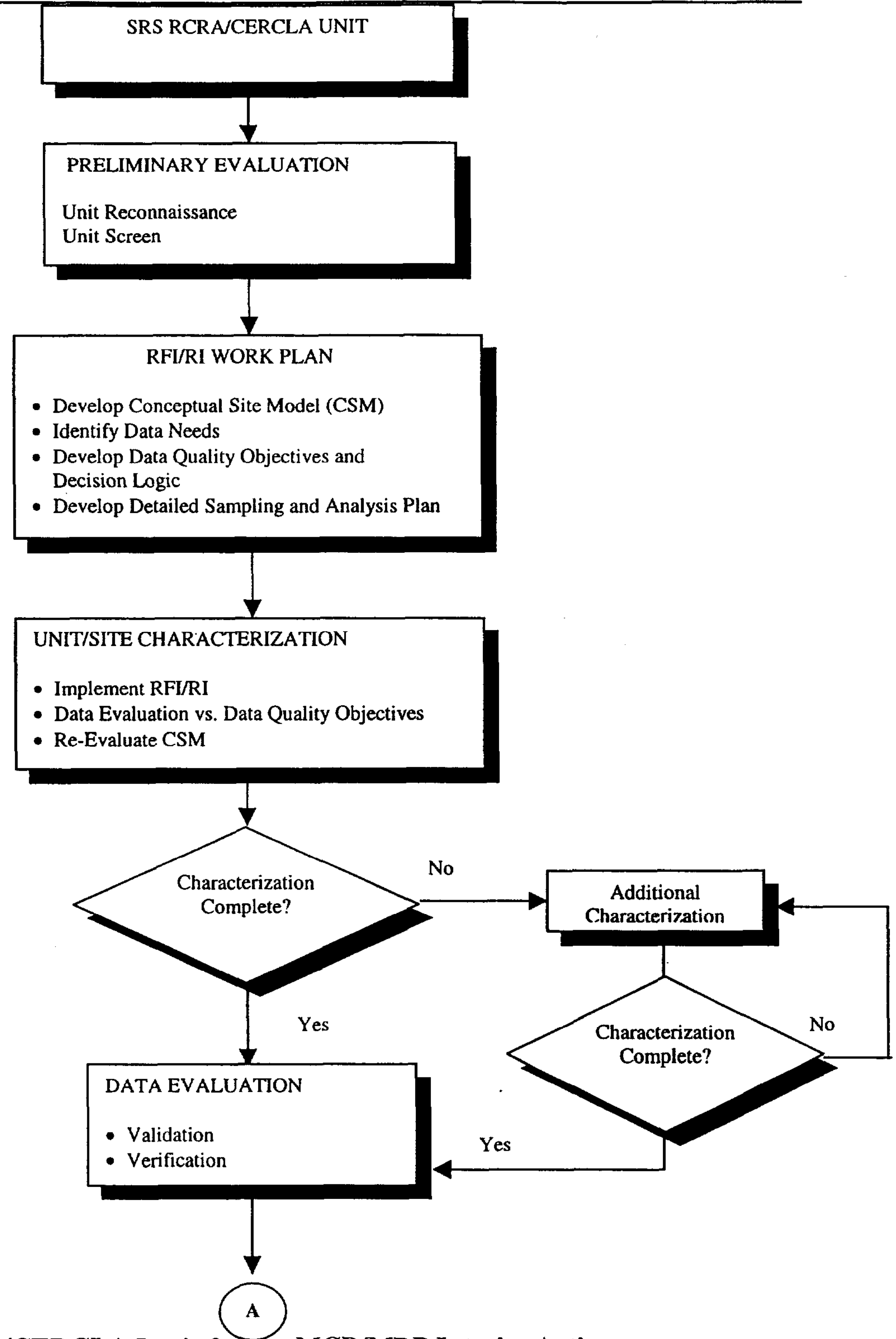

Figure 3. RCRA/CERCLA Logic for the MCB/MBP Interim Action

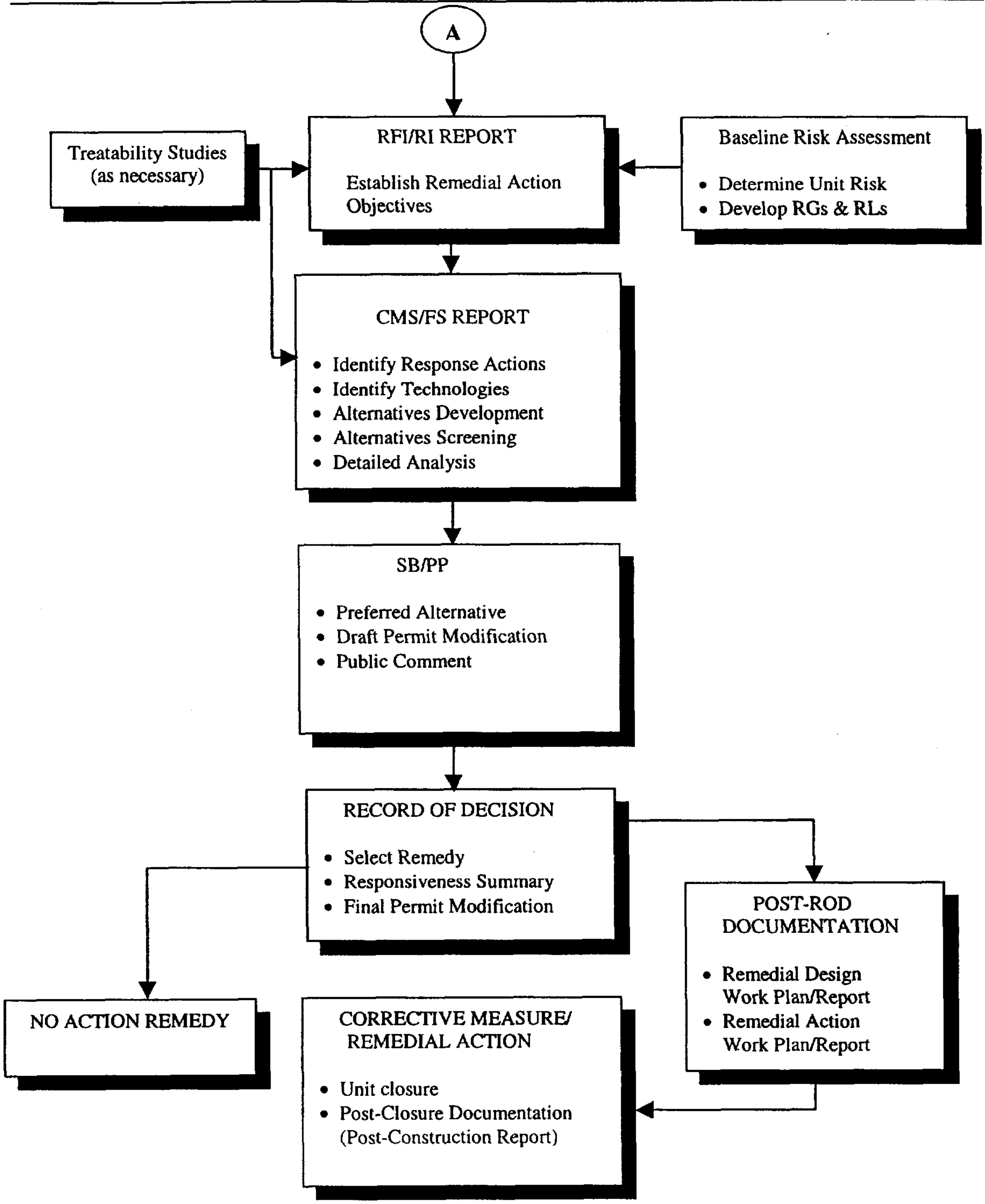

Figure 3. RCRA/CERCLA Logic for the MCB/MBP Interim Action (Cont)

The overall strategy for addressing the MCB/MBP is to perform actions to address the known areas of contamination in the soils, vadose zone and groundwater, while further investigating the groundwater and considering additional alternatives for the groundwater. The early actions to address the soils and vadose zone are final actions, while the early actions to address groundwater contamination are interim.

Soil at the MCB unit is contaminated with polychlorinated biphenyl (PCB) compounds known as Aroclor-1254 (concentrations ranging from non-detect – 3,100 µg/kg) and Aroclor-1260 (concentrations ranging from non-detect – 11,000 µg/kg) . The levels of Aroclor-1260 pose unacceptable risks to potential ecological receptors. Although the soil at the MCB is contaminated with octachlorodibenzo-p-dioxin (OCDD) (concentrations ranging from non-detect – 11 µg/kg), the contamination does not pose a risk to future industrial workers. VOCs are present in the vadose zone at levels that will exceed maximum contaminant levels (MCLs) upon entering the groundwater. Soil at the MBP unit is contaminated with aluminum, resulting in significant potential ecological risk.

V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model for the OU

Based on the data reviewed and collected during the unit preliminary screening and process knowledge, a conceptual site model (CSM) was developed. The CSM provides the framework for determining contamination sources, primary contaminated media, contaminant migration pathways, exposure pathways, and potential human and ecological receptors associated with the OU (see Figure 4).

Development of the CSM facilitates the initial step of determining the nature and extent of unit contamination through the identification of data gaps using the Data.

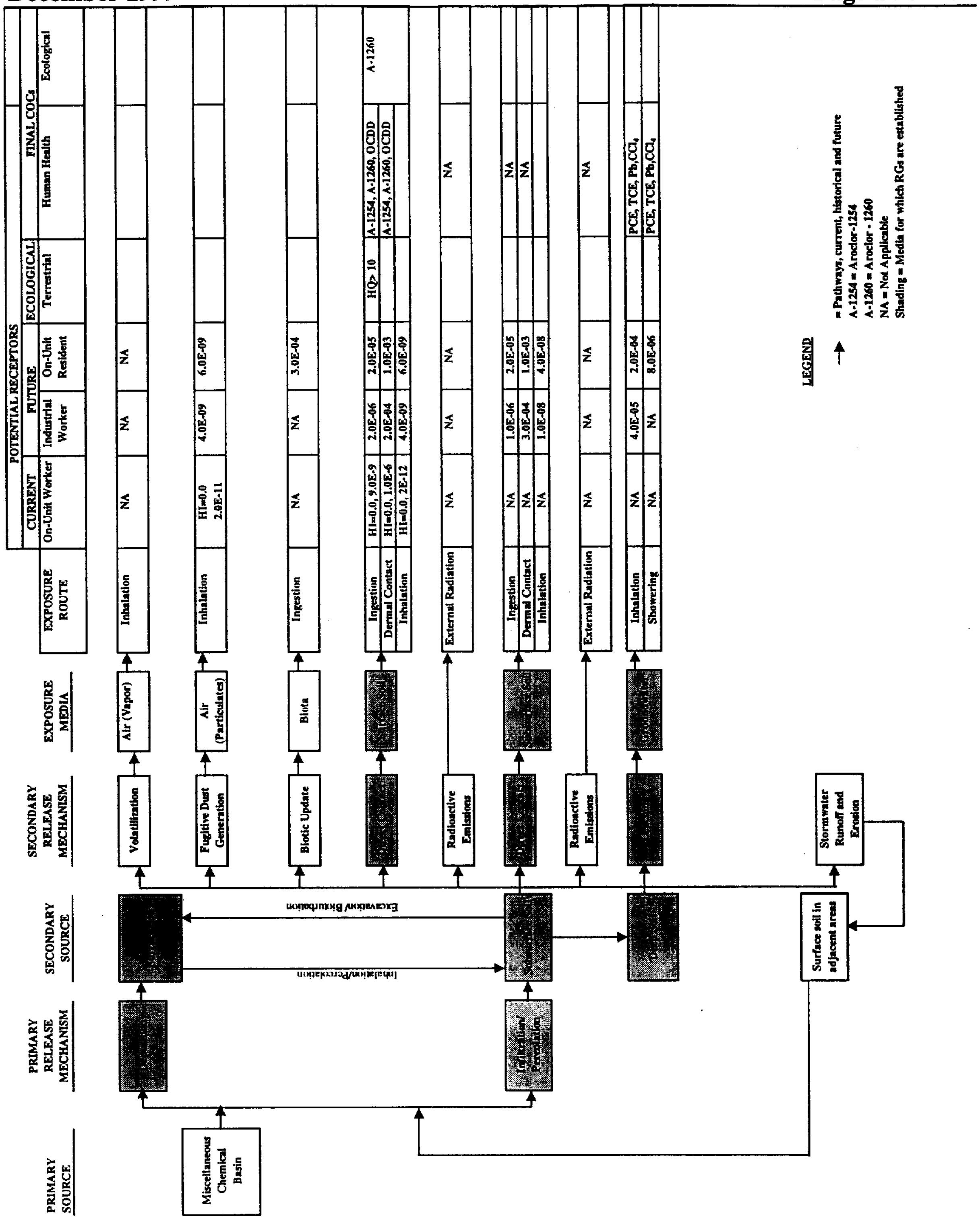

Figure 4. Conceptual Site Model for the Miscellaneous Chemical Basin

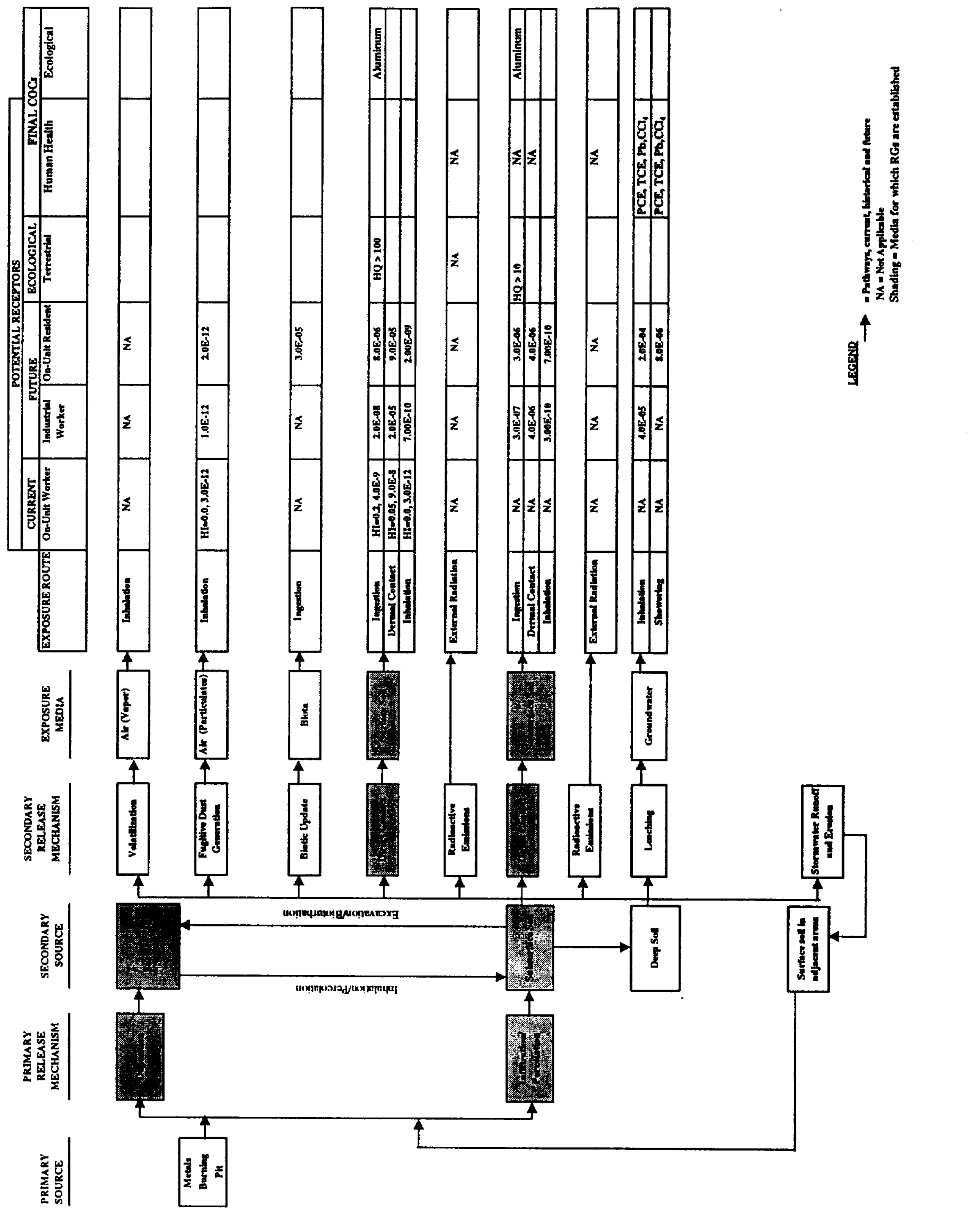

Figure 4. Conceptual Site Model for the Metals Burning Pit (Cont)

Quality Objective (DQO) process. DQOs are useful in identifying data needs associated with the sources and exposure media and in developing a sampling and analytical plan which describes the procedures for collecting sufficient data of known and defensible quality. The unit disposal and monitoring history indicated that the MCB/MBP is a probable contamination source that may represent unacceptable risk to human health and the environment. In order to reduce the uncertainty associated with the nature and extent of contamination at the MCB/MBP, contamination data needs were identified for the surface/subsurface soils and groundwater in the vicinity of the MCB/MBP. Consequently, to make key remedial decisions it was necessary to perform a media assessment to obtain the required data.

Media Assessment

An RFI/RI Work Plan to acquire the above data was developed for the MCB/MBP (WSRC 1994). The RFI/RI established unit-specific constituents (USCs) to determine their distribution in source media associated with the unit. These characterization data provide the contaminant profile and mass information necessary to determine the potential for contaminant migration to off-unit receptors. For a more complete discussion of the current characterization, see the RFI/RI/BRA (WSRC 1998a). A detailed sampling plan was prepared and implemented to investigate the secondary sources and groundwater. A complete description of the sampling methods and protocols is also provided in the RFI/RI/BRA.

MCB

The actual location of the MCB is unknown due to lack of documentation. However, based on old aerial photographs, the general area of chemical disposal has been delineated. The term "basin" is not an accurate description of the MCB. It is actually a shallow depression (an old borrow pit). Very little documentation is available on the waste unit's history, except for the dates of operation. No records of specific materials disposed of at the MCB were kept, although it was presumably used for miscellaneous chemical disposal, including solvents and used oils. It is believed that partially full drums were emptied at this site and the empty drums were then discarded at the MBP. Records indicate the basin was in use from about 1956 to 1974. No physical evidence of source material was identified during characterization. The presence of pesticides, PCBs, dioxins/furans and various VOCs, and semi-volatile organic compounds (SVOCs) in the soils is consistent with chemical disposal.

MCB Soil

The MCB soil sampling locations are shown in Figure 4a. Aroclor-1254 was detected in 9 of 59 samples with a maximum concentration of 3,100 µg/kg and an average concentration of 178 µg/kg in the main area of the MCB. Aroclor-1254 was also detected in 12 of 18 samples taken in the drainage area in the southwest area of the MCB unit with a maximum concentration of 14,000 µg/kg and an average concentration of 1,290 µg/kg.

Aroclor-1260 was detected in 13 of 59 samples with a maximum concentration of 11,000 µg/kg and an average concentration of 341 µg/kg in the main area of the MCB.

OCDD was detected in 46 of 59 samples with a maximum concentration of 11 µg/kg and an average concentration of 0.8 µg/kg.

A passive soil-vapor extraction (PSVE) system was installed (as part of a treatability study) in 1996 in an area in the MCB identified by a 1986 soil gas survey. Soil vapor data were collected during the treatability study. The following table indicates the maximum contaminant concentrations detected.

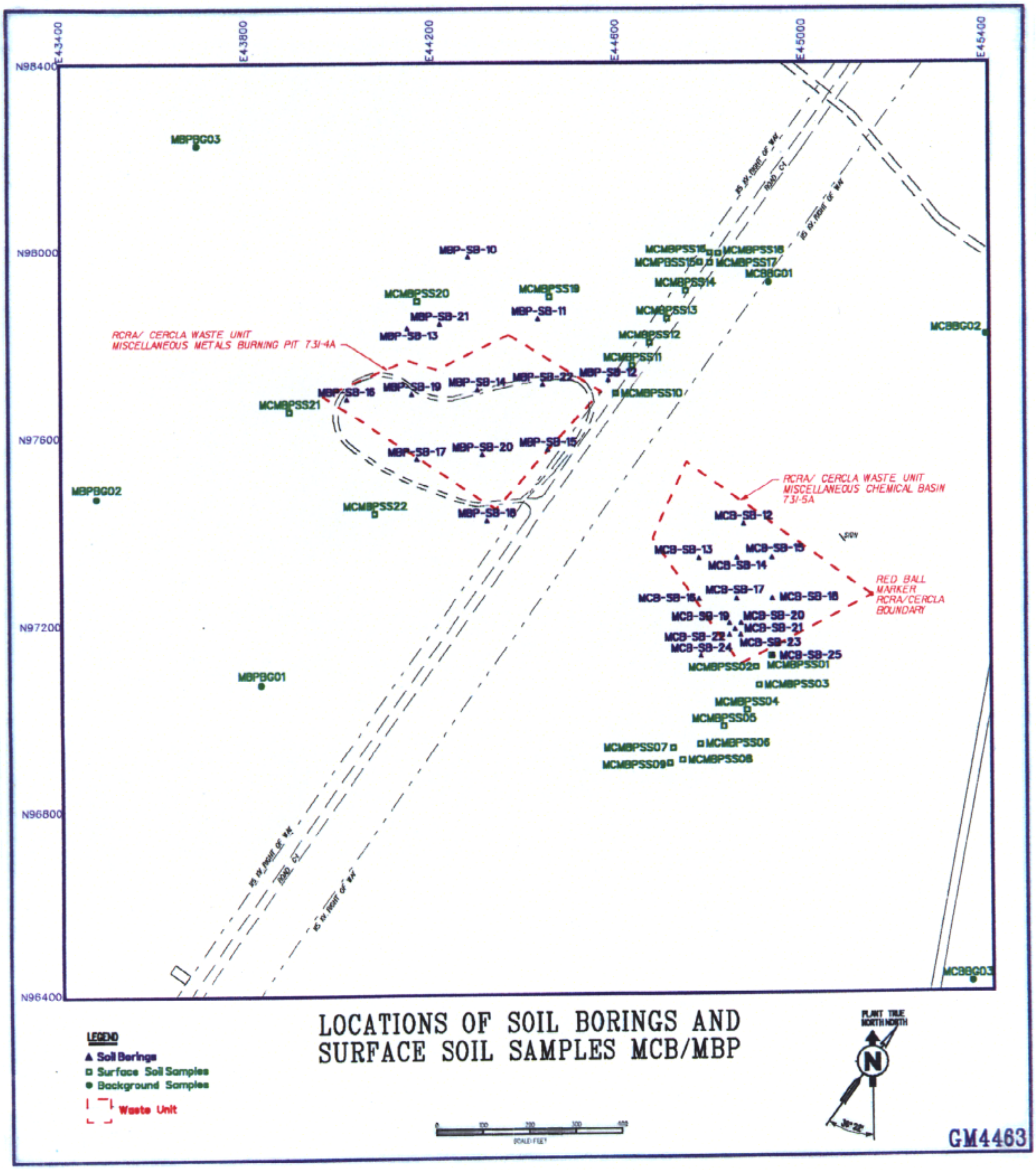

Figure 4a. MCB/MBP Soil Borings and Surface Soil Sample Locations

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Contaminant	Maximum Concentration in Soil Gas, parts per million by volume	Maximum Concentration in Soil, microgram/kilogram (μg/kg)
Carbon tetrachloride	29	25
Trichloroethylene (TCE)	140	372
Tetrachloroethylene (PCE)	100	10,740

MBP

The MBP was a cleared area, rather than an excavation, which was used for burning lithium-aluminum alloys, scrap, and cuttings from the A/M Area operations. Wastes were primarily contained in two discrete areas, one large pile and a series of small piles oriented in a semi-circular arc. The pit was reportedly placed into service in 1960 and taken out of service in 1974.

MBP Soil

Soil sampling locations MBP-SB-14, MBP-SB-19, and MBP-SB-22 were located within these main burning areas (see Figure 4a). Metal shavings and fragments were evident in the soil borings collected at these locations. Aluminum was detected in all MBP samples. The maximum aluminum concentration detected was 25,800 mg/kg with an average concentration of 5,270 mg/kg.

MCB/MBP

Groundwater

The area hydrostratigraphy is shown in Figure 5. The M-Area and Lost Lake aquifers are separated by a discontinuous "green clay" confining zone. In places where the confining zone is absent, the M-Area and the Lost Lake aquifers become one unit, identified as the Steed Pond aquifer. Groundwater monitoring of the MCB/MBP began in 1985 and continued on a quarterly basis until 1994. Depth to groundwater is approximately 36 to 42 meters (120 to 140 feet), with variations due in part to topographic differences between well locations. A total of 14 monitoring wells and two piezometers were installed in the MCB/MBP area as part of the Phase II RFI/RI investigation. Figure 6 shows the location of the groundwater monitoring wells and temporary piezometers at the MCB/MBP. Of the 14 monitoring wells, five are screened in the water table aquifer, five are screened in the upper portion of the Lost Lake aquifer, and the remaining four wells are screened in the lower portion of the Lost Lake aquifer. One piezometer was screened in the upper portion of the Lost Lake aquifer and one was screened in the lower portion of the Lost Lake aquifer.

TCE was detected in 11 of 16 M-Area (water table) aquifer samples with a maximum concentration of 150 μ/L and an average concentration of 21.1 μg/L. PCE was detected in 9 of 16 M-Area (water table) aquifer samples with a maximum concentration of 14.4 μg/L and an average concentration of 2.7 μg/L.

TCE was detected in 47 of 54 Lost Lake aquifer samples with a maximum concentration of 611 μg/L and an average concentration of 43 μg/L. PCE was detected in 34 of 54 Lost Lake aquifer samples with a maximum concentration of 79 μg/L and an average concentration of 8.7 μg/L.

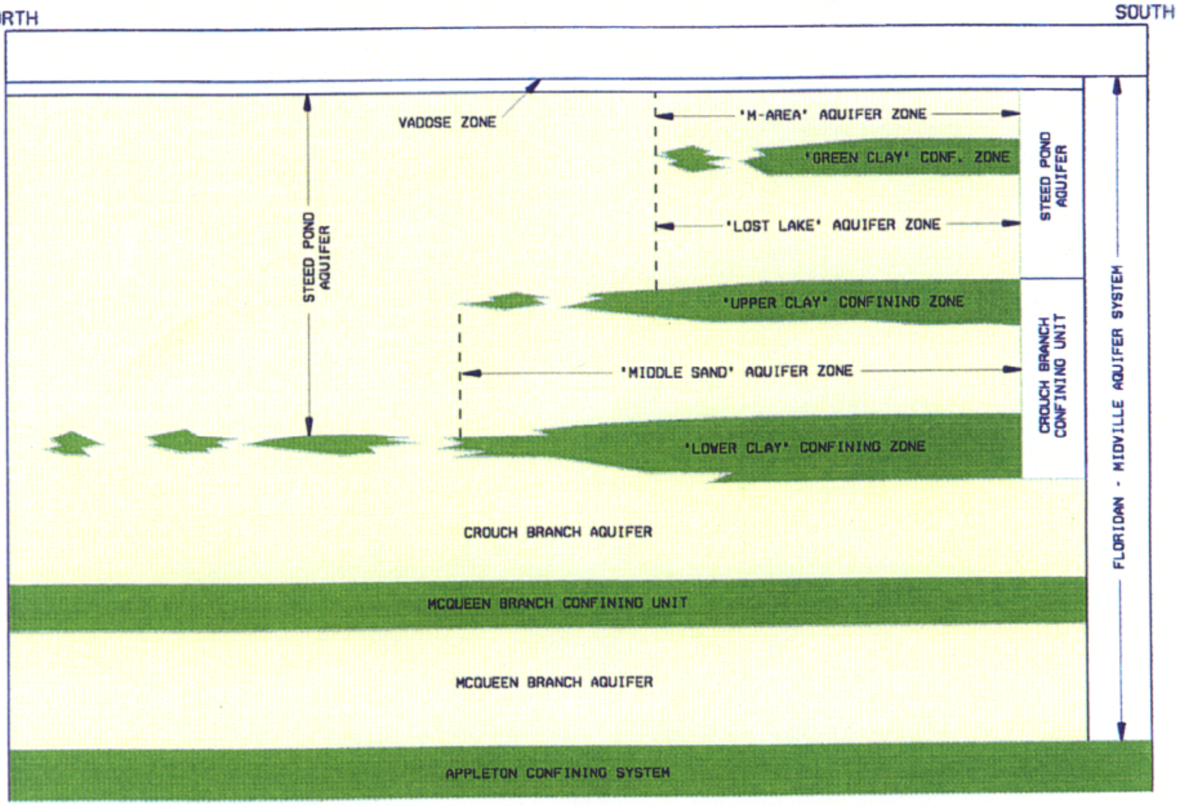

FIGURE 5.
SCHEMATIC NORTH-SOUTH HYDROSTRATIGRAPHIC CROSS-SECTION AT THE MCB/MBP

Figure 5. **Schematic North-South Hydrostratigraphic Cross Section at the MCB/MBP**

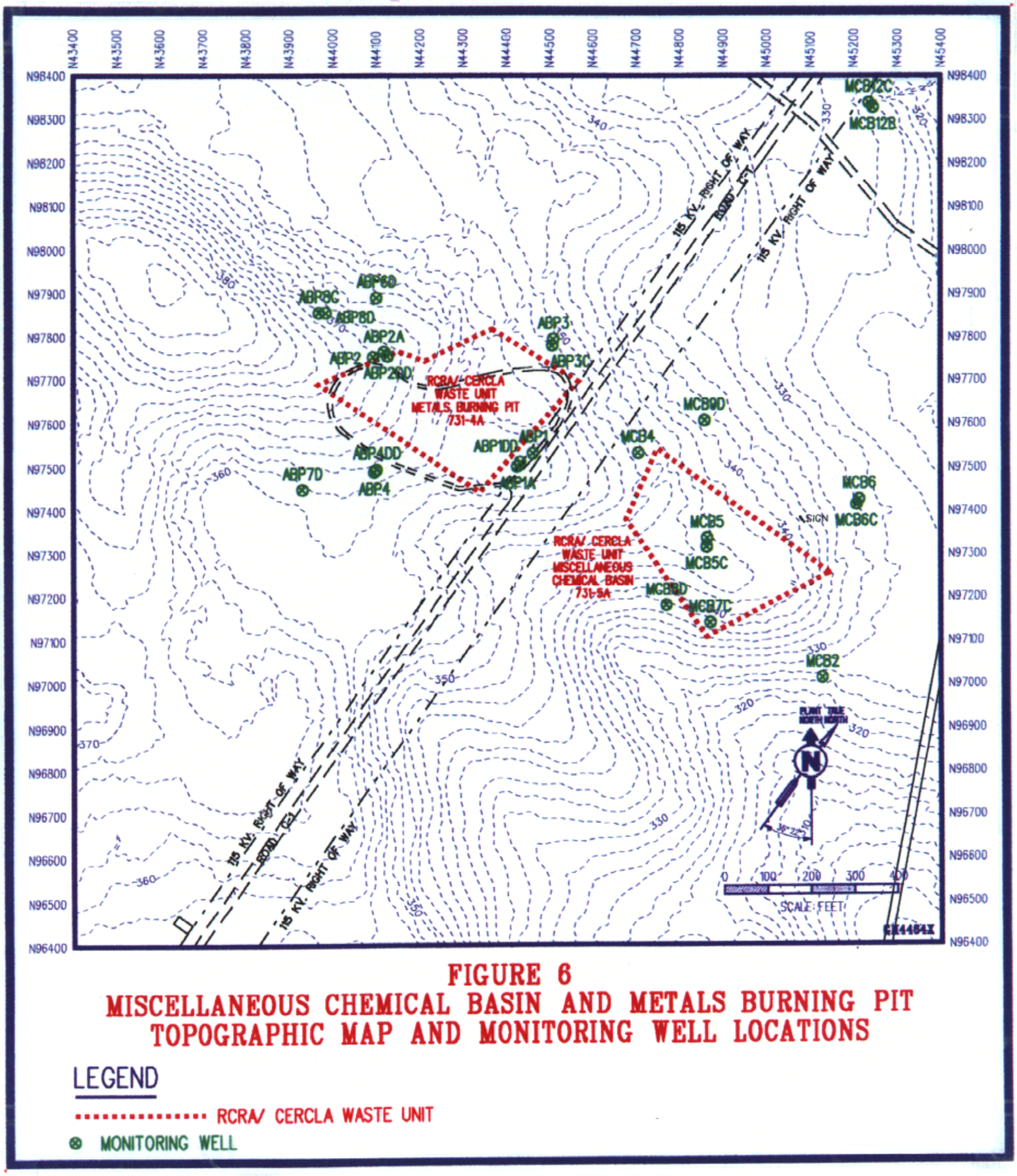

Figure 6. Miscellaneous Chemical Basin/Metals Burning Pit Topographic Map and Monitoring Well Locations

Carbon tetrachloride was detected in 4 of 16 M-Area aquifer samples with a maximum concentration of 4.4 ug/L and an average concentration of 0.5 µg/L. Carbon tetrachloride was also detected in 3 of 26 Lost Lake aquifer samples with a maximum concentration of 0.4 µg/L and an average concentration of 0.03 µg/L.

Lead was detected in 14 of 16 M-Area aquifer samples with a maximum concentration of 55.3 µg/L and an average concentration of 14.9 µg/L. Lead was also detected in 16 of 24 Lost Lake aquifer samples with a maximum concentration of 26.6 µg/L and an average concentration of 7.4 µg/L.

Contaminant Threat Review

A review of the final human and ecological COCs present within the soils and groundwater at the MCB/MBP indicates that the wastes are not principal threat source material (PTSM). PTSM is defined as source material that is highly toxic or mobile at levels that pose a risk to human health greater than 1×10^{-3} should exposure occur. The contaminants within the soils and groundwater can be categorized as follows:

- Low concentrations of Aroclor-1254, Aroclor-1260, OCDD and aluminum in surface and subsurface soils are thought to be a low level threat waste because the material represents relatively low risks (on the order of 10^{-6}) to humans and moderate risks to ecological receptors, has a low potential for migration, and is easily contained.
- VOCs are present in the vadose zone of the MCB and are considered to be residual soil contamination, resulting in MCB groundwater contamination.
- Lead has been detected in the MCB groundwater but its presence is considered to be due to natural geologic conditions.

In conclusion, SRS believes that although the contaminants (Aroclor-1254, Aroclor-1260, OCDD, and aluminum) in the surface and subsurface soils are not principal threat wastes, remedial actions should be considered to remove them. Remedial actions should also be considered for the residual VOC soil contamination in the vadose zone. Finally, interim remedial actions should be taken to prevent the growth of the VOC groundwater plume. A thorough discussion of the specific remedial action objectives is provided in Section VIII.

Contaminant Transport Analysis

Based on SESOIL modeling of soils CMCOCs in MCB, only TCE and PCE are expected to leach to the water table in less than 1000 years. TCE and PCE are the only constituents predicted to have a maximum groundwater concentration above the groundwater limit. TCE and PCE are projected to reach the water table beneath the MCB at their maximum leachate concentrations (1160 and 6530 μg/L, respectively) in 43 and 110 years, respectively, which are above the groundwater MCLs of 5 μg/L for both TCE and PCE. An indication of the lateral and vertical extent of the VOC contamination is provided in Figure 6a. This figure shows the TCE concentration in soil gas samples at two different depth intervals.

VI. CURRENT AND POTENTIAL FUTURE SITE RESOURCE USES

Land Uses

Current land use at the MCB/MBP is industrial, although there are no permanently located workers at the unit. Since the land is likely to remain under the control of the United States Government, it is not likely to ever be used for residential purposes.

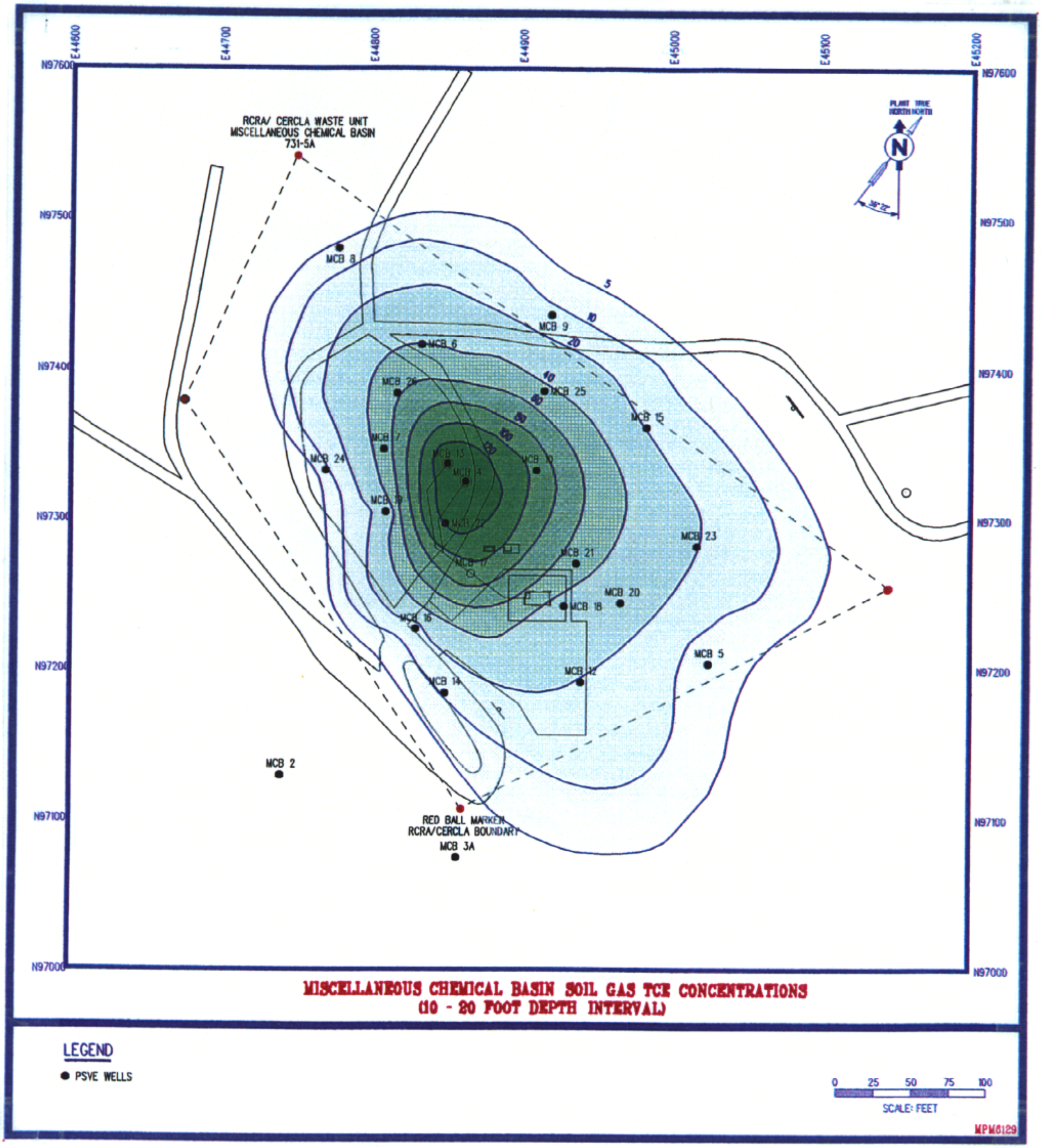

Figure 6a. MCB Soil Gas TCE Concentrations

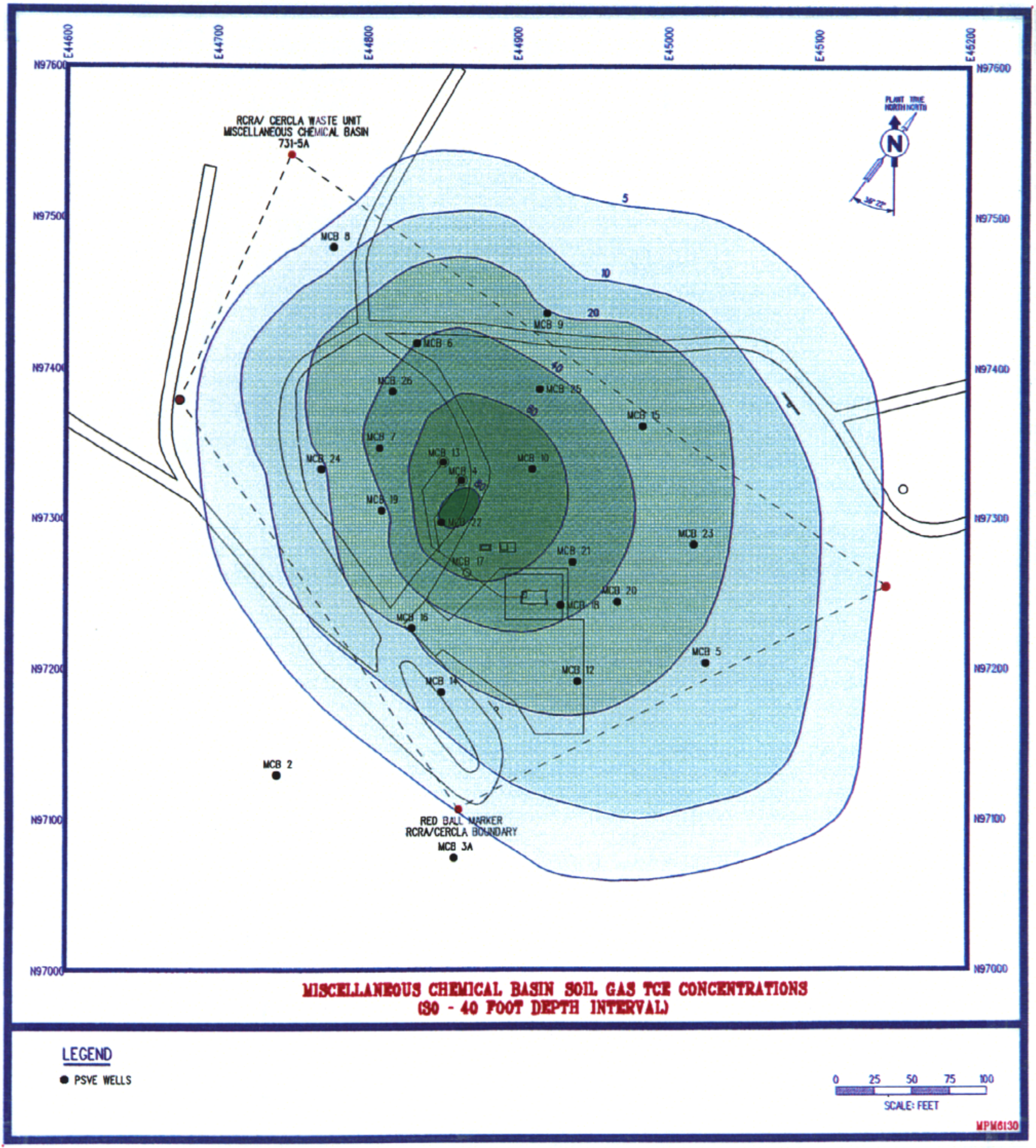

Figure 6a. MCB Soil Gas TCE Concentrations (Cont)

Groundwater/Surface Water Uses

There is no surface water in the immediate vicinity of the unit. The area surrounding the unit is undeveloped and there are currently no drinking water wells in the area. Since the area is likely to remain undeveloped in the future, there will likely be no demand for groundwater to be used for process applications or drinking water.

VII. SUMMARY OF OPERABLE UNIT RISKS

Baseline Risk Assessment

The purpose of the BRA is to assess the potential for adverse human health and ecological effects to occur from exposure to constituents at the MCB/MBP waste unit. Baseline risks are those risks to human health and the environment that can be anticipated to be present without any controls or remedial actions at the unit. The BRA provides the basis for determining whether or not remedial action is necessary and the justification for performing the remedial action. This section of the IROD summarizes the results of the baseline risk assessment for this operable unit. Detailed information regarding the risk assessment process can be found in the RFI/RI/BRA report (WSRC 1998a).

Human Health Risk Assessment

The human health risk assessment considered both the current and future land uses and individuals likely to be exposed. Current exposures were evaluated for an on-unit worker who may occasionally be in the area. Future exposures were evaluated for a hypothetical worker and residents. The resident scenario is the most sensitive land use. The MCB/MBP is located in an area that has been recommended for multiple land uses, with the specific exclusion of residential land use (US DOE 1996).

Exposure parameters were based on unit-specific data and default values published by US EPA. US EPA methods were used in conducting the risk assessment. Soil was evaluated for ingestion, inhalation, dermal and external radiation. Groundwater was evaluated for inhalation (during showering) and ingestion. Produce was evaluated for ingestion. Risks were quantified for adverse cancer and noncancer effects.

As part of the RI/RFI evaluation, if the level of a constituent in a given medium exceeds state or federal chemical-specific ARARs, that constituent is also included as a COC. For drinking water obtained from groundwater or surface water, the MCL is the controlling ARAR. The preliminary COCs generated from the results of the human health risk assessment for the MCB/MBP are detailed in the RFI/RI/BRA report (WSRC 1998a).

Current Exposure: MCB/MBP Soils and Groundwater

Current exposure was considered for the on-unit worker, who may occasionally be in the area. Current groundwater exposures were not evaluated because the MCB/MBP and surrounding area are undeveloped and there are no drinking water wells currently located in the surrounding area. Therefore, the risk assessment for the current land use focused only on the soil at the MCB/MBP. There are no unacceptable risks for the current on-unit worker. Cancer risks for all exposure routes are less than 1×10^{-6}, indicating that under current conditions, carcinogenic risk from chemicals and radionuclides is insignificant at the unit.

Noncancer effects from constituent exposure are expressed in terms of the Hazard Quotient (HQ), which is defined as the ratio of the estimated chronic daily intake of a constituent relative to a reference dose. The reference dose is the daily intake of a chemical (continued over a lifetime) that is likely to be without adverse health effects. The Hazard Index (HI) is the sum of constituent-specific HQs for each environmental medium and exposure route. Therefore, if the constituent HI is greater than 1, the potential for adverse noncancerous health effects exists. The HI for the current on-unit worker is less than 1, indicating that under current conditions, there is no significant risk from noncarcinogens at the unit.

Future Exposure: MCB/MBP Soil

Future exposures were evaluated for the hypothetical industrial worker and resident. Groundwater was included as part of the risk assessment for the future land use scenario. Soil and groundwater were evaluated individually and are detailed below.

The characterization of the primary and secondary sources associated with the MBP soil indicates contamination with SVOCs, VOCs, pesticides, PCBs and radionuclides. Preliminary COCs were identified by comparing USCs with ARARs, analyzing for fate and transport in the environment, and assessing the human health and ecological risk. Details are provided in the BRA portion of the latest revision of the RFI/RI/BRA (WSRC 1998a).

Upon completion of an analysis of uncertainties in the RFI/RI/BRA only Aroclor-1254, Aroclor-1260, OCDD, TCE and PCE were retained as final human health or contamination migration COCs for the MCB soil. Those constituents retained as final COCs and their risks are listed in Table 1 and detailed in the approved of the RFI/RI/BRA.

Future Exposure: MCB/MBP Groundwater

No COCs were retained for the groundwater below the MBP. For groundwater below the MCB, the human health risk evaluation identified preliminary COCs for the hypothetical future on-unit resident and for the hypothetical future on-unit industrial worker. Those groundwater constituents which were retained as preliminary COCs are detailed in the RFI/RI/BRA (WSRC 1998a). In the uncertainty analysis, lead, PCE, TCE, and carbon tetrachloride were retained as final COCs for both the future on-unit industrial worker and resident. These final human health COCs and their associated risk are listed in Table 1.

The rationale for the proposed groundwater interim action is centered on: 1) controlling the source of groundwater contamination, i.e., vadose zone contamination; and 2) remediating the "hot spot" portions of the groundwater plume.

VOC-contaminated groundwater plumes are located upgradient from the MCB/MBP. The larger of these plumes is associated with the A/M Area unit. Since these plumes are moving in the general direction of the MCB/MBP, it is not clear whether these plumes may represent a future VOC source relative to the MCB/MBP groundwater. The proposed interim groundwater action may be sufficient to reduce VOC levels to less than MCLs if there is no interaction between the MCB/MBP and the upgradient waste units, ABRP and/or A/M Area.

Ecological Risk Assessment

The ecological risk assessment defined the likelihood of harmful effects or the risk to ecological receptors from exposure to contaminants at the MCB/MBP. Receptors include terrestrial plants and animals and their habitats. Constituents in the upper four feet of soil were screened because this medium was the principal one resulting in exposures to plants and animals. Based on characterization of the environmental setting and identification of potential receptor organisms, a CSM was developed to determine the complete exposure pathways through which ecological receptors could be exposed to constituents of potential concern.

Upon completion of the uncertainty analysis, aluminum was retained as the final ecological COC for the MBP surface and subsurface soils. Aroclor-1260 was retained as the final ecological COC for the MCB surface soil (see Table 1). Remedial action addressing these COCs is required based on the assessment endpoints of protection of worm-eating and/or insectivorous mammals.

Table 1. Final Human Health, Contaminant Migration and Ecological COCs

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Soil	MCB	Aroclor-1254	Risk to future resident (0-4 ft) Risk to future worker (0-1 ft)	6×10^{-6} 2×10^{-6}	NA NA
	MCB	Aroclor-1260	Risk to future resident (0-4 ft) Risk to future worker (0-1 ft) Ecological risk to animals (worm-eating and/or insectivorous mammals, 0-1 ft)	2×10^{-5} 5×10^{-6} NA	NA NA >10
	MCB	OCDD	Risk to future resident (0-4 ft) Risk to future worker (0-1 ft)	3×10^{-6} $<1 \times 10^{-6}$	NA NA
	MCB	TCE PCE	Migration to groundwater Migration to groundwater	* *	* *
	MBP	Aluminum	Ecological risk to animals (worm-eating and/or insectivorous mammals, 0-4 ft)	NA	>10
Groundwater	MCB	Lead	Risk to future resident; exceedance of MCLs	**	**
		Carbon Tetrachloride	Risk to future resident Risk to future worker	2×10^{-4} 4×10^{-5}	NA NA
		TCE	Risk to future resident Risk to future worker	2×10^{-4} 4×10^{-5}	NA NA
		PCE	Risk to future resident Risk to future worker	2×10^{-4} 4×10^{-5}	NA NA

*Contaminant Migration Constituent of Concern, based on exceedance of MCL, not risk-based
** Due to exceedance of MCL

Summary

The response actions in this IROD are necessary to protect the public health or welfare of the environment from actual or threatened releases of hazardous substances into the environment.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

RAOs specify COCs, media of concern, potential exposure pathways, and remediation goals. The RAOs are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure. Initially, preliminary remediation goals are developed based upon ARARs or other information from the RFI/RI/BRA report. These goals are modified, as necessary, as information concerning the unit and potential remedial technologies becomes available. Final remediation goals are determined when the remedy is selected and are used to establish acceptable exposure levels protective of human health and the environment. Interim RAOs (IRAOs) are specific early action goals developed to reduce risk to human health and the environment. The IRAOs established for this IROD are:

- Surface/Subsurface Soil - prevent direct contact with aluminum, OCDD, Aroclor-1254, and Aroclor-1260 contaminated surface/subsurface soils, such that the COCs are not a continued significant risk to human health or the ecological receptors. These are final remedial actions.
- Vadose Zone Soil - treat VOC-contaminated vadose zone soils with a combination of active and passive treatment, with an overall objective to reduce the solvent contaminant mass that would migrate to the water table, resulting in groundwater concentrations exceeding MCLs. These are final remedial actions.

- Groundwater – treat contaminated groundwater to prevent further VOC plume growth, demonstrate the effectiveness of in situ air stripping wells in achieving significant contaminant mass removal, and obtain necessary site-specific run data to determine a final remedial goal. Although lead is a COC in the groundwater, this action will not address the lead because SRS believes the lead concentrations are the result of natural geological conditions. These are interim remedial actions.

In developing specific interim RGs consistent with the above IRAOs, it is necessary to consider the ARARs that are pertinent to remediation of MCB/MBP OU. A listing of these ARARs is provided in Table 2.

Table 2. Chemical, Action, Location - Specific ARARs

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Chemical			
40 CFR 141 - MCLs and MCLGs	Relevant and Appropriate	MCLs and MCLGs for groundwater that may be a source of drinking water	MCLs should generally be met for cleanup of groundwater under the CERCLA program.
SC R.61-58.5 - MCLs and MCLGs	Relevant and Appropriate	MCLs and MCLGs for groundwater that may be a source of drinking water	State regulations implementing MCLs.
SC R.61-68 Water Classification	Relevant and Appropriate	States official classified water uses for all surface and groundwater in South Carolina.	Mandates meeting MCLs for groundwater unless a Mixing Zone is established. Ground-water Mixing Zone guidance allows developing alternative compliance levels for groundwater
40 CFR 143.3	Relevant and Appropriate	Establishes levels for contaminants that affect the aesthetic qualities of drinking water	Secondary Drinking Water Standards potentially relevant for setting remediation levels
40 CFR 761, (TSCA)	Relevant and Appropriate	Identifies cleanup levels and disposal requirements for cleaning, decontaminating, or removing PCB remediation waste.	§761.61(a)(4)(I)(A) identifies <1ppm as the cleanup level for high occupancy areas without further conditions. Requirements for water are in §761.79(b)(1). Disposal requirements specified in §761.61(a)(5)(i)(B)(2)(ii), §761.61(a)(5)(i)(B)(2)(iii) or §761.61(b)(2)(i). EPA-IV policy consistent with §761.61(c) allows storage of containerized/packaged PCB bulk remediation waste up to 180 days from containerization within AOC.
40 CFR 761, (TSCA)	Applicable	Notification requirements for shipping bulk PCB remediation waste	§761.61(a)(5)(i)(B)(iv)
SC R.61-62.5 Air quality Standard	Applicable	Establishes air quality standards for emissions	Standard 2 Toxic Air Pollutants and Standard 8 Ambient Air Quality Standards
40 CFR 50.6	Applicable	The concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 ug/m^3 (annual arithmetic mean) or 150 ug/m^3 (24-hour average concentration).	Earth-moving activities will generate airborne dust that will have the potential to exceed the levels specified. Dust suppression will likely be required to minimize dust emissions.
SC R.61-62.1 Air Permit Requirements	Applicable	Requires construction and Operating permits for sources of air pollution	SVE unit and catalytic oxidation unit require permits for construction and operation
SC R.61-62.6 Fugitive Dust	Applicable	Fugitive particulate material shall be controlled	Construction activities shall minimize fugitive particulate emissions. Earth-moving activities have the potential to generate airborne particulate matter
40 CFR 107, 171-179 DOT Hazardous Materials Transportation Regulations	Applicable	Specifies requirements for handling, packaging, labeling, and transporting wastes containing DOT hazardous substances.	Applicable to contaminated soil or investigation-derived wastes shipped off-site.

Table 2. Chemical, Action, Location - Specific ARARs (Continued)

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Action			
40 CFR 50.6	Applicable	The concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 ug/m^3 (annual arithmetic mean) or 150 ug/m^3 (24-hour average concentration).	Earth-moving activities will generate airborne dust that will have the potential to exceed the levels specified. Dust suppression will likely be required to minimize dust emissions.
SC R.61-62.1 Air Permit Requirements	Applicable	Requires construction and Operating permits for sources of air pollution	SVE unit and catalytic oxidation unit require permits for construction and operation
SC R.61-62.6 Fugitive Dust	Applicable	Fugitive particulate material shall be controlled	Construction activities shall minimize fugitive particulate emissions. Earth-moving activities have the potential to generate airborne particulate matter
40 CFR 107, 171-179 DOT Hazardous Materials Transportation Regulations	Applicable	Specifies requirements for handling, packaging, labeling, and transporting wastes containing DOT hazardous substances.	Applicable to contaminated soil or investigation-derived wastes shipped off-site.
SC R61-71 Well Construction Standards	Applicable	Prescribes minimum standards for the construction of groundwater wells	Standards for installation and abandonment of groundwater wells.
SC R.61-67 Standards for Wastewater Facility Construction	Applicable	Permits to construct wastewater treatment and transportation systems. Permit to operate prior to startup and licensing of operators.	SVE units require permit to operate.
SC R.72-300 Standards for Stormwater Management and Sediment Reduction.	Applicable	Stormwater management and sediment control plan for land disturbances	Excavation activities will require an erosion control plan.
29 CFR 1910 Occupational Worker Safety (OSHA)	Applicable	Identifies health and safety requirements for remediation workers.	Worker activities involving hazardous materials must be conducted according to a project health and safety plan.
Location			
16 USC 661	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 unit. The action will not affect fish located at the SRS or in nearby bodies of water.
16 USC 703	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 SRS.

The final Human Health COCs and associated final RGs for MCB/MBP soil are summarized in Table 3. The ecological RGs for the MCB/MBP are shown in Table 4. The contaminant migration RGs for MCB soils are shown in Table 5.

Table 3. Final Human Health COCs and Final RGs for the MCB/MBP Soils

Final COC	RG, μg/kg	Waste Area	Soil Interval of Concern
Aroclor-1254	1000[a]	MCB	Surface and Subsurface (0 - 4 ft)
Aroclor-1260	1000[a]	MCB	Surface and Subsurface (0 - 4 ft)
OCDD	11.5[b]	MCB	Surface (0 – 1 ft)

[a] RG based on ARAR limit (40 CFR 761 for high occupancy [residential] areas)
[b] Human health RGs were selected based on a future industrial land use scenario (1 x 10^{-6} risk level).

Table 4. Final Ecological COCs and Final RGs for the MCB/MBP Soils

Final COC	RG	Waste Area	Soil Interval of Concern
Aluminum	11,000 mg/kg	MBP	Surface & Subsurface (0 – 4 ft)
Aroclor-1260	215 μg/kg	MCB	Surface (0 – 1 ft)

The ecological RG for aluminum is set at the maximum unit-specific background. The ecological RG for Aroclor-1260 is set at the Lowest Observed Adverse Effects Level for worm eating and/or insectivorous mammals.

Table 5. Final Contaminant Migration COCs and Final RGs for the MCB Soils

Final COC	RG, μg/kg	Waste Area	Soil Interval of Concern
Tetrachloroethylene	344	MCB	Subsurface & Deep
Trichloroethylene	344	MCB	Subsurface & Deep

Contaminant migration RGs were established utilizing a vadose zone contaminant transport model. See Appendix E of the RFI/RI/BRA (WSRC 1998a) for details.

For MCB soils, an OCDD concentration of 3.0 μg/kg will result in a cancer risk of 1 x 10^{-6} to the future resident. Although the maximum detected OCDD concentration in MCB soils (11.0 μg/kg) exceeded this value, the OU has been excluded from residential land use. Since the maximum concentration detected is also less than the RG for industrial land use, no action is required.

For the MBP, a final RG of 11,000 mg/kg (the maximum unit-specific background concentration) was established for the ecological COC, aluminum. The use of the maximum unit background value of 11,000 mg/kg as the final RG was approved in the Revision 1.2 RFI/RI/BRA. This decision was based on the fact that excavated soils for the unit will be backfilled with material taken from SRS borrow pits. Since soils from SRS have an average aluminum concentration of 8,990 mg/kg, the backfilled material will most likely contain aluminum concentrations exceeding the unit-specific average background value of 4,100 mg/kg.

The surface soil locations at the MCB that had detections of Aroclor-1260 in excess of the ARAR RG of 1000 μg/kg and the ecological RG of 215 μg/kg are shown in Figure 7. The same data in cross section is shown in Figure 8. The surface soil locations at the MCB that had detections of Aroclor-1254 in excess of the ARAR RG of 1000 μg/kg are shown in Figure 9. The same data in cross section is shown in Figure 10. These figures (7 through 10) indicate areas where the detections exceeded the relevant RGs.

The surface and subsurface locations that had detections of OCDD are shown in Figure 11. The same data in cross section is shown in Figure 12. These figures indicate areas where the detections exceeded the 1×10^{-6} human health risk for future residential land use. There were no detections exceeding the 1×10^{-6} human health risk for future industrial land use.

The soil surface and subsurface locations that had detections of aluminum in the MBP are shown in Figure 13. The same data is shown in cross section in Figure 14. These figures show exceedances over unit-specific maximum background (for ecological risk). The volume of MBP soil contaminated with aluminum above the unit-specific maximum background RGO is estimated to be 18,100 ft^3.

The computer model *SESOIL: A Seasonal Soil Compartment Model* predicts that COCs in the vadose zone at MCB will migrate to groundwater, ultimately causing VOC groundwater concentrations to exceed MCLs. For the MCB vadose zone, the RG of 344 µg/kg was established for both the final contaminant migration COCs, PCE and TCE. The volume of MCB vadose zone soil contaminated with VOCs above the RG is estimated to be 4.08 x 10^6 ft^3.

The final Human Health COCs as well as interim and final RGs for MCB/MBP groundwater are summarized in Table 6. Groundwater modeling indicates that the selected remedy (Section XI) is capable of achieving the interim RGs shown in Table 6 within five years of operation (the anticipated duration of the interim action). The design for the selected remedy focuses treatment capacity on the current region of highest groundwater contamination (>500 µg/L) by positioning 5 of the 11 in situ aeration wells within this portion of the plume. This remedial design results in faster cleanup of the more concentrated VOC "hot spot" than the other (less contaminated) regions. The model results are reflected in the interim RGs shown in Table 6.

Table 6. Final Groundwater COCs and Interim RGs for the MCB

Final COC	Final RG, µg/L	Interim RG, High VOC Concentration Wells (>500 µg/L)*	Interim RG, Medium VOC Concentration Wells (ca. 200 µg/L)*	Interim RG, Low VOC Concentration Wells (<50 µg/L)*
TCE	5	20	41	20
PCE	5	20	41	20
Carbon tetrachloride	5	20	41	20
Lead	15	15	15	15

*Interim RGs based on modeling results

A cross section of the MCB TCE groundwater plume is shown in Figure 15. The upgradient ABRP and A/M area VOC plumes are shown in relation to the MCB plume in Figure 15a. The volume of VOC-contaminated groundwater associated with the MCB plume is estimated to be 5.12 x 10^5 ft^3 (3.83 x 10^6 gallons).

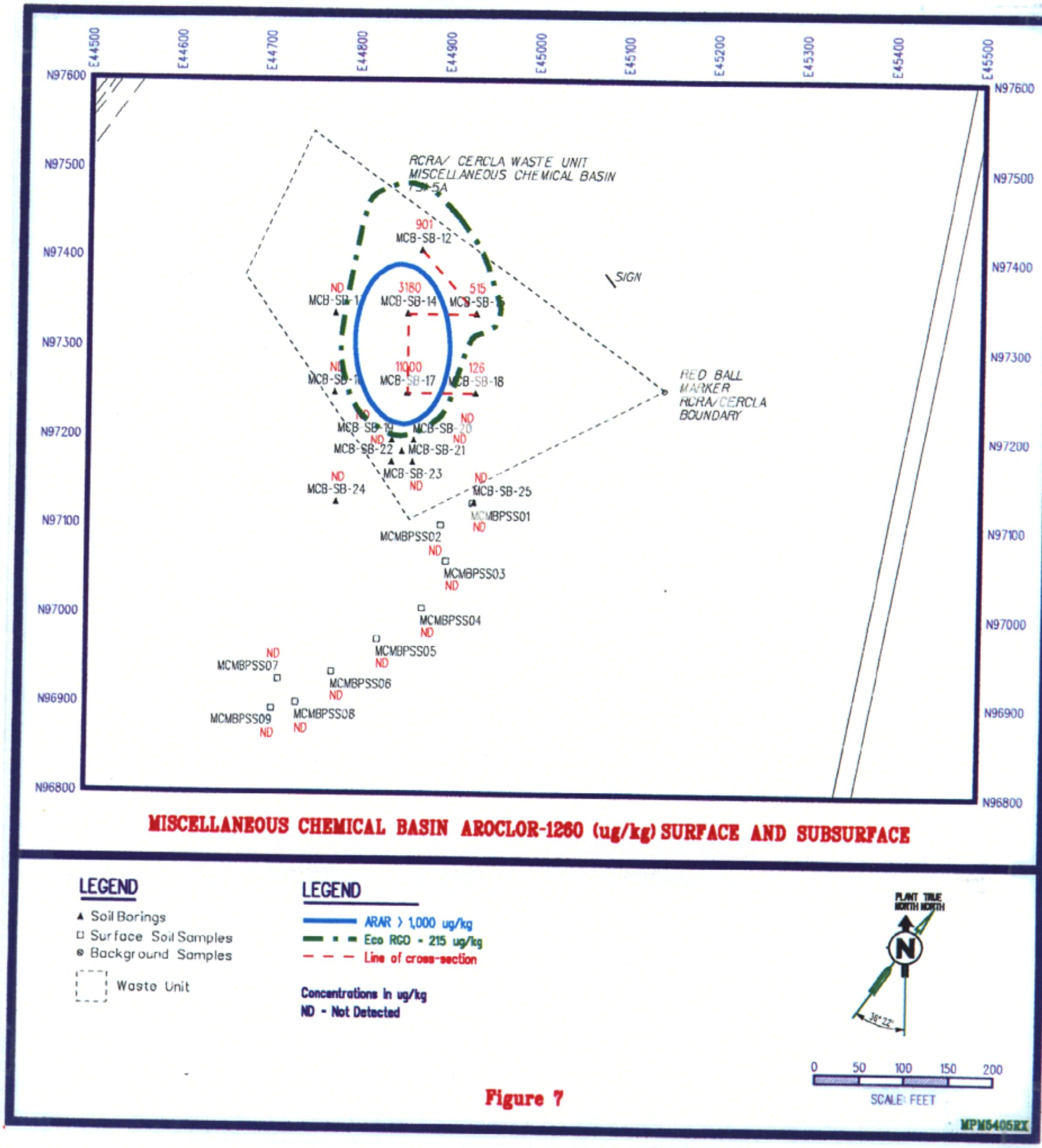

Figure 7. Miscellaneous Chemical Basin Aroclor-1260 (µg/kg) Surface and Subsurface Sample Locations

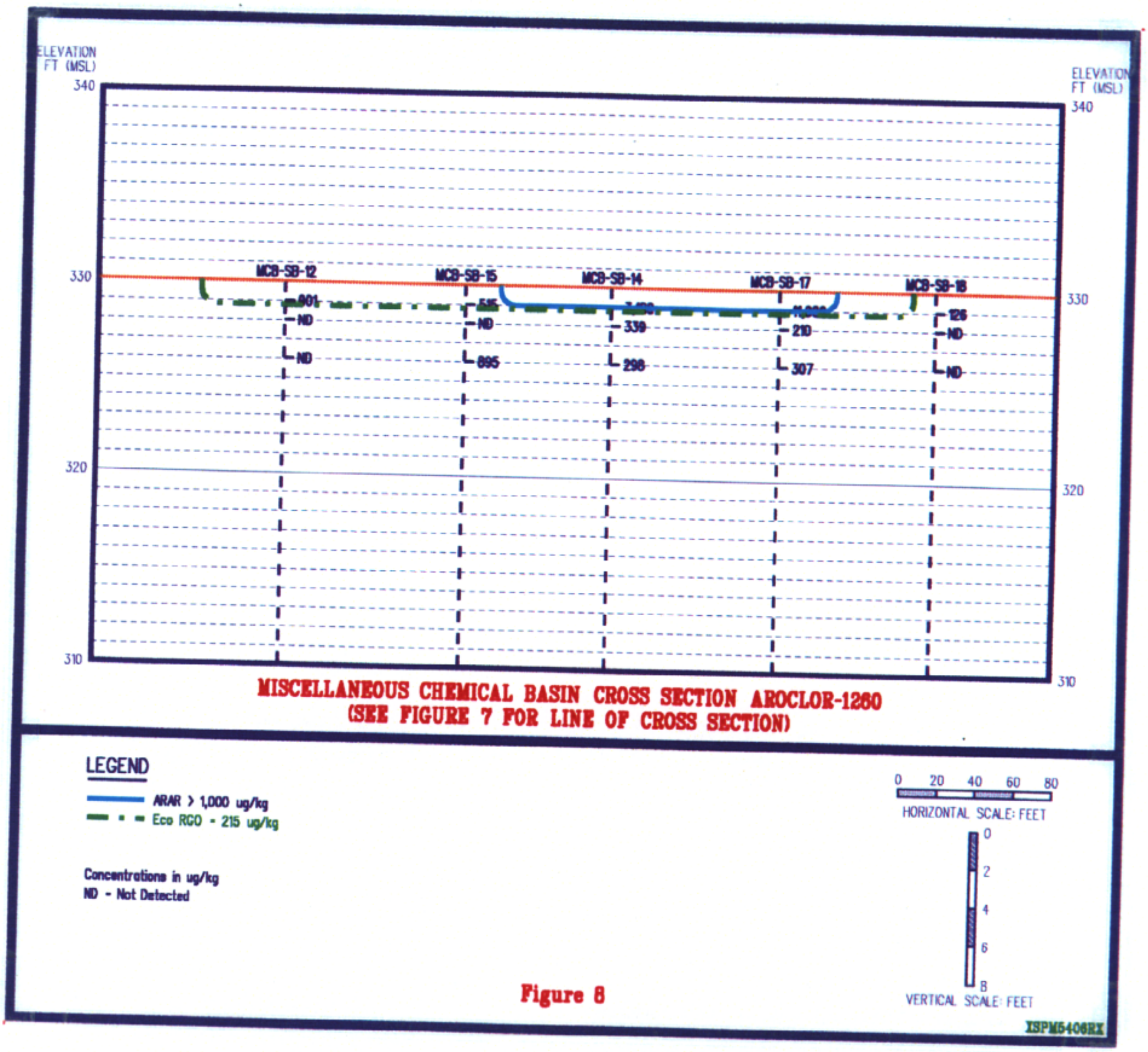

Figure 8. Miscellaneous Chemical Basin Cross Section of Aroclor 1260

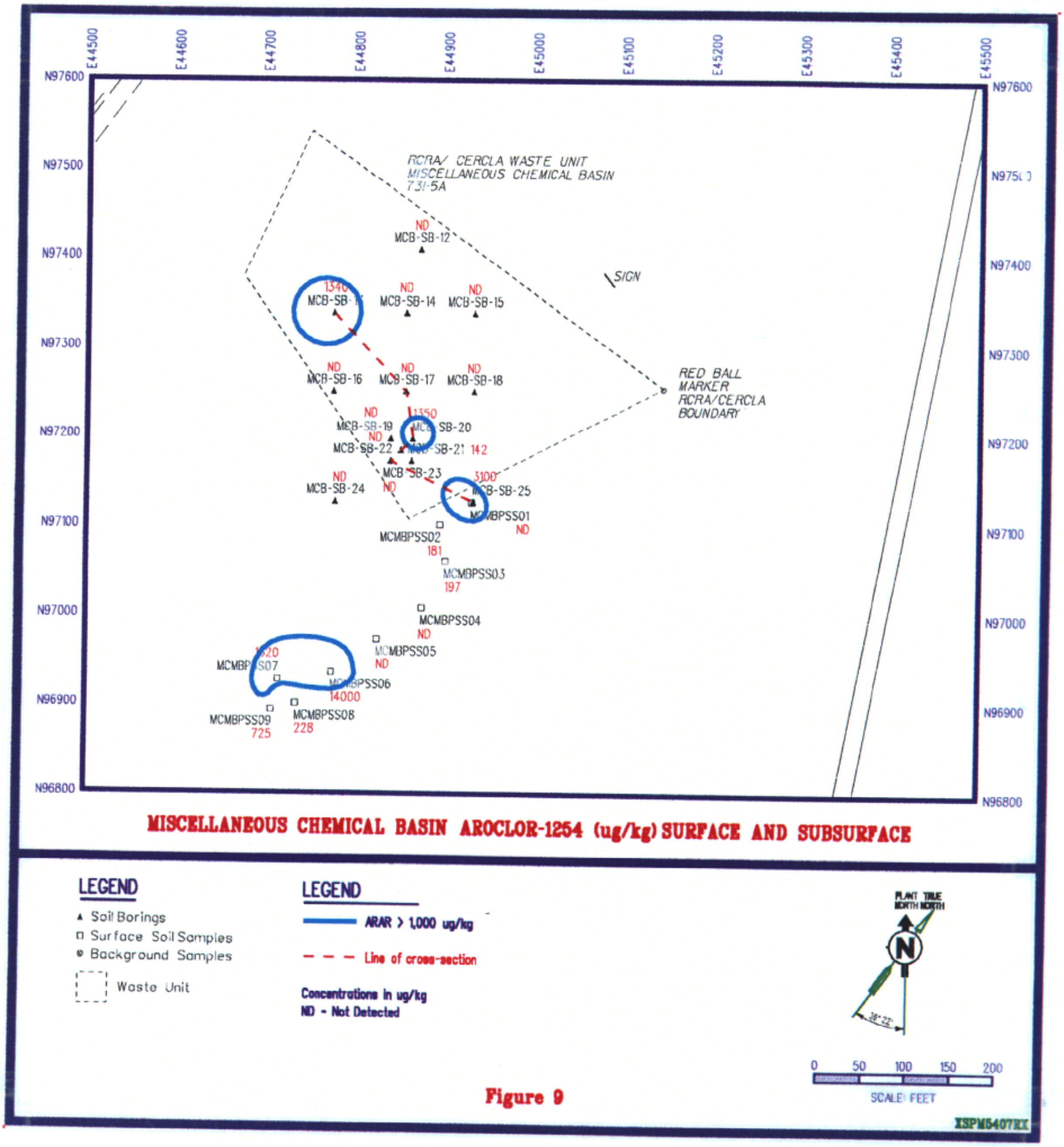

Figure 9. Miscellaneous Chemical Basin Aroclor 1254 (μg/kg) Surface and Subsurface Sample Locations

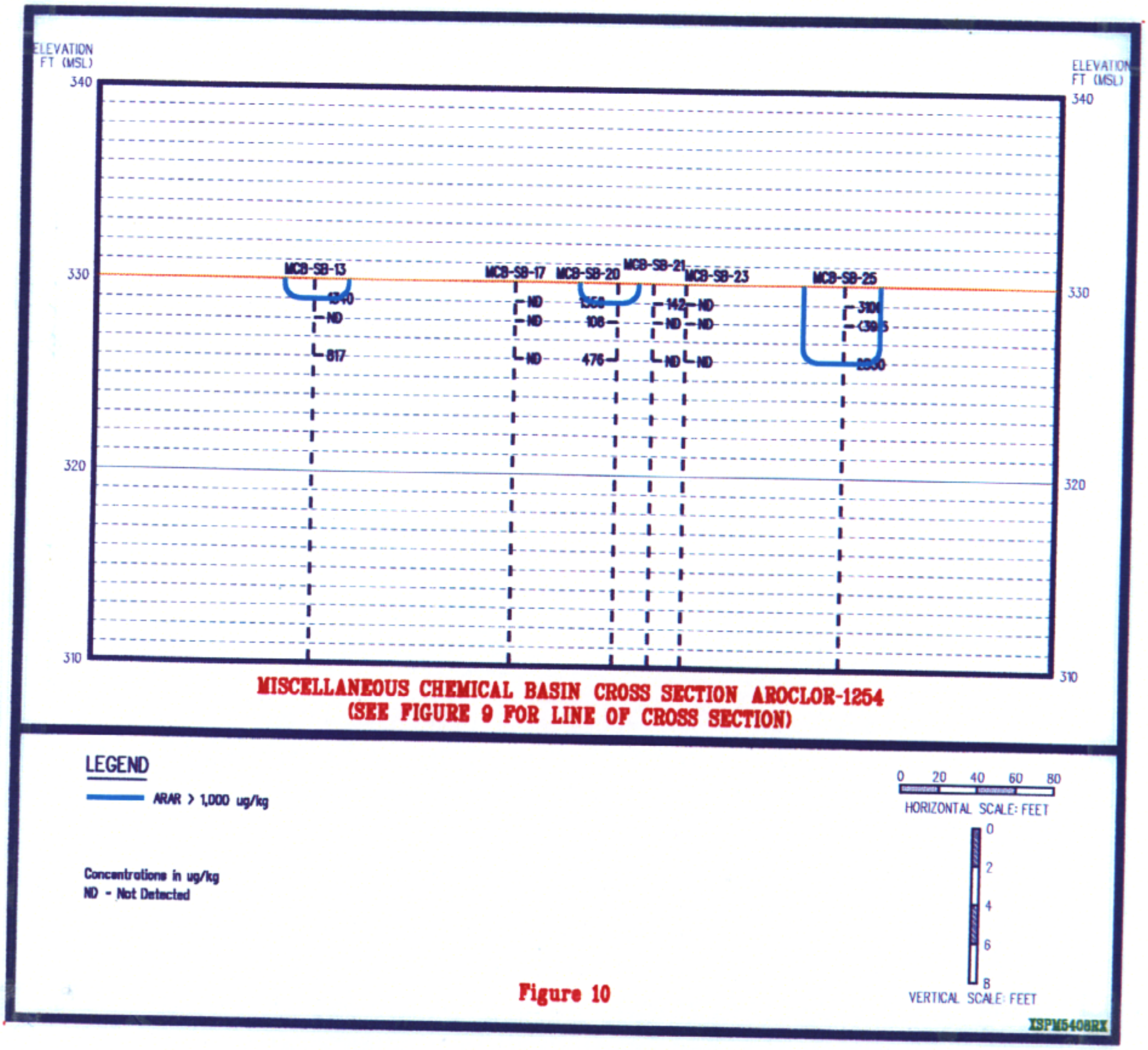

Figure 10. Miscellaneous Chemical Basin Cross Section of Aroclor 1254

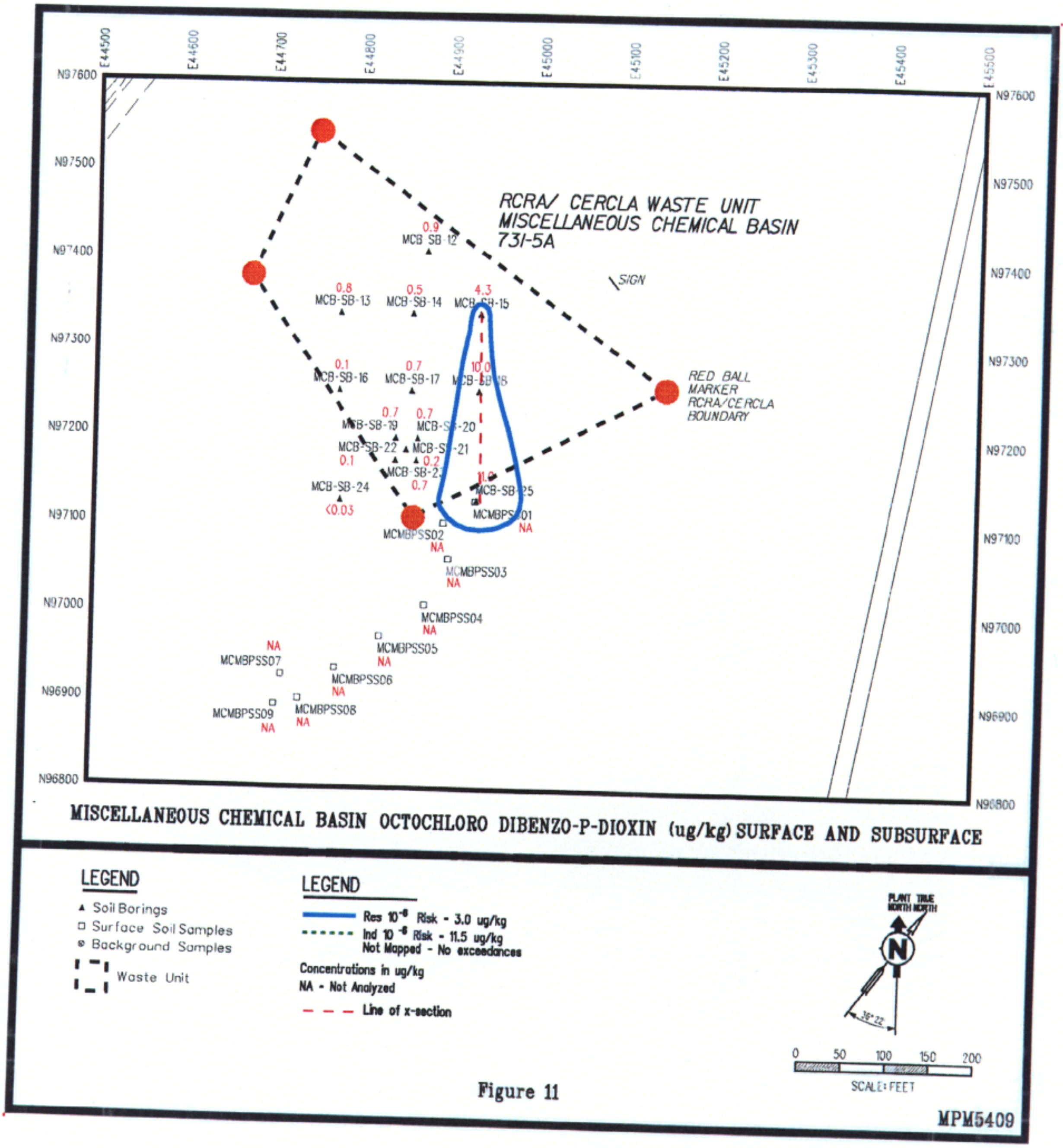

Figure 11. Miscellaneous Chemical Basin Octachlorodibenzo-P-Dioxin (μg/kg) Surface and Subsurface Sample Locations

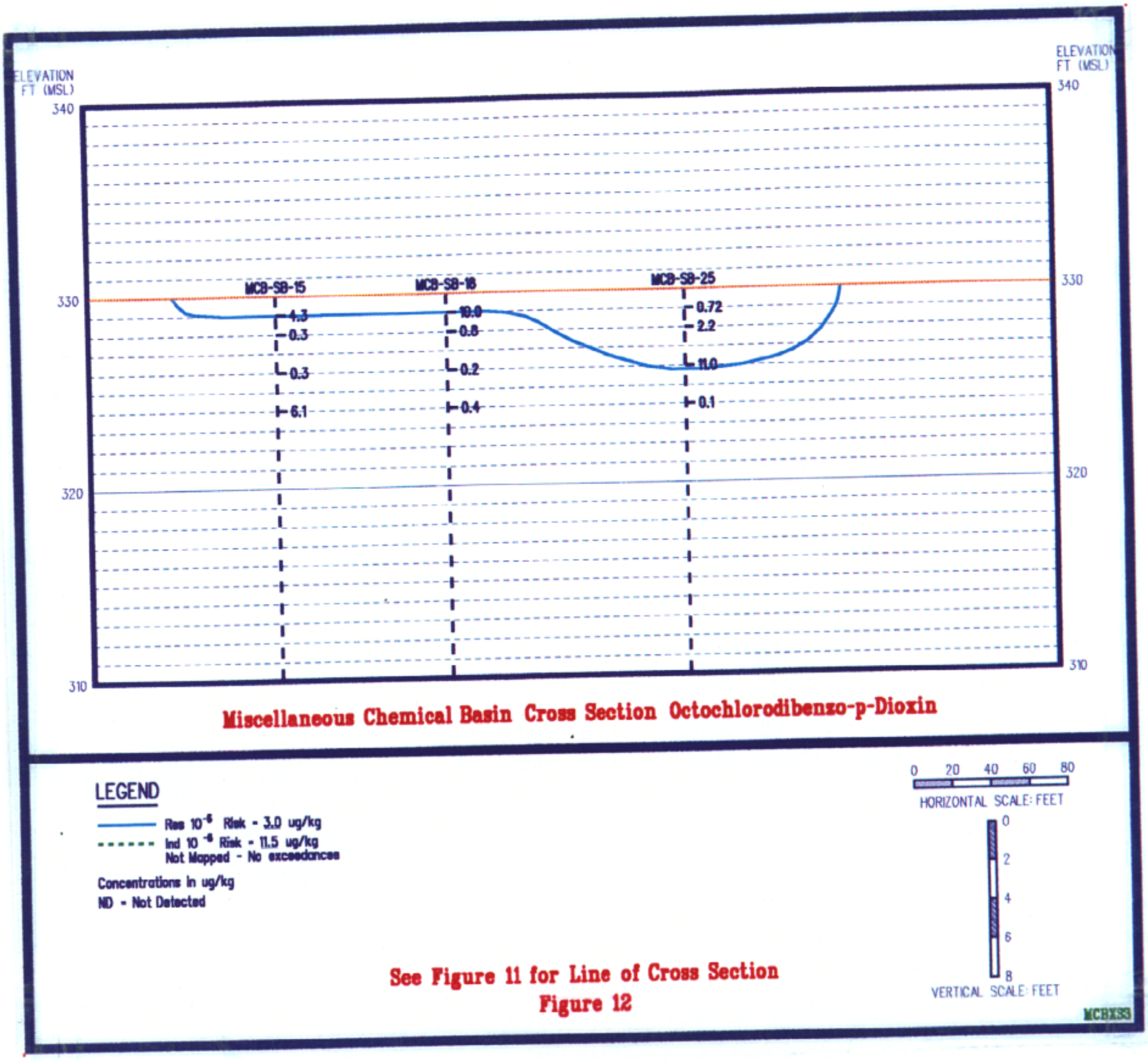

Figure 12. Miscellaneous Chemical Basin Cross Section Octachlorodibenzo-P-Dioxin

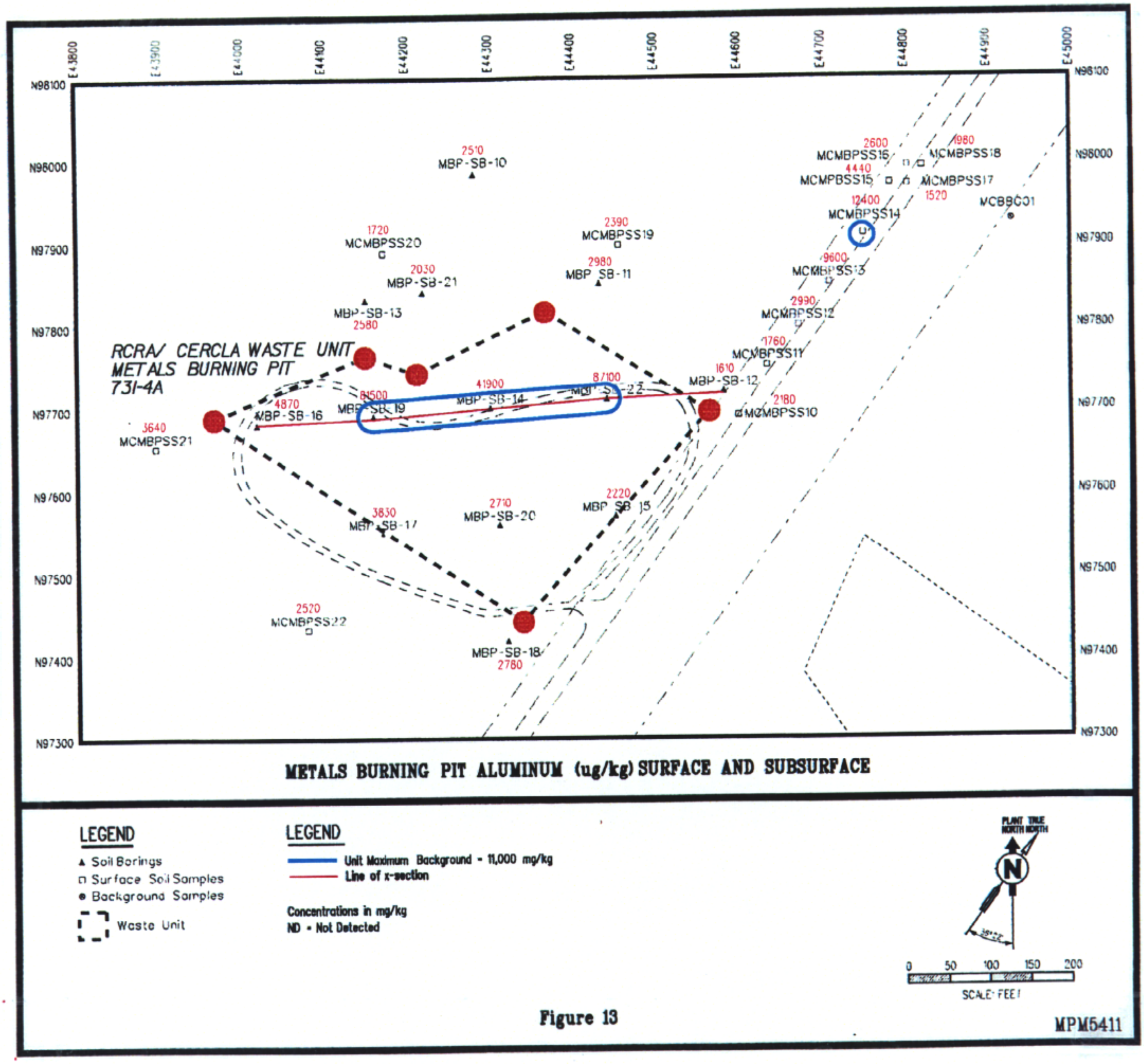

Figure 13. Metals Burning Pit Aluminum (mg/kg) Surface and Subsurface Sample Locations

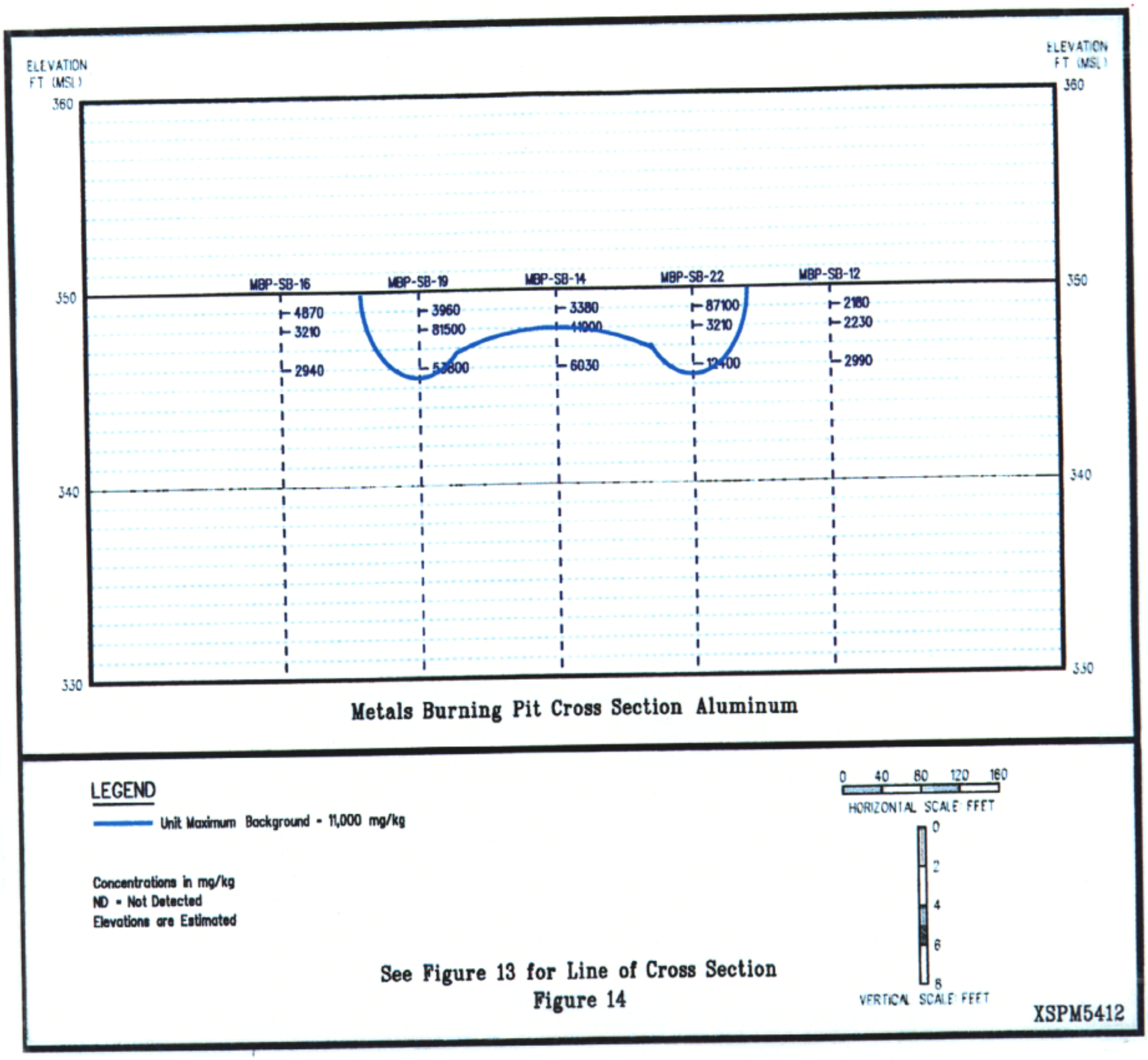

Figure 14. **Metals Burning Pit Cross Section of Aluminum**

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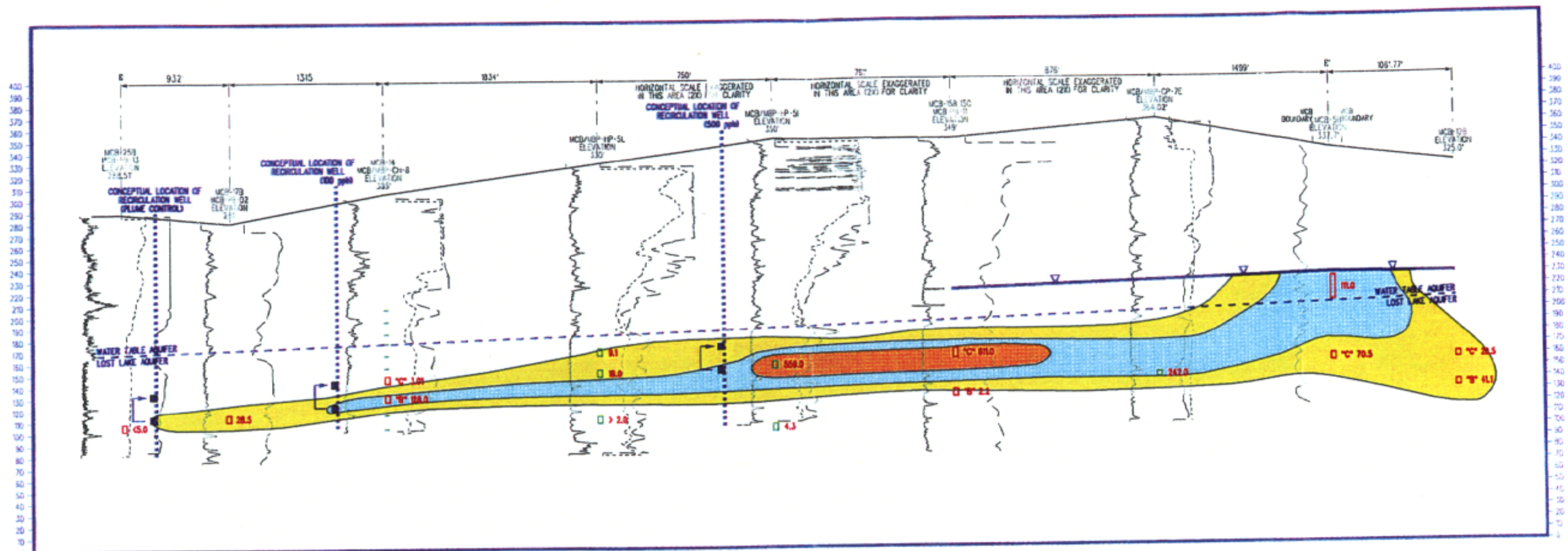

Miscellaneous Chemical Basin/Metals Burning Pit Cross Section E-E' Trichloroethylene (TCE) Plume

Figure 15

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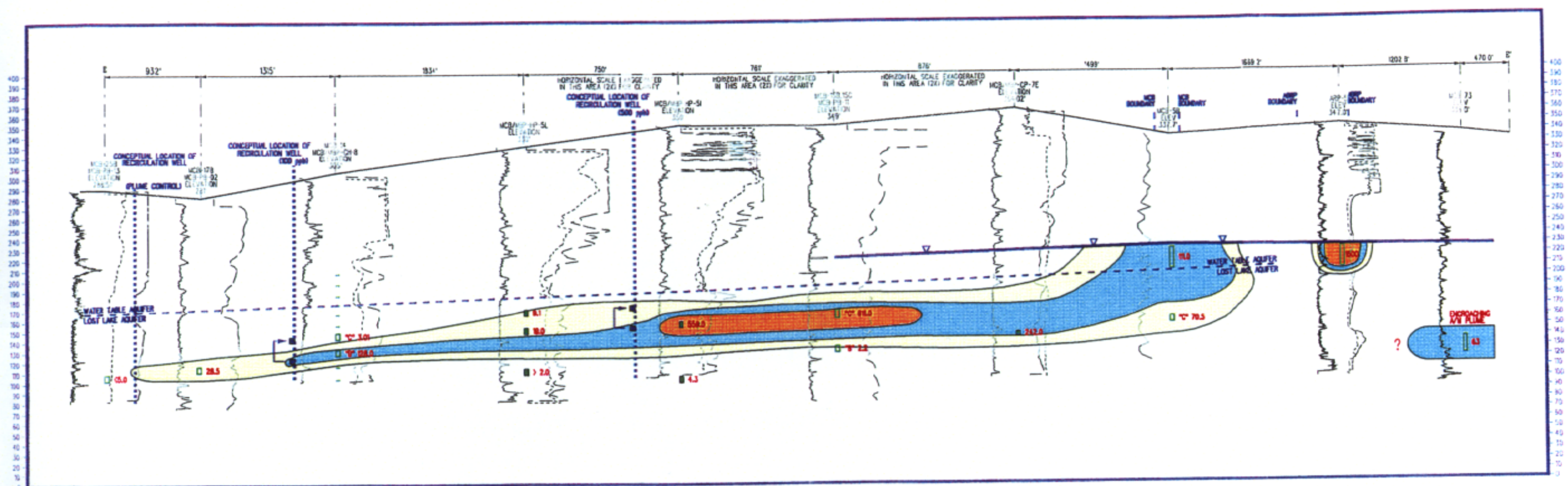

A-Area Burning/Rubble Pits Miscellaneous Chemical Basin/Metals Burning Pit Cross Section E-E' Trichloroethylene (TCE) Plume

Figure 15a

IX. DESCRIPTION OF ALTERNATIVES

Various treatment and containment technologies which may be used in this remedial action are identified below. The goal of the action is to select remedies which will address the known areas of contamination in the soils, vadose zone, and groundwater, while continuing the investigation of the groundwater and considering additional alternatives for the groundwater that will achieve final remedial objectives.

Five alternatives for remediating the surface/subsurface soil at the MCB/MBP were evaluated in the CMS/FFS (WSRC 1998c):

1) 1S, No Action

2) 2S, Institutional Controls

3) 3S, Soil Cover

4) 4S, Soil Excavation and Offsite Disposal

5) 5S, In Situ Stabilization/Solidification

Two alternatives were evaluated for remediating the vadose zone soil:

1) 1SVZ, No Action

2) 2SVZ, Active SVE/Passive SVE.

Three alternatives were evaluated for groundwater remediation:

1) 1GW, No Action

2) 2GW, Extraction with air stripping and monitoring

3) 3GW, In situ air stripping and monitoring

In the discussion that follows, surface/subsurface alternatives are identified with "S", vadose zone alternatives with "VZ", and groundwater alternatives with "GW".

Remedy Components

Surface/Subsurface Soil Remediation Alternatives

Alternative 1S - No Action

Under this alternative, no action would be taken at the MCB/MBP to remediate the soil. US EPA policy and regulations require consideration of a No Action alternative to serve as a basis against which other alternatives can be compared. Because no further action would be taken, the soil in the MCB/MBP would remain in its present condition. Costs associated with this alternative include the completion and reporting of six (6) separate 5-year ROD reviews over a 30-year period.

Alternative 2S - Institutional Controls

Estimated Cost - $32,800

Construction Time to Complete - NA

For the short-term, signs would be posted indicating that this area was used to manage hazardous materials. In addition, existing SRS access controls would be used to maintain the use of this site for industrial use only.

In the long-term, if the property is ever transferred to non federal ownership, the U.S. Government will take those actions necessary pursuant to Section 120(h) of CERCLA, 42 USC Section 9620(h). Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of non-hazardous, inert construction debris and that wastes containing hazardous substances, such as degreasers and solvents, were also managed and burned on the site. These requirements are also consistent with the deed notification requirements at the final closure of the RCRA facility if contamination will remain at the site.

The deed shall also include 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 contamination no longer poses an unacceptable risk under residential use. The US EPA and SCDHEC will have to concur with this reevaluation before the deed restrictions are altered.

In addition, if the site is ever transferred to non federal ownership, a survey plat of the operable unit will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency. ROD reviews would be provided every five years.

The capital costs for this alternative would be for performing a survey of the waste units, filing deed restrictions and deed notifications, and providing ROD reviews every five years for 30 years (30 years used only for demonstration of the costs).

Alternative 3S - Soil Cover

Estimated Cost

3S(a) $2,653,000

3S(b) $101,000

3S(c) $112,000

3S(d) $351,000

Construction Time to Complete: 3 to 9 months

A one or four foot soil cover would be placed over the areas containing levels of COCs in excess of the remedial levels selected for the appropriate future land use scenario. The area under the soil cover would vary with the remedial level selected. The depth would be four feet for residential or ecological risk reduction. A 1-foot soil cover can be used for future industrial land use because the pathways for ingestion of homegrown produce and from children digging in the soil have been removed.

Four soil covers were considered within the CMS/FFS (WSRC 1998c):

- 3S(a), a four foot thick soil cover over area at MCB that contains concentrations of Aroclor-1254 above the future residential risk level of 156 µg/kg and OCDD concentrations above the future residential risk level of 3 µg/kg. Although contained and isolated from future residents by the soil cover, approximately 17,900 ft^3 of soil contaminated with Aroclor-1254 and approximately 2,500 ft^3 of OCDD-contaminated soil would remain at the MCB. Since there is some overlap in the areas of contamination, these volumes are not cumulative. Upon construction completion, 3S(a) would support a future residential land use.
- 3S(b), a four foot thick soil cover over the MBP to provide ecological protection from the aluminum using the unit-specific maximum background level of 11,000 mg/kg. Although contained and isolated from future ecological receptors by the soil cover, approximately 18,100 ft^3 of aluminum-contaminated soil would remain at the MBP. Upon construction completion, 3S(b) would support a future residential land use.

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- 3S(c), a one foot thick cover over the area at MCB that contains concentrations of Aroclor-1260 above the ecological risk level of 215 μg/kg. Although contained and isolated from future ecological receptors by the soil cover, approximately 49,500 ft^3 of soil contaminated with Aroclor-1260 above the ecological risk level would remain at the MCB. Upon construction completion, 3S(c) would support a future industrial land use.
- 3S(d), a one foot thick cover over the area at MCB that contains concentrations of Aroclor-1254 above the industrial risk level of 479 μg/kg. Although contained and isolated from future industrial workers by the soil cover, approximately 4,600 ft^3 of soil contaminated with Aroclor-1254 above the industrial risk level would remain at the MCB. Upon construction completion, 3S(d) would support a future industrial land use.

The soil covers would be one foot or four feet thick over the contaminated areas and feathered into the surrounding area using a 3% slope. Other covers were not considered because they were either considered impractical for the small areas (resulting in numerous mounds) or the difference in covering the smaller areas versus the larger areas was insignificant due to the feathering. Feathering would cover all of the other areas, but at a slightly smaller thickness.

Surface and subsurface soil RGs for the final Human Health COCs Aroclor-1254 and Aroclor-1260 are ARAR-driven, not based on risk. TSCA (40 CFR 761) is the key ARAR that identifies the cleanup levels for the PCBs Aroclor-1254 and Aroclor-1260 that are protective of human health and the environment.

Since alternative 3S involves earth moving activities during construction, 40 CFR 50.6 and SC R.61-62.6 are key ARARs that set airborne particulate concentration limits applicable during this phase of the project. In addition, 29 CFR 1910 identifies health and safety requirements for remediation workers.

All the soil cover sub-alternatives would require periodic monitoring to verify the integrity of the soil cover. These monitoring requirements would be an element of the Institutional Controls implemented upon construction completion.

Alternative 4S - Soil Excavation and Off-Site Disposal

Estimated Cost

4S(a) $762,000

4S(b) $313,000

4S(c) $66,000

4S(d) $148,000

4S(e) $127,000

Construction Time to Complete: 2 to 7 months

The soil containing levels of Aroclor-1254, Aroclor-1260, OCDD, or aluminum in excess of the RGs selected would be excavated and disposed of in an off-unit landfill approved for CERCLA waste, such as Three Rivers Landfill in South Carolina. Clean soil would be placed in the pits and revegetated. Deed restrictions, if future residential land use RGs were not selected, would be filed to preclude residential use of the land if it is ever sold for non-government use.

The cost for this alternative depends on the future land use and the remedial goal selected. The following soil removal sub-alternatives have been evaluated.

- 4S(a), soil contaminated with Aroclor-1254 and Aroclor-1260 above the 1×10^{-6} future industrial risk level (479 µg/kg) would be excavated to maximum depth of 4 feet. By excavating to a depth of 4 feet all soil contaminated with Aroclor-1260 above ecological risk level of 215 µg/kg would also be excavated. Approximately 135,000 ft^3 of soil contaminated with Aroclor-1260 would be removed. Approximately 14,500 ft^3 of soil contaminated with Aroclor-1254 would be removed. Since there is some overlap in the areas of contamination, these volumes are not cumulative. Upon construction completion, 4S(a) would support a future industrial land use.

- 4S(b), soil contaminated with Aroclor-1260 above the ecological risk level of 215 µg/kg would be excavated to a maximum depth of 1 foot. Excavation of this 1-foot interval will also remove all soil contaminated with Aroclor-1260 above the ARAR-based limit of 1000 µg/kg. Soil contaminated with Aroclor-1254 above the ARAR limit of 1000 µg/kg will be excavated to a maximum depth of 4 feet. Approximately 49,500 ft^3 of soil contaminated with Aroclor-1260 would be removed. Approximately 3,000 ft^3 of soil contaminated with Aroclor-1254 would be removed. Upon construction completion, 4S(b) would support a future industrial land use.

- 4S(c), soil contaminated with OCDD above the 1×10^{-6} future residential risk level (3 µg/kg) would be excavated to maximum depth of 1 foot. Approximately 2,500 ft^3 of OCDD-contaminated soil would be removed. Upon construction completion, 4S(c) would support a future residential land use.

- 4S(d), soil contaminated with aluminum above the unit-specific maximum background level of 11,000 mg/kg would be excavated to maximum depth of 4 feet. Approximately 18,100 ft^3 of aluminum-contaminated soil will be removed. Upon construction completion, 4S(d) would support a future residential land use.

- 4S(e), soil contaminated with Aroclor-1260 above the ecological risk level of 215 μg/kg would be excavated to maximum depth of 1 foot. Approximately 49,500 ft^3 of soil contaminated with Aroclor-1260 would be removed. Upon construction completion, 4S(e) would support a future industrial land use.

All the soil excavation sub-alternatives alternatives that leave waste in place above residential RGOs would require periodic monitoring to verify the integrity of the soil backfill. These monitoring requirements would be an element of the Institutional Controls implemented upon construction completion.

Surface and subsurface soil RGs for the final Human Health COCs, Aroclor-1254 and Aroclor-1260, are ARAR-driven, not based on risk. TSCA (40 CFR 761) is the key ARAR that identifies the cleanup levels for the PCBs Aroclor-1254 and Aroclor-1260 that are protective of human health and the environment.

Since alternative 4S involves earth-moving activities during construction, 40 CFR 50.6 and SC R.61-62.6 are key ARARs that set airborne particulate concentration limits applicable during this phase of the project. In addition, 29 CFR 1910 identifies health and safety requirements for remediation workers.

Alternative 5S – In Situ Stabilization/Solidification

Estimated Cost - $171,000

Construction Time to Complete – 6 months

In situ stabilization/solidification would be used to treat hot spots or widespread areas of soil that contain levels of COCs in excess of the remedial goals selected for the appropriate future land use scenario. Solidification/stabilization is a treatment technology that reduces the mobility of hazardous constituents by using a variety of solidification agents such as lime, fly ash, pozzolan, pozzolan/Portland cement, or organic polymers to immobilize contaminants in place.

Stabilization/solidification of the aluminum-contaminated soil at the MBP at concentrations above 11,000 mg/kg to a maximum depth of 4 feet (assuming a final solids matrix of 50% soil and 50% stabilizing agent) would leave approximately 36,200 ft^3 of aluminum-contaminated material at the site.

Soil stabilization/solidification would require periodic monitoring to verify the integrity of the soil stabilization matrix. These monitoring requirements would be an element of the Institutional Controls implemented upon construction completion.

In situ soil stabilization/solidification would support a future industrial land use upon construction completion.

Since alternative 5S involves earth-moving activities during construction, 40 CFR 50.6 and SC R.61-62.6 are key ARARs that set airborne particulate concentration limits applicable during this phase of the project. In addition, 29 CFR 1910 identifies health and safety requirements for remediation workers.

Vadose Zone Soil Remediation Alternatives

The depth of the vadose zone at the MCB (40 m, 130 feet) makes consideration of alternatives which require excavation of soils impractical.

Alternative 1SVZ - No Action

Estimated Cost - $70,000

Construction Time to Complete: NA

Under the no action alternative, no remedial efforts would be conducted to remove, treat, or otherwise lessen the toxicity, mobility, or affected volume of contaminated soil in the vadose zone. All VOC contaminated soil would remain in place. No treatment would be performed. Costs associated with this alternative include the completion and reporting of six (6) separate 5-year ROD reviews over a 30-year period.

Alternative 2SVZ - Active Soil Vapor Extraction/Passive Soil Vapor Extraction

Estimated Cost - $969,000

Construction Time to Complete: 1 year

This alternative would extract the VOCs as vapor from the vadose zone through a series of active and passive vertical extraction wells. Active SVE units require the use of a vacuum pump or blower to extract the VOC-laden vapor from the vadose zone. Passive SVE units make use of naturally occurring atmospheric pressure fluctuations to provide the driving force needed to extract the contaminated vapor.

For cost-effectiveness, the active SVE wells would be located in the vicinity of peak VOC concentration. The passive SVE wells would be located in lower concentration areas. The offgas would be exhausted to the atmosphere at levels not to exceed the air permit limits.

It is anticipated that the active SVE system will operate to remediate the vadose zone until the system has completed the remediation or reached the point of diminishing returns. When the active SVE system has reached the point of diminishing returns (e.g., reduction of VOCs to a level that is commensurate with the concentrations addressed by the passive SVE system), the vadose zone wells will be converted over to a passive remediation approach, fitted with passive enhancements. The converted wells will then become part of the overall passive SVE system that will continue to operate until remediation of the vadose zone is complete.

The cost estimate assumes that two wells will be installed for the active SVE system which will operate for 3 years and that the passive SVE system would operate for 10 years (including the first 3 years).

There are no ARAR-driven cleanup limits for the TCE and PCE contamination present in the vadose zone soil. RGs have been established based on risk.

Groundwater Remediation Alternatives

Three groundwater remediation alternatives were evaluated within the CMS/FFS (WSRC 1998c). Groundwater remediation to remove VOCs will be performed as an interim action until a final decision for the entire VOC plume can be completed. While lead has been detected in the groundwater above action levels, and has been determined to be a COC, it is likely that the source is not unit-related. The monitoring well sampling data will be trended and compared to other wells in A/M Area that exhibit similar fluctuations in lead levels but have no known source (other than

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natural geologic conditions) for the lead. The data obtained will be used in the selection process for the final groundwater remedial action.

Alternative 1GW - No Action

Estimated Cost - $70,000

Construction Time to Complete: NA

Under this alternative, no action would be taken at the MCB/MBP to remediate the groundwater. US EPA policy and regulations require consideration of a no action alternative to serve as a basis against which other alternatives can be compared. Groundwater beneath the MCB/MBP would remain in its present condition. There would be no reduction or mitigation of risk. Costs associated with this alternative include the completion and reporting of six (6) separate 5-year ROD reviews over a 30-year period.

Alternative 2GW - Extraction with Air Stripping and Monitoring

Estimated Cost - $7,058,000

Construction Time to Complete: 12 months

In this alternative, a system of wells is placed to capture the VOC groundwater plume. The contaminated groundwater is pumped to the surface where it is fed to an air stripper. The air stripper effectively removes the VOCs from the groundwater and exhausts them to the atmosphere as a vapor (off-gas treatment would be added, if necessary to meet permit levels). The remediated groundwater is then disposed at a permitted outfall. The estimated time to complete the remediation is 17 years. The present worth cost for installing six wells and operating the pump and treat system for 17 years is estimated to be $7,058,000. This includes the costs for monitoring.

Alternative 3GW - In Situ Air Stripping and Monitoring

Estimated Cost - $3,375,000

Construction Time to Complete: 12 months

In this alternative, in situ air stripping wells would set up a groundwater recirculating cell within the contaminated aquifer. Each well is designed with an upper and lower screen. The well operates by injecting air at the lower screen, which induces an upward flow of air and water in the well. A localized groundwater recirculation zone, or cell, is established between the upper and lower screens. As the air passes through the groundwater, the VOCs are volatilized within the well, and are vented to the atmosphere, provided the VOC vapor concentration levels do not exceed the air permit limits. Off-gas treatment would be added, if required. The treated water is then returned back into the aquifer via the upper screen. The groundwater is expected to recirculate approximately four times prior to exiting the zone of capture of the remediation system. Groundwater downgradient from the wells would be monitored quarterly to ensure that the well system is capturing the VOC contaminated groundwater plume. A system of 11 in situ air stripping wells is assumed for Alternative 3GW. The following system design parameters are assumed:

- 3 groups of wells (containing 5, 3, and 3 wells)
- 40 gallons per minute well flowrate
- 160 foot zone of influence for each well
- well spacing within each group varying from 265 to 320 feet

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- each element of groundwater entering a well's zone of influence will make approximately 4 passes through the well before leaving the zone of influence
- 50% VOC stripping efficiency for groundwater pass through a well
- no offgas treatment required

The present worth cost for installing 11 wells and operating the system for 17 years is estimated to be $3,375,000. This includes the costs for monitoring.

X. SUMMARY OF COMPARATIVE ANALYSIS OF THE INTERIM ALTERNATIVES

The previous section detailed five alternatives for surface/subsurface soil, two alternatives for vadose zone soil, and three alternatives for groundwater. In the IAPP (WSRC 1998b), each of these remedial alternatives was evaluated using nine criteria established by the NCP. The criteria were derived from the statutory requirements of CERCLA 121. The NCP sets forth nine evaluation criteria that provide the basis for evaluating and selecting a remedy as follows:

- overall protection of human health and the environment
- compliance with ARARs
- long-term effectiveness permanence
- Reduction of toxicity, mobility, or volume through treatment
- short-term effectiveness
- implementability
- cost
- state acceptance

- community acceptance

In selecting the preferred alternative, the above criteria are used to evaluate the alternatives developed. Seven of the criteria are used to evaluate all the alternatives based on human health and environmental protection, cost and feasibility issues. Comparative evaluations of all the remedial action alternatives against these seven criteria are detailed in the IAPP and briefly summarized in the Comparative Alternative Analysis section below. The preferred alternatives are further evaluated in the subsequent state acceptance and community acceptance sections below.

Comparative Alternative Analysis

The results of the Comparative Alternative Analysis are summarized in Table 7.

Table 7. Comparative Analysis of MCB/MBP Alternatives

Criterion	Alternative 1S No Action	Alternative 2S Institutional Controls	Alternative 3S (a) MCB, 4 ft cover over Aroclor-1254, Aroclor-1260 and OCDD	Alternative 3S (b) MBP, 4 ft cover over aluminum	Alternative 3S (c) MCB, 1 ft cover over Aroclor-1260
Overall Protectiveness					
Human Health	Not Protective	Protective	Protective	Protective	Protective
Environment	Not Protective	Protective	Protective	Protective	Protective
Compliance with ARARs					
Chemical-specific	None	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 25,000 µg/kg and >50,000 µg/kg if unit is secured by fence and sign. Will be met.	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 25,000 µg/kg if unit is covered with a cap. Will be met	None	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 25,000 µg/kg if unit is covered with a cap. Will be met.
Location-Specific	None	None	None	None	None
Action-Specific	Not applicable	None	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6, SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.

Table 7. Comparative Analysis of MCB/MBP Alternatives (Continued)

Criterion	Alternative 1S No Action	Alternative 2S Institutional Controls	Alternative 3S (a) MCB, 4 ft cover over Aroclor-1254, Aroclor-1260 and OCDD	Alternative 3S (b) MBP, 4 ft cover over aluminum	Alternative 3S (c) MCB, 1 ft cover over Aroclor-1260
Long-term Effectiveness and Permanence					
Magnitude of residual risks	Residual risks would be high, particularly in the absence of institutional controls.	Residual risks would be high because all contamination would remain at the OU.	Much reduced over current conditions. All contamination remains at the OU, although it is covered to prevent exposure.	Much reduced over current conditions. All contamination remains at the OU, although it is covered to prevent exposure.	Much reduced over current conditions. All contamination remains at the OU, although it is covered to prevent exposure.
Adequacy of Controls	Not Adequate	Institutional controls needed as an element of a comprehensive remedy to adequately control access to residual contamination.	Institutional controls needed for effectiveness; cover will provide exposure barrier. All contaminant pathways would be eliminated.	Institutional controls needed for effectiveness; cover will provide exposure barrier. All contaminant pathways would be eliminated.	Institutional controls needed for effectiveness; cover will provide exposure barrier. All contaminant pathways would be eliminated.

Table 7. Comparative Analysis of MCB/MBP Alternatives (Continued)

Criterion	Alternative 1S No Action	Alternative 2S Institutional Controls	Alternative 3S (a) MCB, 4 ft cover over Aroclor-1254, Aroclor-1260 and OCDD	Alternative 3S (b) MBP, 4 ft cover over aluminum	Alternative 3S (c) MCB, 1 ft cover over Aroclor-1260
Reduction of Toxicity, Mobility, or Volume Through Treatment					
Treatment Type	No treatment	No treatment	Containment	Containment	Containment
Reduction of Toxicity, Mobility, or Volume	None	None	None	None	None
Short-Term Effectiveness					
Risk to remedial workers	None	None	Low; minimal handling of contaminated soils.	Low; minimal handling of contaminated soils.	Low; minimal handling of contaminated soils.
Risk to Community	Negligible	Negligible	Negligible	Negligible	Negligible
Construction Schedule	Immediately Implementable	Immediately Implementable	6 – 9 months	6 – 9 months	6 – 9 months

Table 7. Comparative Analysis of MCB/MBP Alternatives (Continued)

Criterion	Alternative 1S No Action	Alternative 2S Institutional Controls	Alternative 3S (a) MCB, 4 ft cover over Aroclor-1254, Aroclor-1260 and OCDD	Alternative 3S (b) MBP, 4 ft cover over aluminum	Alternative 3S (c) MCB, 1 ft cover over Aroclor-1260
Implementability					
Potential Concerns	Potential for public concern if no action is implemented.	Potential for public concern because contaminants stay in place.	Potential for public concern because contaminants stay in place.	Potential for public concern because contaminants stay in place.	Potential for public concern because contaminants stay in place.
Relative Implementability	Readily implementable	Readily implementable	Readily implementable	Readily implementable	Readily implementable
Cost					
	$70,000	$32,000	$2,653,000	$101,000	$112,000

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	**Alternative 3S (d) MCB, 1 ft cover over Aroclor-1254 and Aroclor-1260**	**Alternative 4S (a) MCB, Excavate 4 ft deep, Aroclor-1254 and Aroclor-1260**	**Alternative 4S (b) MCB, Excavate Aroclor-1260 > 215 µg/kg to 1 ft depth and all Aroclor-1254 > 1000 µg/kg**	**Alternative 4S (c) MCB, Excavate 4 ft deep OCDD only**	**Alternative 4S (d) MBP, Excavate 4 ft deep, aluminum only**	**Alternative 4S (e) MCB, Excavate 1 ft deep, Aroclor-1260 only**
Overall Protectiveness						
Human Health	Protective	Protective	Protective	Protective	Protective	Protective
Environment	Protective	Protective	Protective	Protective	Protective	Protective
Compliance with ARARs						
Chemical-Specific	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 25,000 µg/kg and less than 100,000 µg/kg if unit is covered with a cap. Will be met.	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 1,000 µg/kg without further conditions, regardless of future land use. Will be met.	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 1,000 µg/kg without further conditions, regardless of future land use. Will be met.	None	None	40 CFR 761 (TSCA) allows bulk PCB waste to remain at unit at concentrations > 1,000 µg/kg without further conditions, regardless of future land use. Will be met.
Location-Specific	None	None	None	None	None	None
Action-Specific	49 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activiites. Will be met. 40 CFR 107, 171-179, DOT hazardous materials transport regulations. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activiites. Will be met. 40 CFR 107, 171-179, DOT hazardous materials transport regulations. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activiites. Will be met. 40 CFR 107, 171-179, DOT hazardous materials transport regulations. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	49 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activiites. Will be met. 40 CFR 107, 171-179, DOT hazardous materials transport regulations. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	**Alternative 3S (d) MCB, 1 ft cover over Aroclor-1254 and Aroclor-1260**	**Alternative 4S (a) MCB, Excavate 4 ft deep, Aroclor-1254 and Aroclor-1260**	**Alternative 4S (b) MCB, Excavate Aroclor-1260 > 215 µg/kg to 1 ft depth and all Aroclor-1254 > 1000 µg/kg**	**Alternative 4S (c) MCB, Excavate 4 ft deep OCDD only**	**Alternative 4S (d) MBP, Excavate 4 ft deep, aluminum only**	**Alternative 4S (e) MCB, Excavate 1 ft deep, Aroclor-1260 only**
Long-term Effectiveness and Permanence						
Magnitude of residual risks	Much reduced over current conditions. All contamination remains at the OU, although it is covered to prevent exposure.	Residual risks would be low; all contaminant pathways would be eliminated; all contamination greater than 1×10^{-6} residential risk would be removed.	Residual risks would be low; all contaminant pathways would be eliminated; meets TSCA ARAR of 1000 µg/kg for high occupancy areas without further conditions (i.e. cap) for protection of human health and the environment.	Residual risks would be low; all contaminant pathways would be eliminated; all contamination greater than 1×10^{-6} residential risk would be removed.	Residual risks would be low; all contaminant pathways would be eliminated; all contamination greater than the unit-specific maximum background would be removed.	Residual risks would be moderate; Aroclor-1260 contamination above the ecological RG of 215 µg/kg would be removed.
Adequacy of Controls	Institutional controls needed for effectiveness; cover will provide exposure barrier. All contaminant pathways would be eliminated.	Minimal institutional controls required. All contaminant pathways would be eliminated.	Minimal institutional controls required. All contaminant pathways would be eliminated.	Minimal institutional controls required. All contaminant pathways would be eliminated.	Minimal institutional controls required. All contaminant pathways would be eliminated.	Minimal institutional controls required. All contaminant pathways would be eliminated.

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 3S (d) MCB, 1 ft cover over Aroclor-1254 and Aroclor-1260	Alternative 4S (a) MCB, Excavate 4 ft deep, Aroclor-1254 and Aroclor-1260	Alternative 4S (b) MCB, Excavate Aroclor-1260 > 215 µg/kg to 1 ft depth and all Aroclor-1254 > 1000 µg/kg	Alternative 4S (c) MCB, Excavate 4 ft deep OCDD only	Alternative 4S (d) MBP, Excavate 4 ft deep, aluminum only	Alternative 4S (e) MCB, Excavate 1 ft deep, Aroclor-1260 only
Reduction of Toxicity, Mobility, or Volume Through Treatment						
Treatment Type	Containment	Removal and off-unit disposal.	Removal and off-unit disposal.	Removal and off-unit disposal.	Removal and off-unit disposal.	Removal and off-unit disposal.
Reduction of Toxicity, Mobility, or Volume	None.	Volume of contamination would be reduced. All Aroclor-1254 and Aroclor-1260 contaminated soil above the 1 x 10^{-6} residential risk would be removed.	Volume of contamination would be reduced. All Aroclor-1254 and Aroclor-1260 contaminated soil above the ARAR-based RG of 1000 µg/kg would be removed. Also removes all Aroclor-1260 above the ecological RG of 215 µg/kg.	Volume of contamination would be reduced. All OCDD contaminated soil above 1 x 10^{-6} residential risk would be removed.	Volume of contamination would be reduced. All aluminum contaminated soil greater than the site-specific maximum background of 11,000 mg/kg would be removed.	Volume of contamination would be reduced. All Aroclor-1260 contaminated soil above the ecological RG of 215 µg/kg to a depth of 1 ft would be removed.
Short-Term Effectiveness						
Risk to remedial workers	Low. Minimal handling of contaminated soils.	Medium. Approximately 148,500 ft^3 of Aroclor-1260 and 14,500 ft^3 of Aroclor-1254 contaminated soil will be excavated.	Medium. Approximately 49,500 ft^3 of Aroclor-1260 and 3,000 ft^3 of Aroclor-1254 contaminated soil will be excavated.	Medium. Approximately 2,500 ft^3 of OCDD contaminated soil will be excavated.	Medium. Approximately 18,100 ft^3 of aluminum contaminated soil will be excavated.	Medium. Approximately 49,500 ft^3 of Aroclor-1260 contaminated soil will be excavated.
Risk to Community	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	6 - 9 months	2 - 7 months	2 - 7 months	2 - 7 months	2 - 7 months	2 - 7 months

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 3S (d) MCB, 1 ft cover over Aroclor-1254 and Aroclor-1260	Alternative 4S (a) MCB, Excavate 4 ft deep, Aroclor-1254 and Aroclor-1260	Alternative 4S (b) MCB, Excavate Aroclor-1260 > 215 µg/kg to 1 ft depth and all Aroclor-1254 > 1000 µg/kg	Alternative 4S (c) MCB, Excavate 4 ft deep OCDD only	Alternative 4S (d) MBP, Excavate 4 ft deep, aluminum only	Alternative 4S (e) MCB, Excavate 1 ft deep, Aroclor-1260 only
Implementability						
Potential Concerns	Potential for public concern because contaminants stay in place.	Low	Low	Low	Low	Low
Relative Implementability	Readily implementable	Readily implementable	Readily implementable.	Readily implementable	Readily implementable	Readily implementable.
Cost						
	$351,000	$762,000	$313,000	$66,000	$148,000	$127,000

Table 7. Comparative Analysis of MCB/MBPAlternatives (Cont'd.)

Criterion	Alternative 5S, Stabilization/Solidification of Aluminum at MBP, 4 ft deep	Alternative 1SVZ, No Action	Alternative 2SVZ, Active SVE/Passive SVE		
Overall Protectiveness					
Human Health	Protective	Not Protective	Protective		
Environment	Protective	Not Protective	Protective		
Compliance with ARARs					
Chemical-Specific	None	None	None		
Location-Specific	None	None	None		
Action Specific	40 CFR 50.6 and SC R.61-62.6 limit airborne particulates during earth-moving activities. Will be met. 29 CFR 1910 identifies health and safety requirements for remediation workers. Will be met.	Not applicable	SC R.61-62.1 Air Permit requirements will be met.		

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 5S, Stabilization/Solidification of Aluminum at MBP, 4 ft deep	Alternative 1SVZ, No Action	Alternative 2SVZ, Active SVE/Passive SVE		
Long-term Effectiveness and Permanence					
Magnitude of residential risks	Much reduced over current conditions. All contamination remains at the OU, although it is stabilized to reduce exposure.	Residual risks would be high because all contamination would remain at the OU.	Much reduced over current conditions. Combination of active and passive SVE would remove VOC source material from vadose zone.		
Adequacy of Controls	Institutional controls needed for effectiveness.	Not adequate	Institutional controls needed for effectiveness.		
Reduction of Toxicity, Mobility, or Volume Through Treatment					
Treatment Type	Immobilization	No treatment	Volatilization and discharge to atmosphere with catalytic oxidation if needed to meet air permit limits.		
Reduction of Toxicity, Mobility, or Volume	Although toxicity is not impacted, mobility would be reduced. Volume would be increased due to addition of solidification agents.	None	Volume of soil contamination would be reduced.		

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 5S, Stabilization/Solidification of Aluminum at MBP, 4 ft deep	Alternative 1SVZ, No Action	Alternative 2SVZ, Active SVE/Passive SVE		
Short-Term Effectiveness					
Risk to remedial workers	Low; minimal handling of contaminated soils.	None	Low; minimal exposure to contaminated vadose zone soil or soil gas.		
Risk to Community	Negligible	Negligible	Negligible		
Construction Schedule	6 months	Not Applicable	12 months		
Implementability					
Potential Concerns	Low	Potential for public concern because contaminants stay in place.	Low		
Relative Implementability	Readily implementable.	NA	Readily implementable		
Cost					
	$171,000	$70,000	$969,000		

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 1GW, No Action	Alternative 2GW, Extraction with Air Stripping and Monitoring	Alternative 3GW In Situ Air Stripping and Monitoring		
Overall Protectiveness					
Human Health	Not Protective	Protective	Protective		
Environment	Not Protective	Protective	Protective		
Compliance with ARARs					
Chemical-Specific	None	40 CFR 141 and SC R61-58.5, MCLs and MCLGs for groundwater, will not be met by interim action	40 CFR 141 and SC R.61-58.5, MCLs and MCLGs for groundwater, will not be met by interim action.		
Location-Specific	None	None	None		
Action-Specific	None	Not applicable	Not Applicable		
Long-Term Effectiveness and Permanence					
Magnitude of residual risks	Residual risks would be high because all contamination would remain at the OU.	Residual risk during the duration of the interim action would remain relatively high since VOC concentrations are expected to remain above MCLs.	Residual risk during the duration of the interim action would remain relatively high since VOC concentrations are expected to remain above MCLs.		
Adequacy of Controls	Institutional controls needed for effectiveness.	Institutional controls needed for effectiveness.	Institutional controls needed for effectiveness.		

Table 7. Comparative Analysis of MCB/MBP Alternatives (Cont'd.)

Criterion	Alternative 1GW, No Action	Alternative 2GW, Extraction with Air Stripping and Monitoring	Alternative 3GW In Situ Air Stripping and Monitoring		
Reduction of Toxicity, Mobility, or Volume Through Treatment					
Treatment Type	None	Air stripping of VOCs and discharge to atmosphere with catalytic oxidation if needed to meet air permit limits.	Air stripping of VOCs and discharge to atmosphere with catalytic oxidation if needed to meet air permit limits.		
Reduction of Toxicity, Mobility, or Volume	None	Volume of groundwater contamination would be reduced.	Volume of groundwater contamination would be reduced.		
Short-Term Effectiveness					
Risk to remedial workers	NA	Low; minimal exposure to contaminated groundwater or air stripper discharge gasses.	Low; minimal exposure to contaminated groundwater or well discharge gasses.		
Risk to Community	Negligible	Negligible	Negligible		
Construction Schedule	NA	12 months	12 months		
Implementability					
Potential Concerns	Potential for public concern because contaminants stay in place.	Low. Technology is well proven.	Moderate. Technology is innovative.		
Relative Implementability	NA	Readily implementable	Readily implementable.		
Cost					
	$70,000	$7,058,000	$3,375,000		

Surface/subsurface Soil Alternatives

Alternative 4S would give the greatest overall protection of human health and the environment. This alternative would remove the Aroclor-1254, Aroclor-1260, OCDD, or aluminum from hot spots in the soil and dispose of the contaminated soil. Alternative 5S would provide protection of human health and the environment by placing the contaminants in a form that is not readily accessible to receptors. The contaminants would, however, remain in place and could become accessible sometime in the future when the stabilization/solidification materials breakdown. Alternative 3S protects human health and the environment for as long as the soil cover is maintained. Alternative 2S protects human health only by restricting the future land use of the unit. Risks remain at the levels shown in the RFI/RI/BRA for a future industrial worker (or for a hypothetical future resident). Alternative 2S does not reduce ecological risk. Alternative 1S provides no protection of human health or the environment.

Vadose Zone Soil Alternatives

Alternative 2SVZ would give the greatest overall protection of human health and the environment. Although there are no ARARs for the vadose zone, Alternative 2SVZ would prevent further groundwater contamination by eliminating the secondary source of the contamination. In this alternative, most of the VOCs contained in the vadose zone would be removed. However, Alternative 2SVZ must meet air quality ARARs for the Clean Air Act and well installation ARARs for the South Carolina Well Standards and Regulations. Air permits and well installation permits must be obtained. By completely removing VOCs from the vadose zone, Alternative 2SVZ provides a permanent remediation solution that gives complete long-term effectiveness.

Alternative 1SVZ would not provide any reduction in the amount of VOCs migrating to the groundwater and thus would not prevent MCL exceedances in the groundwater. Alternative 1SVZ provides no protection of human health or the environment.

Groundwater Alternatives

Alternatives 2GW and 3GW would give the greatest overall protection of human health and the environment. With these alternatives, most of the VOCs contained in the groundwater would be removed. However, these alternative must meet air quality ARARs for the Clean Air Act and well installation ARARs for the South Carolina Well Standards and Regulations. Air permits and well installation permits must be obtained. Alternatives 2GW and 3GW would meet the ARAR for MCLs for groundwater.

Alternatives 2GW and 3GW provide reduction in the mass of the VOC contamination in the groundwater. These alternatives provide permanent remediation solutions which give complete long-term effectiveness since the VOCs are removed from the groundwater. Alternatives 2GW and 3GW both utilize monitoring wells for determining the effectiveness of the interim groundwater remedial action. Each alternative will also use the wells for lead monitoring and perform sampling at the same frequency (e.g., quarterly sampling). Therefore, alternatives 2GW and 3GW are equivalent with respect to addressing the issue of lead monitoring.

Alternative 1GW does not reduce the toxicity, mobility, or volume of the VOCs, provides no compliance with drinking water MCLs, and therefore is not protective of human health or the environment.

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State Acceptance

Per US EPA guidance on presumptive response strategies for groundwater (US EPA 1996), groundwater response actions should be implemented in a phased approach with provisions for monitoring and evaluating their performance. Consistent with this guidance, an interim action is documented herein to remove high concentrations of VOCs from a known source of contamination.

State of South Carolina and US EPA concurrence with the proposed interim action, detailed in Section IX, has been received. The preferred alternatives are protective of human health and the environment, are readily implementable, and are reasonably priced for the benefit received. For these reasons and those presented below under Community Acceptance, the State of South Carolina has accepted the proposed interim action.

Community Acceptance

For the surface and subsurface soil, alternative 4S is more likely than alternatives 3S and 5S to meet with the Community's acceptance because contamination above RGs would be permanently removed from the unit, as opposed to being contained or immobilized. Alternative 1S would not be acceptable because it would leave all contamination in place at the unit without any treatment. Though unacceptable as a sole remedy, alternative 2S, would likely be acceptable when employed as part of suite of alternatives that fully addresses all contamination at the unit.

For the vadose zone, alternative 2SV would likely meet with the Community's acceptance because contamination above RGs would be permanently removed from the unit. Alternative 1SV would not be acceptable because it would leave all contamination in place at the unit without any treatment.

Alternatives 2GW and 3GW would likely meet with the Community's acceptance because these remediation methods would permanently remove the VOCs from the groundwater. Alternative 1GW would not be acceptable because it will not reduce the level of VOCs to below the MCLs.

Community acceptance of the preferred alternatives is assessed by giving the public an opportunity to comment on the IAPP. The public was notified of a public comment period through mailings of the *SRS Environmental Bulletin*, the *Aiken Standard*, the *Allendale Citizen Leader*, the *Barnwell People Sentinel, The State,* and *Augusta Chronicle* newspapers, and through announcements on local radio stations. In addition, the IAPP was presented to the SRS Citizen Advisory Board, Environmental Restoration and Waste Management Subcommittee. in an open public meeting on February 17, 1999 during the public comment period. Public comments concerning the proposed remedy are addressed in the Responsiveness Summary of this IROD.

XI. THE SELECTED INTERIM REMEDY

Detailed Description of Selected Remedy

Contaminated media at the MCB/MBP OU pose a significant risk to human health and the environment. Based on CERCLA evaluation criteria, the selected alternatives that successfully address the IRAOs to prevent or mitigate these risks are listed below:

MBP Surface/Subsurface Soil

The preferred alternative for the MBP is 4S(d), Soil Excavation and Offsite Disposal.

In order to protect the environment at MBP, Alternative 4S(d) was selected to remove the soils containing levels of aluminum in excess of the unit-specific maximum background of 11,000 mg/kg from the MBP to a maximum depth of four feet. The area to be excavated was determined based on a 25-foot radius around each of the three soil borings within the unit which exceeded the maximum unit-specific background value for aluminum of 11,000 mg/kg. For ease of construction, the entire area as depicted in Figure 13 will be excavated. The small area to the northeast, centered on a soil boring which also exceeded the maximum unit-specific background value, will also be excavated. Confirmation sampling will be performed during excavation. The plan is to excavate soil as needed until the remedial goal is reached.

The excavated soil will be disposed of at an off-unit disposal facility licensed to receive CERCLA waste, such as Three Rivers Landfill in South Carolina.

MCB Surface/Subsurface Soil

The preferred alternative for the MCB is 4S(b), Soil Excavation and Offsite Disposal and 2S, Institutional Controls.

In order to be protective of human health and the environment at the MCB, Alternative 4S(b) was selected to excavate surface soil containing levels of Aroclor-1260 above the ecological RG of 215 μg/kg, to a maximum depth of 1 foot. Excavation of this 1-foot interval will also remove all soil contaminated with Aroclor-1260 above the ARAR-based limit of 1000 μg/kg. Soil contaminated with Aroclor-1254 above the ARAR limit of 1000 μg/kg will be excavated to a maximum depth of 4 feet. Alternative 2S, Institutional Controls, would be implemented as well, because

Alternative 4S(b) would leave soil contaminated with OCDD in place above the 1 x 10^{-6} residential risk level (3 μg/kg). Figure 16 shows the area to be excavated. Confirmation sampling will be performed during excavation. The plan is to excavate soil as needed until the remedial goal is reached.

The excavated soil will be disposed of at an off-unit disposal facility licensed to receive CERCLA waste, such as Three Rivers Landfill in South Carolina.

Vadose Zone Soil

For the soil in the vadose zone, Alternative 2SVZ, Active SVE/Passive SVE, was selected as the only alternative that would protect human health. The depth of the vadose zone (40 m, 130 feet) made consideration of any presumptive remedies that required excavation of soils impractical. Figure 17 shows the proposed area of remediation.

As proposed in the Miscellaneous Chemical Basin Treatability Study reports (WSRC 1997, WSRC 1999), the source zone area will require at least 10 years to remediate using Passive Soil Vapor Extraction (PSVE) only. Active SVE could be applied to the source zone, and would remove vadose zone contaminants much faster than the PSVE system. As a result, SRS proposes to use a combination of active SVE and PSVE to address VOC contamination in the vadose zone at the MCB.

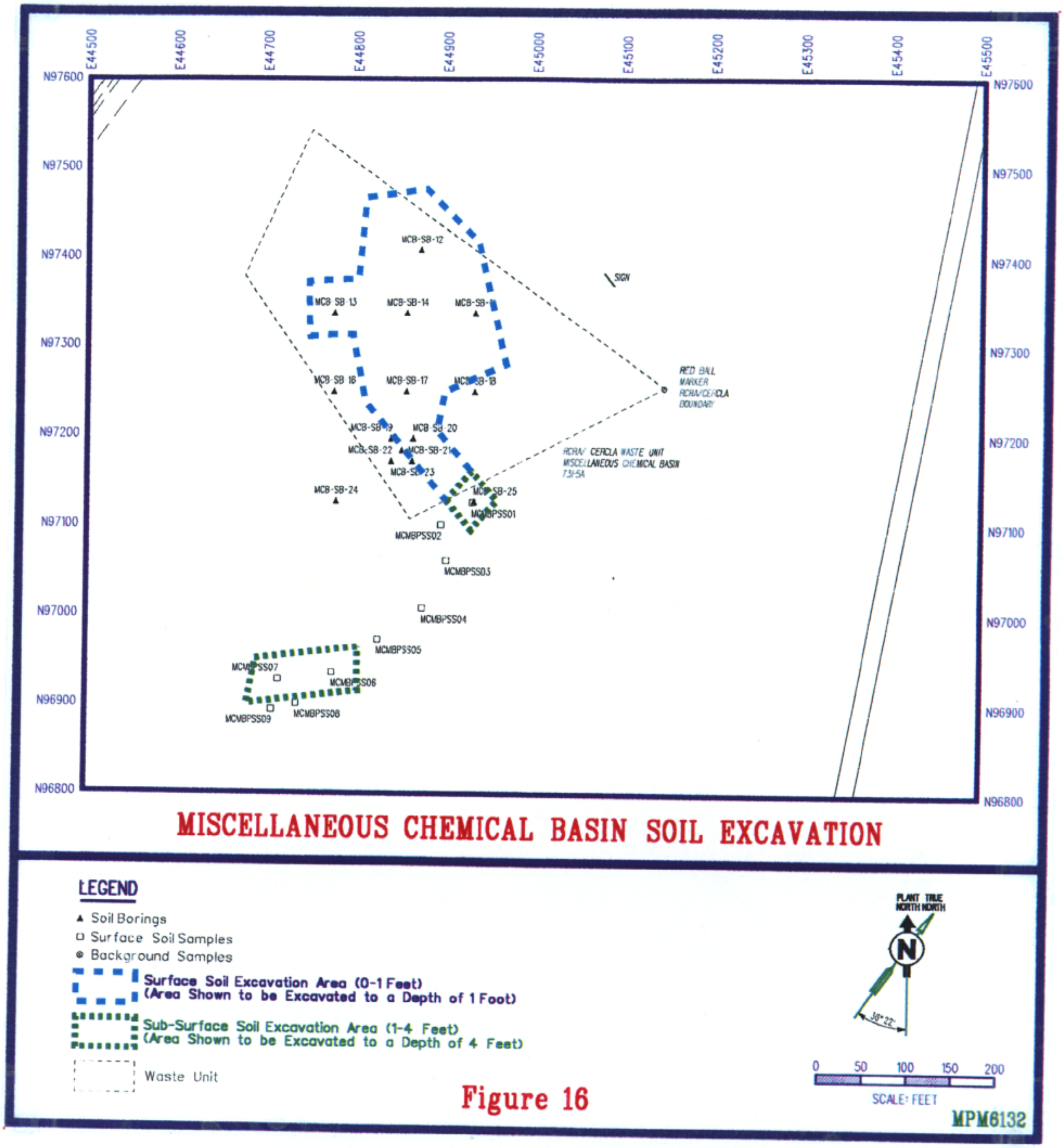

Figure 16. Miscellaneous Chemical Basin Soil Excavation

Active soil vapor extraction will be strategically located to address the source zone area (e.g., area of highest VOC concentrations), whereas the passive soil vapor system is designed to address the lower contaminant concentration areas. It is anticipated that the active soil vapor system will operate for a period of time (approximately three years) to reduce the contaminants to concentrations (e.g., <50 ppmv) commensurate with the use of the passive soil vapor extraction system. At that time, the active soil vapor system will be converted to a passive soil vapor extraction system to complete clean up of the vadose zone soils.

Groundwater

Alternative 3GW, In Situ Air Stripping and Monitoring, was selected as the most technically practical and cost effective alternative for groundwater remediation that would protect human health. In situ air stripping wells would set up a groundwater recirculating cell within the contaminated aquifer. As the air passes through the groundwater within the wells, the VOCs would volatilize within the well and would be vented to the surface, provided the levels did not exceed the air permit limits (off-gas treatment would be added, if needed). The selected interim alternative 3GW, in situ air stripping, is an innovative technology.

Three series of in situ air stripping wells will be installed downgradient from the MCB to address the VOC groundwater contamination (Figures 15 and 18). The purpose of each series of in situ air stripping wells is to provide contaminant control and aquifer restoration. The series of wells closest to the MCB surface soil area is designed to address the highest VOC concentrations (greater than 500 ppb) in the groundwater. The second series of wells is designed to address lower VOC

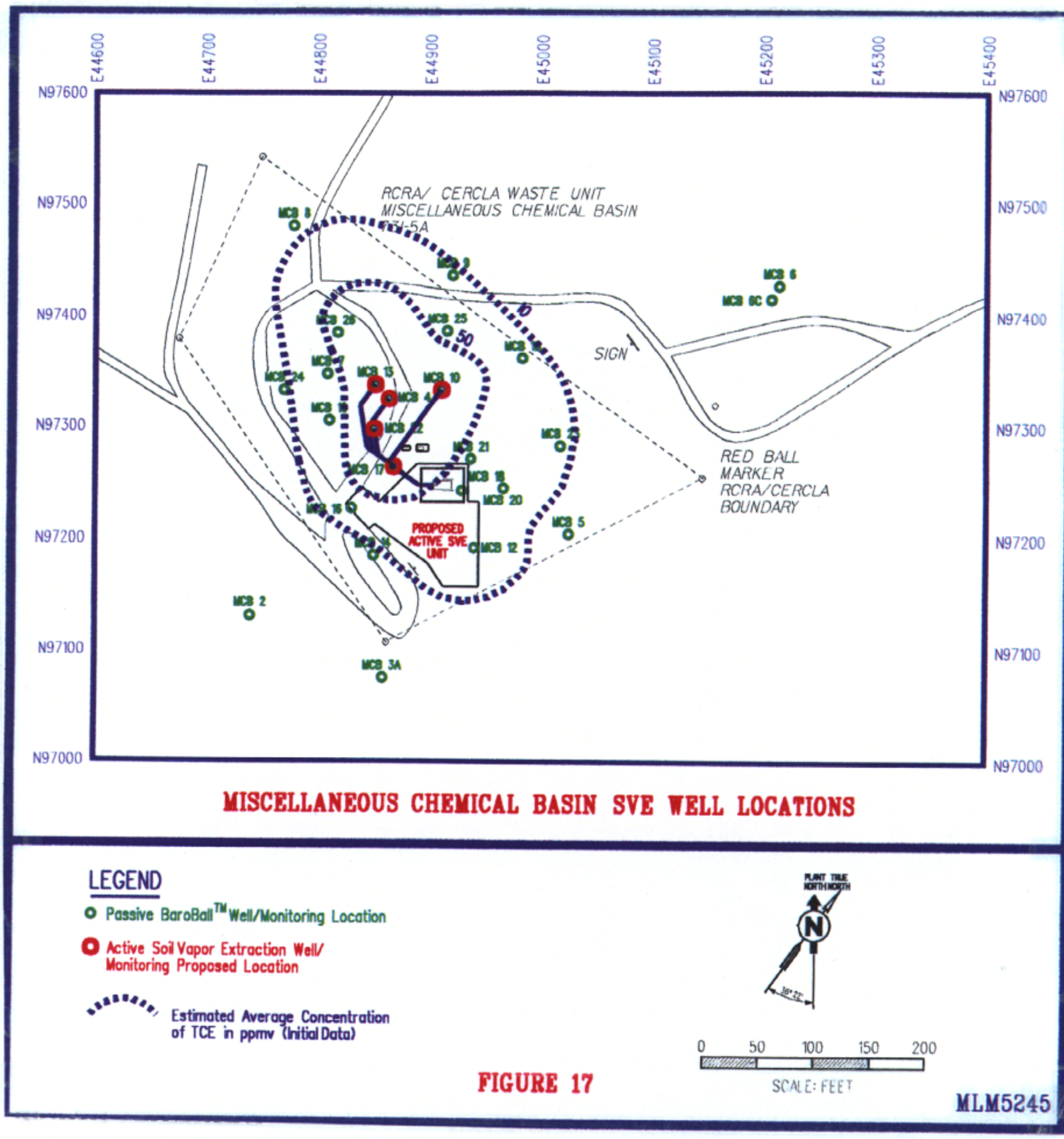

Figure 17. Miscellaneous Chemical Basin SVE Locations

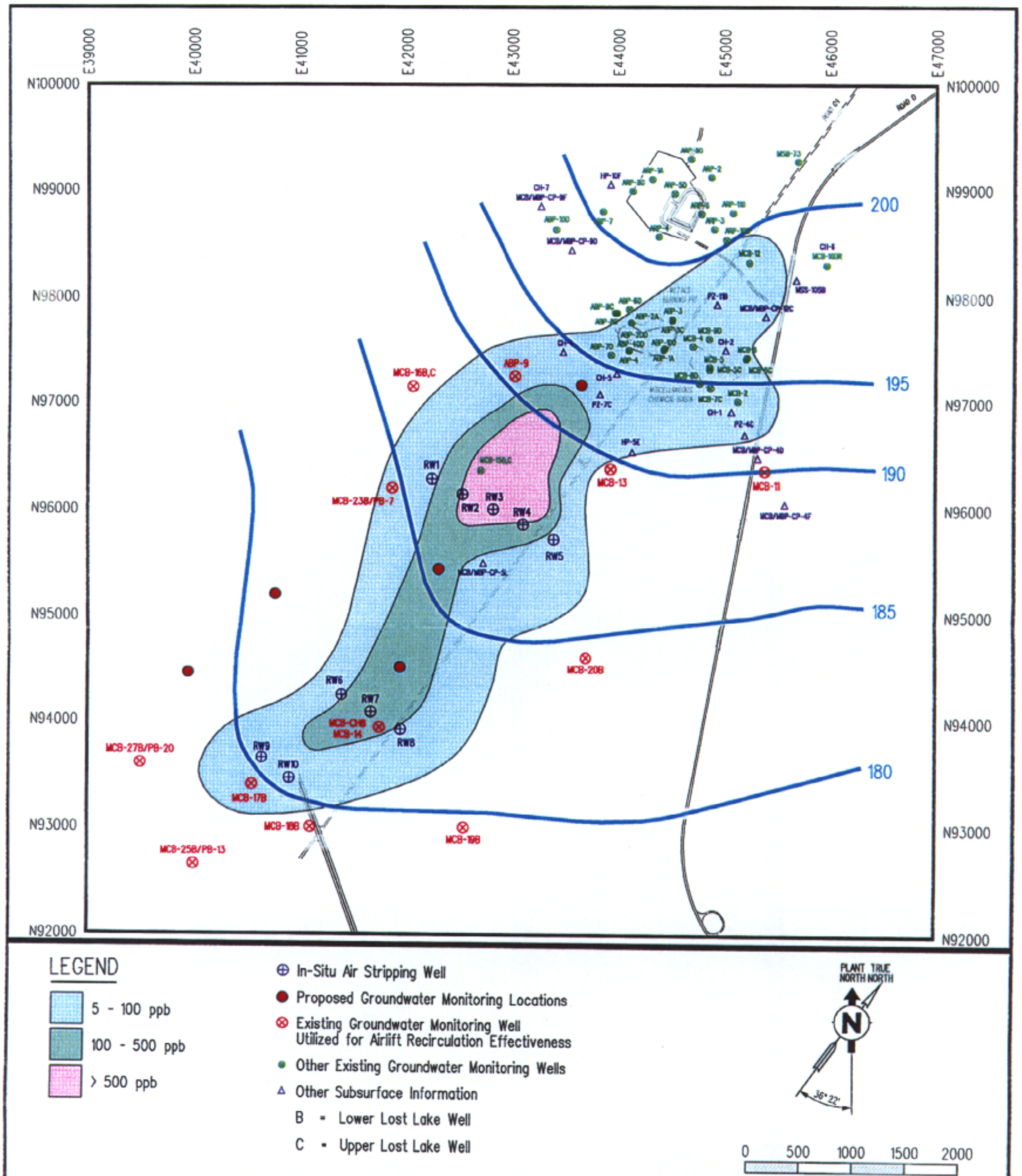

Figure 18. Proposed MCB Groundwater Treatment

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concentrations (approximately 200 ppb). The third series of wells (the farthest downgradient of the MCB surface soil area) is designed to address VOC concentrations of approximately 50 ppb or less. Contaminant fate and transport modeling predicts VOC concentrations will decrease during remediation as shown in Table 7. As indicated by groundwater modeling, and coupled with vadose zone cleanup (source reduction), the VOC plume is anticipated to reach levels below MCLs within 17 years from initiation of groundwater treatment. The effectiveness of the in situ air stripping wells will be monitored and reported to US EPA and SCDHEC.

Table 8. Predicted Maximum Groundwater VOC Concentrations in the Lost Lake Aquifer after Remediation by In Situ Air Stripping

Series of In Situ Air Stripping Wells	Predicted Concentration after 1 year of treatment, µg/L	Predicted Concentration after 5 years of treatment, µg/L	Predicted Concentration after 10 years of treatment, µg/L	Predicted Concentration after 17 years of treatment, µg/L
High VOC concentration wells (> 500 µg/L)	170	20	<5	<5
Medium VOC concentration wells (ca. 200 µg/L)	62	41	18	<5
Low VOC concentration wells (< 50 µg/L)	40	20	14	<5

The in situ air stripping wells will be designed such that groundwater samples can be obtained at both the well inlet and outlet. Samples from these two points will be obtained on a periodic basis to maintain controls on the remediation system and monitor its effectiveness. As an additional measure to determine the effectiveness of the in situ air stripping technology, the offgas associated with the in situ air stripping wells will be sampled. This approach will provide information on the amount of VOCs removed as the result of groundwater treatment.

As part of a strategy to determine the effectiveness of the in situ air stripping technology, a series of monitoring wells will be installed at the MCB. The wells will be designed to allow measurement of the upgradient, sidegradient, and downgradient aquifer conditions during groundwater treatment. Monitoring wells will also be positioned to allow sampling from both the depth interval from which contaminated groundwater is being obtained and the depth interval into which treated groundwater is being recirculated. Samples from these monitoring wells will be analyzed on a quarterly basis and the data will be submitted in an annual report to SCDHEC and US EPA.

Each monitoring well will be sampled for VOC contaminants, associated daughter products and lead. The monitoring well sampling data will be trended and compared to other wells in A/M Area that exhibit similar fluctuations in lead levels but have no known source (other than natural geologic conditions) for the lead.

An interim action is proposed because of the uncertainty of the groundwater remediation within the overall unit remediation strategy. VOC-contaminated groundwater plumes are located upgradient from the MCB/MBP. The larger of these plumes is associated with the A/M Area unit. Since these plumes are moving in the general direction of the MCB/MBP, it is not clear whether these plumes may represent a future VOC source relative to the MCB/MBP groundwater. The proposed interim groundwater action may be sufficient to achieve the final groundwater remedial objective of returning VOC levels to within MCLs if there is no interaction between the MCB/MBP and the ABRP or A/M Area. However, due to the above uncertainties, the proposed early groundwater action will be taken on an interim basis to allow for further characterization of the regional VOC groundwater contamination. Review of the groundwater quality and of this remedy will continue as US DOE, SCDHEC, and US EPA continue to develop final remedial alternatives for the MCB/MBP groundwater. Continuously collected groundwater data for the

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upgradient units (A/M area and the ABRP) will be analyzed and presented as part of the Post-IROD documents. The data will be used in preparation of the Focused Feasibility Study (FFS) for the final groundwater ROD at the MCB/MBP Operable Unit.

Cost Estimate for the Selected Remedy

The total present worth cost for the selected remedy is approximately $4,838,000. A detailed breakdown of these costs is presented in Table 9.

Table 9. Cost Estimate for the Selected Remedial Alternatives

2S, Institutional Controls	$ 32,800
Direct Capital Costs	
4S(b) Soil Extraction and Disposal at MCB	195,800
4S(d) Soil Extraction and Disposal at MBP	92,500
2SV Active/Passive SVE at MCB (2 active SVE wells)	313,560
3GW, In Situ Air Stripping (11 wells)	979,000
Total Direct Capital Cost	1,580,860
Indirect Capital Cost (60% of Direct Capital)	948,516
Total Capital Cost	**2,529,376**
Present Worth of Annual Operating & Maintenance (O & M) Cost	
Active SVE ($98,102 per year, 3 years, 5% interest)	267,154
Passive SVE ($25,865 per year, 10 years, 5% interest)	199,722
In Situ Air Stripping ($160,440 per year, 17 years, 5% interest)	1,808,800
Total Present Worth of Annual O & M Cost	**2,275,676**
Total Present Worth Cost of Selected Alternatives	**$4,837,852**

Estimated Outcomes of Selected Remedy

Upon achieving surface and subsurface soil final human health RGs for Aroclor-1254 and Aroclor-1260 at construction completion (approximately 9 months after construction start), the MCB/MBP will be available for industrial land use. At that time, wildlife populations will also benefit from the removal of aluminum and Arolclor-1260 contamination above RGs.

Since the interim groundwater action at the MCB is not designed to be final, the ability to restore the groundwater to beneficial use will not be determined until final actions are identified and then implemented. However, reduced plume migration and reduced VOC contaminant mass in the groundwater are benefits that will be realized from the interim action.

XII. STATUTORY DETERMINATIONS

This IROD identifies final remedial goals for soils. However, due to uncertainties in the nature and extent of possible groundwater interactions between MCB/MBP and two nearby operable units, ABRP and the A/M Area, final remedial goals for MCB/MBP groundwater cannot be identified. Interim action to begin groundwater remediation while continuing to clarify regional groundwater contamination issues is protective of human health and the environment.

The selected interim groundwater alternative is consistent with the interim remedial action objectives and any final action. The alternative selection focused upon the key ARARs listed below which apply to the limited scope of the interim action. The alternative selection also considered the final action ARARs to ensure that the interim action and any final action are compatible. The final action will comply with federal and state ARARs. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is a furtherance of that statutory mandate.

The selected remedy is protective of human health and the environment, complies with federal and state ARARs and is cost-effective. The level of aluminum in the MBP soils warrants remediation with excavation and off-site disposal. The levels of Aroclor-1254 and Aroclor-1260 in the MCB soils warrant remediation and off-site disposal. The level of VOCs in the vadose zone warrants remediation using active and passive SVE. The levels of VOCs in the groundwater warrant a remedy in which in situ air stripping with monitoring is a practical alternative. This combination of alternatives, in conjunction with Institutional Controls, will be protective of human and ecological receptors by preventing the exposure to and/or assimilation of constituents of concern. These remedies for the soil and vadose zone utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable, and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. As stated earlier, these remedies do not utilize a permanent solution for groundwater; groundwater at the site will continue to undergo study in support of final remedy selection.

An ARARs waiver under § 300.430(f)(1)(ii)(C) of the NCP for all groundwater COCs has been invoked because the selected remedy is an interim measure that will become part of a total remedial action that will ultimately attain ARARs.

Section 300.430 (f)(4)(ii) of the NCP requires that a five-year review of the IROD be performed if hazardous substances, pollutants, or contaminants above health-based levels remain in the waste operable unit. The three Parties (US DOE, SCDHEC, and US EPA) have determined that a five-year review of IROD for the MCP/MBP would be performed to ensure continued protection of human health and the environment.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

Subsequent to the submittal of the MCB/MBP OU IAPP, Revision 1, SRS is including changes to soil alternative 4S(b) and two interim groundwater alternatives, 2GW and 3GW. The change in 4S(b) is a consequence of basing the RG for the final human health COC Aroclor-1254 on the ARAR limit of 1000 μg/kg. The changes in 2GW and 3GW reflect refinement of the MCB/MBP groundwater flow and contaminant transport model, which incorporates the most recent hydrologic data from the A/M Area. The rationale for these changes is presented below.

Alternative 4S(b), Soil Extraction and Offsite Disposal

As presented in the MCB/MBP OU IAPP, Revision 1, the preferred remedy for the MCB soil is Alternative 4S(b), Soil Extraction and Offsite Disposal. Even though the future land use at the MCB/MBP OU is industrial (low occupancy), the 1000 μg/kg RG is protective for high occupancy areas (residential). This remedy calls for removal of soil contaminated Aroclor-1254 above the 1×10^{-6} industrial risk level (479 μg/kg) to maximum depth of one foot and soil contaminated with Aroclor-1260 above the ecological risk RG of 215 μg/kg to a maximum depth of one foot.

Subsequent to the submittal of the MCB/MBP OU IAPP, Revision 1, SRS has determined that Alternative 4S(b) should be modified based on cleanup standards promulgated in 40 CFR Part 761, Disposal of PCB; Final Rule. This modification will remove all soil contaminated with Aroclor-1254 above the ARAR-based RG of 1000 μg/kg to a maximum depth of four feet. All soil contaminated with Aroclor-1260 above the ecological risk RG of 215 μg/kg will still be removed to a maximum depth of one foot.

Alternative 3GW, In Situ Air Stripping

As presented in the MCB/MBP OU IAPP, Revision 1, the preferred interim remedy for the groundwater is Alternative 3GW, In Situ Air Stripping, with ten wells providing hydraulic control and clean up of groundwater to MCLs (5 ppb) in approximately ten years at a total cost of $2,662,875. This interim remedy calls for hydraulic control and contaminant removal at three concentration intervals within the groundwater plume: five wells for the high (>500 ppb) VOC concentration interval; three wells for the medium (>200 ppb) concentration interval; and two wells for the low (<50 ppb) concentration interval. The number and location of the in situ air stripping wells, as well as clean up time, were based on results of a preliminary groundwater flow and contaminant transport model.

Subsequent to the submittal of the MCB/MBP OU IAPP, Revision 1, SRS has determined that an additional in situ air stripping well should be incorporated into the remedial approach to ensure maximum capture of the VOC groundwater plume emanating from the MCB/MBP OU. Refinement of the MCB/MBP groundwater flow and contaminant transport model indicates that an 11-well scenario will provide additional hydraulic control, minimize the potential for plume growth, and clean up groundwater to MCLs in approximately 17 years.

The additional in situ air stripping well is proposed as part of the line of wells designed to address the low (<50 ppb) VOC concentration portion of the groundwater plume (Figure 18). The addition of one well is necessary to ensure maximum capture of the easternmost portion of the low concentration plume. The end result is a total of three wells performing clean up in the vicinity of the downgradient edge of the plume.

The increase (7 additional years) in clean up time is based on using refined aquifer parameters (e.g., transmissivity and leakance) derived from studies conducted in the Lost Lake aquifer at the Southern Sector, A/M Area (WSRC 1996). Since aquifer tests (e.g., pump tests) were not performed on the Lost Lake aquifer at the MCB/MBP OU, pump test data from the nearest site (e.g., Southern Sector, approximately 2 miles away from the MCB/MBP OU) were used to simulate aquifer conditions.

The increase (from 10 to 17 years) in clean up time is associated with a very dilute (<20 ppb) portion of the plume that will be addressed by the second and third lines of in-situ air stripping wells. Furthermore, the increase in clean up time does not correspond to any considerable plume growth. After 10 years of operation, maximum plume concentrations of 6.2 ppb occur approximately 2000 feet down gradient of the third curtain of in-situ air stripping wells; based on the preliminary model, the concentration at year 10 was 5 ppb. In the 13th year of operation, the concentrations are reduced to below MCLs downgradient of the third curtain of wells. The plume between the second and third curtain of in-situ air stripping wells is reduced (from 12 ppb (year 13) to 5 ppb (year 17)) to MCLs after 17 years of operation.

The proposed groundwater interim action, in situ air stripping wells will provide hydraulic control as well as contaminant mass removal and contaminant migration control for the portions of the plume captured by the three curtains of wells. However, the portion of the plume downgradient of the third curtain, specifically outside the zone of capture, will not be hydraulically controlled.

The increase in the number of in-situ air stripping wells and clean up time does not change the decision point, i.e., Alternative 3GW, In Situ Air Stripping, as the preferred interim remedy for the groundwater. The cost, however, will increase by approximately $712,000. This includes the cost of well installation and operation over the period estimated to clean up the aquifer to MCLs. SRS considers this alternative as the most technically practicable and cost effective approach for clean up of VOC contaminated groundwater at the MCB/MBP OU.

Alternative 2GW, Extraction with Air Stripping and Monitoring

The interim groundwater remedy, Alternative 2GW, Extraction with Air Stripping and Monitoring, is revised to reflect the number of extraction wells required to provide maximum hydraulic control and contaminant removal at three concentration (high, medium, and low) intervals within the groundwater plume.

Alternative 2GW, Extraction with Air Stripping and Monitoring, as presented in the MCB/MBP OU IAPP, Revision 1, consists of 6 extraction wells, an air stripper, and an outfall for discharge of treated groundwater as an interim approach to groundwater clean up of the groundwater plume. The duration of this alternative is 10 years, with a total cost of approximately $ 5,800,000.

As indicated by the revised MCB/MBP groundwater flow and contaminant transport model, 11 wells are necessary to provide maximum hydraulic control and contaminant removal at the high (>500 ppb, 5 wells); medium (>200 ppb, 3 wells); and low (<50 ppb, 3 wells) concentration intervals in the groundwater plume.

As discussed above, the increase (7 additional years) in clean up time is based on using refined aquifer parameters from recent studies in the A/M Area. The additional wells and time to operate in order to meet MCLs will increase the cost of this alternative by approximately $1,200,000. See Table 9 for a detailed cost estimate of the revised alternative 2GW.

Table 10. Detailed Cost Estimate for Revised Alternative 2GW Showing Impact of Adding a Well and Increasing Duration of Operation to 17 Years

[illegible]	[illegible]	Units	Quantity	[illegible]
Direct Capital Costs				
Air stripper	$ 700,000	project	1	$ 700,000
Piping to outfall	1,500,000	project	1	1,500,000
11 wells	10,000	Well	11	110,000
Total Direct Capital Costs				**2,310,000**
Indirect Capital Costs	(60% of Total Direct Costs)			**1,386,000**
Total Capital Costs				3,696,000
Annual Operation & Maintenance	220,000	Year	1	220,000
Annual Groundwater Monitoring Costs	78,240	Year	1	78,240
Total Annual Costs				298,240
Present Worth of Annual Costs	@5% interest, 17 years, Present Worth Factor = 11.2741			**3,362,378**
Total Present Worth Costs				**$ 7,058,378**

The direct capital cost of installing an additional extraction well for alternative 2GW is approximately $10,000. The estimated annual operating cost of alternative 2GW, the conventional air stripping system, is approximately $300,000. Therefore, the cost of installing five new extraction wells is relatively insignificant compared to the present worth cost of operating the air stripping system for an additional 7 years.

For alternative 3GW, the direct capital cost of installing an additional in situ air stripping well is greater than the extraction well employed in 2GW (approximately $89,000), but the annual operating cost is significantly less (approximately $160,000). Since the annual operating cost of alternative 3GW is significantly less than the annual operating cost of alternative 2GW, and the difference in capital cost is relatively insignificant, the total cost of extending the required operating time for an additional 7 years is significantly less for alternative 3GW.

The total life cycle costs for both alternatives 2GW and 3GW are dominated by their operating and maintenance cost components.

XIV. RESPONSIVENESS SUMMARY

A Responsiveness Summary of the comments received during the public comment period is included in Appendix A.

XV. POST-IROD DOCUMENT SCHEDULE

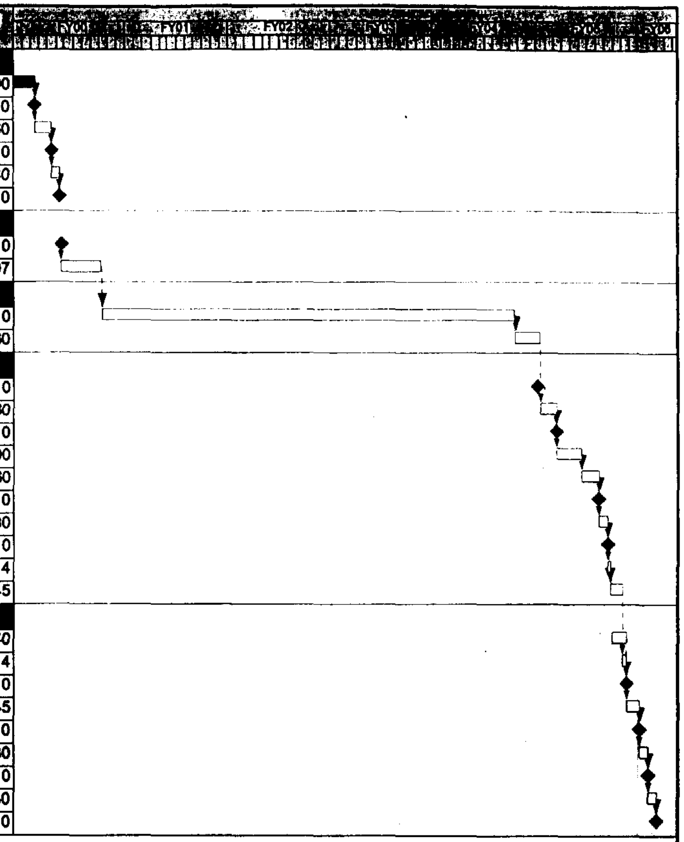
The corrective measures implementation, Remedial Design Report, and the Remedial Action Work Plan will be submitted as one document to eliminate redundancy.

This document will include the following:

- General description of unit,
- Remedial action schedule,
- Discussion of design activities, design criteria, and permitting requirements,
- Design drawings and a discussion of the permit and construction specifications,
- Remedial design change control and US EPA/SCDHEC review of remedial design changes,
- Waste management,
- A discussion of Quality Assurance, Health and Safety Plan and Emergency Plan Implementation Strategy,
- Requirements for project closeout, and
- Land Use Control Implementation Plan.

The Post-IROD Document Schedule is presented in Figure 19. This schedule indicates that a Focused Feasibility Study will be prepared, which evaluates the additional groundwater monitoring data and *in situ* aeration well system performance data. The combined Corrective measures Study/Feasibility Study/Proposed Plan (CMS/FS/PP) is scheduled for public comment in June 2005. The final ROD, identifying the final groundwater remedial actions for this operable unit, is scheduled for December 2005.

Activity ID	Activity Description	Early Start	Early Finish	Orig Dur
ICMI/RAIP				
BSP0602220	EPA/SCDHEC REVIEW OF REV. 0 ICMI/RAIP	02APR99A	15NOV99A	90
BSP0602261	EPA/SCHEC RETURNS REV. 0 COMMENTS		15NOV99A	0
BSP0602240	SRS INCORPORATES EPA/SCDHEC COMMENTS	16NOV99A	14JAN00	60
BSP0602250	SRS SUBMITTAL OF REV. 1 ICMI/RAIP		14JAN00	0
BSP0602260	EPA/SCDHEC FINAL REVIEW & APPROVAL	15JAN00	13FEB00	30
BSP0602280	RECEIPT OF EPA/SCDHEC APPROVAL		13FEB00	0
CONSTRUCTION (INTERIM ACTION)				
BSP0602620	INTERM ACTION REMEDIAL ACTION (RA) START DATE	17FEB00*		0
BSP0602630	CONSTRUCTION ACTIVITIES	18FEB00	07JUL00	97
OPERATIONS				
BSP0602640	OPERATE SVE & INSITU AERATION WELL SYSTEMS	10JUL00	16JUL04	1,010
BSP0602650	PERFORMANCE EVAL, PREPARATION & SUBMITTAL	19JUL04	11OCT04	60
CMS/FS/PP				
BSP0602421	FS SCOPING MEETING	06OCT04		0
BSP0603500	DEVELOP CMS/FS/PP	12OCT04*	10DEC04	60
BSP0603510	SRS SUBMITTAL OF REV. 0 CMS/FS/PP		10DEC04	0
BSP0603520	EPA/SCDHEC REVIEW REV. 0 CMS/FS/PP	11DEC04	10MAR05	90
BSP0603530	SRS INCORPORATE EPA/SCDHEC COMMENTS	11MAR05	09MAY05	60
BSP0603540	SRS SUBMITTAL OF REV. 1 CMS/FS/PP		09MAY05	0
BSP0603550	EPA/SCDHEC FINAL REVIEW & APPROVAL	10MAY05	08JUN05	30
BSP0603560	RECEIPT OF EPA/SCDHEC APPROVAL		08JUN05	0
BSP0603570	NOTIFICATION OF PUBLIC COMMENT PERIOD	09JUN05	22JUN05	14
BSP0601460	PUBLIC COMMENT PERIOD	23JUN05	06AUG05	45
FINAL RECORD OF DECISION				
BSP0601769	DEVELOP REV. 0 ROD	24JUN05	19AUG05	40
BSP0601700	RESPONSIVENESS SUMMARY & APPROVALS	07AUG05	20AUG05	14
BSP0601640	SUBMIT REV. 0 ROD		20AUG05	0
BSP0601660	EPA/SCDHEC REVIEW OF REV. 0 ROD	21AUG05	04OCT05	45
BSP0601625	EPA/SCDHEC RETURNS REV. 0 COMMENTS		04OCT05	0
BSP0601720	SRS INCORPORATE EPA/SCDHEC COMMENTS	05OCT05	03NOV05	30
BSP0601740	SRS SUBMITTAL OF REV. 1 ROD		03NOV05	0
BSP0601760	EPA/SCDHEC FINAL REVIEW & APPROVAL OF REV. 1	04NOV05	03DEC05	30
BSP06MS003	SUBMIT SIGNED REV. 1 ROD TO EPA/SCDHEC		03DEC05	0



Project Start	01OCT92	Early Bar	1407
Project Finish	[illegible]	Progress Bar	
Data Date	[illegible]	Critical Activity	
Run Date	10DEC99		

Sheet 1 of 1

ENVIRONMENTAL RESTORATION
1407 MISC CHEM BASIN/METAL BURN PIT
RCRA/CERCLA Implementation Schedule

Date	Revision	Checked	Approved

Figure 19. Post-IROD Documents Schedule

XVI. REFERENCES

FFA, 1993. *Federal Facility Agreement for the Savannah River Site*, Administrative Document Number 89-05-FF, Effective Date: August 16, 1993, WSRC-OS-94-42.

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

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WSRC, 1994. *Phase II, Revision II, Revision I, RCRA Facility Investigation/Remedial Investigation Work Plan for Miscellaneous Chemical Basin/Metals Burning Pit (U).* WSRC-RP-92-483, Rev. 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 1996. *Development of a Vertical Recirculation Well System for the A/M Area of the Savannah River Site (U).* WSRC-RP-96-477, September 1996, Westinghouse Savannah River Company, Aiken, SC.

WSRC, 1997. *Miscellaneous Chemical Basin Treatability Study: An Analysis of Passive Vapor Extractions Wells (PSVE) (U).* WSRC-TR-97-00405, Rev. 1.0, December 1997, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 1998a. *RCRA Facility Investigation/ Remedial Investigation Report with Baseline Risk Assessment for the Miscellaneous Chemical Basin/Metals Burning Pit (U).* WSRC-RP-96-853, Rev.1.2, May 1998, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 1998b. *Interim Action Proposed Plan for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) Operable Unit (U).* WSRC-RP-98-4153, Rev.1 January, 1999, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

WSRC, 1998c. *Corrective Measures Study/Focused Feasibility Study for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) (U).* WSRC-RP-97-151, Rev. 0, April 1998, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC.

APPENDIX A - RESPONSIVENESS SUMMARY

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Responsiveness Summary

The 30-day public comment period for *the Statement of Basis/Proposed Plan for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A)* began on January 29, 1999 and ended on February 27, 1999.

<u>*Public Comments*</u>

There were no comments received from the public for the MCB/MBP. The Environmental Remediation and Waste Management (ER&WM) Program subcommittee of the SRS Citizen's Advisory Board (CAB) was given a briefing on the preferred alternative on February 17,1999. The ER&WM subcommittee was supportive of the preferred alternative and drafted a motion to be presented to the full CAB at the March 23,1999 meeting.

This motion supports the action and reads as follows:

The SRS Citizens Advisory Board supports the proposed action as being a reasonable and prudent choice among the alternatives. However, we recommend that US DOE-Savannah River, US EPA Region IV and SCDHEC jointly develop criteria against which the vadose zone and groundwater actions will be measured. We recognize that attaining Maximum Concentration Limits (MCLs) in the groundwater is the desired goal but are concerned that it may turn out to be an unattainable goal. Thus, we are interested in criteria which indicates when the proposed actions pass the point of diminishing returns. Specifically, when would the groundwater in situ systems switch from active to passive operations?

The SRS response is as follows:

SRS recognizes that remediation of groundwater to meet MCLs may be an unattainable goal. However, in the absence of the necessary data, it is inappropriate at this time to develop groundwater quality criteria which would trigger conversion of the groundwater remedy from an active to a passive approach. The remedial goals established for the interim groundwater action are based on in situ aeration well system performance modeling. These interim remedial goals are greater than MCLs. The ability of the system to attain MCLs will be assessed as part of the final CMS/FS/PP and ROD for this OU. This assessment will be based on the groundwater monitoring and remediation system performance data collected during the interim action.

The preferred remedy for the vadose zone is soil vapor extraction. Based on the level of VOC contamination in the MCB vadose zone soils, SRS proposes to use a combination of active and passive soil vapor extraction to achieve the remedial goals. Active soil vapor extraction will be strategically located to address the area of highest VOC concentrations, whereas the passive soil vapor system is designed to address the remaining portions of the vadose zone plume.

It is anticipated that the active soil vapor system will operate for a period of time (approximately three years) to reduce the contaminants to concentrations (e.g., <50 ppmv) commensurate with the use of the passive soil vapor extraction system. At that time, the active soil vapor system will be converted to a passive soil vapor extraction system.