United States Department of Energy

Savannah River Site

Record of Decision
Remedial Alternative Selection for the
Silverton Road Waste Unit (731-3A) (U)

WSRC-RP-96-171
Revision 1
February 1997

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

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

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RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

Silverton Road Waste Unit (731-3A)

WSRC-RP-96-171
Revision 1
February 1997

Savannah River Site
Aiken, South Carolina

Prepared by:

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

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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

Silverton Road Waste Unit (SRS Building Number 731-3A)
Savannah River Site
Aiken, South Carolina

The Silverton Road Waste Unit (SRWU) (731-3A) 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).

Statement of Basis and Purpose

This decision document presents the selected remedial alternative for the SRWU located at the SRS in Aiken, South Carolina. The selected alternative was developed in accordance with CERCLA, as amended, 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 specific RCRA/CERCLA unit.

Description of the Selected Remedy

The preferred alternative for the SRWU soils is Institutional Controls which will restrict this land to future industrial use and prohibit the excavation of soil which might expose future workers to low concentrations of hazardous constituents. Implementation of the Institutional Controls alternative will require both near- and long-term actions which will be protective of human health and the environment. For the near-term, signs will be posted at the waste unit which indicate that this area was used for the disposal of waste material and contains buried waste. In addition, existing SRS access controls will 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 would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA. The deed shall include notification disclosing former waste management and disposal activities as well as any remedial actions taken on the site, and any continuing groundwater monitoring commitments. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of construction debris and other materials, including hazardous substances.

The deed shall also include restrictions precluding residential use of the property. However, the need for these restrictions may be reevaluated at the time of ownership transfer in the event that contamination no longer poses an unacceptable risk under residential use.

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

In the "M Area" groundwater aquifer, low levels of contaminants have been detected which minimally and infrequently exceed maximum contaminant levels (MCLs). The probable condition for the "M Area" groundwater aquifer is no significant groundwater contamination resulting from the SRWU. As a result, no remedial action is deemed appropriate for the SRWU "M Area" groundwater aquifer. However, a confirmatory groundwater monitoring program will be established to ensure that this is the appropriate remedial action for the "M Area" groundwater aquifer. In the event that the probable condition is no longer appropriate, DOE w i 11 evaluate the need for remedial action.

Under the confirmatory groundwater program, an adequate number of monitoring wells will be selected to monitor the extent of the contaminant plume and the severity of the contamination. Since only one background well is available for the "M Area" aquifer, new background well(s) will need to be installed. The groundwater monitoring is intended to evaluate trends in the groundwater contamination. GroundWater monitoring was assumed to be conducted on a semi-annual basis for 30 years (for cost estimating purposes only). However, at the five-year Record of Decision review, the groundwater monitoring data will be evaluated to determine if any changes in the groundwater remedy are appropriate. "

The number and location of the new background well(s), a list of the existing wells to be monitored, the frequency of monitoring, and the submittal frequency of the groundwater data for regulatory review will be listed in the SRWU Corrective Measures Implementation/Remedial Action Report (CMI/RAR) post-ROD document. The CMI/RAR will also identify a groundwater strategy which will include trend analysis and recommendations based on the interpretation of the data in the post-ROD groundwater monitoring reports. The CMI/RAR will be submitted to the regulatory agencies four months after issuance of the ROD. The regulatory review period, SRS revision period, and final regulatory review and approval period for the CMI/RAR will be 90 days, 60 days, and 30 days, respectively.

The" SCDHEC has modified the SRS permit to incorporate the selected remedy.

The groundwater in the lower aquifers are separate operable units and are not within the scope of this Record of Decision. The groundwater in the lower aquifers will be evaluated as part of the 1995 RCRA Permit for the A/M Area Western Sector Corrective Action Program.

Statutory Determinations

Based on the SRWU RCRA Facility Investigation/Remedial Investigation (RFI/RI) Report and the Baseline Risk Assessment (BRA), the SRWU poses no significant risk to the environment and minimal risk to human health. Therefore, a determination has been made that institutional controls are sufficient for protection of human health and the environment for the SRWU soils and that no remedial action with confirmatory groundwater monitoring is deemed appropriate for the SRWU "M Area" groundwater aquifer.

The selected remedy is protective of human health and the environment complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The size of the waste unit and the random distribution and low levels of contaminants preclude a remedy in which treatment is a practical alternative. Because treatment of the principal threats of the site was found to be impracticable, this remedy does not satisfy the statutory preference for treatment as a principal element.

Institutional controls will result in hazardous substances, pollutants, or contaminants remaining in the waste unit. Section 300.430 (f)(4)(ii) of the NCP requires that a Five Year Review of the Record of Decision be performed if hazardous substances, pollutants, or contaminants remain in the waste unit. The three Parties have determined that a Five Year Review of the Record of Decision for the SRWU will be performed to ensure continued protection of human health and the environment.

2/26/97
Date

T. F. Heenan
Assistant Manager for Environmental Quality
U.S. Department of Energy, Savannah River Operations Office "

3/27/97
Date

John H. Hankinson, Jr.
Regional Adrninistrator
U. S. Environmental Protection Agency

4/22/97
Date

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

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

Silverton Road Waste Unit (731-3A)

WSRC-RP-96-171
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Savannah River Site
Aiken, South Carolina

Prepared by:

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Aiken, South Carolina

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L Site and Operable Unit Name, Location, and Description

The Savannah River Site (SRS) occupies approximately 310 square miles of hind 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.

SRS is owned by the U.S. Department of Energy (DOE). Management and operating services are provided by Westinghouse Savannah River Company (WSRC). SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense. Chemical and radioactive wastes are by-products of nuclear material production processes. Hazardous substances, as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), are currently present in the environment at SRS.

The Federal Facility Agreement lists the Silverton Road Waste Unit (SRWU), 731-3A, (Figure 2) as a Resource Conservation and Recovery Act (RCRA)/CERCLA unit requiring further evaluation using 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.

The SRWU, 731-3A, is located in the north western part of the SRS in Aiken County (Figure 1), approximately 1.5 miles southwest of A/M Area (Figure 2). The SRWU area is an irregular quadrilateral which contains an unlined earthen depression dug into surficial soils and later filled with various waste materials. This area has been designated as "excavated area (filled)" on Figure 3. Soil borings conducted in 1993 identified the presence of waste buried beyond the excavated area. The additional area of waste disposal is within the orange ball markers and covers an area of approximate y 600 feet by 400 feet with waste being buried to a maximum depth of approximately 16 feet below ground level. The excavated area is larger than the soil boring dimensions, but is less than the orange ball dimensions. Since characterization data indicated contamination of the surface soils, the planar area calculation for the SRWU includes the entire area within the orange balls. Therefore, the SRWU planar area of the SRWU is assumed to be 750 feet by 600 feet (450,000 ft^2). Using an average estimated depth of 6 feet for the excavated area, the approximate waste volume of the SRWU is 2,700,000 ft^3.

The SRWU is located on the southwestern flank of an interstream divide between Upper Three Runs Creek (approximately 4.5 miles to the southeast) and the flood plain of the Savannah River (approximately 1.5 miles to the west). The ground surface elevation at the unit averages 350 feet above mean sea level. Surface drainage is southwestward, along a series of dry-wash tributaries, into the flood plain of the Savannah River. The water table at the SRWU ranges from about 40 feet below ground level to the southwest to about 130 feet below ground level to the northeast.

The SRWU was first used before construction of the SRS. Although there is no written record of when disposal began at the SRWU, or what materials were accepted, it is believed that the SRWU was originally a borrow pit used as an "open dump" by the local municipalities including Old Ellenton before the land was squired by the federal government. Municipal, agricultural, and commercial trash, rubbish, garbage, debris, and refuse probably constituted the waste stream until the early 1950's. The waste material at the dump was probably burned periodically, as was the practice at that time, for volume reduction. This practice would have eliminated many of the combustible organic materials while creating combustion by-products.

After procurement by the federal government, the SRWU land continued to be used as an open dump (a legal practice at the time) by SRS. Historical and aerial photographs show large piles of metal shavings (possibly aluminum), 55-gallon drums, cardboard drums, tires, lumber, wooden pallets, cardboard, construction debris, tanks, possibly asbestos, and other unidentified metal and wood objects. No records of waste disposal activities were kept. In 1974, the disposal of waste at the SRWU ceased, and the area was bulldozed, graded

Figure 1. Location of the **Silverton** Road Waste Unit at the Savannah River **Site.**

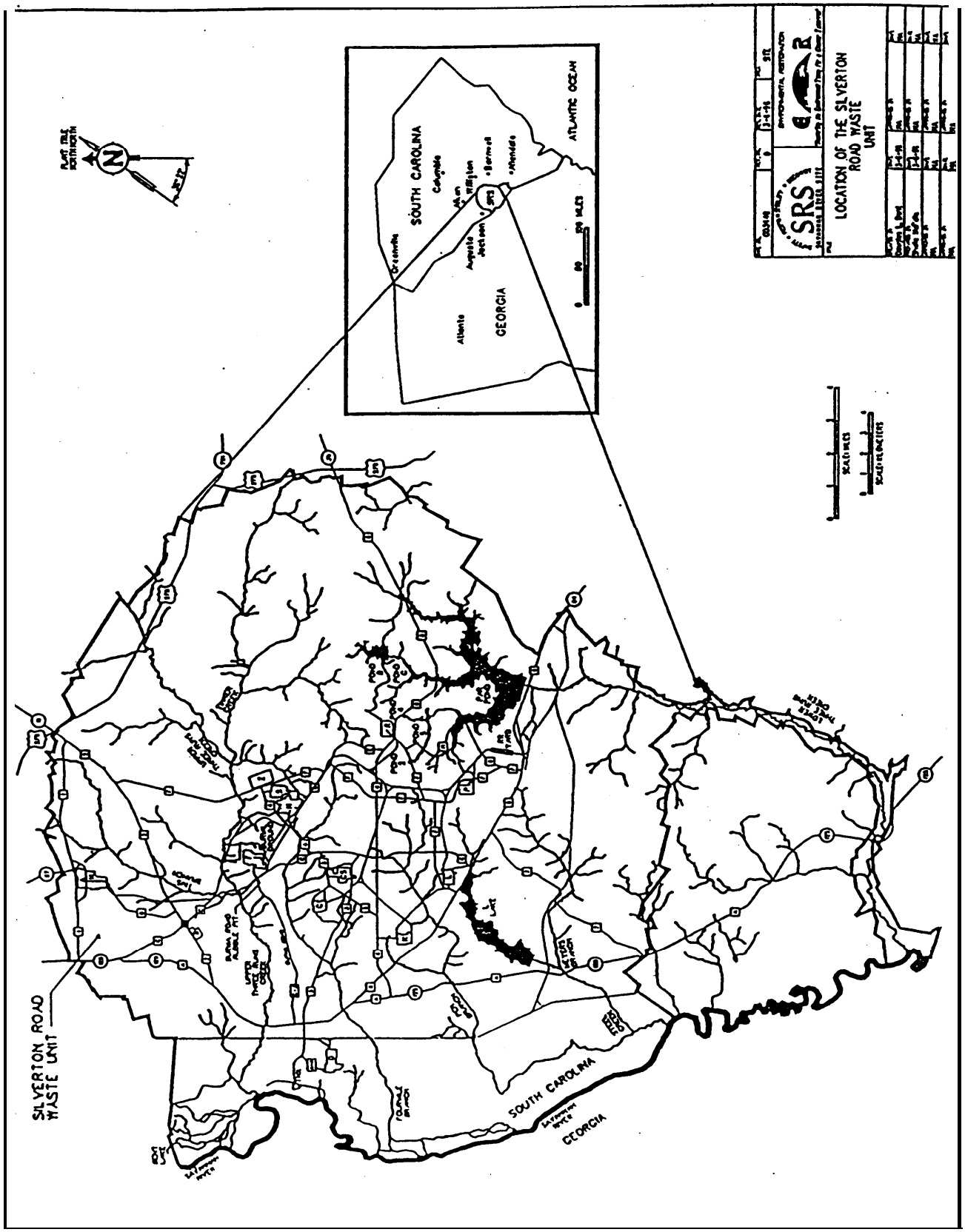


Figure 2. Location of the **Silverton Road Waste** Unit **with** Respect **to A/M** Area.

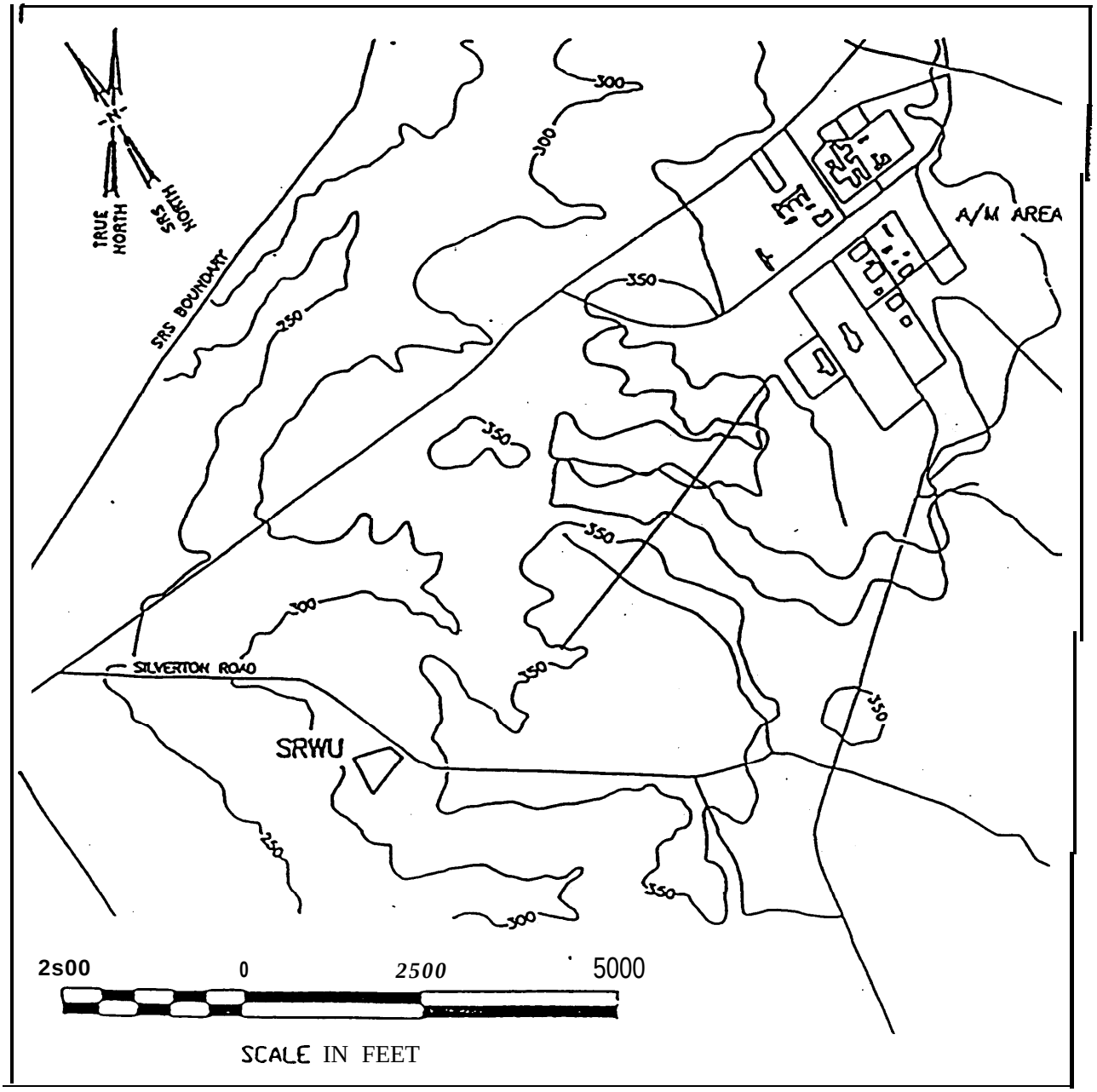
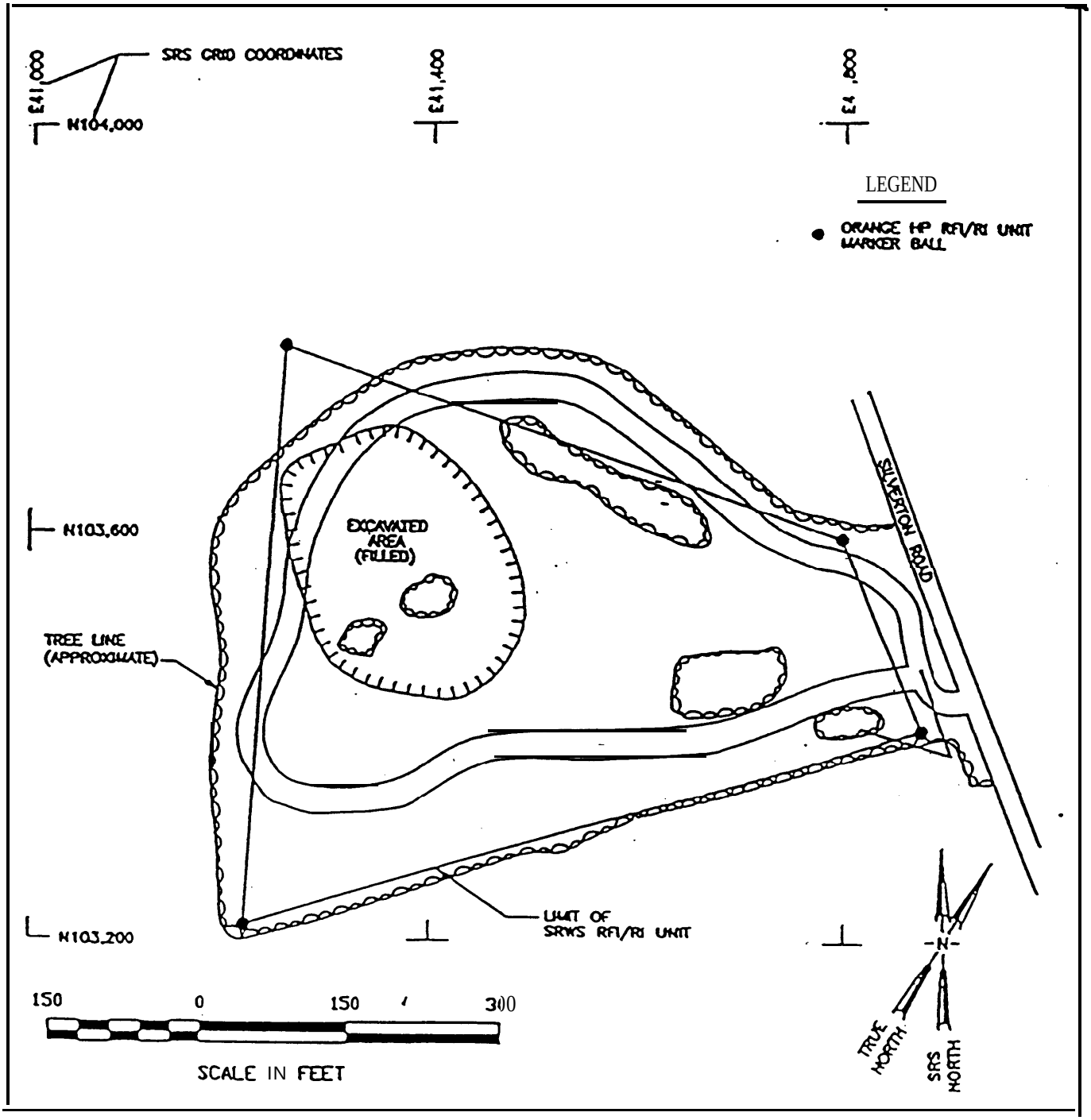


Figure 3. General Configuration of the Silverton Road Waste Unit.



covered with soil, and planted with grasses.

II. Operable Unit History and Compliance History

Operable Unit History

The SRWU was first used before construction of the SRS. Municipal, agricultural, and commercial trash, rubbish, garbage, debris, and refuse probably constituted the waste stream until the early 1950s. After procurement by the federal government, the SRWU land continued to be used as an open dump for disposal of metal shavings, 55-gallon drums, cardboard drums, tires, lumber, etc. No records of waste disposal activities were kept. In 1974, the disposal of the waste at the SRWU ceased, and the area was bulldozed, graded, covered with soil, and planted with grasses.

Compliance History

At SRS, waste materials are managed which are regulated under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities have required Federal operating or post-closure permits under RCRA. SRS received a hazardous waste permit from the South Carolina Department of Health and Environmental Control (SCDHEC) on September 5, 1995. Part V of the permit mandates that SRS establish and implement an RFI program to fulfill the requirements specified in Section 3004(u) of the Federal permit.

Hazardous substances, as defined by CERCLA, are present in the environment at the SRS. On December 21, 1989, SRS was included on the National Priorities List. This 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, DOE has negotiated a Federal Facility Agreement (FFA, 1993) with the U. S. Environmental Protection Agency (EPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements.

III. Highlights of Community Participation

Both RCRA and CERCLA require that the public be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in the South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA. These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternatives for addressing the SRWU soils and groundwater. The Administrative Record File must be established at or near the facility at issue. The SRS Public Involvement Plan (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. SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. The ***Statement of Basis/Proposed Plan for the Silverton Road Waste Unit (731-3A)*** (WSRC, 1996d), which is part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the SRWU.

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

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) 3562183

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, 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 45-day public comment period began on September 17, 1996 and ended on October 31, 1996. A public comment meeting was held on October 15, 1996. A Responsiveness Summary was prepared to address comments received during the public comment period. The Responsiveness Summary is provided in Appendix A of this Record of Decision.

N. Scope and Role of Operable Unit Within the Site Strategy

The overall strategy for addressing the SRWU was to (1) characterize the waste unit delineating the nature and extent of contamination and identifying the media of concern (perform the RFI/RI); (2) perform a baseline risk assessment to evaluate media of concern, constituents of concern, exposure pathways, and characterize potential risks; *(3)* evaluate applicable technologies and identify a preferred technology to remediate the waste site, as needed; and, *(4)* perform a final action to remediate, as needed, the identified media of concern.

The SRWU is an operable unit located within the Savannah River Floodplain Swamp Watershed. Several source control and groundwater operable units within this watershed will be evaluated to determine impacts, if any, to associated streams and wetlands. SRS will manage all source control and groundwater operable units to minimize impact to the Savannah River Floodplain Swamp Watershed. Based on characterization and risk assessment information, the SRWU does not significantly impact the watershed. Upon disposition of all source control and groundwater operable units within this watershed, a final, comprehensive evaluation of the watershed will be conducted to determine whether any additional actions are necessary.

The SRWU investigation considered all unit specific groundwater operable units - The "M Area" groundwater aquifer and the "Lost Lake" groundwater aquifer. Based on the investigation of the groundwater, low levels of contaminants have been detected in the "M Area" groundwater aquifer which minimally and infrequently exceed MCLs. The probable condition for the "M Area" groundwater aquifer is no significant groundwater contamination resulting from the SRWU. As a result no remedial action is deemed appropriate for the "M Area" groundwater aquifer. A confirmatory groundwater monitoring program will be established to ensure that this is the appropriate remedial action. The contamination in the "Lost Lake" aquifer is attributable to upgradient sources. The "Lost Lake" aquifer will be remediated as committed to in the 1995 RCRA Permit for the A/M Area Western Sector Corrective Action Program.

The proposed actions for the SRWU soils and "M Area" groundwater aquifer are final actions. However, in the event that the probable condition for the "M Area" groundwater aquifer is no longer appropriate, DOE will evaluate the need for remedial action.

V. Summary of Operable Unit Characteristics

The SRWU was first used before construction of the SRS. Although there is no written record of when disposal began at the unit, or what materials were accepted, it is believed that the unit was originally a borrow pit. Historical aerial photographs indicate that the SRWU was used as an "open dump" by the local municipalities including Old Ellenton before the land was acquired by the federal government. The first aerial photograph (September 1938) shows a well established "open dump" around the excavated

area even though the excavated area is not visible in the photograph. Aerial photographs were taken at regular intervals throughout the years and indicate a regular and consistent use of this property as a dump site. The photographs only vary by the size of the area being used as a dump. Therefore, SRWU has a history of at least 58 years of use.

Municipal, agricultural, and commercial trash, rubbish, garbage, debris, and refuse probably constituted the waste stream until the early 1950s. These items are visible in some of the early aerial photographs. The waste material at the dump was probably burned periodically, as was the practice at that time, for volume reduction. This practice would also have eliminated many of the combustible organic materials while creating combustion by-products.

After procurement by the federal government, this land continued to be used as an open dump (a legal practice at the time) by SRS. Aerial photographs suggest that the M-Area Fuel and Target Fabrication facilities continued using the existing open dump to dispose of its waste products. This is evidenced by the large piles of metal shavings (possibly aluminum) from the fabrication of fuel rods. Also, present in the photographs, but not necessarily related to the M-Area Fuel and Target Fabrication facilities, are 55 gallon metal drums, cardboard drums, many tires, lumber, wooden pallets, cardboard, construction debris, t inks, possibly asbestos, and other identified metal and wood objects. No records of waste disposal activities were kept. In 1974, the disposal of wastes at the SRWU ceased, and the area was bulldozed, graded, covered with soil, and planted with grasses.

Media Assessment

The Quality Control Summary Report for the Silverton Road Waste Unit RFI/RI Assessment (WSRC, 1994a), ***Final RFI/RI Report for the Silverton Road Wrote Unit (U)*** (WSRC, 1996a), and the ***Final Baseline Risk Assessment for the Silverton Road Waste Unit (U)*** (WSRC, 1996b) contain detailed analytical data for all of the environmental media samples taken in the characterization of the unit.

Since this land was first used as an open dump prior to the government purchase of the land, almost any type of residential, commercial, or agricultural waste could have been disposed at SRWU. It is known that SRS operational policy would not have permitted the disposal of any radioactive material at this site. Any radionuclides detected were likely naturally occurring (Radium-223) or were deposited by global fallout from nuclear testing (Cesium-137).

soils

During the RFI/RX, thirteen soil borings were drilled at the site to collect surf' and subsurface soil samples. Two runoff soil samples were collected from the SRWU. Two offsite soil borings were drilled to collect seven background soil samples. Soil samples were analyzed for numerous parameters including metals, volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, dioxins, furans, and radionuclides. Analyte concentrations were screened using criterion background concentrations of twice the average background concentration.

The analyses of the soil samples were divided into three groups:

- surface soils, O to 0.5 feet (primary direct contact exposure interval for soils),
- subsurface soils, O to 6 feet (potential exposure interval for future scenarios where excavation may occur), and
- underlying soils, 6 to 42 feet (potential soil to groundwater migration).

These soil groups are identical in horizontal extent across the SRWU.

The primary contaminants (those exceeding twice the mean background and risk-based thresholds) in the surface soils (0-0.5 ft.) and subsurface soils (O-6 ft.) were arsenic, benzo(k)fluoranthene, potassium-40, dibenz (a,h)anthracene, cesium-137, and radium-223. Potassium-40 and radium-223 are naturally occurring radionuclides. The source of arsenic is not known. The levels of arsenic detected are consistent with the levels found throughout SRS. Arsenic may be natural, added to the soils as a pesticide (pre-SRS) or associated with site waste or fill. It will be evaluated on a site-wide scale during the

implementation of the Soil Background Study (or potentially the Site-Wide Soil Integrator Operable Unit Workplan). Dibenz(a,h)anthracene and benzo(k)-fluoranthene were observed at maximum concentrations of 643 µg/kg and 219 µg/kg, respectively. Cesium-137 was observed at a maximum activity level of 2.1 pCi/g. This activity level is consistent with the observed activity from global fallout. Radium-223 was only detected once in each soil sample interval. Based on exposure point concentrations, the level of contaminants in the O to 0.5 foot interval was not significantly different from those in the O to 6 foot interval. The contaminants appear to be randomly and heterogeneously scattered throughout the O to 6 foot interval.

The primary contaminants (those exceeding twice the mean background and risk-based thresholds) in the underlying soils (6-42 ft.) were arsenic, beryllium, polycyclic aromatic hydrocarbons, dioxins/furans, and radionuclides. It should be noted that, per regulatory guidance, the underlying soils (6-42 ft.) are not required to undergo risk assessment, but are evaluated for potential migration of contaminants to the groundwater.

Uncertainty in the soil data set is caused by single detections for a large number of analytes. Contaminants that exceeded the twice the mean background and risk-bad thresholds and were detected only once in the underlying soils (6-42 ft.) include beryllium, dioxins/furans, and radionuclides. Single hits indicate that contaminants may be found in only isolated areas. Additionally, many of the radionuclides could not be physically present due to their brief half-life and their detection is probably due to measurement error. Potassium-40 is a naturally occurring analyte. The number of samples in the background data set for the soils was marginally adequate to be representative. This also adds to the uncertainty in the data set.

The potential for migration of the soil contamination to the groundwater was quantitatively evaluated by comparing the mean concentration of each analyte to the proposed soil screening levels calculated by the simple site-specific method. For radiological analytes, the RESRAD model was used to predict the concentration in groundwater over a period of time. This model used both the maximum and average radionuclide concentrations. The average concentrations used did not include non-detects, resulting in conservative modeling results. For each analyte evaluated in the study, all soil data from O to 42 feet was included in the determination of the mean concentrations.

Based on the fact that all the soil analytes passed either the simple site-specific or detailed site-specific method of screening, there is little or no chance for the residual waste at the SRWU to be a source of future contamination. Releases have probably occurred from the SRWU in the past, but due to the unit's age and natural attenuation, the remaining contaminants pose little, if any, threat for future contamination. In addition, no significant contaminants were contributed to any surface water streams.

Groundwater

Seventeen monitoring wells are screened within the "M Area" groundwater aquifer. The wells near the SRWU are shown on Figure 4.

Contaminants minimally and infrequently exceeding their maximum contaminant level (MCL) in the "M-Area" aquifer include: copper, lead, 1,2-dichloroethane, carbon tetrachloride, dichloromethane, tetrachloro-ethylene, and trichloroethylene. Chloroform and thallium concentrations were below their respective MCLs; however, they were above their respective risk-based thresholds.

Table 1 lists the" "M Area" groundwater aquifer constituents, the number of detections, the detections that were above the MCL for the constituent, the maximum concentration, and the MCL.

The upgradient groundwater quality could not be characterized with certainty since one of the new background wells installed in the "M Area" groundwater aquifer yielded no groundwater samples because it went dry. The loss of this well has not only introduced uncertainty in the spatial distribution of possible upgradient contamination, but it has also introduced statistical uncertainty caused by an insufficient background sample size for the "M Area" groundwater aquifer. As a result, the background concentrations were established with the use of only one background well. This led to the use of a maximum of 6

Figure 4. Location of **the Silverton** Road Waste Unit "M Area" Groundwater Monitoring Wells.

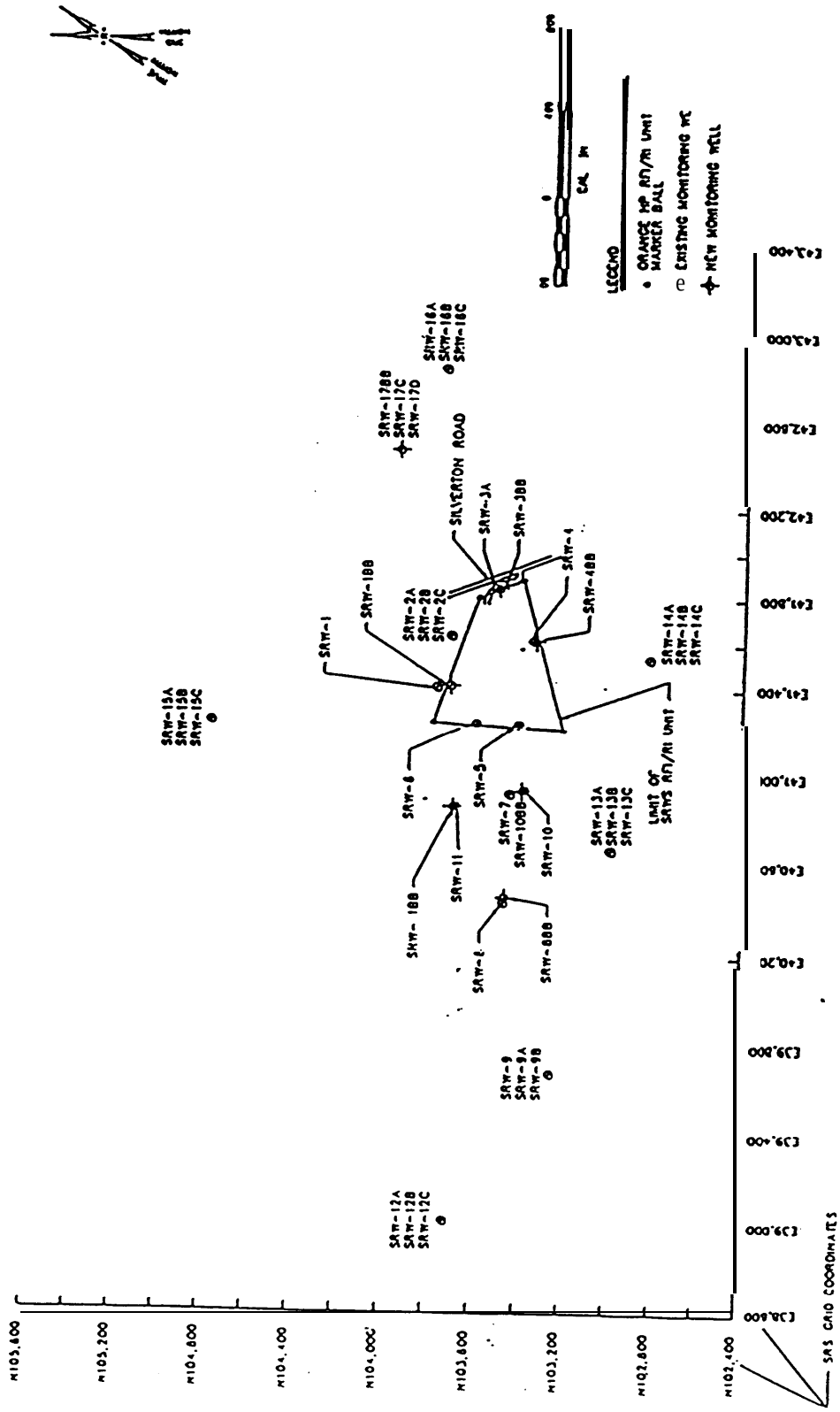


Table 1 "M Area" Groundwater Constituents

Constituent	Units	Number of Detections	Maximum Concentration	MCL	Number of Detections Above MCL
Copper	µg/L	65/96	1430	1000[a]	1/65
Lead	µg/L	64/96	36.2	15.0[b]/50.0[a]	16/64
1,2-Dichloroethane	µg/L	14/96	5.3	5.0	1/14
Carbon Tetrachloride	µg/L	40/96	9.9	5.0	15/40
Dichloromethane	µg/L	38/96	6.62	5.0	1/38
Tetrachloroethylene	µg/L	26/96	6.2	5.0	1/26
Trichloroethylene	µg/L	44/96	7.4	5.0	1/44

MCL - Maximum Contaminant Level
[a] - MCL set by the state
[b] - "At the tap" standard

samples with which to establish background concentrations.

The presence of 1,2-dichloroethane and dichloromethane in the remaining upgradient wells indicate a probable upgradient source of contamination. Additional constituents were also found in downgradient wells at the SRWU which were not found in the upgradient well which indicates that the SRWU probably has contributed additional contaminants to the "M-Area" groundwater aquifer as it flows beneath the unit.

Adding to further uncertainty are those analytes with only one positive detection. This is best typified by the pesticide analysis. Aldrin, dieldrin, and DDT were only detected once; and, they were not detected in subsequent samples from the wells in which they were originally detected. Single detections represent extreme uncertainty in the data because the results could not be reproduced in the same well. It is highly likely that single detections are due to sampling or measurement error.

VI. Summary of Operable Unit Risks

As a component of the RFI/RI process, a baseline risk assessment was prepared for the SRWU. The baseline risk assessment consists of human health and ecological risk assessments. summary information for the human health and ecological risk assessments follows.

Human Health Risk Assessment

As part of the investigation/assessment process for the SRWU, a risk assessment was performed using the data generated during the assessment phase. **Detailed information regarding the development of contaminants of potential concern, the fate and transport of contaminants, and the risk assessment can be found in the *Final RFI/RI Report for the Silverton Road Waste Unit (U)* (WSRC,** 1996a) and the ***Final Baseline Risk Assessment for the Silverton Road Waste Unit (U)*** **(WSRC, 1996b).**

The process of designating the constituents of potential concern was based on consideration of background concentrations, frequency of detection, the relative toxic potential of the chemicals, and chemical nutrient status. Constituents of potential concern are the constituents that are potentially site-related and whose data are of sufficient quality for use in the risk assessment.

An exposure assessment was performed to provide an indication of the potential exposures which could occur based on the chemical concentrations detected during sampling activities. The only existing (current) exposure scenario identified for the SRWU was for environmental researchers who may work or traverse the SRWU . on an intermittent/limited basis. Future exposure scenarios identified for the SRWU included future environmental researchers as well as future residential adults and children and occupational workers. The reasonable maximum exposure concentration value was used as the exposure point concentration.

Per EPA guidance, the carcinogenic (cancer) risks and non-carcinogenic hazards were calculated to determine the appropriate remedial action for a waste unit. Carcinogenic risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of pathway-specific exposure to cancer-causing contaminants. The risk to an individual resulting from exposure to non-radioactive chemical carcinogens is expressed as the increased probability of cancer occurring over the course of a 70 year lifetime. Cancer risks are related to the EPA target risk range of one in ten thousand ($1x10^{-4}$) to one in one million ($1x10^{-6}$) for incremental cancer risk at National Priorities List sites.

Non-carcinogenic effects are also evaluated to identify a level at which there may be concern for potential health effects other than cancer-causing. The hazard quotient, which is the ratio of the exposure dose to the reference dose, is calculated for each contaminant. Hazard quotients are summed for each exposure pathway to determine the specific hazard index for each exposure scenario. If the hazard index exceeds unity (1.0), there is concern that adverse health effects might occur.

The following sections discuss the noncarcinogenic hazards and carcinogenic risks for the current on-unit environmental researcher, the hypothetical future on-unit residential adult/child, the future on-unit residential child, and the future on-unit occupational worker.

Current Land Use - Noncarcinogenic Hazards

The Baseline Risk Assessment (WSRC, 1996b) shows that the total noncarcinogenic (noncancer) hazard index did not exceed unity for the environmental researcher evaluated in the current land use scenario. This indicates that potential adverse health effects are not likely to occur for the current environmental researcher.

Current Land Use - Carcinogenic Risks

Under the current land use scenario, the human health risks were characterized for the current on-unit environmental researcher. The total carcinogenic (cancer) risk from exposure to chemicals in soil was 2 x10-7. The total carcinogenic risk for exposure to radionuclides in soils 3 x10+. Dermal contact (with a risk of $2.7x10^{-6}$) with radionuclides (i.e., Cesium-137) in the soil contributed to the risk. Cesium-137 was observed at a maximum activity level (21 pCi/g) that is consistent with observed activity from global fallout.

Future Land Use - Noncarcinogenic Hazards

Table 2 (0-0.5 ft) and Table 3 (O-6 ft.) provide a summary of the noncarcinogenic hazard indices and applicable constituents of concern associated with the future land use of the SRWU.

The noncancer hazard indices were below unity for the future ease environmental sampler scenario and the hypothetical future occupational worker scenario. This indicates that potential adverse health effects are not likely to occur for the future environmental researcher or the hypothetical future occupational worker.

For the hypothetical future adult/child resident and child resident scenarios, exposure to chemicals in the "M Area" groundwater aquifer exceeded the hazard index of 1. Ingestion of carbon tetrachloride and thallium in the groundwater are the principal drivers for the noncancer hazards. Lead exposure from groundwater was modeled and shown to riot pose any risk.

Future Land Use - Carcinogenic Risks

Table 4 (0-0.5 ft) and Table 5 (O-6 ft.) provide a summary of the carcinogenic risks and applicable constituents of concern associated with the future land use of the SRWU.

Under the future land use scenario, the total carcinogenic (cancer) risk from exposure to chemicals or radionuclides in soils did not exceed a risk level of $1x10^{-4}$ for the environmental researcher or the occupational worker.

For the environmental researcher, the total carcinogenic (cancer) risk from exposure to chemicals in soil was 2 $X10^{-7}$. The total carcinogenic risk for exposure to radionuclides in soils 3 $x10^{-6}$. Dermal contact (with a risk of $2.7x10^{-4}$) with radionuclides (i.e., Cesium-137) in the soil contributed to the risk. Cesium-137 was observed at a maximum activity level (2.1 pCi/g) that is consistent with observed activity from global fallout.

For the future occupational worker, the total carcinogenic risk associated with exposure to chemicals in the soil ($2.0x10^{-4}$) and the "M Area" groundwater aquifer (2.2x 10-5) combined was $2x10^{-5}$. The total carcinogenic risk associated with exposure to radionuclides in the soil ($1.1x10^{-6}$) and the "M Area" groundwater aquifer ($4.2x10^{-6}$) combined was $2x10^{-5}$. The chemical risk drivers for soil ingestion are arsenic, dibenz(a,h)anthracene, and benzo(a)pyrene; for groundwater ingestion are arsenic, aldrin, dieldrin, and carbon tetrachloride. The radionuclide risk drivers for external exposure to soil is cesium-137; and for groundwater ingestion are total radium, radium-226, and thorium-228.

For the future resident adult/child model, the total carcinogenic risk associated with exposure to chemicals in the soil ($1.5x10^{-5}$) and the "M Area" groundwater aquifer (1.1X104) combined was $1x10^{-4}$. The total carcinogenic risk associated with exposure to radionuclides in the soil ($4.5x 10^{-5}$) and the "M Area" groundwater aquifer (8.8x 10-5) combined was $1x 10^{-4}$. The chemical risk drivers for soil ingestion are arsenic, dibenz(a,h)anthracene, and benzo(a)pyrene; for dermal contact with soils are dibenz(a,h)anthracene and benzo(a)-pyrene; for produce ingestion are dibenz(a,h)-anthracene, benzo(a)pyrene, and benzo(b)fluoranthene; for groundwater ingestion are arsenic, aldrin, dieldrin, and carbon tetrachloride; for dermal contact with groundwater are dieldrin, bis(2-ethylhexyl)phthalate, and carbon tetrachlo-

Table 2 Future Land Use - Noncarcinogenic Hazard Index (0-0.5 ft).

RECEPTOR	EXPOSURE TO CHEMICALS (HAZARD INDEX)			
	Soil	Groundwater	Total	Cots
Environmental Sampler	0.0014	NA	0.0014	NA
Residential Adult/Child	0.34	4.02	4.4	Carbon tetrachloride and thallium
Residential Child	0.30	2.84	3.2	Carbon tetrachloride and thallium
Occupational Worker	0.02	0.42	0.44	NA

Shaded areas represent exceedances of a hazard index of 1.0.
COCs - Chemicals of concern
NA - Not Applicable

Table 3 Future Land Use - Noncarcinogenic Hazard Index (O-6 ft).

RECEPTOR	EXPOSURE TO CHEMICALS (HAZARD INDEX)			
	Soii	Groundwater	Total	coca
Environmental Sampler - ST	0.0013	NA	0.0013	NA
Environmental Sampler - LT	0.0013	NA	0.0013	NA
Residential Adult/Child	0.40	4.02	4.4	Carbon tetrachloride and thallium
Residential Child	0.28	2.84	3.1	Carbon tetrachloride and thallium
Occupational Worker	0.02	0.42	0.44	NA

Shaded areas represent exceeds.wes of a hazard index of 1.0.
ST - Short Term
LT- Long Term
COCS - Chemicals of Concern
NA - Not Applicable

Table 4 Future Land Use - Carcinogenic Risks (0-0.5 ft).

RECEPTOR	EXPOSURE TO CHEMICALS			
	soil	Groundwater	Total	Cots
Environmental Sampler - ST	NA	NA	NA	NA
Environmental Sampler - LT	1.6×10^{-7}	NA	2×10^{-7}	NA
Residential Adult/Child	1.5×10^{-5}	1.1×10^{-4}	1×10^{-4}	Carbon tetrachloride, chloroform, aldrin, dieldrin, and arsenic
Residential Child	9.1 x 10-6	4.2×10^{-5}	5×10^{-5}	NA
Occupational Worker	2.0×10^{-6}	2.2×10^{-5}	2×10^{-5}	NA
RECEPTOR	EXPOSURE TO RADIONUCLIDES			
	soil	Groundwater	Total	Cots
Environmental Sampler - ST	2.7×10^{-6}	NA	3×10^{-6}	NA
Environmental Sampler - LT	1.1×10^{-5}	NA	1×10^{-5}	NA
Residential Adult/Child*	4.5×10^{-5}	8.8×10^{-5}	1×10^{-4}	Radium-226, Radium-total alpha-emitting, and Thorium-228
Residential Child	1.1×10^{-5}	2.3×10^{-5}	3×10^{-5}	NA
Occupational Worker	1.1×10^{-5}	4.2×10^{-6}	2×10^{-5}	NA

Shaded items represent risk exceedances of 1×10^{-4}.
COCS - Chemicals of Concern
ST- Short Term
LT - Long Term
NA - Not Applicable
* The COCs listed pertain to the groundwater pathway since this pathway contributed the most to the total risk.

Table 5 Future Land Use - Carcinogenic Risks (0-6 ft).

RECEPTOR	EXPOSURE TO CHEMICALS			
	Soii	Groundwater	Total	Cots
Environmental Sampler - ST	3.2 x 10-8	NA	3 x 10^{-8}	NA
Environmental Sampler - LT	1.6 x 10^{-7}	NA	2 x 10^{-7}	NA
Residential Adult/Child	1.5 x 10^{-5}	4.0 x 10^{-4}	1 x 10^{-4}	Carbon tetrachloride, chloroform, aldrin, dieldrin, and arsenic
Residential Child	6.8 x 10-6	4.2 x 10^{-5}	5 x 10-5	NA
Occupational Worker	1.9 x 10^{-6}	2.2 x 10^{-5}	2x 10^{-5}	NA
RECEPTOR	EXPOSURE TO RAD1ONUCLIDES			
	soil	Groundwater	Total	Cots
Environmental Sampler	NA	NA	NA	NA
Residential Adult/Child	5.0 x 10^{-5}	8.8 x 10^{-5}	1 x 10^{-4}	Radium-226, Radium-total alpha-emitting, and Thorium-228
Residential Child	1.0 x 10^{-5}	2.3 x 10^{-5}	3 x 10-5	NA
Occupational Worker	1.2 x 10^{-5}	4.2 x 10^{-6}	2 x 10-5	NA

Shaded items represent risk exceedances of 1 x 10^{-4}.
COCs - Chemicals of Concern
ST - Short Term
LT - Long Term
NA - Not Applicable
* The COCS listed pertain to the groundwater pathway since this pathway contributed the most to the total risk.

ride. The radionuclide risk drivers for external exposure to soil is cesium-137; and for groundwater ingestion are total radium, radium-226, and thorium-228; and for groundwater inhalation are total radium and radium-226.

For the future resident child model, the total carcinogenic risk associated with exposure to chemicals in the soil (9. $1x10^{-6}$) and the "M Area" groundwater aquifer ($4.2x10^{-5}$) combined was $5x10^{-5}$. The total carcinogenic risk associated with exposure to radionuclides in the soil (1. $1x10^{-5}$) and the "M Area" groundwater aquifer ($2.3x10^{-5}$) combined was 3x10-5. The chemical risk drivers for soil ingestion are arsenic, dibenz(a,h)anthracene, and benzo(a)pyrene; for dermal contact with soils are dibenz(a,h)anthracene and benzo(a)pyrene; for produce ingestion are dibenz(a,h)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene; for groundwater ingestion are arsenic, aldrin, dieldrin, and carbon tetrachloride; and for groundwater inhalation are chloroform and carbon tetrachloride. The radionuclide risk drivers for external exposure to soil is cesium-137; and for groundwater ingestion are total radium, radium-226, and thorium-228; and for groundwater inhalation are total radium and radium-226.

Figures 5 through 7 are graphical summaries of the conceptual risk models for the future on-unit residential adult/child, residential child, and occupational worker.

In summary, the future case residential scenarios showed total hazard and risk levels which exceeded the EPA criterion values relative to the "M Area" groundwater aquifer pathway. Exposure to carbon tetrachloride and thallium in groundwater provided the primary contribution to the total noncancer hazard levels. The total carcinogenic risks (i.e., chemical/radionuclide specific risk > 1x104) for the future residential scenarios were primarily associated with groundwater ingestion and/or inhalation for chemicals and radionuclides. Constituents of concern identified included carbon tetrachloride, chloroform, arsenic, aldrin, dieldrin, total radium, radium-226, and thorium-228.

Radium-226 and thorium-228 are naturally occurring radionuclides. Arsenic, aldrin and dieldrin were only detected once out of 89 samples.

Ecological Risk Assessment

An ecological risk assessment was conducted to assess the potential impacts to biota caused by exposure to chemical and radionuclide constituents at the SRWU.

A site ecological reconnaissance survey was conducted in November 1994. No wetlands or threatened and endangered species were observed in the vicinity of the SRWU, and use of the site by threatened and endangered species is not expected.

Based on the ecological risk assessment, there is 'little or no risk of adverse ecological effects", therefore there is "no need for remediation" from an ecological standpoint (WSRC, 1996b).

***Remedial Action** Objectives*

Remedial action objectives specify unit-specific contaminants, media of concern, potential exposure pathways, and remediation goals. The remedial action objectives 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 applicable or relevant and appropriate requirements (ARARs) under federal environmental or state environmental or facility siting laws , or other information from the RFI/RI and Baseline Risk Assessment Reports. These goals should be modified, as necessary, as more information concerning the unit and potential remedial technologies become available. Final remediation goals are determined when the remedy is selected and establishes acceptable exposure levels that are protective of human health and the environment.

Constituents of potential concern are site- and media-specific, man-made and naturally occurring, inorganic and organic chemicals, pesticides, and radionuclides detected at a unit under investigation. Constituents of concern are isolated from the list of constituents of potential concern by calculating carcinogenic risks and noncarcinogenic hazard indices. A constituent of concern contributes significantly to a pathway that

Figure 5. Conceptual Site Risk Model for the Future Residential Adult/Child Receptor at the SRWU.

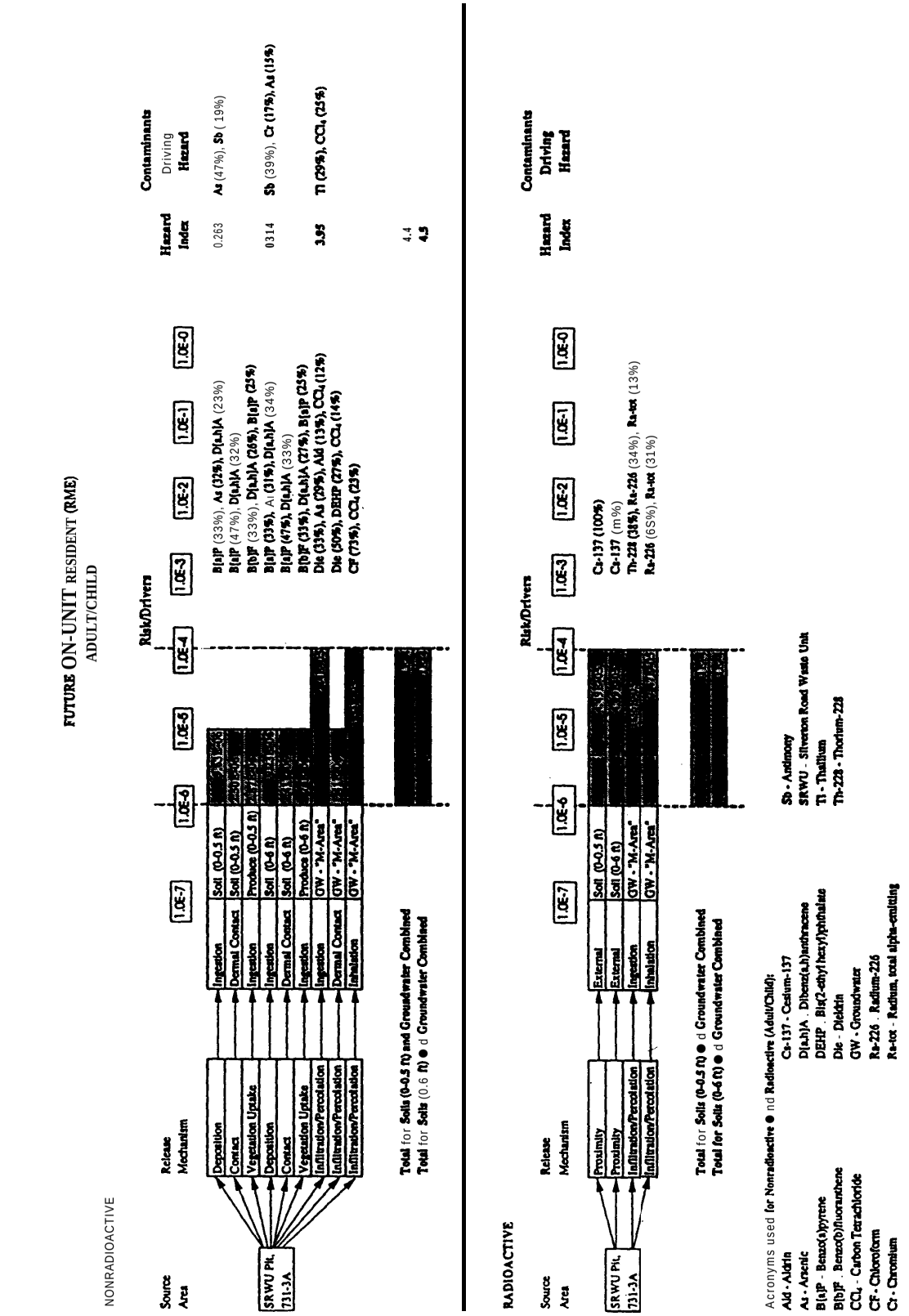


Figure 6. Conceptual Site Risk Model for the Future Residential Child Receptor at the SRWU.

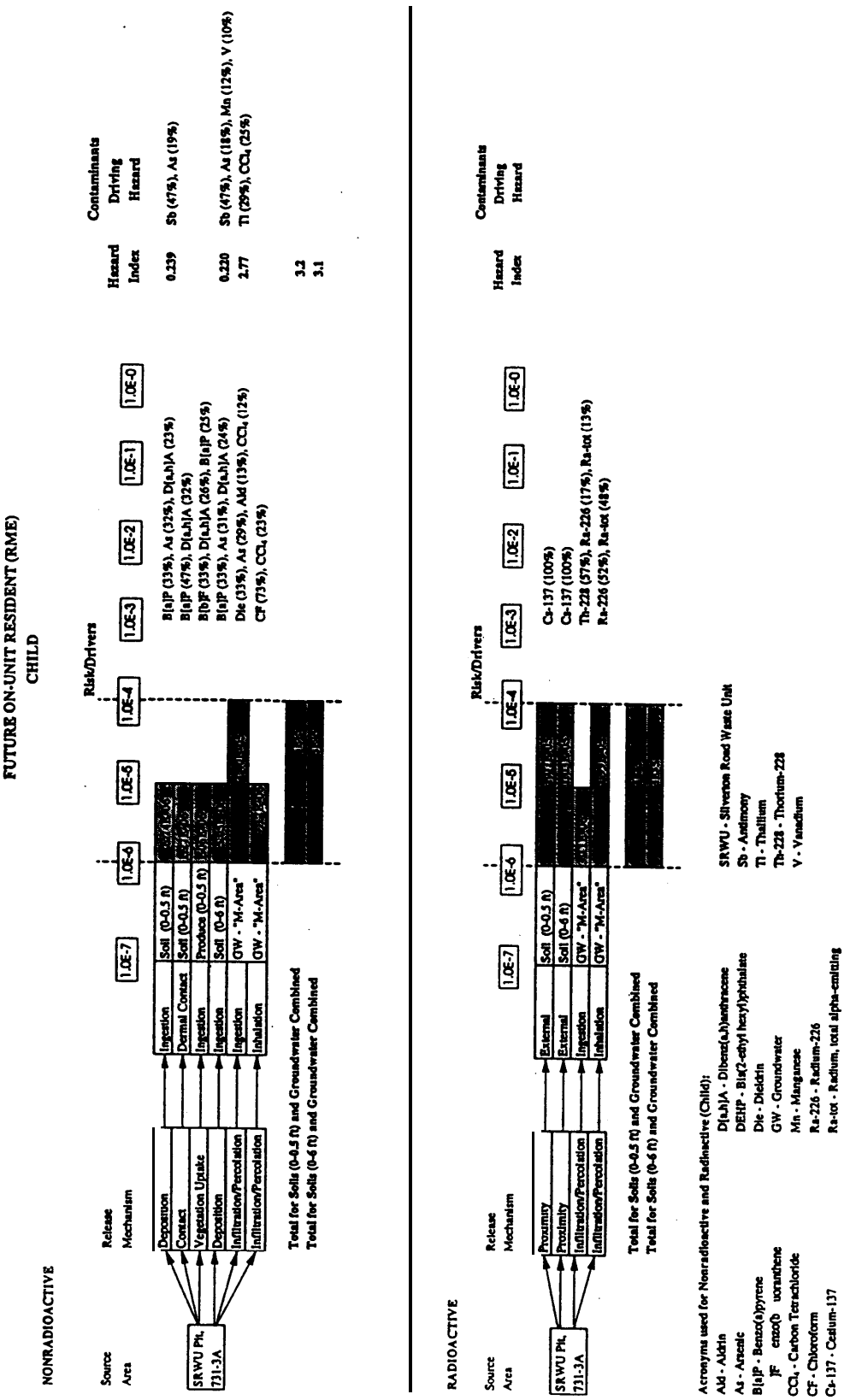
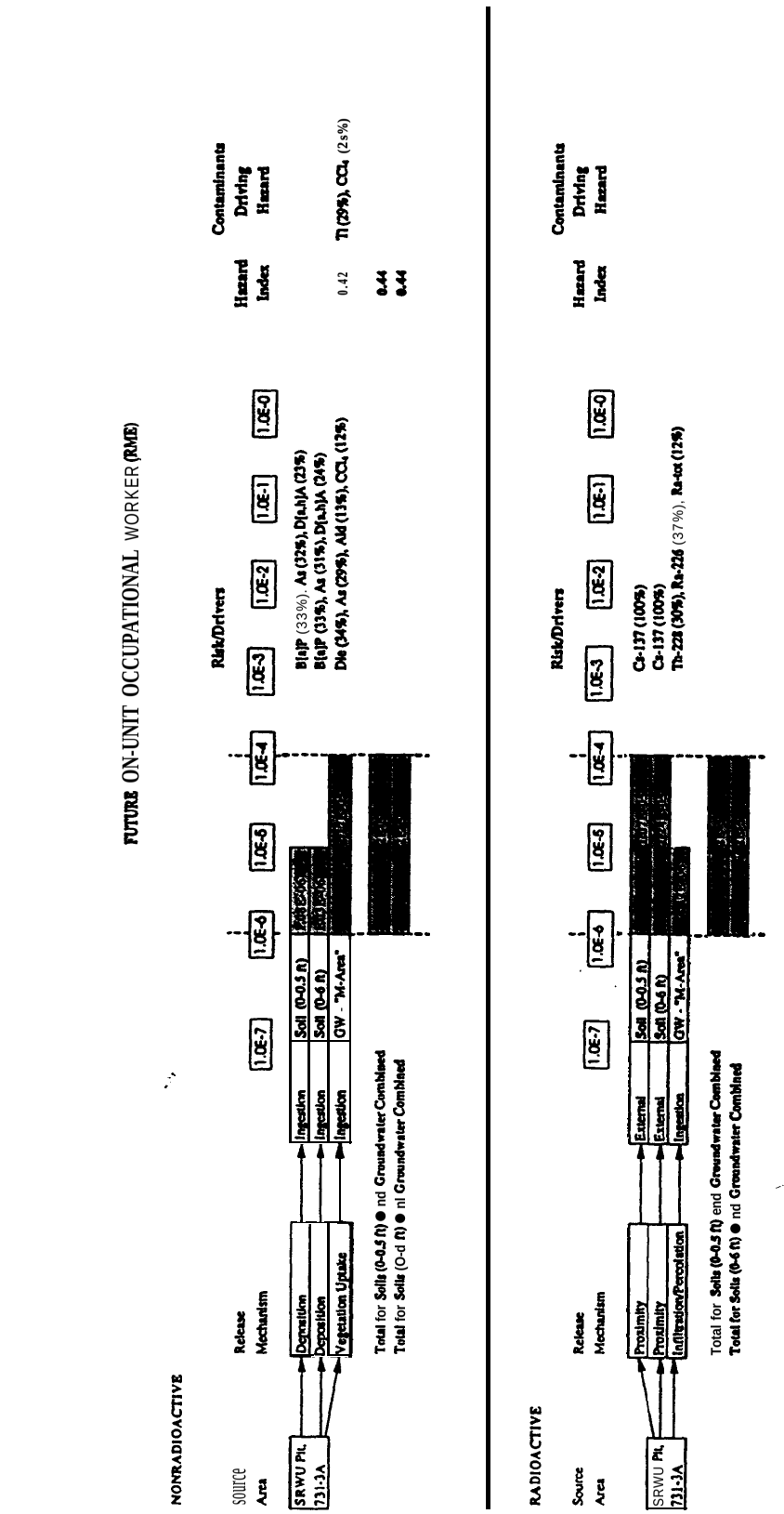


Figure 7. Conceptual Site Risk Model for the Future Occupational Worker Receptor at the SRWU.



contributes to either a cumulative site carcinogenic risk greater than lx 10^{-4} or a hazard index greater than 1.0. Risk levels at or above the upper-bound of the target risk range of $1x10^{-4}$ are considered significant and these sites are expected to undergo remediation. Risk levels between $1x10^{-6}$ and lx 10^{-4} require consideration for remediation.

ARARs are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal, state, or local environmental law that specifically address a hazardous substance, pollutant contaminant, remedial action, location, or other circumstances at a CERCLA site. Three types of ARARs; action-, chemical-, and location-specific; have been developed to simplify identification and compliance with environmental requirements. Action-specific requirements set controls on the design, performance and other aspects of implementation of specific remedial activities. Chemical-specific requirements are media-specific, health-based concentration limits developed for site-specific levels of contaminants in specific media. Location-specific ARARs must consider federal, state, and local requirements that reflect the physiographical and environmental characteristics of the unit or the immediate area.

None of the risks associated with the SRWU soil have been found to be greater than $1x10^{-4}$. However, the risks are within the intermediate risk range for the future resident adult/child and child only scenarios. The nonradiological intermediate risks were contributable to arsenic, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(b)fluoranthene. For all three future scenarios (future resident adult/child, future resident child, and future industrial worker), the radiological intermediate risks were attributable to cesium-137. However, the average activity levels for cesium-137 are consistent with those expected from global fallout. There were no HIs above 1.0 for the SRWU soil.

The remedial action objective for the future on-unit resident (adult/child and child) is to prevent ingestion of soil and produce, and dermal contact with soil from arsenic, benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(b)fluoranthene.

Tables 6 (future resident) and 7 (occupational worker) list the Remedial Goal Options for intermediate risk contaminants ($1x10^{-4}$ to lx 10^{-6}) for soil. The exposure point concentration is also provided in these tables to provide a comparison for the risks and hazards associated with the contaminants.

The "M Area" groundwater aquifer poses risks near lx 10^{-4} for the future residential adult/child scenario and near $1x10^{-5}$ for the future occupational worker scenario through groundwater ingestion, dermal contact, and groundwater inhalation. Dieldrin, arsenic, aldrin, chloroform, carbon tetrachloride, and bis(2-ethylhexyl) phthalate were the nonradiological contributors to the intermediate risk. Radium-226, radium-total, and thorium-228 were the radiological contributors to the intermediate risk. For the future residential adult/child and child scenarios, thallium and carbon tetrachloride were contributors to HIs above 1.0 for groundwater ingestion. There were no HIs above 1.0 for the future occupational worker associated with the "M Area" groundwater aquifer.

Bis(2-ethylhexyl)phthalate was detected only twice above its MCL; and aldrin and dieldrin were only detected once; and, they were not detected in subsequent samples from the well in which they were originally detected. It is highly likely that the single detections were due to sampling or measurement errors. Radium and thorium are naturally occurring radionuclides.

The preliminary remedial action objective for the future on-unit resident (adult/child and child) and occupational worker is to prevent ingestion, dermal contact, and inhalation of groundwater from constituents with concentrations that minimally and infrequently exceed MCLS. "

Tables 8 (future resident) and 9 (future occupational worker) list the Remedial Goal Options for the "M Area" groundwater aquifer by receptor. The exposure point concentrations and MCLS are listed to provide a comparison for the risks and hazards associated with the constituents.

Based upon the levels and concentrations of the groundwater constituents, it was determined that development of final remediation goals was not needed for groundwater cleanup.

Table 6 Remedial Goal Options for Intermediate Risk Contaminants of Concern for the Future Residential Adult and Child at the SRWU (Soil)

Contaminant	Carcinogenic Risk			Noncarcinogenic Hazard			EPC
	1x10^{-6}	1X10-^{5}	1X10^{4}	0.1	1.0	3.0	
Arsenic (mg/kg)[a]	0.43	4.3	43	2.3	23	69	1.02
Benzo(a)pyrene (m#kg)[a]	0.088	0.88	8.8	NA	NA	NA	0.267
Benzo(b)fluoranthene (mg/kg)[a]	0.88	8.8	88	NA	NA	NA	0.277
Dibenz(a,h)anthracene (mg/kg)[a]	0.088	0.88	8.8	NA	NA	NA	0.192 "
Cesium-137 (pCi/g)[b]	2.0X10-^{2}	2.0X10-'	2.0	NA	NA	NA	1.36

● - Risk-Based Concentration Table, July-December 1995 (EPA, 1995)
[b]- Risk-Based PRGs for Radionuclides (WSRC, 1994b)
EPC - Exposure Point Concentration
NA - Not Applicable

Table 7 Remedial Goal Options for Intermediate Risk Contaminantts of Concern for the Future Occupational Worker at the SRWU (Soil)

Contaminant	Carcinogenic Risk			Noncarcinogenic Hazard			EPC
	1x10^{-6}	1X10-^{5}	1x10^{-4}	0.1	1.0	3.0	
Arsenic (mg/kg)[a]	3.8	38	380	61.0	610	1830	1.02
Benzo(a)pyrene (m#kg)'	0.78	7.8	78	NA	NA	NA	0.267
Dibenz(a,h)anthracene (mg/kg)[a]	0.78	7.8	78	NA	NA	NA	0.192
Cesium-137 (pCi/g)[b]	8.33x10-'	8.33x10^{-1}	8.33	NA	NA	NA	1.36

[a] - Risk-Based Concentration Table, July-December 1995 (EPA, 1995)
[b]- Risk-Based PRGs for Radionuclides (WSRC, 1994b)
EPC - Exposure Point Concentration
NA - Not Applicable

Table 8 Remedial Goal Options for Contaminants of Concern for the Future Residential Adult and Child at the SRWU ("M Area" Groundwater Aquifer)

Contaminant	Carcinogenic Risk			Noncarcinogenic Hazard			EPC	MCL
	$1X10^{-4}$	$1X10^{-5}$	$1x10^{-6}$	0.1	1.0	3.0		
Arsenic (mg/L)[a]	0.000045	0.00045	0.0045	0.0011	0.011	0.033	0.00102	0.05
Aldrin (mg/L)[a]	0.000004	0.00004	0.0004	NA	NA	NA	0.0000468	NA
Bis(2-ethylhexyl) phthalate (m#L)*	0.0048	0.048	0.48	NA	NA	NA	0.0192	0.006
Carbon Tetrachloride (mg/L)[a]	0.00016	0.0016	0.016	0.02	0.20	0.60	0.007s4	0.005
Chloroform (mg/L)[a]	0.00015	0.0015	0.015	NA	NA	NA	0.015	0.10
Dieldrin (mg/L)[a]	o.0000042	0.000042	0.00042	NA	NA	NA	0.00013	NA
Radium-226 (pCi/L)[b]	0.00418	0.0418	0.418	NA	NA	NA	2.06	20
Radium, total (pCi/L)[b]	0.0184	0.184	1.84	NA	NA	NA	2.s4	5
Thorium-228 (pCi/L)[b]	0.000162	0.00162	0.0162	NA	NA	NA	167	NA

[a] - Risk-Based Concentration Table, July-December 1995 (EPA, 1995)
[b] - Risk-Based PRGs for Radionuclides (WSRC, 1994b)
EPC - Exposure Point Concentration NA - Not Applicable

Table 9 Remedial Goal Options for Contaminants of Concern for the Future Occupational Worker at the SRWU ("M Area" Groundwater Aquifer)

Contaminant	Carcinogenic Risk			NonCarcinogenic Hazard			EPC	MCL
	$1x10^{-6}$	$1X10^{-5}$	$1X10^{-4}$	0.1	1.0	3.0		
Arsenic (mg/L)[a]	0.00016	0.0016	0.016	0.0086	0.086	0.258	0.00102	0.05
Aldrin (mg/L)[a]	0.000017	0.00017	0.0017	NA	NA	NA	0.0000468	NA
Bis(2-ethylhexyl) phthalate (mg/L)[a]	0.0048	0.048	0.48	NA	NA	NA	0.0192	0.006
Carbon Tetrachloride (mg/L)[a]	0.0029	0.029	0.29	0.02	0.20	0.60	0.00754	0.005
Dieldrin (mg/L)[a]	0.000018	0.00018	0.0018	NA	NA	NA	0.00013	NA
Thallium (mg/L)[a]	NA	NA	NA	0.0023	0.023	0.069	0.00100	0.002
Radium-226 (pCi/L)[b]	1.30	13.0	130	NA	NA	NA	2.06	20
Radium, total (pCi/L)[b]	1.60	16.0	160	NA	NA	NA	2.54	5
Thorium-228 (pCi/L)[b]	16.0	160	1600	NA	NA	NA	167	NA

[a] - Final Baseline Risk Assessment - Appendix H Table 6 (WSRC, 1996b)
[b] - Final Baseline Risk Assessment - Appendix H - Table 7 (WSRC, 1996b)
EPC - Exposure Point Concentration NA - Not Applicable

VII. Description of the Considered Alternatives

VII.A Description of the Considered Alternatives for the SRWU Source Control Operable Unit

Four alternatives were evaluated for remedial action at the SRWU source control operable unit. Each alternative is described below:

Alternative S1 -No Action

Under this alternative, no action would be taken at the SRWU. EPA policy and regulations require the consideration of a no action alternative to serve as a baseline against which the other alternatives can be compared. Because no further action would be taken at the unit and the SRWU would remain in its present condition, there are no costs associated with this alternative There would be no reduction of risk.

Alternative S2 - Institutional Controls

Under this alternative, Institutional Controls would be implemented at the SRWU. The primary purpose of institutional controls is to prevent the exposure of the general public or potential future resident to the contaminants present in the surface soils.

Implementation of this alternative will require both near- and long-term actions. For the near-term, signs will be posted at the waste unit which indicate that this area was used for the disposal of waste material and contains buried waste. In addition, existing SRS access controls will 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 would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA. The deed shall include notification disclosing former waste management and disposal activities as well as remedial actions taken on the site, and any continuing groundwater monitoring commitments. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of construction debris and other materials, including hazardous substances.

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 contamination no longer poses an unacceptable risk under residential use.

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

The soil sample analyses indicate that a majority of the contamination is located 8-32 feet below the surface. Institutional controls would prevent excavation to these depths and prevent future residential use of this waste unit. The present worth cost associated with this alternative is approximately $18,060. This cost includes land surveys, installation of signs, filing with the Aiken County Records, inspection and maintenance, and record of decision reviews every 5 years for 30 years.

Alternative S3 - Excavation, Debris Removal, and Offsite Disposal

This alternative consists of excavating the soil (to a depth of 6 feet) from the source control operable unit, screening it to remove rubble and debris, and disposing of the debris in an off-site disposal facility. The excavated area would then be backfilled with soil. Treatment of the residual deeper soils would not be necessary since fate and transport analysis has shown that there is little or no chance for the residual waste at the SRWU to be a source of future groundwater contamination. The present worth cost for this alternative is approximately $60,115,350. This cost includes site preparation (i.e., vegetation removal, excavation, required utilities, etc.), backfill, site closure (reseeding), and groundwater monitoring. If the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA with notification and restrictions similar to Alternative S2. Deed restrictions under this alternative would be

necessary to prevent excavation of buried waste and groundwater use.

Alternative S4 - Placement of a Cap

Under this alternative, a low-permeability cover (i.e., clay layer, 30-mil flexible membrane liner, and a vegetative soil cover) would be placed on top of the SRWU source control operable unit. The primary purpose of the cover is to prevent exposure to surface soils. The low permeability cover would also further reduce any potential contaminant migration into the underlying soils and groundwater. The low permeability cover would be required to cover a planar area of approximately 450,000 ft^2 or 10 acres. The present worth cost for this alternative is approximately $6,475,350. 'Ibis cost includes placement of the low permeability cover, deed notifications and restrictions, inspection and maintenance, groundwater monitoring, and record of decision reviews every 5 years for 30 years. If the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA with notification and restrictions similar to Alternative S2. Deed restrictions under this alternative would be necessary to prevent excavation of buried waste and groundwater use.

VII.B Description of the Considered Alternatives for the SRWU Groundwater ("M Area" Aquifer)

Four alternatives were also evaluated for remedial action at the SRWU groundwater ("M Area") operable unit. Each alternative is described below:

Alternative GW1 -No Action

Under this alternative, no action would be taken at the SRWU "M Area" groundwater operable unit. EPA policy and regulations require the consideration of a no action alternative to serve as a baseline against which the other alternatives can be compared. Because no further action would be taken at the unit and the SRWU "M Area" groundwater operable unit would remain in its present condition; there are no crests associated with this alternative. There would be no reduction of risk.

Alternative GW2 - Institutional Controls

Under existing controls at the SRS, the shallow groundwater at the SRWU is not used for drinking or industrial use. Upon transfer of the property, deed notifications and restrictions would be needed to prevent use of the groundwater for domestic purposes (consumption or hygiene). Groundwater monitoring would need to continue at the site on a semi-annual basis to determine potential future groundwater impacts as well as the source of groundwater contamination. For cost estimating purposes only, the groundwater monitoring was based on sampling eight wells for 30 years. However, at the five-year Record of Decision review, the groundwater monitoring data will be evaluated to determine if any changes in the groundwater remedy are appropriate. Based on the current concentrations in groundwater, the probable condition for the "M Area" groundwater aquifer is no significant groundwater contamination resulting from the SRWU. As a result, no remedial action is deemed appropriate for the "M Area" groundwater aquifer. However, a confirmatory groundwater monitoring program will be established to ensure that this is the appropriate remedial action for the "M Area" groundwater aquifer.

The present worth cost for this alternative is expected to be approximately $725,060. This cost includes placement of the deed notifications and restrictions, inspection and maintenance, groundwater monitoring, and record of decision reviews every 5 years for 30 years. If the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA with notification and restrictions similar to Alternative S2.

Alternative GW3 - Extraction, Reverse Osmosis, Reinfection

Under this alternative, the groundwater would be extracted and treated by reverse osmosis. The reverse osmosis system would consist of semi-permeable membrane elements mounted in pressure tubes, high pressure water pump(s), pressure gauges, temperature gauges, and flow meters. Pre-treatment components consisting of

filters or pH-adjustment may be part of this system. The present worth cost for this alternative is expected to be approximately $2,622,070. 'Ibis cost includes placement of the deed notifications and restrictions, inspection and maintenance, purchase and installation of extraction wells and a reverse osmosis unit, operation of the extraction wells and a reverse osmosis unit, groundwater monitoring, and record of decision reviews every 5 years for 30 years. It should be noted that four groundwater extraction wells were estimated to be sufficient. There was no capture zone analysis conducted to determine the exact number of wells that would needed, so the estimate for the wells may be >+50 percent if more wells are required. If the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA with notification and restrictions similar to Alternative S2.

Alternative GW4 - Extraction, Recirculation Wells, Reinjection

Under this alternative, the groundwater would be extracted and treated by recirculation wells. The recirculation wells would operate by transiting the contaminants from the aqueous phase to the gaseous phase and subsequent treatment of the contaminants. The present worth cost for this alternative is expected to be approximately $772,000 for pilot test costs only and $4,620,350 for full scale remediation. This cost includes placement of the deed notifications and restrictions, inspection and maintenance, purchase and installation of extraction and recirculation wells, operation of the extraction and recirculation wells, groundwater monitoring, and record of decision reviews every 5 years for 30 years. It should be noted that for the pilot-scale system, two groundwater extraction wells and 6 monitoring well clusters were estimated to be sufficient. Full scale remediation was estimated to require 10 additional wells. There was no capture zone analysis conducted to determine the exact number of wells that would needed for either the pilot-scale or full-scale remediation systems, so the estimate for the wells may be >+50 percent if more wells are required. If the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA with notification and restrictions similar to Alternative S2.

VIII. Summary of Comparative Analysis of the Alternatives

Description of Nine Evaluation Criteria

Each of the remedial alternatives was evaluated using the nine criteria established by the National Oil and Hazardous Substances Contingency Plan (NCP). The criteria were derived from the statutory requirements of CERCLA Section 121. The NCP [40 CFR $300.430 (e) (9)] sets forth nine evaluation criteria that provide the basis for evaluating alternatives and selecting a remedy. 'he criteria are:

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

In selecting the preferred alternative, the above mentioned criteria were used to evaluate the alternatives developed in the *Silverton Road Waste Unit Corrective Measures Study/Feasibility Study (U)* (WSRC, 1996c). Seven of the criteria are used to evaluate all the alternatives, based on human health and environmental protection, cost, and feasibility issues. The preferred alternative is further evaluated based on the final two criteria state acceptance and community acceptance. Brief descriptions of all nine criteria are given below.

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

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) - ARARs are Federal and state environmental regulations that

establish standards which remedial actions must meet. There are three types of ARARs: (1) chemical-specific, (2) location-specific, and (3) action-specific. "

Chemical-specific ARARs are usually health- or risk-based levels or methodologies which, when applied to unit-specific conditions, result in the establishment of numerical values. Often these numerical values are promulgated in Federal or state regulations.

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

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

The remedial activities are assessed to determine whether they attain ARARs or provide grounds for invoking one of the five waivers for ARARs. These waivers are:

- the remedial action is an interim measure and will become a part of a total remedial action that will attain the ARAR,
- compliance will result in greater risk to human health and the environment than other alternatives,
- compliance is technically impracticable from an engineering perspective,
- the alternative remedial action will attain an equivalent standard of performance through use of another method or approach,
- the state has not consistently applied the promulgated requirement in similar circumstances or at other remedial action sites in the state.

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

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

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

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

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

cThe evaluation of remedial alternatives must include capital and operational and maintenance costs. Present value costs are estimated within +50/-30 percent, per EPA guidance. The cost estimates given with each alternative are prepared from information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs may vary from the estimates presented herein.

State Acceptance - In accordance with the FFA, the State is required to comment on/approve of the RFI/RI Report, the Baseline Risk Assessment, the

Corrective Measures Study/Feasibility Study, and the Statement of Basis/Proposed Plan.

Community Acceptance - The community acceptance of the preferred alternative is assessed by giving the public an opportunity to comment on the remedy selection process. A public comment period was held and public comments concerning the proposed remedy are addressed in the Responsiveness Summary (Appendix A) of this Record of Decision.

Detailed Evaluation

The remedial action alternatives discussed in Sections VILA and VII.B have been evaluated using the nine criteria just described. Table 10 presents the evaluation of the soil remedial alternatives. Table 11 presents the evaluation of the "M Area" groundwater remedial alternatives.

Ix. The Selected Remedy

Based on the SRWU Baseline Risk Assessment (WSRC, 1996b), for the residential scenarios the total site carcinogenic risk for exposure to chemicals ranged from $1x10^{-4}$ to 5X10-S and the cumulative noncarcinogenic hazard indices exceeded 1.0. The total site carcinogenic risks for exposure to radionuclides ranged from $1x10^{-4}$ to 3x10-5 for the residential scenarios. Groundwater is the only pathway that exceeds risks of 10^{-4} and a hazard index of 1.0. For the industrial scenarios, the total site carcinogenic risks for exposure to chemicals ranged from 2X10-S to $3x10^{-8}$ and the noncarcinogenic hazard indices were below 1.0. The total site carcinogenic risks for exposure to radionuclides ranged from lx 10^{-5} to $3x10^{-6}$ for the industrial scenarios. The primary contributors for the carcinogenic risks and noncarcinogenic hazards were from groundwater. It should be noted that based on the size of the SRWU (approximately 10 acres), the contaminants of concern are present in low concentrations over a large area. Some contaminants had a low frequency of detection and were present at levels that just exceeded the most conservative contaminant level goals. Fate and transport analyses indicated that residual contaminants in the soils will not migrate to the groundwater. The presence of surface soil contamination prevents the use of this waste unit for residential use. Therefore, for the SRWU source control operable unit, the preferred alternative is Institutional Controls. This alternative is considered to be the least cost option which is still protective of human health and the environment. Institutional Controls meets the RAOs for the SRWU soils by precluding future on-site residential use of the area.

Implementation of this alternative will require both near- and long-term actions. For the near-term, signs will be posted at the waste unit which indicate that this area was used for disposal of waste material and contains buried waste. In addition, existing SRS access controls will be used to maintain the use of this site for industrial use only. Further, excavation below 8 feet will be prohibited.

In the long-tan, if the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner which would include information needed for compliance with Section 120(h) of CERCLA. The deed shall include notification disclosing former waste management and disposal activities as well as remedial actions taken on the site, and any continuing groundwater monitoring commitments. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of construction debris and other materials, including hazardous substances.

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 contamination no longer poses an unacceptable risk under residential use.

In addition, if the property is ever transferred to non-federal ownership, a survey plat of the area will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

In the "M Area" groundwater aquifer, low levels of contaminants have been detected which minimally and infrequently exceed MCLS and the groundwater is currently not used as a drinking water source. The probable condition for the "M Area" groundwater aquifer is no significant groundwater contamination resulting from the SRWU. As a result, no remedial action is deemed

Table 10 Evaluation of Remedial Alternatives Considered for the SRWU Source Control Operable Unit.

Evaluation Criteria	*Alternative S1 No Action*	*Alternative S2 Institutional Controls*	*Alternative S3 Excavation, Debris Removal, and Offsite Disposal*	*Alternative S4 Cap*
Overall Projection of Human Health and the Environment	This alternative is the least protective of human health risk. However, risks due to soil exposure are within EPA's target risk range. There was no significant ecological risks for the unit.	This alternative is protective of human health. Future residential use of the area would be prevented. There was no significant ecological risks for the unit.	This alternative is protective of human health. Most of the possible source of contamination would be removed. There was no significant ecological risks for the unit.	This alternative would be protective of human health. The potential source of contamination would be covered.
Compliance with ARARs	There were no chemical-or location-specific ARARs identified for the waste unit. Since this alternative does not require any action at the unit, there are no action-specific ARARs to be met.	There were no chemical-or location-specific ARARs identified for the waste unit. Since this alternative does not require any action at the unit, there are no action-specific ARARs to be met.	There were no chemical-or location-specific ARARs identified for the waste unit. Compliance with the Clean Air Act in limiting the amount of dust created through this alternative would be required. Land disposal restrictions for disposal of any wastes generated would also be required. All activities would be required to comply with OSHA standards,	There were no chemical-or location-specific ARARs identified for the waste unit. Compliance with the Clean Air Act in limiting the amount of dust created through this alternative would be required. All activities would be required to comply with OSHA standards. However, RCRA guidance on caps are To-Be-Considered.
.ong-term effectiveness and permanence	This alternative will not reduce risks which are within EPA's target risk range.	This alternative will provide long-term effectiveness and permanence as long as the deed notifications are enforced,	This alternative providea long-term effectiveness through removal of most of the waste material.	This alternative will provide long-term effectiveness and permanence as long as the low permeability cover is properly maintained.
Reduction of toxicity, mobility, or volume through treatment	This alternative does not reduce toxicity, mobility, or volume through treatment since there is no treatment precess.	This alternative does not reduce toxicity, mobility, or volume through treatment since there is no treatment process.	This alternative provides reduction in the mobility of contaminants by removing the source of contamination to a managed facility,	'his alternative would provide reduction in the mobility of the contaminants since migration of the contaminants is reduced.

Table 10 Evaluation of Remedial Alternatives Considered for the SRWU Source Control Operable Unit (cent'd).

Evaluation Criteria	*Alternative S1 No Action*	*Alternative S2 Institutional Controls*	*Alternative S3 Excavation, Debris Removal, and Offsite Disposal*	*Alternative S4 Cap*
Short-term effectiveness	This alternative does not provide any active remediation and would therefore not expose any workers to hazards associated with remedial activities. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	This alternative does not provide any active remediation and would therefore not expose any workers to hazards associated with remedial activities. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	This alternative may potentially expose the workers to the waste disposed of at the unit. The use of heavy equipment poses typical risks to the workers involved. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	The workers will not be exposed to the waste disposed of at the unit. The use of heavy equipment poses typical risks to the workers involved. This alternative would not expose the surrounding community to short-term risk as site access is restricted.
Implementability	This alternative is currently in-place. There is no action involved with this alternative.	This alternative is easily implementable requiring the filing of deed notifications, inspection and maintenance, and ROD reviews every 5 years for 30 years..	This alternative is probably the most difficult to implement since it would require earth and debris removal as well as the location of an appropriate disposal location for the debris and earth removed from the unit.	This alternative would require the filing of deed notifications to notify any potential future purchasers of the land that the land has been used for waste management and disposal activities. In addition, the location of a large quantity of suitable clay borrow material would need to be found.
Cost	There are no costs involved with this alternative.	The total cost for this alternative is estimated to be $18,060.	The total cost for this alternative is estimated to be $60,115,350.	The total cost for this alternative is estimated to be $6,475,350.
State Acceptance	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.
Community Acceptance	This criterion will be completed following public review.	This criterion will be completed following public review.	This criterion will be completed following public review.	This criterion will be completed following public review.

Table 11 Evaluation of Remedial Alternatives Considered for the SRWU "M Area" Groundwater Operable Unit.

Evaluation Criteria	*Alternative G WI No Action*	*Alternative G W2 Institutional Controls*	*Alternative GW3 Extraction, Reverse Osmosis, Reinfection*	*Alternative. GW4 Extraction, Recirculation Wells, Reinfection*
Overall Protection of Human Health and the Environment	This alternative is the least protective of human health risk. However, this aquifer is not currently being used as a source of drinking water.	This alternative is protective of human health. Future usc of the groundwater would be prevented.	This alternative is protective of human health. This alternative would treat the contaminants from the "M Area" groundwater to below MCLs.	This alternative is protective of human health. This alternative would treat the contaminants from the "M Area" groundwater to below MCLs.
Compliance with ARARs	There were no location-specific ARARs determined for the groundwater. This alternative would meet all action-specific ARARs as this alternative does not involve any action at the unit. This alternative would not meet all maximum contaminant level (MCL) goals. However, the low levels of contaminants in the groundwater minimally and infrequently exceeded the MCL goals which indicate that there is no significant groundwater threat.	There were no location-specific ARARs determined for the groundwater. 'I'his alternative would meet ail action-specific ARARs as this alternative does not involve any action at the unit, This alternative would not meet all MCL goals. However, the low levels of contaminants in the groundwater minimally and infrequently exceeded the MCL goals which indicate that there is no significant groundwater threat.	There were no location-specific ARARs determined for the groundwater. compliance with the Clean Air Act in limiting potential 'air releases; with the Clean Water Act for discharge limitations; with the Safe Drinking Water Act for MCLs; and with the South Carolina Well Standards and Regulations would be required for this alternative. All work would need to comply with OSHA standards. .	There were no location-specific ARARs determined for the groundwater. Compliance with the Clean Water Act for discharge limitations: with the Safe Drinking Water Act for MCLs; and with the South Carolina Well Standards and Regulations would be required for this alternative. All work would need to comply with OSHA standards.
.ong-term effectiveness and 'ermanence	This alternative will not provide long-term effectiveness and permanence. The groundwater plume is minimal and possibly depleting; and there is no potential future unit impact to the groundwater.	This alternative will provide long-term effectiveness and permanence as long as the deed notifications are enforced.	This alternative providea long-term effectiveness through treatment of contaminants in the groundwater.	This alternative provides long-term effectiveness through treatment of organic contaminants in the groundwater.
₹eduction of toxicity, mobility, r volume through treatment	This alternative does not reduce toxicity, mobility, or volume through treatment since there is no treatment precess.	This alternative does not reduce toxicity, mobility, or volume through treatment since there is no treatment process.	This alternative provides reduction in toxicity, mobility, and volume by treating the contaminants in the groundwater.	This alternative provides reduction in toxicity, mobility, and volume by creating the organic contaminants in the groundwater. "

Table 11 Evaluation of Remedial Alternatives Considered for the SRWU "M Area" Groundwater Operable Unit (cont'd).

E aluation Criteria	A...rnati.. GW1 No Action	Alternative GW2 Institutional Controls	Alternative GW3 Extraction, Reverse Osmosis, Re'njection	Alternative GW4 Extraction, Recirculation Wells, Reinjection
S m	Th al m tl doe n provide any active remediation and would therefore not expose any workers to hazards associated with remedial activities. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	Th al ernati.. does no. provid. any active remediation and would therefore not expose any workers to hazards associated with remedial activities. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	Th.. alternative provides minor risk to remediation workers during implementation. The use of equipment poses typical risks to the workers involved. Strict adherence to OSHA guidelines would limit the risks. This alternative would not expose the surrounding community to short-term risk as site access is restricted.	This alternative provides minor risk to remediation workers during implemen-tation. The use of equipment poses typical risks to the workers involved. Strict adherence to OSHA guidelines would limit the risks. This alternative would not expose the surrounding community to short-term risk as site access is restricted.
Implementability	This alternative is currently in-place. There is no action involved with this alternative.	This alternative is easily implementable requiring the filing of deed notifications and the continuation of groundwater monitoring.	This alternative would require the filing of deed notifications and the continuation of groundwater monitoring. Additional permits would be required for operation of the equipment. This alternative is readily available.	This alternative would require the filing of deed notifications and the continuation of groundwater monitoring. This alternative is also an innovative technology that may be more difficult to implement correctly.
Cost	There are no costs involved with this alternative. However, confirmatory groundwater monitoring will be implemented.	The total cost for this alternative is estimated to be $725,060.	The total cost for this alternative is estimated to be $2,622,070.	The total cost for this alternative is estimated to be $4,620,350.
State Acceptance	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.	This criterion will be completed following review by the appropriate regulatory agencies.
Community Acceptance	This criterion will be completed following public re[illegible]	Th criterion wi be comp eted following public review.	Thi. criteri... wi.. be comp..ted following public review.	This criterion will be completed f..llowing public review.

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appropriate for the SRWU "M Area" groundwater aquifer. However, a confirmatory groundwater monitoring program will be established to ensure that this is the appropriate remedial action for the "M Area" groundwater aquifer. In the event that the probable condition is no longer appropriate, DOE will evaluate the need for remedial action. There are no groundwater RAOs to be met for the "M Area" groundwater aquifer since the selected remedy for the aquifer is no remedial action with confirmatory groundwater monitoring.

Under this groundwater monitoring program, additional background monitoring well(s) will be installed since one of the original background wells for the "M Area" groundwater operable unit went dry and was never monitored. The background well(s) will be used to further evaluate the upgradient concentrations of the contaminants in the "M Area" groundwater operable unit. In addition to the new background well(s), the existing background well and approximately six existing "M Area" wells will also be monitored. This monitoring is intended to evaluate trends in the groundwater contamination. Groundwater monitoring was assumed to be conducted on a semi-annual basis for 30 years (for cost estimating purposes only). However, at the five-year ROD review, the groundwater monitoring data will be evaluated to determine if any changes in the groundwater remedy are appropriate.

The number and location of the new background well(s), a list of the existing wells to be monitored, the frequency of monitoring, and the submittal frequency of the groundwater data for regulatory review will be listed in the SRWU Corrective Measures Implementation/ Remedial Action Report (CMI/RAR) post-ROD document. The CMI/RAR will also identify a groundwater strategy which will include trend analysis and recommendations based on the interpretation of the data in the post-ROD groundwater monitoring reports.

The SCDHEC has modified the SRS RCRA permit to incorporate the selected remedy.

This proposal is consistent with EPA guidance and is an effective use of risk management principles.

X. statutory Determinations

Based on the SRWU RFI/RI Report and the Baseline Risk Assessment the SRWU poses no significant risk to the environment and minimal risk to human health. Therefore, a determination has been made that institutional controls are sufficient for protection of human health and the environment for the SRWU soils and that no remedial action with confirmatory groundwater monitoring is deemed appropriate for the "M Area" groundwater aquifer.

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The size of the waste unit and the random distribution and low levels of contaminants preclude a remedy in which treatment is a practical alternative. Because treatment of the principal threats of the site was frond to be impracticable, this remedy does not satisfy the statutory preference for treatment as a principal element.

Institutional controls will result in hazardous substances, pollutants, or contaminants remaining in the waste unit. Section 300.430 (f)(4)(ii) of the NCP requires that a Five Year Review of the ROD be performed if hazardous substances, pollutants, or contaminants remain in the waste unit. The three Parties have determined that a Five Year Review of the ROD for the SRWU will be performed to ensure continued protection of human health and the environment.

XI. Explanation of Significant Changes

The 45-day public comment period for the ***Statement of Basis/Proposed Plan for the Silverton Road Waste Unit (731-3A)*** **(WSRC, 1996d)** began on September 17, 1996 and ended on October 31, 1996. A public meeting was held on October 15, 1996. During the public comment period, there were three comments received. These comments are addressed in Appendix A of this Record of Decision. Based on these comments, there were no significant changes made to the preferred alternative originally presented in the SRWU Statement of Basis/Proposed Plan. However, based' on a review of recent groundwater data indicating minimal and infrequent MCL

exceedances, the ROD no longer references an ACL/MZ demonstration for the groundwater. The proposed action for the groundwater is no remedial action with confirmatory groundwater monitoring.

XII. Responsiveness Summary

There were three comments received during the public comment period. The Responsiveness Summary (see Appendix A) of this Record of Decision addresses these comments.

XIII. Post-ROD Document Schedule

The post-ROD document schedule is listed below and is illustrated in Figure 8:

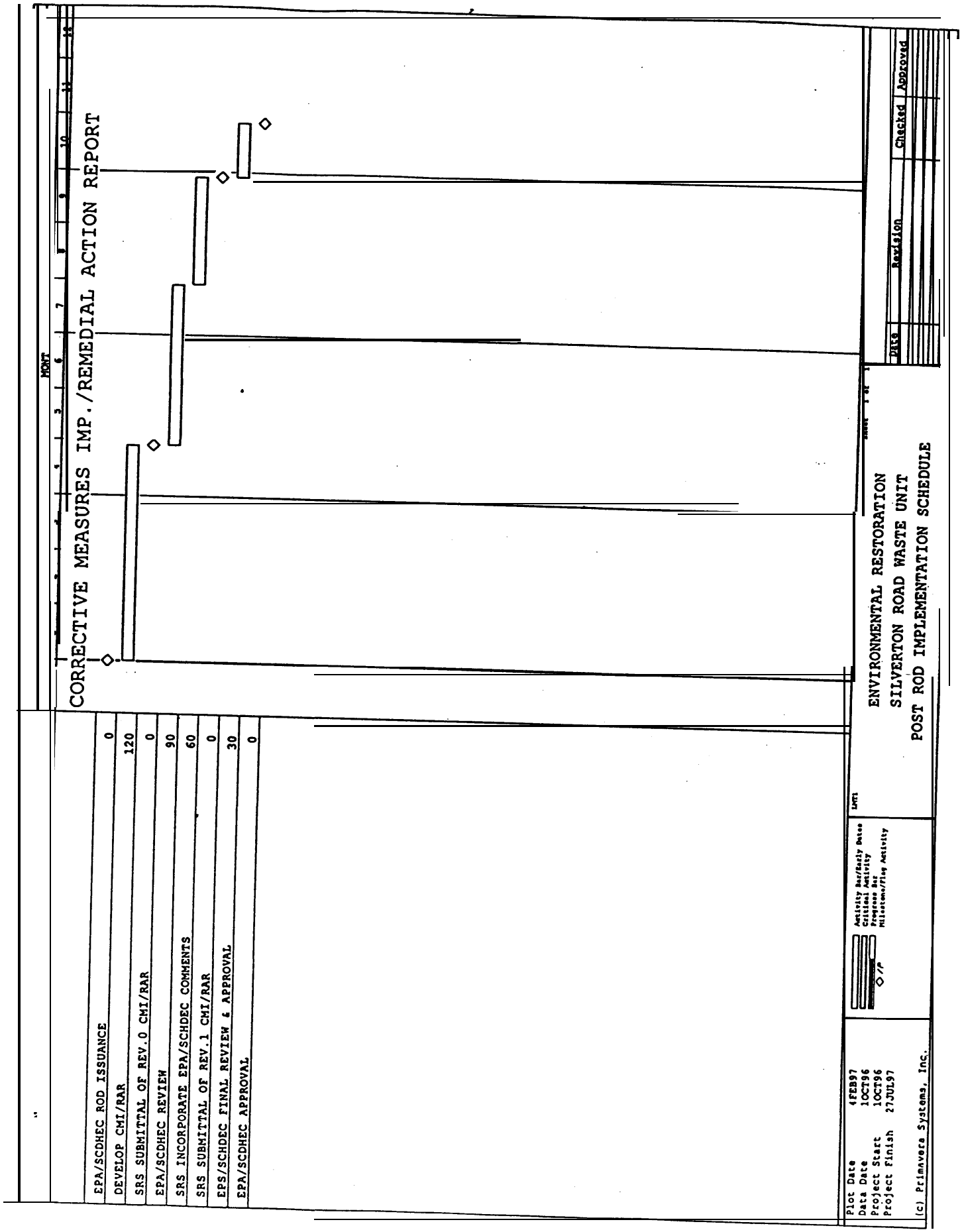
1. *Corrective* Measures Implementation/ Remedial Action Report (CMI/RAR) (rev. O) for the SRWU will be submitted for EPA and SCDHEC review four months after issuance of the ROD.

2. EPA and SCDHEC review of the SRWU CMI/RAR (rev. 0) -90 days.

3. SRS revision of the SRWU CMI/RAR (rev. O) after receipt of regulatory comments -60 days.

4. EPA and SCDHEC final review and approval of the SRWU CMI/RAR (rev/ 1) -30 days.

Figure 8. Post-ROD Document Schedule



xxv. REFERENCES

DOE (U.S. Department of Energy), 1994. ***Public Involvement, A Plan for the Savannah River Site.*** **Savannah River Operations Office, Aiken,** South Carolina.

EPA (U. S. Environmental Protection Agency), 1995. ***EPA Region III Risk-Based Concentration Table, July-December 1995.*** Roy L. Smith, October 20, **1995.**

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

WSRC (Westinghouse Savannah River Company), **1994a.** ***Quality Control Summary Report for the Silver-ton Road Waste Unit RFI/RI Assessment (U), ESH-EMS-94-0532, Rev. O,*** Westinghouse Savannah River Company, **Aiken,** South Carolina.

WSRC (Westinghouse Savannah River Company), **1994b.** ***Risk-Based Preliminary Remediation . Goals for Radionuclides: Scoping Phase Calculations (U),*** **WSRC-TR-94-0181,** ***Rev.*** 1, Westinghouse Savannah River Company, **Aiken,** South Carolina.

WSRC (Westinghouse Savannah River Company), **1996a.** ***Final RFI/RI Report for the Silverton Road Waste Unit (U),*** **WSRC-RP-95-214,** ***Rev.*** 1.2, Westinghouse Savannah River Company, **Aiken,** South Carolina.

WSRC (Westinghouse Savannah River Company), **1996b.** ***Final Baseline Risk Assessment for the Silverton Road Waste Unit (U), WSRC-RP-95-215,*** Rev. 1.1, Westinghouse Savannah River Company, **Aiken,** South Carolina.

WSRC (Westinghouse Savannah River Company), 1996c. ***Silverton Road Wrote Unit Corrective Measures Study/Feasibility Study (U),*** WSRC-RP-96-1OO, Rev. 1.1, Westinghouse Savannah River Company, **Aiken,** South Carolina.

WSRC (Westinghouse Savannah River Company), **1996d.** ***Statement of Basis/Proposed Plan for the Silverton Road Waste*** Unit (731-3A) ***(U),*** **WSRC-RP-96-1** 18, Rev. 1.2,. Westinghouse Savannah River Company, **Aiken,** South Carolina.

APPENDIX A

RESPONSIVENESS SUMMARY

Responsiveness Summary

The 45-day public comment period for the *Statement of Basis/Proposed Plan for the Silverton Road Waste Unit (731-3A) began on* September 17, 1996 and ended on October 31, 1996. A public meeting was held on October 15, 1996. During the public meeting, there were two questions received during the Public Meeting and Comment Session on the Limited Action Proposed Plans/Permit Modifications presentations; and, there was one public comment received during the Formal Public Comment Session. All of the comments are listed as recorded in the Savannah River Site Information Exchange transcript based on the October 15, 1996 Public Meeting.

Specific comments and responses are noted below. The comments are italicized and the responses are bolded.

Public Comments

The following two comments were received during the Limited Action Proposed Plans/Permit Modifications presentations.

1) Public Citizen: What risk is there for animals or I guess future environmental, like if you were going to turn this into a park?

Response to Comment 1):

As part of the baseline risk assessment process for the Silverton Road Waste Unit (SRWU), an ecological risk assessment was conducted to consider the potential impacts to animal and plant life caused by exposure to chemical and radionuclide constituents at the SRWU. The process included a site ecological reconnaissance survey that determined no wetlands important to animal or plant habitats or threatened and endangered species were in the vicinity of the SRWU; and use of this site by threatened and endangered species would not be expected.

Based on the ecological risk assessment, there is no reason to expect any adverse effects on animal or plant life from the SRWU if the area were to be turned into a park in the future.

A more detailed discussion of the ecological risk assessment may be found in Section 2 of the *Final Baseline Risk Assessment for the Silverton Road Waste Unit* (WSRC, 1996b).

2) Public Citizen: Are you using like private landfills and private - or I guess what other communities have developed? I mesh it looks like a landfill to me. And it looks like there are landfills all over the country and there's a whole lot of landfills that have turned into like parks and stuff. Is that an opportunity here to turn it into a park or to use private models and maybe look at who has done this a lot? I guess the EPA guy was talking about streamlining. Are you guys using private streamlining ideas ?

Response to Comment 2):

The SRS is currently considered to be a national environmental research park and as such, the site is/will be used for environmental research. For the institutional controls units, the only thing that our remedial decision has done is to state that these waste units will not be used for any residential use. The selected remedy is consistent with what other federal, state, municipal, and private entities are doing.

Due to the proximity of the SRWU to the site boundary, there is a potential that this area could be converted for recreational use (i.e. used as a park). For the SRWU, the risk levels

for the soils alone barely exceed the threshold for residential (both adult and child) use; and the presence of buried debris should not interfere with the use of the SRWU as a park. However, there are low levels of groundwater contamination present at the SRWU that could prevent use of the groundwater as a drinking water source. There are constituents present in the groundwater that minimally and infrequently exceed primary drinking water standards.

It should be noted that the use of the SRWU as a park or any other recreational use would be evaluated at the time of property transferor change in use.

The following comment was received during the Formal Public Comment Session.

3) *Mike Rourak: My name is Mike Rourak and my question is directed directly to Mr. Brian Hennessey's earlier discussion [unintelligible] Silverton Road property, for example. In the Future Use Manual that was sent out to some of us about the disposal of close to a million acres of property for DOE, in your deed restrictions there 're things that we cannot do. And we 're going to need a little bit before we can respond back to Washington. Those of us who received the manual, we almost are going to need* to know what *those deed restrictions are because if we cannot have a subdivision then there's no need* to *bid the price accordingly or say that's what we want to use it for. If we cannot graze cattle there like we do in Tennessee at [unintelligible] or something or grow crops because we cannot put a well in for contamination, then we are left with only looking at it for the pine trees.*

So being federal, you own this property. Even with deed restrictions you 've got to give us either a Phase I, II, or III audit. In this case, it's the seller who has to provide this liability, not necessarily the buyer's neglect of liability to due diligence. So it would really help if we knew what deed restrictions would be there to a more extent and also what we can use the land for. If I want to use it for applying 50 *--- under the Code of Federal Regulations 503, if I want to use it for bio solid disposal, can I do so? Because it's adjacent to your other property. So the deed restrictions that you brought up were of immense concern about responding back to the future use and the disposal of roughly 849,000 acres nationwide for - to be put back into - I understand from Washington, they would like to put it back mainly into public use to get the taxes off of it. Maybe not so much for the government, but for the local entities who lose the tax base. Thank you.*

Response to Comment 3):

The SRS Future Use Project Report was distributed to inform citizens of the planned future uses of SRS. The recommendations that were presented in the report may change over time and will be discussed with the stakeholders. Deed restrictions for federal property are not determined until the land is transferred to non-federal control. At the time of property transfer, the need for deed restrictions will be evaluated. Due to natural attentuation, decay, etc., the conditions at specific areas may not warrant any deed restrictions. All legal requirements will be met at the time of property transfer.