

United States Department of Energy

**Savannah River Site
Federal Facility Agreement
Implementation Plan**

**Revision.0
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**Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808**

SPECIAL NOTICE

This is the Rev.0 consensus FIP. This document is currently undergoing revision (Draft Rev.1 2/97 and many changed and new protocols are under review). Many of the protocols regarding the development of RFI/RI/BRA documents are under revision, as are many of the scoping protocols. Please contact Howard Hickey at (803)952-6378 for any questions you may have and additional information.

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- 1. Off-Site Checklist
- 2. Number of Document Copies Required
- 3. Proposed Generic Document Outlines
- 4. Generic RI/FS Schedules
- 5. The SRS DQO Process Example
- 6. Technology Demonstration Agreement

LIST OF ACRONYMS

ABS	dermal absorption factor
ACL	Alternate Concentration Limit
AF	adherence factor
AGT	above-ground tanks
ARAR	Applicable or Relevant and Appropriate Requirement
ASCAD	Approved Standardized Corrective Action Design
BRA	Baseline Risk Assessment
BW	body weight
CAB	Citizens Advisory Board
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
COCs	contaminants of concern
COPC	Contaminant of Potential Concern
CPT	Cone Penetrometer Testing
CSA	container storage areas
CSM	Conceptual Site Model
DNAPL	dense non-aqueous phase liquid
DOE-SR	U.S. Department of Energy Savannah River Operations
DQO	Data Quality Objectives
EBS	Environmental Baseline Survey
ED	exposure duration
EF	exposure frequency
EHRAV	Electronic Handbook of Risk Assessment Values
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERA	ecological risk assessment
ESC	Expedited Site Characterization
ET	exposure time
FACA	Federal Advisory Committee Act
FFA	Federal Facility Agreement for the Savannah River Site
FI	fraction ingested
FIP	FFA Implementation and Management Plan
FOSL	findings of suitability to lease
FOST	findings of suitability to transfer
FS	Feasibility Study
FSA	Fundamental Study Area
FY	Fiscal Year
HEAST	Health Effects Assessment Summary

LIST OF ACRONYMS (continued)

HQ	hazard quotient
HRS	Hazard Ranking System
HSWA	Hazardous and Solid Waste Amendments
IA	Interim Action
IAPP	Interim Action Proposed Plan
IDW	Investigation Derived Waste
IEUBK	Integrated Exposure Uptake Biokinetic
IOU	Integrator Operable Unit
IR	ingestion rate
IRA	interim remedial action
IRIS	Integrated Risk Information System
LNAPL	light non-aqueous phase liquid
MCL	maximum contaminant levels
MCLG	maximum contaminant level goals
MX	mixing zone
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Protection Act
NERP	National Environmental Research Park
NFA	No Further Action
NPL	National Priorities List
OSWER	EPA Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbons
PC	permeability constant
PCR	Post Construction Report
PPOA	Pollution Prevention Opportunity Assessments
PREscore	Preliminary Ranking Evaluation Score
PRGs	Preliminary Remedial Goals
RA	Remedial Action
RAO	Remedial Action objectives
RAWP	Remedial Action Work Plan
RBC	risk based concentrations
RCRA	Resource Conservation and Recovery Act of 1976
RD	Remedial Design
RDR	Remedial Design Report
RDWP	Remedial Design Work Plan
RfDs	reference doses
RFI	RCRA Facility Investigation

LIST OF ACRONYMS (continued)

RGO	Remedial Goal Options
RI	Remedial Investigation
RME	reasonable maximum exposure
ROC	Regional Off-Site Contact
ROD	Record of Decision
RPM	Remedial Project Manager
SA	skin surface area
SACM	Superfund Accelerated Cleanup Model
SAFER	Streamlined Approach for Environmental Restoration
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SCDM	Superfund Chemical Data Matrix
SE	Site Evaluation
SF	shielding factor
SRS	Savannah River Site
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
TE	gamma exposure factor
TIC	Tentatively Identified Compounds
TRVs	toxicity reference values
TTP	technical task plan
USC	United States Code
UST	underground storage tanks
VOC	volatile organic compounds
WSRC	Westinghouse Savannah River Company

1.0 INTRODUCTION

The Savannah River Site (SRS) was issued a Resource Conservation and Recovery Act (RCRA) permit on September 30, 1987. This permit included provisions for addressing releases from solid waste management units. Subsequently, SRS was placed on the National Priorities List (NPL) on December 21, 1989. In accordance with the terms of Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, the Department of Energy Savannah River Operations Office (DOE-SR), the Environmental Protection Agency - Region IV (EPA), and the South Carolina Department of Health and Environmental Control (SCDHEC) (the Parties) entered into an interagency agreement, the *Federal Facility Agreement for the Savannah River Site* (FFA). The FFA became effective on August 16, 1993, and is designed to integrate the CERCLA response action process with the corrective measures provisions of Section 3004(u) of RCRA. The FFA also establishes requirements for the prevention and mitigation of releases or potential releases at or from the SRS high-level radioactive waste tank system(s) identified in Appendix B of the FFA.

1.1 Reservation of Rights

The FFA Implementation Plan (FIP) has been developed to aid the Parties in their task of administering the terms of the FFA. The Plan is also intended to facilitate greater understanding among affected Stakeholders of the terms and process of the FFA. If any inconsistency exists between the FIP and the FFA, the FFA shall govern. Only those requirements, deliverables, schedules, and deadlines specified in the FFA are enforceable. The Parties hereby expressly reserve all statutory and regulatory rights, powers, duties, authorities, and/or obligations. Nothing in this document shall affect any of these statutory/regulatory rights, powers, duties, authorities and/or obligations. The Parties further acknowledge that in the event that a dispute shall arise concerning any portion of the FIP or the FFA, the Parties retain such recourse as is available in law or agreement to resolve the dispute.

2.0 PURPOSE

This Plan describes overall SRS Environmental Restoration (ER) management strategies and goals and provides detail on protocols established in the FFA. The Plan is not intended to duplicate the FFA but rather to summarize and provide clarification and detail regarding procedures established by the Parties to conduct day to day activities. These strategies and protocols will be used to implement the requirements of the FFA. Relevant sections of the FFA and regulatory requirements are referenced throughout the document. The Plan will be revised, as necessary, as the environmental restoration process is refined. Additionally, the Plan will help to identify environmental restoration activities that can be enhanced by further input from the Parties and affected Stakeholders.

3.0 FFA PROGRAM GOALS, APPROACH, OBJECTIVES and STRATEGIES

Section 3.0 discusses the Environmental Restoration management goals and strategies that DOE-SR, EPA, and SCDHEC will implement to help meet the terms of the Federal Facility Agreement.

SRS's Environmental Restoration (ER) program is a relatively young program when compared to other DOE facilities. Thus, the ER program is still under development and as it becomes more established, the remediation strategy will become more defined in terms of future land use and remediation goals. SRS is working closely with its Stakeholders to refine the remediation strategy. The SRS FFA, and FIP are evolving documents that will be refined as SRS continues to define its strategy and find ways to streamline the remedial process.

The SRS Environmental Restoration Strategy describes a comprehensive plan for environmental remediation at SRS. The strategy is comprehensive in the sense that it provides the framework for remediating the entire SRS, while recognizing that the SRS is composed of many individual contaminated areas, some of which are contiguous to active facilities that support current and possible future DOE missions. The strategy is designed to accommodate the restoration of currently identified contamination areas in a safe, efficient and timely manner, comply with the regulatory requirements affecting SRS, including diligent efforts in seeking FFA funding, and preserving the SRS assets (e.g., buildings and related infrastructure) required to fulfill its future missions.

3.1 FFA Program Goals and Approach

The Goal of the SRS Environmental Restoration Program is to identify and implement, in a time and cost effective manner, clean up remedies that are protective of human health and the environment, over time by reducing levels of environmental contamination and/or minimizing exposure of the public, workers, and the environment to hazardous and radionuclide contaminants. SRS will focus its resources on implementing remedial actions to address both potential current and future threats to human health and the environment posed by historical waste units and by treating and controlling contaminants and wastes to reduce their mobility, toxicity, and volume. SRS is working with the EPA and SCDHEC to implement a bias for action approach in reaching the FFA remedial action goals as stated here and the objectives and strategies further presented in the FFA Implementation Plan.

The sitewide goal of environmental restoration at SRS is to eliminate or prevent offsite population exposures to hazardous substances and to reduce on-site levels of environmental contamination to minimize current and future potential exposure to human health and the environment. The strategy accomplishes this goal by articulating the Sitewide procedures to be used in implementing the SRS Federal Facilities Agreement as identified in the FFA Implementation Plan (FIP), and by outlining the strategy for establishing remediation goals and remedy selection based on risk reduction, cost, and future land use.

3.2 FFA Program Management Principles and Expectations

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) investigatory and remedy selection process [40 CFR 300.430] establishes a general environmental cleanup framework, incorporating the expressed "Program Goal, Program Management Principles and Expectations" described under 40 CFR 300.430(a)(1). This Plan serves to guide the Parties to selection of remedies by documenting unit-specific investigatory/remedy selection strategies consistent with the goals, management principles and expectations of the NCP. These strategies are intended to facilitate a consistent use of the flexibility of the NCP to streamline the investigatory/remedy selection process, while ensuring consistency with the NCP goals, principles

and expectations. It is acknowledged by the three Parties to the FFA that regulations, policies and guidances may be changed and/or refined and that the SRS ER Program will evolve. As issues arise which affect the stated FFA Program Management Principles and Expectations herein and the SRS Environmental Restoration Program, this plan will be revised to express the consensus approach in addressing the new principles and expectations.

The following is a summary of the SRS ER Program specific objectives, principles and expectations, incorporating the NCP Program Goals and Expectations, that will be used to address the SRS remedial action objectives for specific operable units.

- Selection of remedies will be consistent with the national NCP Goal of selecting remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste where applicable.
- Resources will be focused on implementing remedial actions by employing a bias for early action and collecting data necessary to support remedy selection.
- Releases of contaminants beyond the boundaries of SRS from waste units will be prevented or eliminated. Any releases that cannot be eliminated will be minimized to levels that are protective of human health and the environment.
- Further migration of contaminants emanating from source units and/or secondary sources of contaminants will be eliminated or minimized (e.g., subsurface “hotspots”).
- Groundwater resources will be restored for beneficial re-use to the extent technically practicable. If complete groundwater resource restoration is not practicable, SRS will prevent further plume migration and exposure to contaminated groundwater. SRS will also consider and propose the appropriateness of waiving groundwater requirements as allowed under CERCLA via alternate concentration limits (ACL) and/or State mixing zone (MZ) demonstrations, or technology based or impracticability waivers.
- Wherever practicable, principle threat source materials will be treated or removed including hazardous and toxic liquids, areas containing high concentrations of toxic substances and areas containing highly mobile contaminants.
- As appropriate, a combination of engineering and institutional controls will be used for units containing large volumes of low concentrations of contaminants or where treatment or removal is not practical.
- Treatment, removal, engineering controls, physical, chemical and biological degradation processes (natural attenuation), and institutional controls will be used to address the contamination at the waste units.
- The number of areas that will require long-term engineering and institutional controls will be minimized, to the degree practicable, and thereby reduce the footprint of contaminated areas subject to long-term care and the associated long-term O&M costs. The feasibility of this goal will be considered for individual waste source units and multiple waste units by addressing its feasibility with respect to the NCP nine-criteria for remedy selection. This objective is especially critical to areas that could potentially become unrestricted access areas.
- Innovative technologies will be used to remediate waste units where it is cost effective and/or increases efficiency.
- Streamlined approaches to waste unit remedy selection and remedial action will be implemented.

- Remedy selection will be a waste unit-specific decision which is supported by the analysis and interpretation of the data collected and documented in the Remedial Investigation Report (including the assessment of Baseline Risk). Remedial decisions will be made for individual waste units to facilitate early remedial action. Those units which pose minimal threats (e.g., risk between 10^{-6} and 10^{-4}), and/or units subject to five-year reviews will be further assessed for potential cumulative exposure effects during assessment of the relevant Integrator Operable Unit. The following provides the general expectations for the approach to determining the degree to which the analysis of alternatives may be focused.
 - Generally, it is expected that an evaluation of alternatives will be conducted for waste units which do not meet chemical-specific ARARs. The documentation necessary to support an ARAR waiver should be included in the alternatives analysis.
 - In cases where the current or future risk or toxic effect to human health is within the EPA target range (10^{-4} to 10^{-6}) or is greater than an HI of 1 but less than 3, a focused evaluation of alternatives may be performed, which will include alternatives which prevent exposure through engineering and/or institutional controls.
 - It is expected that the evaluation of alternatives for units which pose a current or future risk or toxic effect to human health greater than a carcinogenic risk of 10^{-4} for a Contaminant of Concern or cumulative exposure path or toxic effect greater than an HI = 3, and do not have chemical-specific ARARs, will include alternatives which meet the statutory preference for achieving permanent remedies through treatment.
 - It is expected that all alternatives evaluations will be focused on a minimum set of alternatives, to the degree feasible, while meeting the requirements of the FFA and the expectations expressed herein.
- Generally, remedial actions employing the statutory preference for permanence through treatment shall be selected for waste units which exceed ARARs or exceed a carcinogenic risk of 10^{-4} or an HI greater than or equal to 3. RODs for remedial actions that do not meet this statutory preference for permanence will describe why this preference is not met.
- Generally, limited remedial actions (e.g., institutional controls, monitoring) will be considered for waste units which do not exceed ARARs and exceed a carcinogenic risk of 10^{-6} (but not 10^{-4}) an HI greater than or equal to 1 (but less than 3) and are located in industrial areas (Figure 3.3). RODs for remedial actions that do not employ limited remedial action will describe why alternative remedial action objectives are appropriate. RODs for remedial actions that do not meet the statutory preference for permanence will describe why this preference is not met.
- To expedite cleanup, generally individual waste units will be evaluated and cleaned up as soon as unit data supports selection of a remedy. Additionally, a comprehensive evaluation of the Site will be conducted to assess the cumulative impacts to larger portions of the Site from multiple waste unit releases. This comprehensive evaluation will be approached by assessing watersheds with primary stream systems serving as Integrator Operable Units (IOUs). Operable Units/waste units have been grouped into watersheds. There are six watersheds designated for the SRS, each one consisting of those Operable Units which do, or potentially could contribute contamination to one of the seven IOUs on, or contiguous to the Site as a whole. The rationale behind the designation is that the watersheds, with their primary stream systems serve to transport contamination across Operable Unit boundaries and should,

therefore, be evaluated separately with regard to the overall Site-wide environmental impact. Site-wide surface soils will be evaluated to address the following:

- levels of anthropogenic contamination
- identifying new media-specific (surface soil) operable units
- document concentration ranges of naturally occurring and anthropogenic chemicals

SRS Operable Units, Integrator Operable Units and watersheds are listed in Table C.3, Appendix C of the FFA. Evaluation of Integrator Operable Units will be long-term assessment and will not be concluded until after completion of all Site Evaluations and issuance of final RODs for waste units assessed within the area of the associated watershed.

3.3 Components of the FFA Remediation Process

The following is a brief description of the overall response action process in the FFA. This process is a fully integrated process designed to be consistent with both the NCP, Section 3004(u) of RCRA, and all associated guidance. Section 4.0 of the Plan provides specific details of the primary components of the process. The following discussion of the remediation process is provided in its general order of occurrence. The general process is illustrated in Figure 3-1. The approach illustrated is intended to be flexible and may include variations not illustrated. Variations in the approach are encouraged to facilitate streamlining and a bias for early actions.

3.3.1 Site Evaluations

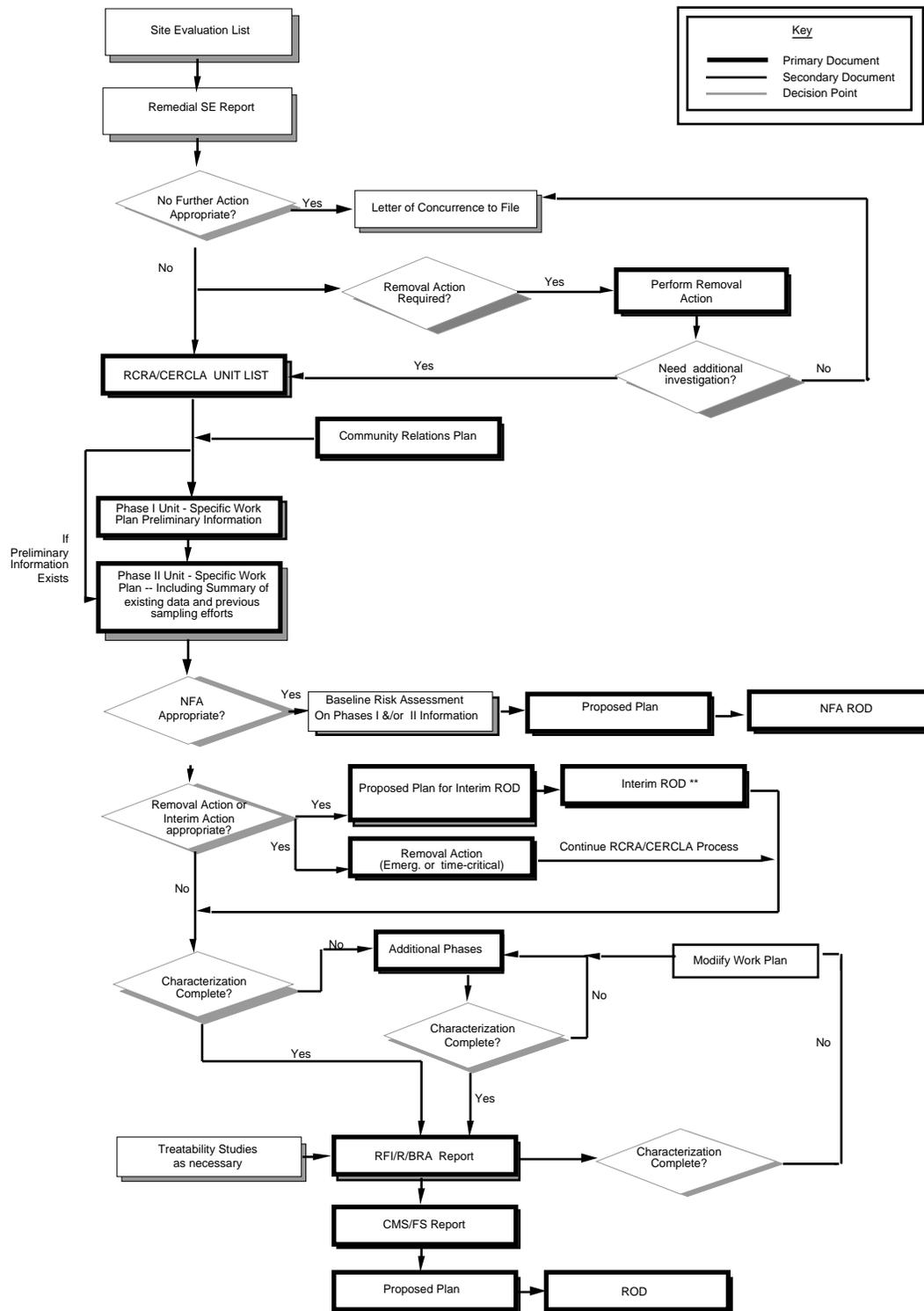
The first step in the process is to evaluate newly discovered releases and potential releases of hazardous substances for consideration of inclusion in Appendix G.1 of the FFA, the Site Evaluation List. Appendix G.2 lists all areas which have been deemed to require no further response action under the terms of the FFA. Site evaluations (SE) of those areas listed in Appendix G.1 are a preliminary analysis of potential and known releases for consideration of further investigation under the RFI/RI provisions, removal actions or no further action.

3.3.2 Removal Actions

Removal actions may be taken to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or the threat of release. This may be done based on information presented in SE Reports or other available means (historical information, RFI/RI data, etc.). Removal actions may result in (1) areas being listed in Appendix G.2 and subject to no further action or (2) may be a preliminary step in the remedial action process. SRS will conduct removal actions in accordance with the NCP. Three types of removal actions can be performed:

1. Emergency Removal Actions
2. Time Critical Removal Actions
3. Non-Time Critical Removal Actions

The criteria and requirements for each are specified in the Response Action Matrix, Table 4-1.



** After a Removal Action or Interim ROD the RCRA/CERCLA Process will continue to obtain a Final ROD

Figure 3-1. SRS Remedy Selection Process

3.3.3 Remedial Actions

The remedial action process is conducted, as shown in Figure 3-1, for all units listed in Appendix C, RCRA/CERCLA Units, of the FFA. The process and resulting Primary Documents (highlighted below in bold-faced text), in the order of their occurrence, are briefly summarized by the following discussion. Individual steps in the process are not completely sequential. Considerable overlap in the implementation of these steps is necessary because of their interdependence and to effect streamlining of the overall process. However, the generic remedial process described below can be effectively streamlined using the strategies presented in Section 3.4.

The process includes scoping the **RFI/RI Work Plan** and Conceptual Site Release Model (CSM), the development of an **RFI/RI Work Plan** describing the investigation strategy to collect data to assess the nature and extent of the releases, based on the CSM. The results of the assessment of the nature and extent of the release(s) is documented in an **RFI/RI Report**. The results of the assessment of the current or potential future impact to human health and the environment are documented in the **Baseline Risk Assessment**, which is included in the **RFI/RI Report**. An evaluation of various remedial alternatives is performed to evaluate the remedial alternatives using the CERCLA nine criteria and is documented in the **CMS/FS Report**. The selection of the preferred alternative, based on the **CMS/FS**, is briefly summarized in the **Statement of Basis/Proposed Plan** to support further public input into the process leading to selection of the preferred remedy. The **Record of Decision (ROD)** and **RCRA Permit Modification Decision** provides the final documentation of the basis for selection of the remedial alternative and the response to public input. Depending on the scope and complexity of the selected remedy, a number of post-ROD documents are developed to support the design, implementation and completion of the remedy. The key post-ROD Primary Documents include the **Corrective/Remedial Action Work Plan**, the **Corrective Measures/Remedial Design Work Plan**, and the **Corrective Measures/Remedial Design Report**. The scope and complexity of the operable unit evaluated under this process may allow for streamlining documentation and/or elimination of some entire Primary Documents. For example, proceed with a Statement of Basis/Proposed Plan for a no action unit when the RFI/RI and the Baseline Risk Assessment Reports confirm no threat to human health or the environment or the combining of the CM/RD WP and the C/RA WP into an RD/RA Work Plan.

The process described above is the process for selecting final remedial actions. Interim remedial actions are often implemented to achieve quick risk reduction and/or to stabilize ongoing migration of releases of hazardous substances. Because of the interim nature of these actions, it is generally appropriate to proceed with remedy selection without completion of all of the above documentation (e.g., RFI/RI/Baseline Risk Assessment Report, CMS/FS Report). Additionally, the scope of the remedy selection documentation (i.e., Proposed Plan and ROD) and the post-ROD documentation may be streamlined due to the limited scope of the interim remedial action.

For actions being remediated under RCRA, Appendix H of the FFA, no CERCLA Proposed Plans or RODs will be issued at this time. A determination to issue CERCLA documentation for RCRA closures will be made following initiation of remediation or after completion of remediation.

3.4 Streamlining the Remediation Process

3.4.1 Bias for Early Response Action

Section XIV of the Federal Facility Agreement specifies that removal actions conducted by the DOE at SRS shall be consistent with CERCLA and its implementing document, the National Contingency Plan. The NCP encourages taking early actions prior to a final ROD, under removal

or remedial authorities, to abate the immediate threat to human health and the environment and/or stabilize unit releases and mitigate continuing migration of hazardous substances. In deciding whether to initiate these actions, the desire to definitively characterize unit risks and analyze alternative remedial approaches for addressing those threats in great detail must be balanced with the desire to implement protective measures quickly. This balancing should be performed as early as possible with a bias for initiating response actions necessary or appropriate to eliminate, reduce, or control hazards posed by a unit [55 FR 8704, March 8, 1990].

Consideration of early actions should be ongoing throughout the SE and RFI/RI process. Critical stages for considering the use of early actions includes the SRS development of and regulatory agency review stage of the SE Report, the scoping stage of the RFI/RI Work Plan, and during the initial review of the RFI/RI findings (e.g., scoping the RFI/RI Report). Many of the streamlining strategies discussed can be used to support the prudent use of interim remedial actions allowed under the NCP. However, in cases in which releases of hazardous substances need to be promptly addressed, SRS will perform spill responses, removal actions, or early remedial actions.

RCRA/CERCLA Units will be managed in operable units (OUs). Removal actions or early remedial actions, including interim or early final remedial actions, may be performed for/at portions (i.e. source or surface unit) of the OU; (1) when early actions are necessary or appropriate to achieve significant risk reduction quickly; (2) when phased analysis and response is necessary or appropriate given the size or complexity of the units; or (3) to expedite the complete remediation of an OU. Generally, interim remedial actions are preferred over non-time critical removal actions.

3.4.2 Overview of the SRS Scoping Process

To effectively streamline any or all portions of the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, efficient and effective scoping of the supporting regulatory documents must be conducted by the three parties. Through successful scoping, significant reductions in document development, review, and approval are achievable. Reducing the number and scope of documents and elimination of excessive document revisions will allow acceleration to baseline schedules and prevent extending unit-specific implementation schedules. Figure 3-2 represents a generalized timeline of the RCRA/CERCLA process as implemented at the SRS. Scoping windows are identified for their respective regulatory document. Chapter 4, FFA Protocols and Implementation, will provide a more detailed description of the objectives/goals for each scoping effort identified on the figure. The following narrative provides a brief synopsis of each scoping step and the proposed timing of each scoping window.

All scoping should present an approach for developing and implementing data quality objectives (DQO) and the Streamlined Approach for Environmental Restoration (SAFER) at the Savannah River Site (SRS). These approaches build on guidance provided by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), and it incorporates experience gained from conducting environmental restoration activities at SRS and other DOE facilities. Overall, the SRS DQO and SAFER processes promote a comprehensive approach to scoping of RCRA/CERCLA activities.

Project scoping should include a thorough evaluation of historical data and preliminary remedial action objectives. The potential for early remedial action will be assessed, considering the extent to which we can:

Figure 3-2 Generalized Timeline for the SRS RCRA/CERCLA Process

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- identify the problem (CSM)
- identify possible early responses, including generic remedies and their objectives
- identification of uncertainties that would impact problem definition or remedy selection/implementation
- manage or reduce uncertainty

This project scoping process can support completion of a remedial action or a remedial investigation and feasibility study (RI/FS) based on existing data, or the process can be used to identify specific data needs and the corresponding action that will be taken to address that data need.

3.4.2.1 RFI/RI Work Plan Scoping

Work plan scoping is to be conducted 2 to 5 months prior to document submittal (Figure 3-2).

Scoping of the work plan includes a thorough review of historical data, development of a conceptual site model, identification of data needs, completion of unit-specific DQO worksheets to support work plan development (to include the required sampling and analysis strategy), identification of decision rules and uncertainty based on completion of the DQO worksheets, and implementation of innovative field techniques such as expedited site characterization (ESC) (see Section 3.4.2.2). In addition a site-specific strategy and the technical assumptions that will be utilized in the development of the Baseline Risk Assessment (BRA) will be proposed. Also a preliminary determination of the most likely final remedy(s) for the unit will be developed based upon existing information and, as appropriate the ASCAD (generic remedies) approach.

3.4.2.2 RFI/RI/BRA Report Scoping

RFI/RI/BRA scoping is to be conducted 5 to 9 months prior to document submittal (Figure 3-2).

Every effort should be made to conduct this scoping as soon as data becomes available and is reduced to depict conditions of the CSM. Characterization, and to a lesser extent risk assessment uncertainty analysis should be one of the primary focuses of this scoping session. Another would be the decision to place the unit on a path for an early and/or final remedial action or no action.

Limitations of this scoping will be determined by the data quality level available at the time of the scoping. For example, if screening level data or unvalidated data are the only data available at the time of scoping, then the extent of the scoping may be limited to nature and extent of contamination. Preliminary discussions concerning the risk assessment approach and potential remedial approach should be initiated but a subsequent scoping meeting will be necessary to converge on summary and conclusions.

3.4.2.3 Remedial Goal Option (RGO) Scoping

RGO scoping is to be conducted up to two months prior to the submittal date for the RFI/RI/BRA and no later than at document submittal (Figure 3-2).

The timing of the RGO scoping relative to submittal will determine whether or not revisions to a Rev. 0 RFI/RI/BRA Report will be possible based on the meeting's outcome. Therefore, the latest point on the RGO scoping window should be prior to the date for submission of the report. If it is identified that revisions to RGOs will not be able to be incorporated in the Rev.0 document, reviewers will be notified of this condition in the document transmittal letter.

Primary objectives of the RGO scoping will be to establish an appropriate set(s) of RGOs, present site-specific risk management assumptions/decisions, and identify the most appropriate RGOs for use in remedy selection (based upon site specific conditions).

- Further development is underway by the FFA Process Improvement Team and the section will be revised.

3.4.2.4 Corrective Measure Study/Feasibility Study (CMS/FS) Scoping

Scoping of remedial technologies and alternatives should be performed during the development of the Rev.1 RFI/RI/BRA Report when all parties are converging on the approval of this report (Figure 3-2).

Alternatives should focus on an appropriate set of remedial options given a number of considerations.

1. An appropriate agreed upon set of RGOs.
2. Potential interim response actions for principle threat source material and the bias for action principle which generally supports streamlining the RI/FS in support of defensible remedial actions given site-specific considerations (e.g., ASCAD)
3. Technical impracticability of remediating large volumes of minimally contaminated media.
4. Likely future land use.
5. Permanent remedies employing treatment vs. engineering/institutional controls.
6. FS screening criteria of effectiveness and implementability, with the modifying criterion of cost effectiveness.

In many cases, focused CMS/FSs would be developed limiting remedial alternatives to a few appropriate options. For example:

1. No action.
2. Institutional controls.
3. Engineering controls.
4. Offsite (i.e., off OU) removal/disposal.
5. Onsite or offsite treatment.

3.4.2.5 Statement of Basis/Proposed Plan Scoping

During development of the Rev. 1 CMS/FS, scoping of the Statement of Basis/Proposed Plan should be performed (Figure 3-2). At this point in time, all parties should be able to converge on the preferred alternative including any specific requirements for future monitoring, engineering controls, or institutional controls. If all parties can converge quickly at this phase of the RI/FS process, acceleration of the Record of Decision (ROD) and subsequent activities may be achievable. Early public involvement during development of the CMS/FS and Statement of Basis/Proposed Plan is a key in this streamlining process.

The three parties have entered into an agreement which assists them in developing and demonstrating new potential remedial technologies. A copy of the agreement is in Attachment 6.

3.4.2.6 Record of Decision (ROD) Scoping

Generally, scoping of the ROD will not be necessary. Much of the information provided in these documents will have already been presented in previous submittals and, if adequate document templates exist, changes to Revision.0 documents should be minimal.

3.4.2.7 Post ROD Document Scoping

Under development

3.4.3 *Streamlining Methods to be Employed*

- Streamlining strategies include any efforts to increase the efficiency and decrease the time and cost required to reach a remedial decision and complete restoration. Streamlining strategies used at SRS may include the use of, early response actions, and the strategies summarized below. Generic remedy strategies (i.e., presumptive remedies and Approved Standardized Corrective Action Design) may also be used for the cleanup of common categories of units pending their development and approval by the Parties and acceptance from affected Stakeholders.

3.4.3.1 Generic Remedies

- Presumptive remedies developed by the EPA may be applied, as appropriate (EPA, 1993).
- Approved Standardized Corrective Action Design™ (ASCAD™). A methodology which groups waste units with similar waste types together and applies a similar remedy for all the units. ASCAD™ helps streamline the characterization, selection and design of remedies, and cost of remediation.

3.4.3.2 Expedited Site Characterization (ESC)

ESC is best described as a flexible and real-time interpretation of the waste unit investigation conducted during a field mobilization event of which the primary focus is to minimize uncertainty associated with the CSM as developed utilizing DQO principles. ESC in conjunction with principles of SAFER emphasizes the importance of data quantity/quality relationships in refinement of the CSM, as necessary to support selection of early and/or final remedial actions currently under consideration.

ESC gathers, evaluates, and integrates all available site information/data; culminating in a short term (daily preferred) powerful decision making tool based on expert analysis of the dynamic site model. ESC promotes in-field data analysis and validation. This necessitates characterization to be conducted under a flexible, dynamic work plan with the participation of appropriate stakeholders during field activities. Real-time decisions will be made for subsequent characterization activities based upon preceding results.

During the establishment of DQOs for ESC application at a Hazardous Waste Management Unit (HWMU) a number of criteria, if met, facilitates ESC implementation. Failing to meet each of these criteria by no means eliminates ESC application; however, its utility may be minimized. ESC application criteria are as follows:

1. *Common and limited number of unit specific contaminants (USC).* A small number of constituents (or a site with a high CSM certainty that a limited set of predominant constituents are present) to analyze requires less equipment and operating staff. Common methodologies are less expensive and easier to perform.

2. *Remote.* Unimpeded mobilization will allow for a thorough investigation as dictated by accumulated and interpreted data. Minimal operational and/or other interference will allow logistics to be unaffected.
3. *Limited vadose zone/shallow water table.* Shallow water table conditions allows for a variety of simple, inexpensive sampling techniques for entire vadose zone as well as groundwater.
4. *Radiological indicator parameters adequate for characterization.* Radiological speciation methodologies are complex and time consuming. Equipment needs and maintenance becomes prohibitive.
5. *Schedule.* Implementation of ESC must begin prior to work plan submittal. An initial Phase (I) of intrusive characterization is required to determine and establish USC and determine ESC field needs. A limited number of samples, with comprehensive analytical suites, using traditional laboratory capabilities are needed from the primary source area as well as background. This interpreted data will be utilized to scope DQO for the subsequent ESC Phase (II) of intrusive characterization. Data from ASCAD lead sites may replace the Phase I characterization of subsequent ESC efforts confirming the lead site's data with respect to the secondary ASCAD units. High USC certainty for some units (e.g., based on detailed operational records, historical data, etc.) may also be used in lieu of Phase I ESC data.

3.4.3.3 Streamlined Approach for Environmental Restoration (SAFER)

SRS has worked closely with EPA to develop SAFER and to set up pilot projects that will implement and evaluate the SAFER process. The DOE SAFER process combines two major initiatives to plan and conduct environmental restoration more effectively: (1) the Data Quality Objective (DQO) process and (2) the Observational Approach. Using this combination, SAFER aims to increase focus on planning and scoping, link data collection directly to decision making needs, openly recognize and manage uncertainty and converge early on a remedy.

3.4.3.4 Soil Consolidation

The consolidation of contaminated soils from SRS ER waste units may represent a viable alternative for the disposition of various types of waste generated during environmental restoration activities. SRS is evaluating the possibility of constructing a central facility in which to consolidate contaminated soils from waste units. This could facilitate implementation of a statutorily preferred permanent remedy for some source units thus reducing the footprint of contaminated areas at SRS and the cost associated with long-term maintenance of a number of contaminated areas.

3.4.3.5 Technology Development

It is an SRS initiative to press forward in the effort to develop and identify innovative and new technologies for treating the more difficult waste streams at SRS. SRS will participate in the new DOE-HQ initiative designed to review treatment technologies complex-wide. This initiative involves Site-by-Site roundtable evaluations of waste streams and treatment issues to identify common problems and identify commonalities in solutions.

SRS will pursue cooperative studies and testing programs with remediation vendors, universities and EPA in developing new technologies. Strategies under consideration and development include participation in the EPA SITE program and the development of an onsite field test and proving facility for hazardous substances.

3.5 Land Use Considerations in the Remediation Process

3.5.1 Overview

Remedial determinations under the FFA must meet the threshold criteria for the overall protection of human health and the environment [40 CFR 300.430(f)(1)(i)(A)] and compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Current use and potential future land use considerations in the remediation process will be made in accordance with the NCP. Land use considerations for making remedial determinations at SRS include the following:

- Current land use or uses of the RCRA/CERCLA unit and surrounding area
- Human activities and activity patterns associated with each land use(s) for the unit
- Potential future changes in land use activities or land use (e.g., agricultural, residential, recreational, commercial, industrial, etc.)
- Potentially exposed populations and "sensitive" subpopulations
- Current local uses of groundwater and potential future uses
- Current local uses of surface water systems and potential future uses
- Any potentially affected, endangered, or threatened plant or animal species known to occur in the vicinity of the RCRA/CERCLA unit

SRS personnel in conjunction with EPA and SCDHEC establish unit-specific objectives for corrective actions. These objectives are based on human health and environmental information gathered during the RFI/RI, using EPA guidance (e.g., *Risk Assessment Guidance for Superfund (Volume I): Human Health Evaluation Manual (Part A)*, EPA/540/1-89/002, December 1989 and *Risk Assessment Guidance for Superfund (Volume II): Environmental Evaluation Manual*, EPA, 1989), and the requirements of any applicable Federal and state statutes.

3.5.2 DOE's Future Use Initiative

The DOE issued a Land and Facility Use Policy (DOE, 1994) in December 1994. The policy is intended to ensure that all DOE land will be managed as valuable national resources, using the principles of ecosystem management and sustainable development. Based on mission, ecological, social, and cultural factors, a comprehensive plan has been written which will be developed with Stakeholder participation. The land use policy will result in land and facility uses which support DOE's missions, stimulate the economy, and protect the environment.

DOE-SR has developed a future use report entitled *Savannah River Site Future Use Project Report, Stakeholder Recommendations for SRS Land and Facilities*, (DOE, 1996) U.S. DOE-SR Operations Office, January 1996. This report contains interested internal and external Stakeholders' preferred use recommendations. The Proposed National Environmental Research Park Map, shown on page 16 of this report and in Figure 3-3 of the FIP is the SRS Future Use Map.

The recommendations in the report are as follows:

Figure 3-3. Proposed SRS Future Land Use Map

- *SRS boundaries should remain unchanged, and the land should remain under the ownership of the federal government, consistent with the Site's designation as the first National Environmental Research Park.*
- *Residential uses of SRS land should be prohibited.*
- *If DOE or the federal government should ever decide to sell any of the SRS land, then DOE shall seek legislation to permit former landowners (as of 1950-52) and/or their descendants to have the first option to buy back the land they once owned.*
- *All SRS land should be available for multiple use, except for residential use, (e.g., industry, ecological research, natural resource management, research and technology demonstration, recreation, and public education) wherever appropriate and non-conflicting.*
- *Some of the land should continue to be available for nuclear and non-nuclear industrial uses, and commercial industrialization should be pursued.*
- *Industrial and environmental research and technology development and transfer should be expanded.*
- *Natural resource management should be pursued wherever possible with biodiversity being the primary goal.*
- *Recreational opportunities should be increased as appropriate.*
- *Future use planning should consider the full range of worker, public, and environmental risks, benefits, and costs associated with remediation.*

The report recommendations are a reflection of the desires of the great majority of the approximately 350 Stakeholders who participated in the two-year process. The report contains all of the options and opinions received. The report recommendations are derived from common themes that emerged during the process.

The ER program will use the recommendations outlined in the DOE Land and Facility Use Policy (DOE, 1994) and the CAB Recommendation Number 2 to support selecting and evaluating remedial alternatives during the RI/FS process.

The guidelines in Recommendation Number 2 are as follows:

The CAB recommends that industrial and residential use alternatives be used for CERCLA clean up decisions based on the following guidelines:

1. Residential and industrial use alternatives should be evaluated in the Baseline Risk Assessment.

Preliminary remedial action alternatives should be identified for both residential and industrial use in the initial Feasibility Study screening process.
2. Stakeholder involvement in the CERCLA decision making process should be sought early in the Feasibility Study process (i.e., after initial screening process).

3. Selection of residential and industrial use remediation criteria as a basis for detailed analysis in the Feasibility Study should be based on the results of the initial screening process and proximity of the waste unit to existing industrial areas.
 - (a) if the waste unit is within a current industrial area, industrial use criteria will be evaluated in the detailed Feasibility Study. Residential use criteria may also be considered, if it appears that application of residential use criteria is practical or in response to public comment.
 - (b) if the waste unit is not within a current industrial area, the scope of the Feasibility Study should generally address both residential and industrial use remediation criteria.
5. The application of this approach should undergo periodic independent technical review with results documented, made available to the public, and presented to the CAB for possible use in future recommendations.
6. Program schedules for Remedial Investigation/Feasibility Studies (RI/FS), and remedial actions included in the Federal Facility Agreement should not be impacted by the approach described in this recommendation.

The Environmental Protection Agency recently reiterated the importance of land use in risk assessment and remedy selection with its 1995 Land Use Guidance (OSWER Directive No. 9355.7-04, *Land Use in the CERCLA Remedy Selection Process*). This guidance emphasizes the need to consult with citizens from affected communities to make reasonable assumptions about how land will be used in the future. Consistent with the CAB Recommendation Number 2, the remedy selection process will consider plausible future land uses, in a manner consistent with the Section 3.3 of the FIP. Generally, the preferred alternative presented in a proposed plan for public review will be based on achieving remedial action objectives consistent with the expected future land use (See Figure 3-3), unless the risk management decision demonstrates the basis for a remedy that is consistent with an alternate future land use.

3.6 Program Support Initiatives

3.6.1 Pollution Prevention/Waste Minimization

An important adjunct to the SRS environmental restoration strategy is the pollution prevention/waste minimization strategy. This strategy and its implementing initiatives is designed to ensure that the inventory of hazardous substances at the SRS is maintained at as low a level as can be achieved without jeopardizing mission objectives. DOE-SR objective is to reduce and minimize the generation of new hazardous waste streams, while the remediation of waste units progresses. SRS has the goal to minimize the generation of all types of waste (non-hazardous, hazardous, radioactive and mixed).

In order to integrate pollution prevention/waste minimization (PP/WMin) into the SRS Environmental Restoration Program, the following strategies are being implemented: integrate pollution prevention into all waste generating activities; comply with DOE Order 5820.2A, the Waste Minimization and Pollution Prevention Plan, and all applicable site documentation; ensure that appropriate individuals are trained to identify waste minimization and pollution prevention opportunities; review all procedures and work plans for PP/WMin practices prior to approval; implement plans and programs which ensure investigation-derived waste is managed and minimized wherever possible; complete Pollution Prevention Opportunity Assessments (PPOA) on all major waste generating activities which includes waste unit investigations and remedial projects; prepare and submit required PP/WMin documentation which includes PP/WMin Plans, Pollution

Prevention Activity Forms, and Quarterly Reports; recycle/Reuse equipment, materials, and supplies whenever possible and ensure that information regarding PP/WMin activities is shared throughout the Site and the DOE Complex.

Initiatives to support these efforts are: continue Investigation Derived Waste (IDW) waste minimization initiatives which include well minimization, purge water management system, resonance testing, dialysis sampling; and implementing PPOAs.

3.6.2 Community Relations

Section 117 of CERCLA and R.61-79.124 of the South Carolina Hazardous Waste management regulations, and Section XXXV of the FFA outlines public participation requirements. To meet these requirements, and those of the Superfund Community Relations Policy Memorandum of 1983 and the Community Relations in Superfund: A Handbook (EPA, 1992), SRS has developed the *SRS Public Involvement Plan* (DOE, 1994) and is currently developing a Community Relations Plan for ER activities.

To provide the public an alternate opportunity to review and offer input to SRS remedial activities, the following strategies were initiated:

- An SRS CAB was formed by DOE and is chartered under the Federal Advisory Committee Act.
- SRS provides quarterly public information meetings.
- It is SRS's intent to begin public input early in the remedial process.
- Continuing to improve their public relations activities: examples of activities are tracking of information requests, the creation of a database which tracks public feedback, FS scoping and sharing of strategic planning with the public.

3.6.3 Budget and Funding

It is assumed for purposes of the Environmental Restoration Strategy, that funding will be available to conduct restoration activities and meet regulatory commitments. If funding levels deviate from projections, and DOE has demonstrated due diligence in seeking the needed funds, the impact to the strategy may result in delaying characterization/remediation of lower priority waste units.

Budget and funding uncertainties will also be addressed through the mutual discussion and decision-making processes with the EPA, SCDHEC and the Stakeholders, as provided for in the FFA.

3.6.4 Prioritization of ER Activities

SRS has committed in the FFA to prioritize restoration activities by employing the Preliminary Ranking Evaluation Score (PREscore) computer program which is based on U.S. EPA's Hazard Ranking System (HRS). The PREscore process is currently being used to prioritize restoration activities for the waste units identified in Appendix C of the FFA, and will continue to be used for that purpose. Generally, implementation of remedial action will be prioritized over assessment activities. However, to ensure that information for selecting and implementing remedial actions is available, a baseline level of assessment activities will continue.

SRS has committed to allocate 75% of the FY 97 Environmental Restoration Division budget to remediation, and to have begun remediation in FY 97 of evaluated waste unit that constitute 80% of the risk.

4.0 PROTOCOLS

The following subsections include protocols the Parties have established to implement the requirements of the FFA.

4.1 Site Evaluations

Title 40 CFR 300.410 and 300.420 of the NCP require that Removal SEs and Remedial SEs be conducted, respectively. The Site Evaluation Program at SRS was formalized in 1993 consistent with EPA and SCDHEC guidance.

As outlined in Section 6.0 of the SRS NCP Implementation Program Guide, if a Removal SE indicates that a Removal Action (RA) is needed, a request to amend Appendix G of the FFA will be made to include the area. If the RA completely addresses the contamination, the area should be added to appendix G.2 of the FFA so that a record of all No Further Action (NFA) decisions is maintained in the FFA. If the RA does not completely address the contamination, the area should be listed on G.1 so that it can undergo a Remedial SE or it can be added directly to Appendix C if the level of contamination remaining in the area warrants an RFI/RI. Section X of the FFA outlines the Site Evaluation Process for SRS, which is further detailed below in Section 4.2.3. Appendix G.1 of the FFA lists all areas requiring evaluation in accordance with the terms of Section X of the FFA. Appendix G.2 lists those areas for which the evaluation under Section X of the FFA concluded that no further response action was appropriate.

SRS will submit Site Evaluation Reports in accordance with Appendix D. Areas from Appendix G.1 or newly discovered areas, will be proposed by SRS for evaluation during the current quarter. The EPA and SCDHEC have 5 days to review the proposed list and make recommended changes.

The review and revision of SE Reports is as follows:

- The DOE shall submit to EPA and SCDHEC Remedial Site Evaluation Reports based on such evaluations, and recommend the need for further response actions. The EPA and SCDHEC shall review and comment on the Remedial Site Evaluation Report in accordance with Section XXII (Review/Comment on Documents).
- If DOE's recommendation is accepted, then EPA and SCDHEC will concur by written response. Failure of the EPA to provide written concurrence by the close of the review/comment period or prior to DOE's receipt of SCDHEC concurrence, whichever comes later, shall be deemed agreement with the SCDHEC concurrence.
- If the EPA and SCDHEC provide comments on the Remedial Site Evaluation Report, those comments shall be provided in accordance with Section XXII (Review/Comment on Documents). In the event that EPA declines to provide comments on a Remedial Site Evaluation Report, EPA agrees to notify the Parties in writing prior to the close of the review/comment period. Failure of EPA to provide written notification or to provide comments by the close of the review/comment period shall be deemed to constitute EPA's declination to comment.
- DOE shall respond to those comments received on a Remedial Site Evaluation Report in accordance with Section XXII (Review/Comment on Documents). The final disposition of the

Remedial Site Evaluation Report requires that concurrence of only those parties, EPA and/or SCDHEC, that provided comments.

- If the DPA and SCDHEC determine that further response action is necessary for an area, then the DOE agrees, subject to the dispute resolution procedures in Section XXVII (Resolution of Disputes), to amend Appendix C to this Agreement to include such areas and to conduct additional work at such areas under the terms of this Agreement. If the three Parties concur on a recommendation of no further response action for a Remedial Site Evaluation Report or a Removal Site Evaluation Report, the DOE agrees to amend Appendix G.2 of this Agreement to include such area. To the extent practicable, the DOE may combine the notices and SEs required by this Section of the Agreement with the information required by Part II.B of the SRS Federal RCRA permit.

4.1.1 Newly Discovered Areas

Note: Spill response versus removal/remedial action protocol to be developed.

When an area is discovered that is not listed on Appendix G.1 of the FFA and has a potential for or has a known release of a hazardous substance which cannot be addressed as spill response, SRS will provide written notice to EPA and SCDHEC in accordance with Section 300.405 of the NCP and Section X of the FFA.

SRS will submit a Removal SE Report to the EPA and SCDHEC, consistent with Section XIV of the FFA, and then conduct a removal action in accordance with 40 CFR 300.410, if needed. The submittal of the Removal SE Report will satisfy the commitment for the submittal of a SE Report established pursuant to Section XX of the FFA. Submittal of a Removal SE shall not serve as a substitute for a specified SE Report, previously identified as one of the reports to be submitted, without previous concurrence from SCDHEC. The Removal SE Report also satisfies the criteria for an Action Memorandum. A removal action may be conducted based upon the findings of the Removal SE Report. If the Removal SE indicates that a remedial action under Section 300.430 of the NCP may be necessary for the area, SRS may recommend inclusion of the unit on Appendix C, or recommend inclusion on Appendix G.1 for a remedial site evaluation. SRS will also make the notifications required in Section X of the FFA and 40 CFR 300.405. If the Parties agree on a recommendation of no further response action for a Removal SE Report, SRS will amend Appendix G.2 to include the area.

In accordance with Section XIV of the FFA, EPA and SCDHEC shall respond with any comments and/or objections within 30 days of receipt of the Removal Site Evaluation Report. All additional requirements will be met, as outlined in the NCP, for each type of removal action.

4.1.2 Additions to Appendix G

To amend Appendix G.1, SRS will notify EPA and SCDHEC by letter that an area is to be added. Upon receipt of the EPA and SCDHEC concurrence, the SRS will include the area on the next revision of Appendix G.1 in accordance with Section X of the FFA.

4.1.3 Prioritization of Site Evaluation Areas

SE Areas are prioritized based on the type/amount of information that is currently known about the area, any known or potential releases, and how the area relates to other ongoing remedial activities. The following factors (in no particular order) are considered during the SE Prioritization Process. The SE Prioritization Process is portrayed in Figure 4-1.

- type of area
- location, as it pertains to adjacent facilities
- location, as it pertains to other waste units

- location of monitoring wells, National Pollutant Discharge Elimination System outfalls
- past history, if known
- Units scheduled for demolition
- Units scheduled for re-use
- Units that have previously undergone clean-up under another program
- Units located in operating areas
- Likelihood of release
- Existing data, if any, including files, databases, interviews with knowledgeable personnel
- The amount and quality of data
- Sampling requirements
- Availability of resources and equipment to conduct necessary sampling

Units are further delineated by assigning a number (1-6) which indicates where in the prioritization process a particular SE Area falls. This scale is defined as:

1. Information indicates potential presence of contaminants of concern, but there is not enough information to recommend a path forward.
2. Initial results, based on existing information, indicate a potentially serious hazard or potential for uncontrolled migration of hazardous substances.
3. Current information is not adequate to recommend a path forward. Previous sampling has been performed but results did not indicate a potentially serious hazard or potential for uncontrolled migration of hazardous substances.
4. Adequate information exists to recommend a path forward and no sampling is required.
5. There is no concern over potential contaminants and the completion of the SE Report supports other on-site activities.
6. There is no concern over potential contaminants and the completion of the SE Report does not support other on-site activities.

This prioritization is based on existing information only and is not a risk based ranking, Adequate information does not exist to rank these areas based on risk, which is why they are listed on Appendix G so that type of information can be gathered.

4.1.4 Site Evaluation Implementation and Reporting

For those areas listed in Appendix G.1, SRS will conduct a site evaluation in accordance with 40 CFR 300.420. The Remedial SE Report format is included in Attachment 2. The Site Evaluation Process is shown in Figure 4-2.

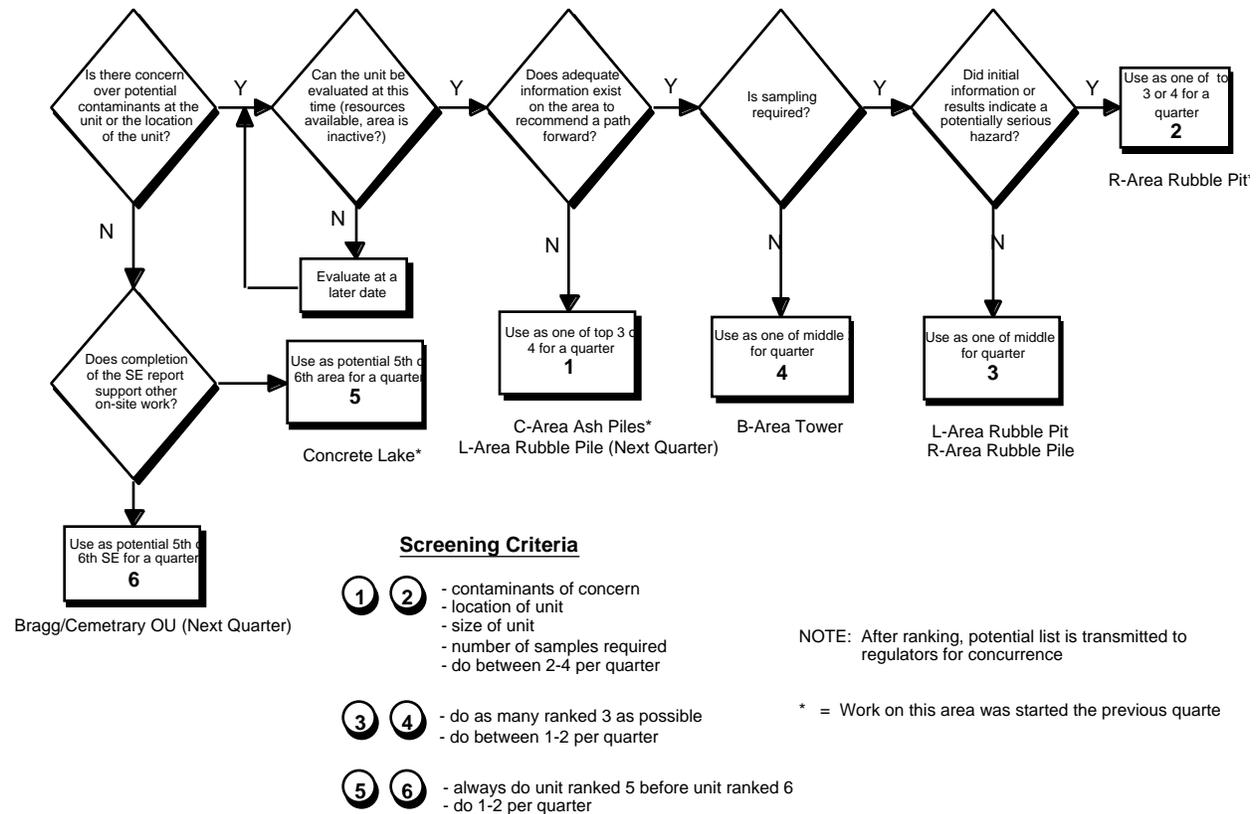


Figure 4-1. Prioritization of Site Evaluation Areas

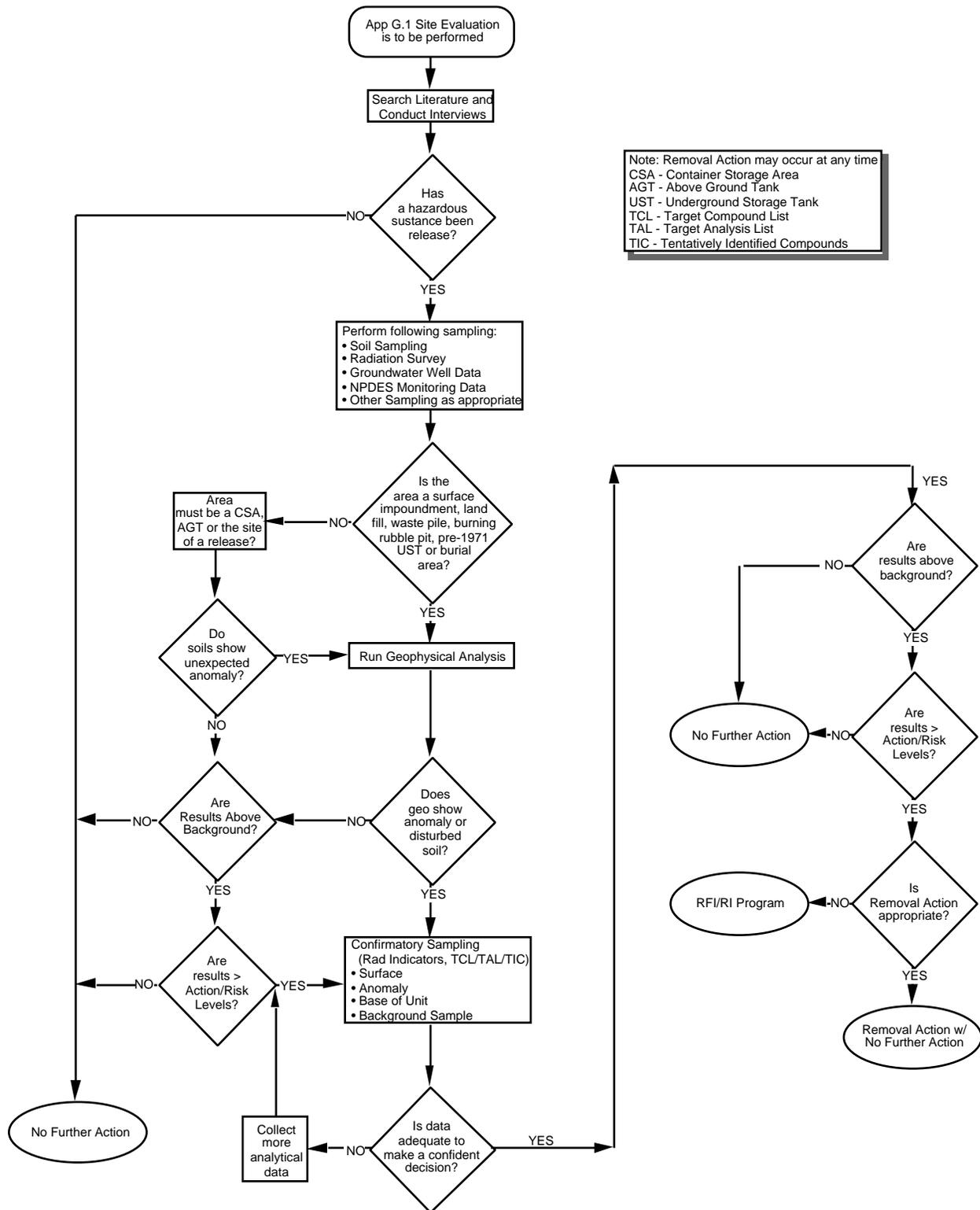


Figure 4-2. Site Evaluation Process

The SE Program at SRS was formalized in 1993 consistent with EPA and SCDHEC guidance. This SE process includes a records search, an area visit, classification of the area, area screening, review of the data collected, and determination of area disposition based on the information collected. The record search should include previously published reports and other available documents and should focus on the receipt of hazardous substances or radioactive materials at the SE Area. Areas will be classified into one of two groups.

Group 1 includes surface impoundments, landfills, waste piles, burning rubble pits, pre-1971 underground storage tanks (USTs), and burial areas. Group 2 includes container storage areas (CSAs) and above-ground tanks (AGTs). Containers or tanks that were placed in a berm or otherwise covered will be considered to be buried and fall into Group 1. Area screening will depend on the classification of the area. The basic types of area screening procedures are listed below:

1. Soil Sampling
2. Radiation Survey
3. Groundwater Well Data
4. NPDES Monitoring Data
5. Geophysical Surveys
6. Other Sampling as Appropriate

In general, screening procedures 1-6 (above) will be applied to Group 1 areas, and screening procedures 1-4 and 6 (above) will be applied to Group 2 areas. Additional sampling will be conducted as warranted by preliminary sampling results or area conditions. Sample location or survey maps will be included in the SE Report indicating area boundaries, reference points, background sample location(s) and any other information pertinent to identifying the sample locations on the area. If radiation surveys do not indicate any measurements above background, only the survey map, stating the readings were below background, will be included in the SE Report, with the radiation survey referenced and the results stated in the text of the report. If laboratory QA/AC is within analytical control limits and within all pertinent sampling and laboratory guidelines, it should be so stated in the narrative and only the pertinent sample results will be tabulated and included in an appendix in the SE Report. Data that is determined to be outside of normal QA/QC limits may be considered usable data, with justification provided in the report.

Area screening will result in one of four scenarios:

- Area screening geophysical survey detects an anomaly in the subsurface environment. Samples will be collected from the surface, within, and at the base of any geophysical anomaly detected.
- Area screening results indicate that the concentration of contaminants are above maximum contaminant level goals (MCLGs), maximum contaminant levels (MCLs), health based standards, risk based concentrations (EPA Region III list which will be updated periodically), or other state or Federal limits or guidelines (collectively referred to as "action levels"). The recommended disposition of these areas will be initiation of a Removal Action or inclusion of the area on Appendix C of the FFA for a RFI/RI.
- Area screening results indicate that the concentration of contaminants are at or below background levels. The recommended disposition of these areas will be No Further Action.
- Area screening results indicate that the concentration of contaminants are above background levels and below action levels (RBCs). The recommendation will in most cases be no action.

Confirmatory sampling will be conducted as necessary to confirm or deny the presence of contaminants and to better quantify contaminant concentrations. Confirmatory samples should be analyzed for the Target Compound List (TCL), Target Analyte List (TAL), Tentatively Identified Compounds (TIC), and radiation indicators. Specific radionuclides may be analyzed at each area if radionuclide indicators are elevated, as appropriate.

Confirmatory sampling will also include at least one background or control sample which will be collected from an upgradient location outside of the suspected area of concern. At the conclusion of the confirmatory sampling one of three situations will exist:

- Confirmatory results indicate that the concentration of contaminants are at or below background levels and a no action recommendation is made.
- Confirmatory results indicate that the concentration of contaminants are above action levels and a recommendation to add the area to Appendix C is made.
- Confirmatory results indicate that the concentrations of contaminants are above background levels and below action levels and best professional judgment is used to make a recommendation for disposition of the area. In most cases, if the levels are below action levels, there is no risk to human health or the environment; therefore, no current action is warranted.

All rubble/trash will be removed and properly disposed in accordance with current South Carolina Solid Waste Regulations. When sufficient information is obtained to support rubble removal, an approval for the removal will be issued from SCDHEC.

In accordance with the requirements of the NCP and the FFA, SRS may initiate a removal action at any time during the SE process to eliminate, control or mitigate an imminent threat to the public health or the environment due to a release or threatened release of a hazardous substance.

Sampling techniques and sample analysis will be based on the area history, types of material known or suspected to have existed at the area, and soil type. Overall, many areas evaluated under the site evaluation process may not require further investigation. If the area is recommended for placement on Appendix C, the site evaluation process will provide information needed for scoping future investigations, resulting in a more effective, streamlined, and less costly remedial investigation.

4.1.5 Site Evaluation Determinations

SRS will submit a Remedial SE Report to EPA and SCDHEC for the area that summarizes the investigation and conclusions in accordance with 40 CFR 300.420. The following conclusions might be recommended:

- Perform a removal action with the area remaining on Appendix G.1
- Further investigation is required and the area is removed from Appendix G.1 and included on Appendix C
- No further action (NFA) with the area deleted from Appendix G.1 and added to Appendix G.2 [however, the area may have been placed in another SRS regulatory program, another SRS program, or required housekeeping cleanup before the NFA statement]

If NFA is recommended (or housekeeping and NFA), then the following statement is required:

"In accordance with Section 300.420(b)(1)(i) of the NCP, this area poses no threat to human health and the environment and no further action is appropriate. It is recommended that this area be removed from Appendix G.1, Site Evaluation List, of the SRS FFA and added to Appendix G.2, Sites Evaluated Under the SRS FFA and Require No Further Action."

4.2 Early Response Actions: Removal Actions And Remedial Actions

4.2.1 Removal Actions

The purpose for a removal action is to take immediate or near immediate short term actions to address a spill/release or a threat of release that may pose a threat to human health, welfare, or the environment. If a release cannot be addressed as a spill, then SRS may conduct a Removal SE. SRS will notify EPA and SCDHEC in accordance with Sections X and XIV in the FFA. If the Removal SE Report indicates that a removal action under 40 CFR 300.415 is necessary, a removal action will be initiated. Removal actions at SRS will be performed in accordance with 40 CFR 300.415 and Section XIV of the FFA. The Removal Action Program at SRS is detailed in Section 6.2 of the *SRS NCP Implementation Program Guide* (WSRC, 1994). The criteria for removal actions are shown in Table 4-1.

Removal SE Reports shall include the history of the release, a description of the factors considered in determining the appropriateness of the removal action consistent with 40 CFR 300.415(b)(2), and proposed technical specifications. The Removal SE Report shall identify whether a planning period of at least six months exists before on-site activities must be initiated. The planning period shall commence upon receipt of notification by EPA and SCDHEC that they concur with the recommended Removal Action. Removal SE Reports are Secondary Documents, in accordance with Section XXII.D of the FFA.

Removal actions shall fall into one of three categories, as outlined in the 40 CFR 300.415, SRS NCP Implementation Program Guide, and Section XIV of the FFA.

- Emergency
 - Imminent and substantial endangerment to human health or the environment
 - Immediate action necessary
 - Regulatory notification of situation, written notification submitted within 5 business days
 - Removal Action Report documenting action taken
 - Regulatory and public comment periods after action has been taken
- Time Critical
 - Regulatory notification of situation within 15 working days of discovery
 - Action must be initiated within 6 months of regulatory notification
 - Action can be completed within one year of initiation
 - Submittal of Removal SE Report for 30 day regulatory review/comment period prior to initiation of action
 - 30 day public comment period required within 60 days of initiation of action

Table 4-1. Removal and Remedial Action Criteria

	Triggers for Action	Documentation	CR Requirements	Example
Emergency Removal Action	<ul style="list-style-type: none"> Actual or threat of endangerment of human health or the environment 	<ul style="list-style-type: none"> Notice to EPA and SCDHEC Annual Removal Action Report within one year of completion 	<ul style="list-style-type: none"> Designate spokesperson Notice of availability of ARF within 60 days of starting action CRP in on-site activities greater than 120 days Public comment period of not less than 30 days 	<ul style="list-style-type: none"> Removal of highly radioactive substance released to soil near site workers
Time Critical Removal Action	<ul style="list-style-type: none"> Meets one or more removal criteria Action must begin within 6 months to protect human health and the environment 	<ul style="list-style-type: none"> Removal Site Evaluation Annual Removal Action Report within one year of removal completion 	<ul style="list-style-type: none"> Designate spokesperson Notice of availability of ARF within 60 days of starting action CRP in on-site activities greater than 120 days Public comment period of not less than 30 days Responsiveness Summary 	<ul style="list-style-type: none"> Removal of corroded drums of waste Removal of plating shop waste Removal of free product from groundwater Capping contaminated surface soil
Non-Time Critical Removal Action	<ul style="list-style-type: none"> Meets one or more of the removal criteria Planning period of 6 months or more is available without further threats to human health or the environment Early remedial actions are less desirable 	<ul style="list-style-type: none"> Removal Site Evaluation EE/CA approval Memorandum EE/CA Annual Removal Action Report within one year of removal completion 	<ul style="list-style-type: none"> Designate spokesperson Notice of availability of ARF by the time EE/CA is complete Prepare CRP prior to EE/CA completion Public comment period of not less than 30 days Responsiveness Summary 	<ul style="list-style-type: none"> Removal and on-site treatment of contaminated surface soils/sediments Removal of buried drums and treatment of contents.

Table 4-1. (continued) Removal and Remedial Action Criteria

	Triggers for Action	Documentation	CR Requirements	Example
Interim Remedial Action	<ul style="list-style-type: none"> • Qualitative and/or quantitative assessment of risk indicates action is necessary • Exceedence of health based ARAR or action level (PRG/RBC) • Environmental damage or potential for damage • Interim remedial action objectives can be established for site subject to RI/FS plan 	<ul style="list-style-type: none"> • Site assessment data • FFS or Proposed Plan that evaluates alternatives • Qualitative risk assessment (can be in IAPP) • Interim Action proposed Plan (IAPP) • Interim ROD 	<ul style="list-style-type: none"> • CRP • Notice of availability of ARF prior to public comment period • Public comment period of not less than 30 days • Responsiveness Summary in ROD 	<ul style="list-style-type: none"> • Alternative water supply • Groundwater plume controls • Temporary protective covers
Early Final	<ul style="list-style-type: none"> • Remedial alternative limited and obvious (including presumptive remedies) • Final remedial action objectives can be established for portion of site subject to RI/FS plan and RI/FS documentation commensurate to scope and complexity of that portion of the site is complete 	<ul style="list-style-type: none"> • RFI/RI Report • CMS/FS • Statement of Basis/Proposed Plan • ROD <p>Note: the above documentation is focused to the scope/complexity of the action and can be streamlined by using presumptive or generic remedies</p>	<ul style="list-style-type: none"> • Designate spokesperson • Notice of availability of ARF by the time FFS or PP is complete • Public comment period of not less than 30 days • Responsiveness Summary in ROD 	<ul style="list-style-type: none"> • Excavation and treatment of drums, soils and backfill • Capping of landfill • Source remediation

Table 4-1. (continued) Removal and Remedial Action Criteria

	Triggers for Action	Documentation	CR Requirements	Example
Final Remedial Action	<ul style="list-style-type: none"> • BRA indicates unacceptable risk or • Exceedance of ARAR(s) • Final remedial action objectives can be established for entire site subject to RI/FS plan 	<ul style="list-style-type: none"> • RI • FS • Proposed Plan • ROD <p>Note: the above documentation is focused to scope/ complexity of the portion of site being addressed</p>	<ul style="list-style-type: none"> • CRP • ARF established and available when RI starts • Public comment period of not less than 30 days • Responsiveness Summary in ROD • Fact Sheets available throughout project 	<ul style="list-style-type: none"> • Capping landfill with leachate treatment system • Groundwater extraction and treatment • Contaminated media treatment and disposal of residuals

- Non-Time Critical
 - Regulatory notification of situation within 15 working days of discovery
 - A planning period of at least 6 months exists before action must be initiated
 - Requires generation of an Engineering Evaluation/Cost Analysis (EE/CA)
 - 30 day public comment period required prior to commencement of field activities
 - Submittal of Removal SE Report for 30 day regulatory review/comment period prior to initiation of action

A Removal Action Report will be generated for each removal action, documenting a summary of events, effectiveness of the removal action, any difficulties encountered, remedial action recommendations, any sampling and characterization data generated, quantity of contaminated material generated, and treatment, storage or disposal location of contaminated material. Removal Action Reports will be submitted to the WSRC-OSC for inclusion in the Annual Removal Action Report which is submitted to EPA and SCDHEC on or before January 1 of each year, in accordance with the FFA. This report will meet the requirements of 40 CFR 300.165.

4.2.2 *Criteria for Interim Actions*

Interim actions are used at SRS as a streamlining strategy to accomplish prompt risk reduction and/or stabilization of a source and/or its releases through early action. An interim remedial action is generally intended to address a threat in the short term, while a permanent remedial solution is being developed. An early interim remedial action can be taken during scoping or at other points during the RI/FS and CMS/FS process. Less documentation is required for the ROD for an interim RA than for a ROD covering a final RA; however, adequate documentation must be provided to justify the action and should be tailored to the limited scope and purpose of the interim action. Focused feasibility studies will be conducted, when necessary, to provide for an adequate engineering evaluation of the interim remedial alternatives. Interim remedial action objectives will not be inconsistent with nor preclude implementation of an expected final remedy.

The criteria for remedial actions are shown in Table 4-1.

4.2.3 *Integrating Early Response Action Documentation with Appendices D and E*

As early remedial actions are identified, the projected deadlines for the appropriate documentation and milestones (e.g., Interim Action Statement of Basis/Proposed Plans, interim RODs, Removal Action reports and field start dates) will be added to Appendices D and E by agreement of the Parties.

4.3 Operable Units (OU)

OUs at SRS will generally address geographical portions of the Site (i.e., an OU is a geographical location or area). Consistent with the "Bias for Action" principles and streamlining initiatives discussed in this plan, early response actions at operable units will be planned as appropriate. When a response action for either the source unit or specific media is found to be appropriate, a Statement of Basis/Proposed Plan for the action will be prepared, while continuing the investigation for the other media. These response actions prior to the completion of the RCRA/CERCLA process for the operable unit will be considered early actions.

Early action, whether an interim or final action, will be initiated to minimize overall site risk, to decrease the potential for continuing releases, or to slow movement of a contaminated groundwater

plume. The distinction between interim or final is made by determining whether any additional action is required for that media after the action is complete and whether the remedial action objectives are interim or final. For example, a final remedial action for a source unit may entail final remedial action objectives that include long-term engineering controls to minimize exposure and migration (e.g., design of a permanent cover system). Alternatively, an interim remedial action for a source unit may entail interim remedial action objectives that include a short term stabilization controls to prevent wind dispersion of source material (e.g., design of a temporary cover) while the RI/FS is allowed to continue for consideration of establishing final remedial action objectives. The decision to have separate final and/or interim remedial actions for a single waste unit subject to an RFI/RI Work Plan will be documented in the appropriate primary document for the relevant early response action (e.g., Statement of Basis/Proposed Plan for an interim action, RI Report for an early final action). Proposed schedules and a description of the proposed additional work to be performed, not a detailed plan, will also be incorporated, in accordance with the Additional Work provisions of the FFA.

The general objective of the RFI/RI Work Plan is to establish the necessary scope of work and schedule to achieve a final action for the respective FFA Appendix C Operable Unit (i.e., source and impacted media from source releases) addressed in the plan. Throughout the course of the RI/FS, early actions will be considered and implemented as soon as unit data warrant. This will incorporate a phased approach to mitigating potential risks from portions of the operable unit without creating new operable units.

4.3.1 Designating Operable Units

In accordance with Section XIX of the FFA, SRS will submit the annual OUs list with the FFA Appendix C annual submittal on October 1 of each Fiscal Year. The Parties agree that SRS will revise the OUs list incorporating EPA and SCDHEC comments.

4.3.2 Integrator Operable Units

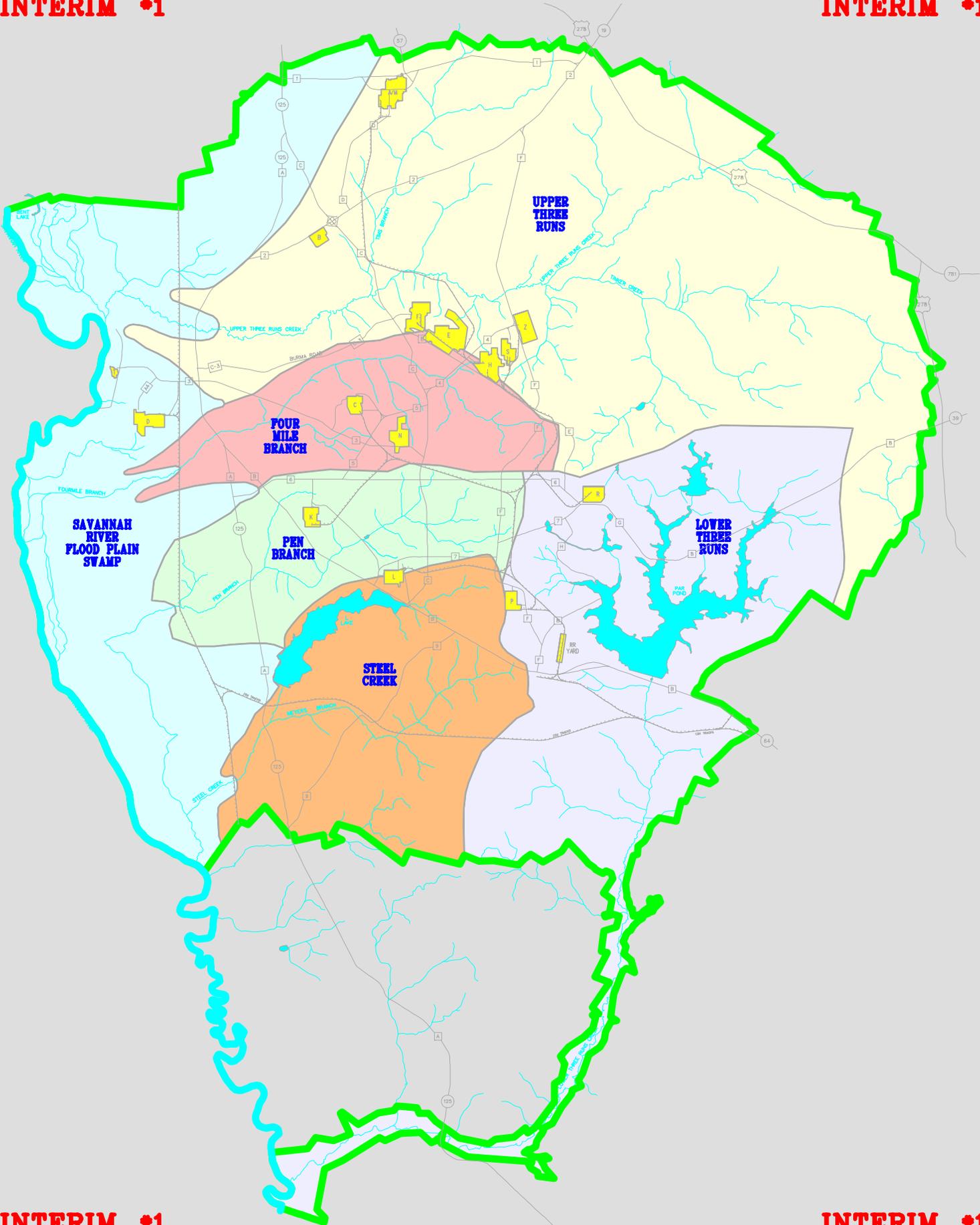
The primary pathway of contaminant migration at SRS occurs through hydrologic pathways with the direction of flow being from upgradient terrestrial habitats into downgradient streams and wetlands. Thus, potential cumulative, or integrated effects from releases are most likely to be observed in these stream and wetland areas. Ultimately, understanding the source, pathways and potential receptors of contamination is essential in determining remedial strategies and priorities.

The topography and hydrology of the Site allow for division of the SRS into six spatial units representing watersheds with primary stream systems functioning as Integrator Operable Units (IOUs). Figure 4-3 illustrates the location of the watersheds.

Watersheds at SRS will combine OUs and waste units into geographical areas with common shallow groundwater and surface water discharges. To describe IOUs, surface water nomenclature will be used when applicable; however, the use of surface water nomenclature does not constitute the creation of a separately identified waste unit.

INTERIM #1

INTERIM #1



INTERIM #1

INTERIM #1

Watersheds at SRS have been defined in terms of the distinct hydrogeologic domains (e.g., A and M Areas). The SRS hydrogeology is primarily depicted by shallow to intermediate depth horizontal groundwater flow discharging to tributaries to the Savannah River or directly into the Savannah River. Also, the deep regional drinking water aquifer is affected by downward flow of groundwater from the above mentioned shallow to intermediate depth aquifers.

As agreed to by the three Parties, the FFA Appendix G streams/tributaries defined as watersheds or IOUs have been moved to Appendix C of the FFA. Section X of the FFA will no longer be applicable. Moving these areas from Appendix G to Appendix C will make them subject to work plan development (i.e., Primary Documents). Monitoring and characterization will continue for each of these areas. The RI/FS strategy for IOUs will be similar in scope to a “long-term” SE unit rather than a “shorter” traditional RI/FS for a source unit.

SRS proposes to evaluate each of the designated IOUs as part of the ongoing FFA driven Environmental Restoration program. Existing monitoring data for each of the IOU's will be collected and assessed for applicability in determining impact and potential risk to human health and the environment. The process for evaluation will include data screening, development of conceptual models, and will consider only relevant scenarios for evaluating impact. Data Quality Objectives will be defined to ensure consideration of only appropriate and relevant data. A process flow diagram for completing the initial IOU evaluation is provided in Figure 4-4. A list of Watersheds, IOUs and OUs can be found in Appendix C of the FFA. This list is updated annually.

Upon completion of the initial report, SRS proposes a meeting with the regulators to evaluate/refine the process, develop lessons learned, and incorporate the program into the FFA. Implementation of the process for the remaining IOUs in a mutually acceptable sequence and schedule will then proceed.

SRS will perform the initial evaluation on the Savannah River IOU. This evaluation will use existing data to evaluate the risks to human and ecological receptors in the context of CERCLA. The analysis will include historical data and will focus on data collected over the past several years to assess current and future risks based on these recent data. Because the Savannah River IOU receives the aggregated inputs from the SRS, the analysis will concentrate on assessing existing conditions, and any temporal trends with no attempt to relate phenomena in the river to individual OUs. Following completion of the seven IOU reports, it is anticipated that IOU assessment strategies will be update and revised as necessary to incorporate continued interpretation of IOUs and OU characterization data.

4.4 RCRA Facility Investigation/Remedial Investigation

The CERCLA remedial investigation/feasibility study and remedy selection process is detailed in 40 CFR 300.430. The FFA is intended to integrate this CERCLA process with the corrective measures required by the RCRA permit. The FFA combines the RCRA and CERCLA processes in Section XI, RCRA Facility/Remedial Investigation

4.4.1 Process

SRS has developed a generic plan to delineate standard investigative and management procedures for the RCRA/CERCLA process and to promote consistency in the development of RCRA/CERCLA documents required by the FFA, including the identification of ARARs and “to-be-considered” (TBC) guidance.

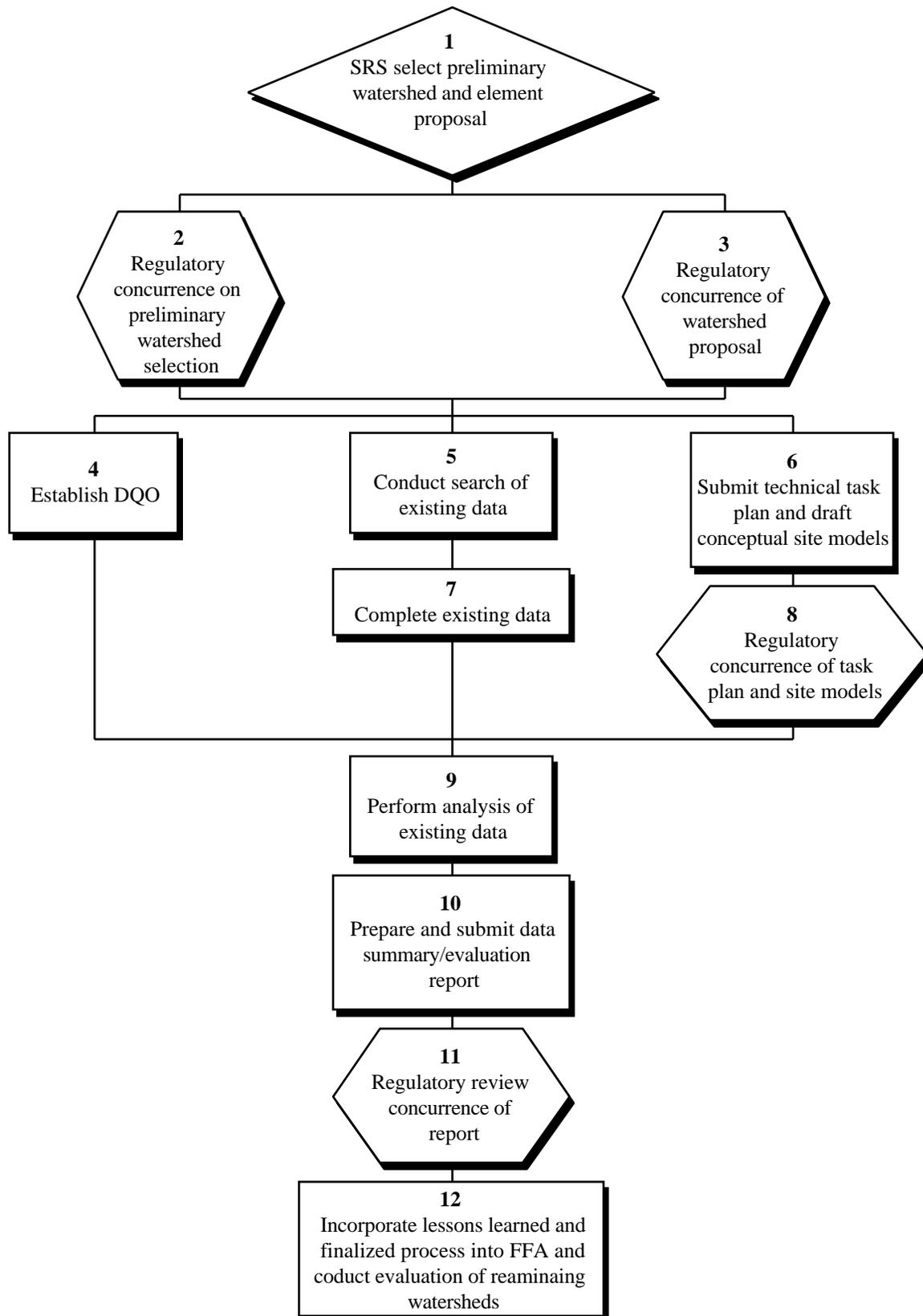


Figure 4-4. Watershed Evaluation Proposal

The Generic "No Contingency" Schedule (Attachment 3) from field start to ROD approval is based upon the use of sampling equipment which will enable field activities for both groundwater and soils to be conducted in parallel. This "generic" waste unit is considered to be nine (9) acres in size with a soil sampling frequency of six (6) locations or borings per acre for a total of fifty-four (54) boring per waste unit. Well installation, development, and sampling is required for an average of ten (10) wells for this size waste site. The schedule for field investigatory activities in the generic plan (Attachment 3) is consistent with the time frames established for RI/FS to remedy selection process (36 months). The schedule does not fully employ some of the streamlining initiatives identified under Section 3.5 above and is, therefore, generally considered to represent the baseline schedule duration for typical operable units.

Initiation of the RFI/RI Report, including the Baseline Risk Assessment, and the feasibility study can begin after completion of the characterization field work and prior to the availability of the complete validated data package. However, the finding and conclusions of subject documents will be made after all data is available and validated. The Baseline Risk Assessment comment resolution meeting and CMS/FS scoping meeting are scheduled concurrently to ensure that technology/alternative development and evaluation is based on approved risk factors.

A number of contingencies have been previously identified that impact the implementation schedule of field characterization activities. No contingencies have been identified for development of regulatory documents (RFI/RI Work Plan, Baseline Risk Assessment, CMS/FS Report, Statement of Basis/Proposed Plan, ROD).

4.4.2 Scoping

It is the intent of the Parties to participate in scoping incremental stages of the process to ensure appropriate consideration of the site management goals, principles and expectations throughout the process. Scoping entails coordination of the Parties at critical stages of the process to ensure that the scope and timing of these stages are appropriately tailored to the nature and complexity of the response alternatives being considered. Scoping is designed to reach earlier consensus among the Parties.

Scoping meetings for the development of primary documents will be coordinated among the Parties to best facilitate early consensus on Primary Documents.

Process scoping meetings will be scheduled on a case by case unit-specific basis. The DOE WAG manager (or the WSRC project manager) will schedule the meetings when needed and contact SCDHEC and the appropriate EPA FFA Project Managers to schedule the meeting. EPA and/or SCDHEC can request a scoping meeting whenever they feel one is necessary.

However, SRS will supply to EPA and SCDHEC, at the same time the Interim Appendix D is submitted, a list of documents to be scoped during the next fiscal year. The list will indicate by month which documents may need scoping meetings. During the monthly PM meeting, scoping meetings for the next month will be confirmed and scheduled, and document scoping meetings for the current month + 2 will be scheduled.

In general, Wednesdays are the preferred day to hold scoping meetings. If it is not possible to hold the meeting on a specific Wednesday, then the regulatory agencies will suggest alternate dates to meet.

Ten working days (2 weeks) prior to a scoping meeting, ER will submit a scoping package to the EPA and SCDHEC. The package will contain background information, data and maps (as needed), and the information that will be discussed at the meeting.

Within two weeks following a scoping meeting, SRS will issue minutes from the scoping meeting outlining the issues discussed and specifying the methodologies to be used and any other agreements reached for the development of the document(s) being scoped. The EPA and SCDHEC will provide written agreements and/or comments on the meeting minutes within two weeks of receipt of the meeting minutes.

Scoping does not compromise the enforceability of the FFA nor the oversight responsibilities of EPA and SCDHEC. Its primary purpose is to ensure early consistency between the three parties before work is conducted and to make the process efficient.

4.4.3 RFI/RI Work Plan Scoping

The following subsections describe the primary objectives and/or goals to be covered during the scoping of work plans as listed in the FFA. By standardizing these objectives/goals as topics to be covered during scoping, input from all parties will be more effectively and efficiently offered and incorporated into the work plan document. This will lead to streamlined reviews which will minimize or potentially eliminate work plan revisions.

4.4.3.1 Preliminary Data Collection

The Parties agreed that the SRS can collect preliminary data without prior notification or pre-approval from EPA and SCDHEC. Preliminary data is defined as those samples taken prior to the finalization of the RFI/RI or RI Work Plan. This data collection is limited to RCRA/CERCLA Units. Written approvals are needed only when the groundwater is to be sampled or monitored. In that case, SCDHEC - Columbia written approval will be required to collect those samples.

The scope of the work for these soil samples will include their collection with a comprehensive analytical suite with full data validation. Collection of soil samples is estimated to require approximately two (2) weeks per unit, with the analytical results being available within six (6) weeks of the end of the sampling event.

This protocol is supportive of the terms of § 300.430(b) Scoping, of the NCP that states, in regard to the program goal to select remedies that are protective of human health and the environment:

“Specifically, the lead agency shall:(4) Undertake limited data collection efforts or studies where this information will assist in scoping the RI/FS to support decisions regarding remedial response activities.”

The collection of this preliminary data is not in conflict with the terms of Section XXII.I. Finalization of Documents, of the Federal Facility Agreement. The finalization of a document is dependent upon the issuance of written concurrence by the EPA and SCDHEC. As such, the conditions and terms of an RFI/RI or RI Work Plan are not to be implemented until the Work Plan is finalized. The preliminary data is collected prior to the scoping of the Work Plan, and the data is used to develop this document. As such, the collection of preliminary data advances the goals of the early response action and streamlining because the data collected will enable the three Parties to more effectively scope the RI/FS.

4.4.3.2 Review and Evaluate Existing Data

Operational history and existing data for waste units will be evaluated to develop a conceptual site model (CSM). Data from ASCAD™ primary units will also be evaluated for CSM development. Many units were previously investigated [e.g., pre-Work Plan Characterization efforts and other regulatory (e.g., RCRA) programs] resulting in the generation of large volumes of data. The focus

of the data review will be to maximize use of the existing data with respect to the CSM. Existing data will be used to provide the following types of information:

- Describe past operational and disposal activities that have led to contamination of this unit. As appropriate, quantify any information that could be used for developing a source term, including disposal volumes, weights, activities, or size of the waste unit.
- Describe potential pathways (primary and secondary) of contaminant migration based on operational/disposal history and/or data available from the OU or similar OUs at the site [e.g., seepage basin overtopping, vadose zone infiltration, leaching of residual source material, runoff, wind dispersion, dense non-aqueous phase liquid (DNAPL) or light non-aqueous phase liquid (LNAPL) dissolution].
- Provide the basis for the physical setting of the waste unit. This could include information such as hydrogeologic cross sections, descriptions of lithologic units, soil types, information on background conditions, and summaries of water elevations (e.g., potentiometric surface map).
- Evaluate existing data quality with respect to end use. This includes considerations such as risk assessment, risk management, remedial action and remedial design, and necessary and sufficient standards. Background and anthropogenic concentrations should also be evaluated.
- Describe the types of habitats in which the unit is located or to which it is adjacent. Identify features such as surface water bodies and the potential presence of any threatened or endangered species.
- Summarize existing information that may be useful for leachability analysis and for remedial design and remedial action (RD/RA) purposes. This can include information such as soil bulk density, porosity, particle size analysis, total organic carbon, and contaminant soil/water partitioning coefficients (K_d).
- Identify and describe contaminated areas per the CSM and potential volumes of contaminated soils.
- Summarize historical assessment and/or monitoring activities. As appropriate, discuss identified media contamination (e.g., presence of any plumes).
- Identify suspected primary contaminants and potential risk drivers based on exceeding risk-based concentrations or Safe Drinking Water Act (SDWA) maximum contaminant levels (MCL).

The overall quality and usability of the existing data set should be summarized. This should include summaries of supporting quality assurance and quality control (QA/QC) documentation. The data summaries should then be used to address the CSM by sources, exposure pathways, and receptors.

If a pre-work plan characterization effort was conducted, significant high quality definitive data is available for background and “worst case” components of the CSM (primary source and partial secondary source data). Appropriate levels of uncertainty management (i.e., level of certainty of “worst case” conditions) must be demonstrated, especially for highly heterogeneous components of the CSM. Pre-work plan characterizations are conducted as the first phase of potential Expedited Site Characterization (ESC) efforts.

4.4.3.3 Conceptual Site Model (CSM)

Information on the waste sources, pathways, and receptors provides an understanding of the unit to evaluate potential risks to human health and the environment. The CSM will include known and suspected sources of contamination (primary sources), affected media (secondary sources), respective release mechanisms for sources, pathways, and known or potential human and environmental receptors. This effort, in addition to assisting in identifying locations where sampling is necessary, will also assist in the identification of potential remedial technologies.

4.4.3.4 Unit Specific Contaminant (USC) list

This list is expected to be a subset of the COPC list and its primary purpose (data usability) is to refine the understanding of the extent and distribution of contamination for the relevant components of the CSM (e.g., impacted environmental media). It is expected that data quantity will be greater for the ESC Phase II effort (see Section 3.4.2.2) and that data quality should be less stringent and established based on the ability to discern zone of contamination and the general distribution of contamination within such zones. Allowing for less stringent data quality standards should enable reduction of data collection costs per unit analysis for Phase II ESC. Because this short list of parameters is intended to facilitate effective characterization of site releases, USC selection should be based on available field analytical technologies which support an ESC approach and the probable conditions of the CSM. Therefore, the USC list may vary per media. Also, USCs may include non-hazardous constituents which serve as indicators of contamination and thereby improve the certainty of the nature and extent of contamination. Collection of USC data may also serve to expand the quantity of definitive COPC data for calculating a BRA concentration term. However, as mentioned above, data quantity is a primary data need for the data usability purpose of characterization while the quality is of secondary importance for Phase II ESC efforts.

The list should include constituents which are the predominant COPCs based on the CSM expected conditions and should include many of those COPCs exceeding EPA Region III residential risk based concentrations and two times the average background concentration. EPA Soil Screening Levels will also be evaluated for constituents that exceed the two times background criteria for those data that were collected for the secondary source that may contribute to leachability to the groundwater.

4.4.3.5 Data Quality Objectives (DQO)/DQO Worksheets

Following completion of the existing data review and development of the CSM, the next stage of the SRS DQO process is to identify the specific sources, media, and pathways for which additional data are required. Again, the emphasis is on maximizing the use of existing data, so additional data collection should be limited to filling specific data needs necessary for critical uncertainty management in light of the preliminary remedial action objectives under consideration and answering specific questions related to either (1) exposure pathways and certainty of the COPC concentration terms for the Baseline Risk Assessment, (2) confirming or supplementing historical data, including nature and extent for all sources and pathways for remedy selection purposes, or (3) providing geotechnical data necessary for modeling the soil to groundwater pathway or for addressing data needs related to the RD/RA.

Specific data needs should then be documented in the SRS DQO worksheets. The DQO worksheets are designed to integrate information related to the following areas:

- Sources and secondary sources.
- Release mechanisms and migration pathways.
- Exposure paths and receptors.
- Probable conditions of above and critical uncertainties remaining.
- Data needs and DQO (including engineering and physical processes).

- Field activities including interim and removal actions and characterization activities.
- Specific analytical parameters that will be measured.
- Potential early and final remedial activities.

The completed DQO worksheet should then be used to develop decision rules and descriptions of the major sources of uncertainty. The description should include approaches for dealing with uncertainty. As appropriate, acceptable levels of uncertainty should also be addressed.

Detailed examples of completed DQO work sheets, decision rules, and summaries of uncertainty for a hypothetical pesticide pit at SRS are also provided with this document (see Attachment 4).

As a product of scoping, decision rules will be developed. Generic examples could include decision rules with the following logic:

- a) If leachability needs to be evaluated, then contaminant concentrations in the soil column (> two times background) at depth are required.
- b) If leachability needs to be evaluated, then physical parameters of the vadose zone are required.
- c) If an ESC approach is utilized and a significant portion of the data is screening level, then a specified number or percentage of samples are needed for Baseline Risk Assessment (BRA) requirements (i.e., 10^{-6} risk based concentration levels) or as confirmation of the screening level data.

4.4.3.6 Application of Expedited Site Characterization (ESC)

ESC will be implemented in two phases. The first phase being implemented as pre-characterization (prior to work plan development); the second as scoped, detailed, and approved in the work plan.

Full implementation or application of portions/aspects of ESC must be evaluated. This will enable characterization activities to expedite the determination of the extent of contamination, terminate the field activities, and evaluate the path forward for the unit (see Section 3.4.2.2 for additional details on ESC).

It is important to retain flexibility for a Phase II ESC investigation as “real-time” data dictates. Specific locations and samples will not be detailed in scoping nor the work plan document for phase two activities. The sampling and analysis techniques and potential targeted areas can be provided. Phase II activities to the extent possible, will focus on the refined preliminary remedial action objectives. Phase II may also include collection of non-ESC data for final confirmation of COPCs (e.g., it may be determined that Phase I definitive data did not come from the most contaminated portions of media, based on Phase II ESC interpretation), corroboration of ESC data, and data sufficiency need for the BRA.

Scoping ESC should detail work plan activities such as:

- a) What analyses can be performed via Phase II in the field and at what detection level.
- b) How many samples or what percentage of samples will be needed to accommodate definitive data requirements.
- c) Feasibility study data needs.

4.4.3.7 Baseline Risk Assessment Technical Task Plan (TTP)

The TTP will provide the site-specific strategy and technical assumptions that will be utilized in the development of BRA documentation. With historical information/data and pre-work plan characterization data, site-specific BRA strategy and assumptions will be achievable at this time.

4.4.3.8 Presumptive Action Decision

If the phase one data dictates that an action is appropriate, the unit should be placed on a streamlined schedule for remediation as opposed to a schedule that reflects time-consuming characterization efforts to refine the extent of characterization. This should include consideration of early actions or interim remedial actions, and final remedial actions for a portion of the OU being addressed under the scope of the ongoing RI/FS (e.g., continue RI/FS for groundwater and implement final source remedy). Conversely, if the Phase I ESC data reveals no impact to the environment and poses no threat for future impact (i.e., will not leach), then the unit should be considered for no further action and proceed immediately to the RFI/RI/BRA Report. In this instance, the RFI/RI/BRA Report will identify that a CMS/FS is not required and a “no action” Statement of Basis/Proposed Plan and ROD would be developed.

4.4.3.9 Scoping Process

The Scoping Process for the remaining RCRA/CERCLA documents is being developed by the FFA Process Improvement Task Team and will be added when complete.

4.4.4 *Baseline Risk Assessment Key Assumptions*

The purpose of this section is to document the protocol utilized for the preparation of Baseline Risk Assessments. The protocol for BRAs is intended to be consistent with EPA Region IV specific guidelines, and SCDHEC specific guidelines, as appropriate.

4.4.4.1 Exposure Groups

To determine risks, it is necessary to specify the concentrations used in the risk calculations. During the unit investigation, contaminant concentrations are determined for a variety of media, such as groundwater, soil, sediment, and surface water.

For soils, the data may be divided into multiple exposure groups. The 0-1 foot interval is established for determination of risk from direct exposure. An exposure group for the 0-4 foot interval is established to account for a hypothetical situation in which the subsurface soils are disturbed and brought to the surface by a potential future onsite resident.

Generally, 4 feet is considered a reasonable depth for excavation to construct a small structure in the SRS area. The 4 foot depth is also appropriate for use by burrowing animals found in the area. Risk characterization of direct exposure to the uppermost 4 feet of soil will be quantified separately from the risk characterization of direct exposure to the uppermost 1 foot of soils. Risk characterization of direct exposure to soils greater than 4 feet below grade should only be assessed qualitatively when site-specific conditions warrant.

Background data for the various media are also assigned to appropriate background exposure groups.

4.4.4.2 Selection of Contaminants of Potential Concern (COPC) and Exposure Routes

The following information details the process to determine exposure routes and COPCs for use in the Baseline Risk Assessment. The COPC Selection Process is shown in Figure 4-5.

A. INITIAL COPC AND EXPOSURE ROUTE PROCESSING STEPS

- A.1 Sort the data for each constituent and group by media and exposure group. Identify the appropriate set of background data for each media and exposure group.
- A.2 For each constituent in each media or exposure group, eliminate constituents which have no detects.
- A.3 For each constituent in each media and exposure group, eliminate constituents as COPCs based on comparisons to blanks, as follows:
 - a. All analytes - Eliminate as COPC if constituent concentration is less than 5 times the maximum detected in the blank.
 - b. Common laboratory contaminants - Eliminate common laboratory contaminants such as acetone and methylene chloride as COPC if constituent concentration is less than 10 times the maximum detected in the blank.
- A.4 For each constituent in each medium and exposure group, determine the following parameters:
 - a. Maximum value
 - b. Frequency of detection
 - c. Arithmetic average background concentration
 - d. Range (min. - max.)

B. HUMAN HEALTH COPC AND EXPOSURE ROUTE PROCESSING STEPS

- B.1 Perform screening against 1×10^{-6} RBC levels calculated using EPA slope factors for carcinogens and radionuclides by comparing the maximum concentration to the screening value. Retain as a COPC if it exceeds the screening level.
- B.2 Perform screening against a hazard quotient (HQ) level of 0.1 by comparing the maximum concentration to 0.1 of the screening value. Retain the constituent as a COPC if it exceeds the screening level. (RBC screening levels for Region III are based on hazard level of 1.0 instead of 0.1. Therefore, screening must be made against 0.1 of the screening value for an accurate evaluation).

NOTE: This selection process is not designed to eliminate any chemical as a COPC in the subsurface soils relative to protection of groundwater. The potential for chemicals in subsurface soils to leach to groundwater will have been addressed in an earlier part of the RFI/RI/BRA document.

- B.3 The following is a list of human health essential nutrients which are not considered to be toxic and do not have health based limits:

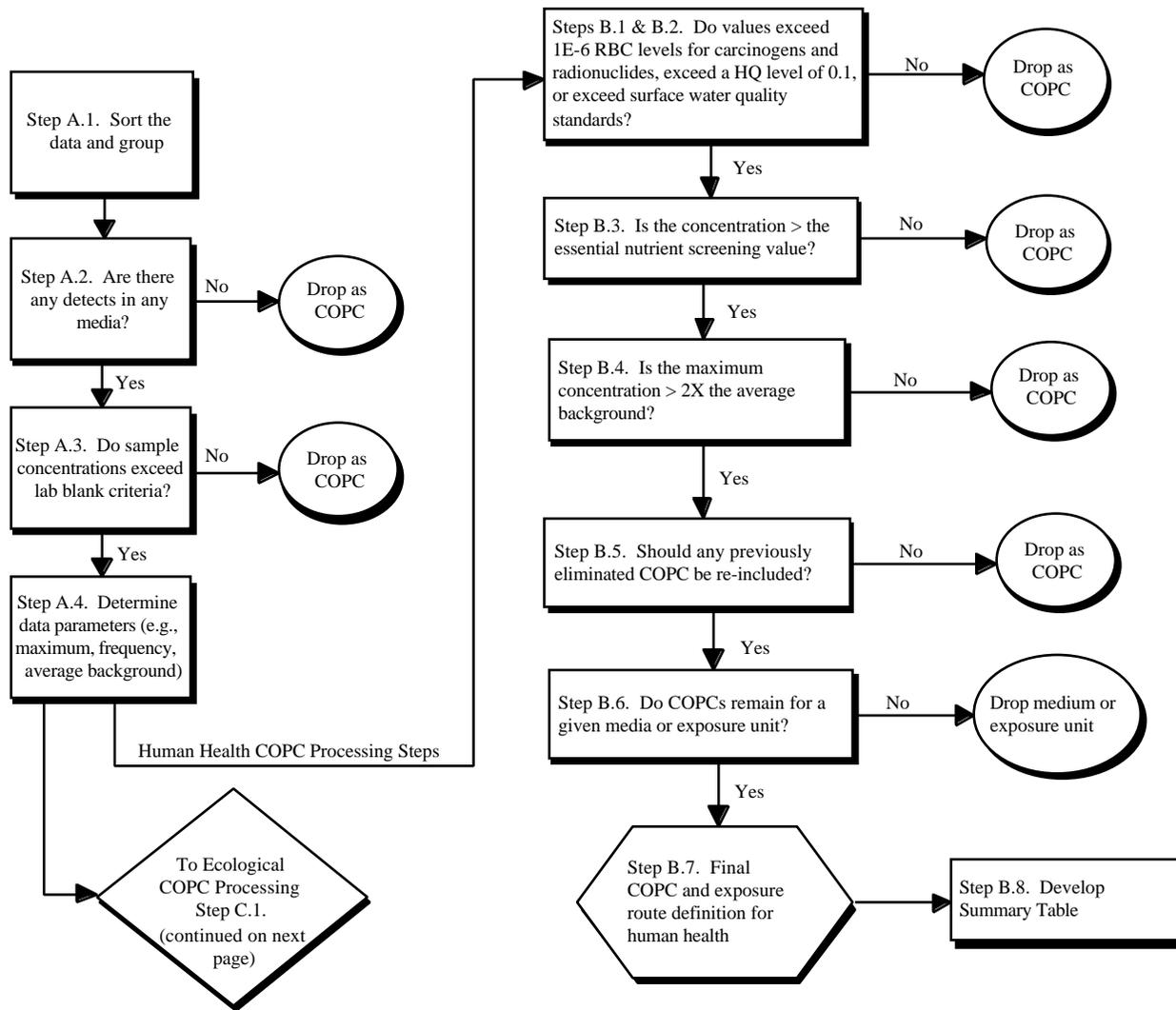


Figure 4-5. COPC and Exposure Route Selection Process

Ecological COPC Processing Steps

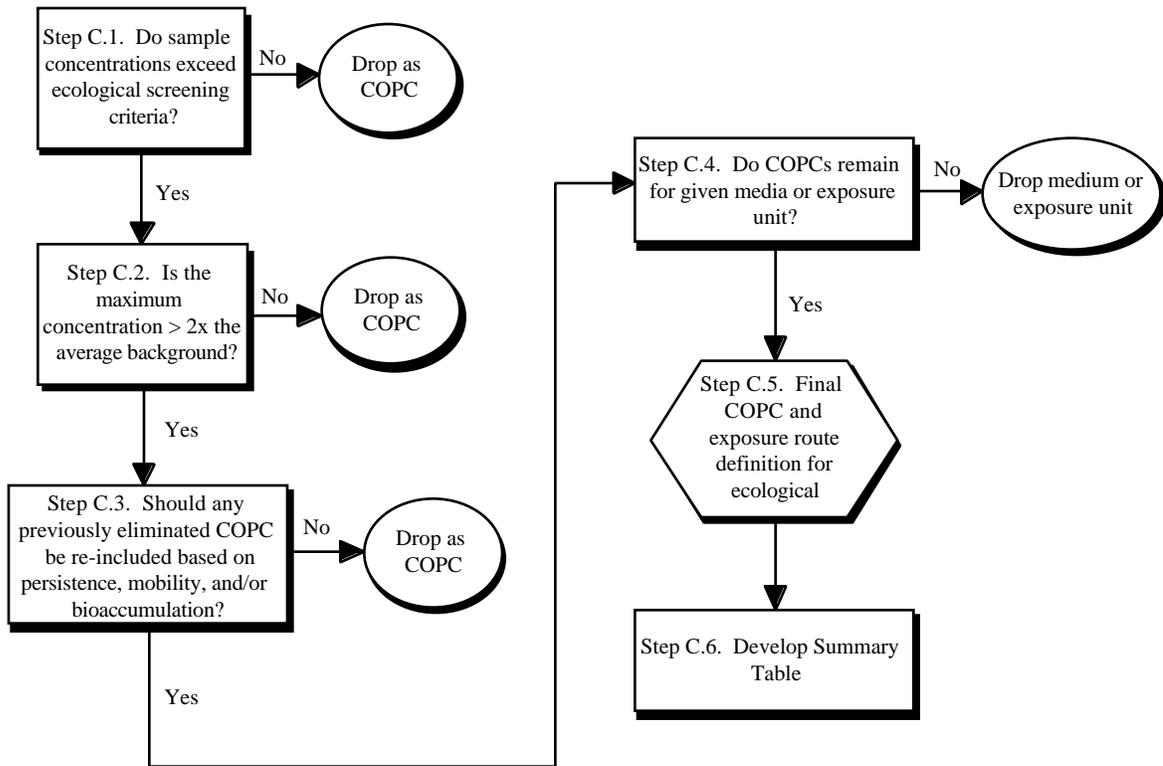


Figure 4-5. (continued) COPC and Exposure Route Selection Process

Calcium
Chloride
Iodine

Magnesium
Phosphorous
Potassium

Sodium

For the constituents listed above, determine the chronic daily intake value and compare to the recommended daily allowance (RDA). Eliminate the constituent as a COPC if the intake value is calculated to be below the RDA.

- B.4 For the naturally occurring and anthropogenic inorganics and radionuclides which exceed a screening level in steps B1 or B2, compare the maximum concentration to 2 times (2X) the background mean concentration. The comparison will be made for each media and exposure group. Eliminate the constituent as a COPC if the maximum is less than the 2X background media in each media.

Background risk will be calculated for any contaminant that exceeds the 1×10^{-6} RBC screening level and the 0.1 HQ level in an Appendix to the BRA.

- B.5 Consider whether any previously eliminated constituent, medium, or exposure group should be re-included due to historical information or considerations such as mobility, bioaccumulation, persistence, and toxicity.
- B.6 For each medium and/or exposure group, determine whether there are any COPCs remaining. If no COPCs remain, drop the medium and/or exposure group from further consideration in the risk assessment.
- B.7 The constituents and exposure routes which are retained after the application of this process should be selected for use as the starting point of the human health risk analysis.
- B.8 Provide summary table(s) including frequency of detection, range of detection limits, arithmetic average background concentration, arithmetic average of detected concentrations, risk-based screening value, and basis for elimination as a COPC.

C. ECOLOGICAL COPC AND EXPOSURE ROUTE PROCESSING STEPS

- C.1 Identify the appropriate receptors for the screening process. For each receptor and each constituent, compare the maximum detected concentration to the appropriate screening value, which may be derived from the following:
- 1) NOAEL - no observed adverse effect level
 - 2) EPA Region IV Ecological Screening values
 - 3) Radionuclide dose of 0.1 rad/day
- C.2 For each constituent, compare the maximum concentration to 2 times (2X) the background mean concentration. This comparison will only be made for naturally occurring and anthropogenic inorganics and radionuclides. The comparison will be made for each media and exposure group. Eliminate the constituent as a COPC if the maximum is less than the 2X background mean in each media.
- C.3 Consider whether any previously eliminated constituent, medium, or exposure group should be re-included due to historical information or considerations such as mobility, bioaccumulation, persistence, and toxicity.

- C.4 For each medium and/or exposure group, determine whether there are any COPCs remaining. If no COPCs remain, drop the medium and/or exposure group from further consideration in the risk assessment.
- C.5 The constituents and exposure routes which are retained after the application of this process should be selected for use as the starting point of the ecological risk analysis.
- C.6 Provide summary table(s) including frequency of detection, range of detection limits, arithmetic average background concentration, arithmetic average of detected concentrations, risk-based screening value, and basis for elimination as a COPC.

D. LEACHABILITY OF CONTAMINANTS FROM SOIL TO GROUNDWATER

Under development and review

4.4.4.3 Exposure Point Concentrations

For each COPC identified in either soil or water, the RME concentration is the smaller of the UL 95 concentration or the maximum concentration detected. Exposure point concentrations are adjusted, as necessary, in order to reflect chemical and physical characteristics that may affect estimated intake and risk (e.g., concentrations of PAHs are often adjusted by a relative potency factor)

4.4.4.4 Estimated Contaminant Concentrations

Estimates of possible contaminant concentrations are determined for three cases - the concentration of soil particulates in air, the concentration of volatile contaminants in soil or water, and mobile contaminants in soil.

A. Volatile Contaminant Concentrations in Air

Modeling, as necessary, will be performed to determine concentrations of soil particulates and VOCs in the air at the unit. The modeling will use RME concentrations for the soil COPCs.

4.4.4.5 Human Health Risk Assessment

The purpose of the human health risk assessment is to determine the exposure pathways exceeding risk threshold levels and the contaminants causing that risk for human receptors under both current use and hypothetical future use conditions. This approach has been standardized for two important reasons. First, standardization of the quantitative risk characterization and its presentation in BRA Reports for all SRS OUs will facilitate expedited review/approvals. Second, Detailed descriptions of the uncertainty associated with the risk characterization, both overestimation and underestimation of risk, will be a primary tool for the Risk Manager in proceeding toward further refinement of the RAOs through completion of the FS.

In general, the usual media impacted by a unit are soil, surface water, groundwater, and wetland sediments. Soil contaminants may be released from a unit due to infiltration and percolation into groundwater, as windblown dust and vapors, and through vegetative uptake. Unit contaminants may be released from groundwater through discharge to surface water and sediments and/or through vegetative uptake.

A. Human Health Assessment Receptors

A quantitative evaluation will be performed for the following scenarios which include both actual and hypothetical receptors.

- Known On-Unit Worker
- Hypothetical On-Unit Industrial Worker
- Hypothetical On-Unit Resident Adult/Child

There may be other potential receptors at SRS such as the trespasser and the off-SRS resident, all depends on how close the unit is to the boundaries of SRS.

The following sections provide a brief description of the above human health exposure scenarios.

1. Known On-Unit Worker

The known on-unit worker exposure scenario addresses potential risks to individuals who visit the unit on an infrequent or occasional basis, such as a researcher associated with an organization that uses SRS as an outdoor laboratory. The primary exposure pathway for evaluation relative to the known on-unit worker is exposure to contaminated soils (incidental ingestion, inhalation of windblown dust and possibly volatile constituents, dermal contact, and external exposure). A drinking water pathway is not credible for the known on-unit worker since shallow groundwater is not used as a source of drinking water at SRS.

Additional on-unit workers, such as personnel who sample monitoring wells, are also evaluated if appropriate.

2. Hypothetical On-Unit Industrial Worker

The hypothetical on-unit industrial worker exposure scenario addresses long-term risks to workers who are exposed to unit contaminants while working within an industrial setting. The hypothetical on-unit industrial worker is an adult who works in an outdoor industrial setting for the majority of his time. The primary exposure pathways for evaluation relative to the hypothetical on-unit industrial worker include:

- Exposure to contaminated soils -via incidental ingestion, dermal contact inhalation of windblown dust, inhalation of volatile constituents, if present, and external exposure from radionuclides, if present.
- Exposure to groundwater through ingestion of drinking water from contaminated sources.

3. Hypothetical On-Unit Resident Adult and Child

The hypothetical on-unit resident exposure scenario evaluates long term risks to individuals expected to have unrestricted use of the unit. It assumes that residents live onsite and are exposed chronically, both indoors and outdoors, to unit contaminants. The hypothetical on-unit resident includes adults and children who will be exposed to all of the contaminated media.

The primary pathways utilized for evaluation relative to the future hypothetical on-unit resident (adult and child) include:

- exposure to contaminated soils (incidental ingestion, inhalation of windblown dust and possibly volatile constituents, dermal contact, external exposure and ingestion of home grown produce).
- exposure to groundwater (ingestion, dermal contact, and possibly inhalation of volatile contaminants).
- exposure to contaminated sediment and surface water, if present (ingestion, external exposure, and dermal contact)

B. Human Health Exposure Parameters

This section describes exposure scenario assumptions and the values to be used in the exposure calculations. The assumptions are consistent with standard EPA values, when applicable.

The following are SRS site-specific default assumptions. Unit-specific conditions at a given OU may justify use of differing assumptions. These OU-specific assumptions must be justified, and clearly identified in the introduction to the BRA.

1. Current On-Unit Worker

For the current worker who visits the site on an infrequent or occasional basis, the exposure duration (ED) will be assumed to be 5 years, a reasonable amount of time for an individual to work on a scientific study. An exposure frequency (EF) of 6 days per year, once every other month, and an exposure time (ET) of 1 hour will be used for exposure to soils. For the current visitor a body weight (BW) of 70 kg will be used, the average adult weight over the exposure period. An inhalation rate of 2.5 m³/hr will be used for the current visitor, based on a reasonable upper-bound inhalation rate of 20 m³/8-hour workday for an adult male working at a moderate level of activity (i.e., 20 m³/d , 8 hours/d = 2.5 m³/hr).

The skin surface area (SA) used for visitor dermal exposure to soil will be 3200 cm² (i.e., 50th percentile value for head, hands, and forearms). The adherence factor (AF) assumed for soil will be 0.2 mg/cm², which represents the adherence of sand to skin. Sand is at the lower end of the range believed to be typical for environmental exposures (0-1 with one being 100 percent adherence). The surface soil is assumed to be dry the majority of the time, based on observation of the site. Therefore, the AF of 1.0 mg/cm² will be used for soil.

Different dermal absorption factors (ABS) for soil will be used for organic and inorganic COPCs: 1.0 percent for organics and 0.1 percent for inorganics.

The assumed soil ingestion rate (IR) for the worker will be 50 mg/d. The fraction ingested (FI) from a contaminated source will be 1.0, a conservative estimate that all soil ingested will be from the contaminated source.

2. Hypothetical On-Unit Industrial Worker

For the future industrial scenario, an ED of 25 years will be assumed. This value represents the national upper-bound (95th percentile) time working at the same location. An EF of 250 days/year will be assumed for the industrial worker. Exposure time assumed for inhalation of particulates and possibly volatiles from soil will be 8 hours/day based on the amount of time the worker will be assumed to spend at the unit. This exposure time is a worst case estimate because it assumes that the particulate and VOC concentrations indoors will be equal to the concentrations outdoors.

For the future hypothetical industrial worker a BW of 70 kg will be used, the average adult weight over the exposure period. An inhalation rate of 2.5 m³/hr will be used for the future industrial worker, based on a reasonable upper-bound inhalation rate of 20 m³/8-hour workday for an adult male working at a moderate level of activity (i.e., 20 m³/d , 8 hours/d = 2.5 m³/hr).

The skin surface area (SA) used for industrial worker dermal exposure to soil will be 3200 cm² (i.e., 50th percentile value for head, hands, and forearms). The adherence factor (AF) assumed for soil will be 1.0 mg/cm²d.

An adult groundwater IR of 1 liter/day (90th percentile) will be assumed for the future hypothetical industrial worker (EPA, 1991a). The assumed soil IR for the future industrial worker will be 50 mg/d. The FI from a contaminated source will be 1.0, a conservative estimate that all soil ingested will be from the contaminated source.

The standard SF for radionuclides in surface soil, one minus 30 percent, will be used. The TE that will be assumed for the future industrial worker is 0.333 (8 hours assumed spent indoors each day 24 hours per day).

In the event structures exist, gamma radiation shielding factors (SFs) will be used to quantify attenuation of gamma photons from surface soils through a structure. The gamma exposure factor (TE) is the quotient of the number of hours an individual is directly exposed to an external radiation field divided by the total number of daily exposure hours. The TE for the on-unit visitor will be 1.0 hour of exposure time divided by 24 hours in a day, equals 4.16E-2.

3. Hypothetical On-Unit Resident Adult and Child

For the residential scenario, an ED of 30 years will be assumed. This value represents the national upper-bound (95th percentile) of time spent at one residence. Residential ED will be apportioned between adult and child, with 24 years as an adult and 6 years as a child.

An EF of 350 days/year will be assumed for the resident. Exposure times assumed for inhalation of particulates and possibly volatiles from soil will be 15 hours/day (resident adult) and 18 hours/day (resident child) based on average time spent at home as reported in time use studies. For dermal exposure to groundwater while bathing, an ET of 12 minutes (90th percentile) will be assumed for child and adult receptors.

The values used for BW will be the average weight over the exposure period: 70 kg for adult and 15 kg for child. In accordance with EPA guidance, an adult body weight will be used to calculate intake for older children and adults.

Skin SA used for resident dermal exposure to soil will be 50th percentile values for the body parts representing the RME: head, hands, forearms and lower legs. It will be assumed that the resident adult or child wears a short sleeve shirt, shorts, and shoes while gardening, working, or playing outdoors at home, with about 25 percent of the total skin surface area exposed. This equates to an SA of 5000 cm² for the adult and 1800 cm² for the child. The entire body surface area will be used for exposure to groundwater while bathing (resident adult = 20,000 cm², resident child = 7300 cm²). The AF assumed for soil will be 1.0 mg/cm², which represents sandy soils and the lower end of the range believed to be typical for environmental exposures.

A different dermal ABS for soil will be used for organic and inorganic COPCs: 1.0 percent for organics and 0.1 percent for inorganics. Dermal permeability constant (PC) used for COPCs in groundwater will be obtained from the EPA guidance document on dermal exposure assessment. Where a PC cannot be obtained from an EPA guidance document, a PC will be obtained from published or predicted values in open literature, or it will be calculated based on the COPCs octanol/water partition coefficient.

An inhalation rate of 0.83 m³/hr (i.e., 20 m³/d, 24 hours/d) will be used for adult receptors in the residential scenario. This value represents the reasonable upper-bound inhalation rate over an entire day for indoor and outdoor activities, including periods of rest and light, moderate, and heavy activity. The corresponding inhalation rate for the residential child is 1.0 m³/hr.

For the on-unit resident receptor, an upper bound soil IR of 200 mg/d will be assumed for children 1-6 years of age and 100 mg/d for older children and adults. An adult resident drinking water IR of 2 liters/day (90th percentile) will be assumed. The child IR used will be 1 liter/day. Intake via inhalation of VOCs released from groundwater during domestic use will be assumed equal to the intake of VOCs from ingestion of 2 liters of groundwater a day.

Intakes from the ingestion of homegrown produce by the future resident adult will be calculated using IRs of 113, 202, and 123 g/d for leafy vegetables, tuberous vegetables, and fruits, respectively. IRs of 42, 75, and 45 g/d for leafy vegetables, tuberous roots, and fruits will be used for the future resident child. The ingestion rates for the adult are based on an average daily consumption of fruits and vegetables at the 95th percentile and the child rates were assumed to be 37 percent of adult rates.

For soil ingestion by the on-unit resident, adult and child, the value assumed for FI from a contaminated source will be 1.0, a conservative estimate that all soil ingested will be from the contaminated source. FI values used in the calculation of intakes from homegrown produce ingestion by the future resident adult will be 0.042, 0.119, and 0.487 for leafy and tuberous vegetables, and fruits, respectively. The same FI values will be used for the future resident child. The FI values represent the homegrown portion of all vegetables ingested by the future adult and child resident.

The standard Shielding Factor (SF) for radionuclides in surface soil, one minus 30 percent, will be used. Two TEs will be assumed for future on-site residents: 0.63 for adult (15 hour ET, 24 hour day) and 0.75 for child (18 hour ET, 24 hour day).

4.4.4.6 Human Health Toxicity Values

Human health slope factors (SFs) and reference doses (RfDs) are obtained from the latest available version of the Electronic Handbook of Risk Assessment Values (EHRAV). EHRAV contains information available from the Integrated Risk Information System (IRIS) database (the EPA's on-line service) and Health Effects Assessment Summary Tables (HEAST) (a quarterly publication).

The screening level for lead in soil is 400 mg/kg and the action level in drinking water is 15 ug/l. If either of these levels is exceeded, a model should be used to assess childhood exposure to lead. EPA recommends using the current version of the Integrated Exposure Uptake Biokinetic (IEUBK) model to assess lead exposures to children 7 years of age and less.

A. Calculation of Intakes for Human Health Assessment

Chemical-specific intakes are calculated for the receptors and the complete exposure pathways identified for quantitative evaluation. The development of chemical intakes is based on methodology provided in EPA risk assessment guidance (EPA, 1989a; 1991a).

RME estimates of intake will be developed for each exposure pathway. The RME estimate, the highest exposure that is reasonably expected to occur in a small but definable "high-end" segment of the potentially exposed population, will be derived using the maximum or near maximum values for one or a few of the most sensitive exposure parameters (e.g., chemical concentration, intake rate, exposure duration) and average values for the remaining parameters.

B. Human Health Risk Calculations

1. Carcinogens

The "Linear Low-dose Cancer Risk Equation" presented in equation 1 will be used to calculate estimated cancer risk for the COPCs at the unit.

$$\text{Risk} = \text{CDI} \times \text{SF} \quad (1)$$

Where:

CDI = chronic daily intake averaged over 70 years (mg/kg-day); and
SF = slope factor, expressed in (mg/kg-da)⁻¹

Risk in equation 1 is expressed as a unitless probability of an individual developing cancer.

When estimating lifetime cancer risks, radiological decay will be considered. Total exposure cancer risk from multiple pathways should be calculated by summing the risk from individual pathways. As suggested by EPA guidance, the estimates of risks from radionuclides will be tabulated separately in the BRA.

2. Noncarcinogens

The potential for noncarcinogenic health effects at the unit should be evaluated using the "Noncancer Hazard Quotient" (EPA, 1989a) presented in equation 2.

$$\text{Noncancer Hazard Quotient} = E / \text{RfD} \quad (2)$$

Where:

E = exposure level (or intake);

RfD = reference dose; and

E and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or shorter-term)

Total potential for noncarcinogenic effects will be calculated for each scenario by summing the hazard indices from all pathways for a given exposure period and receptor.

4.4.4.7 Human Health Risk Characterization

A. Summary by Pathways and Scenarios

Pathways that have risks greater than 10^{-6} and hazard quotients greater than 1 will be identified in the BRA along with the primary risk drivers for these pathways. The BRA will contain tables summarizing carcinogenic and noncarcinogenic risks for each receptor by media-specific pathway. A summarization of the estimated intake for each pathway will also be provided.

B. Human Health Assessment Uncertainty Analysis

A qualitative discussion regarding uncertainty will accompany the RFI/RI/BRA Report. The discussion will include key variables and assumptions that contribute most to the uncertainty of the risk assessment, including uncertainties in the CSM.

4.4.4.8 Ecological Risk Assessment

Note: The approach outlined below is under review/revision by the parties as stated in Section 7.0.

The purpose of the ecological risk assessment (ERA) component of the BRA is to evaluate the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to unit-related contaminants based on a weight of evidence approach. An ecological risk does not exist unless a given contaminant has the ability to cause one or more adverse effects and it either co-occurs with, or is contacted by, an ecological receptor for a sufficient length of time, or at a sufficient intensity to elicit the identified adverse effect(s). The preparation of the ERA will be consistent with the intent of the latest EPA and SCDHEC guidance.

The ecological assessment methodology consists of four interrelated steps: problem formulation, exposure assessment, effects assessment, and risk characterization.

Problem Formulation

Problem formulation establishes the goals, breadth, and focus of the ecological risk assessment through evaluation of the following: (1) identification of the ecological COPCs determined in the COPC screening process previously discussed, (2) characterization of ecological communities, (3) selection of assessment endpoints, (4) presentation of an ecological conceptual site model, and (5) selection of an analysis plan (including measures of effects).

Exposure Assessment

The exposure assessment evaluates potential exposures of ecological receptors to unit-related contaminants, and it consists of the following: (1) description of the spatial distribution of COPCs, (2) description of the spatial and temporal distribution of ecological receptors, and (3) quantification of receptor exposures that may result from overlap of these distributions.

Effects Assessment

The effects assessment defines and evaluates the potential ecological effects of COPCs on selected assessment and measurement endpoints. The effects assessment includes the derivation of toxicity reference values (TRVs) that are the basis of the evaluation. The results of the effects assessment are used in risk characterization to identify ecological COCs and characterize ecological risk.

Risk Characterization

Risk characterization integrates exposure(s) and effect(s) on receptors using hazard quotients (ratios of exposure and effect concentrations). The resulting data are used to define the magnitude of risk from ecological COPCs at each exposure group and to assess the risk to ecological receptors. Risk characterization includes two main steps: risk estimation and risk description. Risk estimation uses the results of the exposure and effects assessments to calculate a hazard quotient (HQ) for each COPC. The HQs are based on relevant measurement endpoints and are indicative of the COPCs' potential to pose ecological risk to receptors. Risk assessment related uncertainties are also analyzed and discussed. Risk description summarizes the conclusions of the risk estimation and discusses confidence in the risk estimates based on a weight of evidence evaluation. Any COPCs for a given exposure group that were identified as likely to pose significant risk to receptors are classified as ecological constituents of concern (COCs).

4.4.5 RFI/RI/BRA Uncertainty Analysis

To be developed on recommendations from the FFA Process Improvement Task Team.

The uncertainty analysis will include a discussion regarding infrequently detected constituents (less than 5%) and whether they represent a true COPC or risk or are they anomalies.

4.4.6 Integration with the Corrective Measures Study/Feasibility Study

The RI/FS is an integrated process. A preliminary identification of potential response actions and applicable technologies occurs during scoping of the RFI/RI work plan. As data becomes available to refine the CSM, further screening of alternatives may occur. The detailed analysis is scoped as soon as the CSM can be adequately refined to support the evaluation. The RI/FS process should be concluded without a detailed analysis of alternatives (a CMS/FS) for those OUs without chemical-specific ARARs and a CSM pathway (including individual or cumulative pathways) that does not exceed 10^{-6} risk or a HI equal to or less than 1. For those units with potential carcinogenic risks within EPA's risk range of 10^{-4} to 10^{-6} , and where future industrial use is anticipated (see Figure 3.3), a detailed analysis of alternatives may not be necessary, and in general actions may be limited to activities such as institutional controls and/or continued monitoring.

A. Remedial Action Objectives

Note: Sections A and B are being combined and rewritten.

The following is a description of the general strategy for proceeding to an evaluation of alternatives based on the results of the RFI/RI Report. However, this approach is not a rule and OU-specific considerations may justify variances from this approach. Based on the refined CSM presented in the RFI/RI, Remedial Action Objectives will be developed for each alternative undergoing a detailed analysis in the CMS/FS.

This methodology is based on developing and documenting a detailed OU-specific Conceptual Site Model (CSM), testing the CSM (through data collection), managing critical uncertainties in the CSM utilizing defensible DQO principles, and converging on remedial actions early (including appropriate use of early response actions) to focus data needs.

A list of the critical components of this process along with a brief discussion follows. These components emphasize early convergence toward remedial action objectives which are appropriately protective as a final remedy.

- 1) Early consideration of Remedial Action Objectives (RAOs) during startup of the RI/FS;
- 2) Standardizing the approach to assessing the baseline risk, including the development of Remedial Goal Options (RGOs) for all Contaminants of Concern (COCs);
- 3) Effectively managing uncertainty and separating the uncertainty analysis from the risk characterization
- 4) Further refinement and focusing of RAOs in the conclusions of the RFI/RI for consideration in the scoping the detailed analysis of the CMS/FS; and,

Remedial Action Objectives (RAOs) are a general description of what the remedial action will accomplish to ensure adequate protection of human health and the environment. RAOs may include both contaminant levels (remedial goals) and exposure path controls, recognizing that protectiveness may be achieved by reducing exposure, reducing contaminant levels, or a combination of the two. RAOs should be considered early in the RI/FS process. Early consideration and focusing of RAOs serve to guide streamlining of the RI/FS process throughout its implementation and to support consideration of early actions. Due to site-specific complexities, RAOs may not be focused for some OUs. For such complex OUs, the CMS/FS may include alternatives with both cleanup and exposure control goals. A clear definition of the OU-specific RAOs are necessary for the detailed analysis of alternatives, documentation of the preferred alternative in the Statement of Basis/Proposed Plan, and the ROD (including RODs for interim actions).

The detailed analysis in the CMS/FS will include an alternative(s) capable of meeting all Chemical-specific ARARs, unless an ARAR waiver is achieved. Use of the Superfund risk range of 10^{-4} to 10^{-6} to establish RAOs is expected to be used during the CMS/FS in the following manner. For OUs with a CSM pathway (individual or cumulative pathways) that exceeds a 10^{-4} risk, the detailed analysis in the CMS/FS will include an alternative(s) with RAOs which meet the statutory preference for permanence and is capable of achieving 10^{-6} risk RGs. In general, for OUs with a CSM pathway (individual or cumulative pathways) that exceeds a 10^{-6} risk but is less than 10^{-4} risk, the alternatives analysis, where appropriate, will not require the same level of detail required for OUs that exceed a 10^{-4} risk. The limited alternatives for these lower risk sites would include alternatives such as institutional controls and continued monitoring. Therefore, based on site-specific conditions (and if agreed to by the three Parties), a CMS/FS may not be necessary for these lower risk sites.

For a noncarcinogenic COC that exceeds a HI of 1 but is less than a HI of 3, the detailed analysis in the FS will include a limited-action alternative(s) with RAOs capable of achieving protectiveness by reducing exposure potential via engineering and/or institutional controls. For a noncarcinogenic

COC that exceeds a HI of 3, the detailed analysis in the FS will include an alternative(s) with RAOs capable of achieving a HQ of 1 for each noncarcinogenic COC.

B. Remedial Goal Options

The risk-based PRGs are refined into Remedial Goal Options (RGOs) in the Baseline Risk Assessment (BRA) for COCs which contribute to a media-specific pathway, or a combined pathway risk greater than 10^{-4} and an HI greater than 1 for both residential and industrial land use scenarios. In addition, based on unit specific conditions, RGOs may be developed before COCs contributing to risks within EPA's acceptable range of 10^{-4} to 10^{-6} . Contaminant specific remedial goal options (RGOs) are remedial goals (cleanup concentrations) for individual contaminants for a specific medium, land use, and receptor. There are three sources of remedial goals: (1) concentrations based on ARARs; (2) risk-based concentrations; and, (3) hazard-based concentrations.

RGOs will also be developed for ecological contaminants of concern. For surface water and sediment, the risk-based RGO will equal the toxicity benchmark. For soils, RGOs will be calculated corresponding to a hazard quotient level of 1.

RGOs carried forward into the CMS/FS will be based on an evaluation of unit specific conditions and agreement by the three Parties.

4.5 Corrective Measures Study/Feasibility Study

The primary objective of the CMS/FS is to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented and an appropriate remedy selected. The overall goal is to allow an unbiased analysis of an appropriate array of alternatives and selection of an action which meets the statutory requirements as they relate to the scope and objectives of the action specified in §300.430 (f) (5) (ii) (A-F) and R.61-79.264.101 of the South Carolina Hazardous Waste management regulations, as amended:

- (A) How the selected remedy is protective of human health and the environment, explaining how the remedy eliminates, reduces, or controls exposures to human and environmental receptors based on contaminants of concern which were determined to be risk or hazard drivers;
- (B) The federal and state requirements that are applicable or relevant and appropriate to the site that the remedy will attain;
- (C) The applicable or relevant and appropriate requirements of other federal and state laws that the remedy will not meet, the waiver invoked, and the justification for invoking the waiver;
- (D) How the remedy is cost-effective, i.e., explaining how the remedy provides overall effectiveness proportional to its costs;
- (E) How the remedy utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
- (F) Whether the preference for remedies employing treatment which permanently and significantly reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants as a principal element is or is not satisfied by the selected remedy. If this preference is not satisfied, the record of decision must explain why a remedial action involving such reductions in toxicity, mobility, or volume was not selected.

The development and evaluation of alternatives should reflect the scope and complexity of the remedial action under consideration and the unit problems being addressed. In addition, the development of alternatives should be fully integrated with the unit characterization activities of the remedial investigation.

4.5.1 Process

SRS will conduct CMS/FS(s) for operable units based on the RFI/RI. Results of the RFI/RI report are summarized in the CMS/FS to provide a basis for the determination of remedial action objectives and the evaluation of remedial alternatives. The evaluation of remedial alternatives integrates the elements of RCRA and CERCLA. EPA guidance for FS preparation is currently more developed than for CMS preparation and the FS process is more structured than the CMS process. Accordingly, evaluating remedial alternatives at SRS primarily focus on CERCLA requirements with regulatory guidance for CMS preparation integrated into the process.

The CMS/FS will include a detailed analysis of alternatives. Remedial alternatives at SRS are established using the nine evaluation criteria listed in the NCP [40 CFR 300.430(e)(9)(iii)]. To reduce the need for long-term management of hazardous substances, the Parties will, whenever practicable, seek to reduce hazards to levels that ensure that contaminated material remaining onsite will allow unrestricted land use. The CMS/FS will be submitted to EPA and SCDHEC for review and comment as detailed in the FFA.

A streamlining approach to the CMS /FS has been developed by SRS. ASCAD is an innovative process which will provide a regulatory framework for streamlining the waste unit remediation process through use of site specific generic remedies. The ASCAD™ approach reduces the time and cost for remediating waste units by grouping waste units with similar conceptual release models, focusing characterization and technology development on waste unit groups, and providing standardized designs which are modified based on unit specific requirements.

ASCAD™ provides for the complete characterization, technology evaluation, and remedial design of a primary site within a waste unit group followed by a focused characterization, technology validation, and the unit specific design for secondary sites. ASCAD™ also projects focused technologies for remedial action based upon a single primary unit and assumes that generic remediation strategy to similar waste units.

4.5.2 Scoping the CMS/FS

Note: to be revised per the recommendations of the FFA Process Improvement Task Team.

Scoping meetings provide the opportunity for the early identification of potential remedial technologies and the needed type and quality of data required to fully develop and evaluate remedial alternatives. In addition, determination of whether a focused CMS/FS is sufficient when employing the generic remedy approach can also be evaluated early in the remedy selection process.

The CMS/FS will be scoped in four phases: (1) identification of likely response scenarios, remedial action objectives and potentially applicable technologies; (2) technology screening; (3) alternative screening; (4) and retained alternatives for detailed analysis. The first three scoping meetings are to be held with the EPA/SCDHEC while the last scoping meeting is to be held for the purpose of obtaining comments from the public.

The Parties agree that the CMS/FS scoping will be performed as follows:

1. During scoping of the RFI/RI Work Plan likely response scenarios, including potential early actions, remedial action objectives and potentially applicable technologies will be identified. This will be the start of planning for possible early actions and will provide opportunity to consider whether the RI/FS can be streamlined based on a focused set of remedial action objectives and applicable technologies.
2. Two weeks before the "Technology Screening" scoping meeting, SRS will submit the following information to EPA and SCDHEC:
 - a) Table identifying applicable technologies
 - b) Table identifying a technology screening summary
 - c) Table identifying retained technologies for use in development of alternatives
 - d) Summary of the remedial action objectives

The Technology Screening scoping meeting will be held about 1 month after the FFA commitment date for submittal of the RFI/RI/BRA Rev.0 to EPA/SCDHEC and may be conducted as either a conference call or face to face meeting.

3. Two weeks before the "Alternative Screening" scoping meeting, SRS will submit the following information to EPA and SCDHEC:
 - a) Summary of the RFI/RI/BRA
 - 1) Media of concern
 - 2) Volume of concern
 - 3) Contaminants of concern
 - 4) Vertical/horizontal extent of contamination
 - b) Table identifying developed alternatives
 - c) Table identifying an alternative screening summary
 - d) Table identifying retained alternatives which require analysis based on the CERCLA nine criteria and the remedial action objectives (e.g., cleanup goals, access control measures, engineering control measures) of each alternative.

The Alternative Screening scoping meeting will typically be held at the same time as the RFI/RI/BRA Rev.0 comment resolution meeting. A streamlining approach that will be pursued when feasible will be to conduct scoping of the RI Report and Alternatives Screening concurrently.

4. Scoping of the CMS/FS with the public will be held during the ER CAB Subcommittee meeting following the Alternative Screening scoping meeting if so requested by the CAB subcommittee. Efforts will be made to clearly present the refined conceptual site model using standard tables and figures to aid the public's understanding of the nature and extent of the OU problem. The alternatives under consideration for a detailed analysis will be presented in terms of the remedial action objectives intended to be met per alternative. The cost of each alternative will include capital cost, long-term O&M costs and administrative costs.

4.5.3 Integration with Statement of Basis/Proposed Plan

The detailed analysis will ensure that the appropriate remedial alternative is identified to meet the requirements of 40 CFR 300.430(f)(1). SRS will then present the preferred remedial alternative to the public in a Statement of Basis/Proposed Plan. The Statement of Basis/Proposed Plan will briefly describe the remedial alternatives analyzed, propose a preferred remedial action alternative,

clearly define its remedial action objectives, and summarize the information relied upon to select the preferred alternative.

4.6 Statement of Basis/Proposed Plans and Records of Decision

Title 40 CFR 300.430(f) of the NCP requires that the selection of remedy reflect the scope and purpose of the actions being undertaken. Requirements for Statement of Basis/Proposed Plans and RODs are detailed in this section of the NCP. In an effort to expedite the development and review of these documents, Appendix I of the FFA contains the schedule for review, comment and revision of primary documents at SRS.

4.6.1 Process

The purpose of the Statement of Basis/Proposed Plan is to provide the public with a rational basis for understanding the RCRA/CERCLA unit and Conceptual Site Model and potential remedial alternatives so they may participate in the selection of remedial action. The Statement of Basis/Proposed Plan provides a summary of the alternatives identified in the feasibility study requiring detailed analysis. This Statement of Basis/Proposed Plan will provide alternative discussions geared toward public understanding and solicitation of public comments. The Statement of Basis/Proposed Plan is submitted for public comment about 4 months following approval of the feasibility study. Information required in the Statement of Basis/Proposed Plan is contained in 40 CFR 300.430(f)(2). The Statement of Basis/Proposed Plan will clearly state that the preferred remedy is not final and the actual remedy will be selected only after public comment has been reviewed and considered. The ROD is submitted to EPA/SCDHEC two weeks following completion of the public comment period. The final remedy is documented in the ROD, which contains a responsiveness summary addressing public comment on the Statement of Basis/Proposed Plan.

4.6.2 Public Notice

Section XV of the FFA requires SRS to publish Statement of Basis/Proposed Plans for public review and comment in accordance with Section 117(a) of CERCLA. SRS has the responsibility for publishing these notices. A 30-day initial public review period is required, and a 30-day extension may be requested. The three Parties routinely use 45 days for public comment period incorporating the RCRA public comment period when Class II or Class III permit modifications are required.

SRS has developed the SRS Public Involvement Plan (DOE, 1994; PIP), which serves as the Community Relations Plan for SRS until the Community Relations Plan for ER activities is finalized. The SRS PIP contains the protocols and processes that SRS uses to meet the public participation requirements for CERCLA, RCRA and NEPA, thus including the FFA requirements.

4.6.3 *Record of Decision and Responsiveness Summary*

To be developed.

4.6.3.1 Five Year Reviews

Subject to approval pending review/concurrence of Five Year review report submitted by SRS to the regulatory agencies.

CERCLA 121(c) and Section 300.430(f)(4)(ii) of the NCP requires a five-year review of all RODs which result in hazardous substances, pollutants, or contaminants remaining at a unit above levels that allow for unlimited use and unrestricted exposure. Executive Order 12580 delegates the responsibility for issuance of these reviews to the DOE at the SRS.

In accordance with 300.430(f)(5)(iii)(C) of the NCP each ROD will indicate where hazardous substances, pollutants, or contaminants will remain at the unit such that a five-year review of that action will be required.

The current guidance for the preparation of these reviews are provided in *Structure and Components of Five-Year Reviews*, OSWER Directive 9355.7-02, May 23, 1991 and *Supplemental Five-Year Review Guidance*, OSWER Directive 9355.7-02, July 26, 1994. In general, the five-year review is expected to be conducted as follows:

1. One Five-Year Review of RODs will be issued every five years;
2. The review will cover all RODs issued in the previous five years that require review and all other RODs issued previously that require re-review;
3. Although DOE has been delegated the authority to prepare and issue the Review, SRS has agreed to gain EPA and SCDHEC input to generation of the document through the following process:

As a general guideline the Parties expect to conduct the following process:

 - a) SRS will submit a Revision.0 Report approximately 7 - 8 months prior to the date that it is due to be issued.
 - b) EPA and SCDHEC will review/comment on the document within 60 days.
 - c) SRS will revise the document and submit a Revision.1 Review within 90 days of the receipt of EPA and SCDHEC comments.
 - d) EPA and SCDHEC will concur with the Revision.1 Review within 30 days.
 - e) SRS will provide notice to the public of the availability of the Report, and distribute copies to the Information Repositories, EPA, and SCDHEC, approximately 30 days after the receipt of EPA and SCDHEC concurrence or approximately 60 days after the submittal of the Revision.1 Report, absent the receipt of the EPA and SCDHEC concurrence.
4. The following elements will be included in the Five-Year Review Report and will be addressed for each ROD under review:
 - a) Justification for the level of review;
 - b) A summary of the ROD's remedial action objectives;
 - c) A determination of the current and projected protectiveness of the action;
 - d) A discussion of the areas of noncompliance with the conditions of the ROD;
 - e) Recommendations for future response actions and/or modifications to the ROD, and;
 - f) A statement of the next five-year review.

4.7 Remedial Design(s) and Corrective/Remedial Action(s)

Section XVI of the FFA requires SRS, as appropriate, to document the response action in integrated manner for both RCRA and CERCLA. The process includes the submission of technical, schedule and quality assurance information for the design and construction of the selected remedial action and is intended to provide adequate level of detail for meaningful review by the regulators. The most complex of actions will require the submission of a Remedial Design Work plan (RDWP), Remedial Design Report (RDR), Remedial Action Work Plan (RAWP), Post Construction Report (PCR), and Final Remediation Report. The content of the documents actually submitted for a specific action will vary greatly due to:

- the complexity of the work, which can vary from simple excavation of a source to a complex innovative technology requiring long-term O&M.
- other documentation submitted to comply with other permitting processes; e.g., Industrial Wastewater Treatment, Air Quality Control, etc.

Typically, RD/RA schedules will be submitted as follows:

- proposed implementation schedule in the Statement of Basis/Proposed Plan
- approved implementation schedule in signed ROD
- any changes to the schedule provided in the ROD will be highlighted in an extension request included with the submittal of the RD/RA. The RD/RA will include the updated schedule.

In general, the Remedial Design Work Plan and the Remedial Action Work Plan will contain general information regarding the approach to design and/or remedial action, a summary of the remedial action objectives, and an implementation schedule with FFA Appendix D and E milestones. However, all documentation must be completed and the remedial action started within 15 months of the signing of the ROD.

For a majority of remedial actions, it will be feasible and desirable to streamline the process by submitting combined documents. This will be done on a project specific basis and will include EPA and SCDHEC review of an outline for a proposed combined document. In addition, where other submittals contain required information, it is SRS's intent to reference these other submittals as secondary documents and not repeat the information, unless it is needed for clarity. Throughout preparation of the RDWP, etc. it is anticipated that SRS will review the content of the proposed documents with the regulators and obtain comments on the specific approach being taken.

In an effort to streamline the RCRA/CERCLA RI/FS process, SRS developed the ASCAD approach. This approach will help streamline the complex remedial actions. Although ASCAD will be appropriate for many waste units, it can not be implemented at all the units. As actions are implemented at ASCAD waste site groups, designs which have previously been developed and implemented will be used to streamline the development of RD/RA regulatory documentation. Although all sites will require a certain level of site specific design, a significant part of the design process can be used from one site to another using the same or similar remediation strategies.

4.8 Off-Site Rule

The CERCLA Off-Site Rule (40 CFR 300.400) describes procedures that must be observed when a response action under CERCLA involves off-site management of RFI/RI wastes. EPA developed this rule to ensure that RFI/RI wastes are transferred only to properly permitted facilities that have no relevant violations of their environmental permits or uncontrolled releases of hazardous substances. Generally when RFI/RI wastes from a removal or a remedial action are moved off the waste unit or outside an area in very close proximity to the contamination necessary for implementation of the response action, it will be considered off-site.

The EPA Regional Off-Site Coordinator (ROC) is responsible for determining the acceptability of an off-site facility to which CERCLA waste may be sent. Consistent with the Off-Site Rule, SRS will continue to use SRS facilities with affirmative determinations unless otherwise notified by the ROC. SRS facilities that will be used for interim transfer of waste must also receive affirmative determinations from the ROC, including all SRS facilities that are outside the area of contamination. All facilities which will receive subsequent transfers of CERCLA waste will also require affirmative determinations. SRS will contact the ROC to determine the acceptability status of any facility located outside the SRS boundary before shipping CERCLA waste to that facility. Consistent with the Rule, the acceptability status for a facility outside the SRS boundary is valid for 60 days. The following clarifications of the Rule are applicable to SRS:

1. The Off-Site Rule is not applicable to regulated units authorized by RCRA (Appendix H units in the FFA) at SRS.
2. Laboratory samples and sample residues will be returned to SRS for proper management when determined to be necessary by SRS policy.
3. The Off-Site Rule applies to RFI/RI wastes generated from a removal or remedial action. Emergency removal actions may waive the approval but must document the decision.

A completed Off-Site Checklist (Attachment 1) will be submitted with the earliest FFA document (either the Statement of Basis/Proposed Plan or ROD) specifying the facility chosen for treatment, storage or disposal of all of the RFI/RI wastes. The transmittal letter for the document will request approval of the facilities from the Regional Off-Site Coordinator (ROC) with the EPA RPM approval of the document.

It may not be possible to specify the facilities that will receive all the RFI/RI waste generated (even non-hazardous and water) prior to the actual action. Approvals will then be obtained from the ROC prior to movement of any RFI/RI waste off-site on a case-by-case basis. Copies of all approvals will be sent to the EPA RPM and the Administrative Record.

4.9 Streamlining the Remediation Process

To the extent possible, streamlining initiatives have been and continue to be integrated into the scoping process.

Streamlining strategies include any efforts to increase the efficiency and decrease the time and cost required to reach a remedial decision and complete restoration. Streamlining strategies used at SRS may include the use of operable units, early response actions, and the strategies summarized below. Generic remedy strategies (i.e., presumptive remedies and Approved Standardized Corrective Action Design) may also be used for the cleanup of common categories of sites pending their development and approval by the Parties and acceptance from affected Stakeholders. Generic remedies are

expected to have several benefits. In addition to streamlined site assessments and accelerated remedy decisions, generic remedies may promote consistency in remedy selection, and decrease remedial action time and provide cost savings. Presumptive remedies may be applied, as appropriate (EPA, 1993).

4.9.1 Streamlined Approach for Environmental Restoration (SAFER)

DOE has worked closely with EPA to develop SAFER and to set up pilot projects that will implement and evaluate the SAFER process. The DOE SAFER process combines two major initiatives to plan and conduct environmental restoration more effectively: (1) the Data Quality Objective (DQO) process and (2) the observational approach. Using this combination, SAFER aims to accomplish the following:

- Increase focus on planning and scoping
- Link data collection directly to decision making needs
- Openly recognize and manage uncertainty
- Learn while proceeding with planning and remediation
- Converge early on a remedy
- Ensure participation and consensus of key Stakeholders (SRS, EPA, SCDHEC, and the public)

The SAFER framework for environmental restoration consists of three phases: (1) planning or scoping, (2) assessment and selection, and (3) implementation. These three phases are similar to the CERCLA phases of scoping, RI/FS, and RD and RA. They also correspond roughly to the three phases of a RCRA corrective action: (1) RCRA facility investigation, (2) corrective measures study, and (3) corrective measures implementation. Streamlining tools used during the SAFER process include the following: development of a conceptual site model (CSM), which provides a qualitative understanding of how a site works; decision rules for DQOs; a contingency plan to manage remediation uncertainties; and the development of a monitoring plan for use during remediation to detect any of the reasonable (potential) deviations identified in the RI/FS. The development of a CSM and decision rules for DQOs are required components of a standard RI/FS.

Environmental Restoration at DOE facilities is being conducted with the understanding that uncertainty exists in site and contaminant characterization, risk assessment, technology development and application, and regulatory development. The key is to determine what level of knowledge is acceptable in making environmental restoration decisions, or conversely the level of uncertainty that is appropriate. SAFER quantitatively defines the level of acceptable uncertainty in making decisions while managing the residual uncertainty throughout the process. More information on the SAFER process is available in DOE's *Streamlining Approach For Environmental Restoration, An Overview* (DOE)

4.9.2 Approved Standardized Corrective Action Design

The Approved Standardized Corrective Action Design (ASCAD™) process is an innovative process which will provide a regulatory framework for streamlining the waste unit remediation process through use of site specific generic remedies. SRS has a number of waste units which have similar conceptual site models. The ASCAD™ approach reduces the time and cost for remediating waste units by grouping, waste units with a similar conceptual release model, focusing

characterization and technology development on waste unit groups, and providing standardized designs which are modified based on unit specific requirements.

ASCAD™ provides for the complete characterization, technology evaluation, and remedial design of a primary site within a waste unit group followed by a focused characterization, technology validation, and the unit specific design for secondary sites. ASCAD™ provides for streamlining beyond the record of decision in the design development process. ASCAD™ also projects focused technologies for remedial action based upon a single primary site and immediately applies that remediation strategy to other waste units within a waste site group.

SRS has identified four groups of similar waste units:

1. Bingham Pump Outage Pits
2. Radiologically Controlled Basins
3. Burning Rubble Pits/Piles
4. Coal Pile Runoff Basins

The OU list in the FFA Appendix lists which units are currently being investigated/remediated under the ASCAD™ program.

4.9.3 Other Initiatives

In addition to the potential streamlining approaches discussed above, other potential areas for further streamlining and acceleration of the cleanup process include the following:

- standardizing technical and field methodologies
- expanding the use of screening and innovative sampling technologies
- increased field and fixed laboratory capacity
- use of focused FSs
- early RD starts
- more effective planning, scoping, and use of site evaluation data for removal or remedial determinations;
- development of common measures of performance (e.g., risk reduction)
- improved teamwork at sites among the Parties by clearly defining SRS project ownership
- and fostering increased communication among the responsible SRS project managers.

These streamlining efforts are currently being review by SRS for inclusion in the ER program. As more information about the efforts is developed, such as implementation strategies, they will be added to the FIP.

4.9.4 Expedited Site Characterization

As specific protocols are developed, they will be added to this section. Also, to the extent possible, the ESC process has been integrated into the scoping process.

ESC is the use of mobile field laboratories and direct push technologies to generate real time data in the field and uses the information to make field decisions to track the path of contamination. ESC employs a flexible investigatory strategy which should enable a more detailed definition of the nature and extent of contamination by providing flexibility in selecting sample locations and number of samples based on the initial interpretation of data collection efforts.

ESC employs the effective use of cone penetrometer test (CPT) method coupled with onsite laboratory capabilities employing a data collection strategy of collecting larger data sets of primary

contaminants in conjunction with an array of screening techniques. Using onsite laboratories and screening techniques provides the users with real time data in which to make field decisions. ESC can be combined with SAFER methodology to provide a focused and streamlined characterization.

ESC was pilot tested at the D-Area Oil Seepage Basin in September 1995. The initial results of the characterization are promising. At this time, SRS is planning to use ESC at another waste unit while the continue to evaluate the results form the Oil Basin and determine how to integrate ESC into the ER program.

4.10 Primary Document Review and Revision Process

In accordance with Section XXII.G of the FFA, all primary documents will be subject to the document-specific period for review and comment as provided in Appendix I of the FFA. The approval process follows these general steps:

1. SRS submits the Revision.0 documents, developed and written in a manner consistent with the Attachment 2 outlines, on or before the scheduled date listed in Appendix D of the FFA or contained in another enforceable schedule. Rev.0 documents do not need to be certified documents. The Certification will be provided with the Rev.1 document or if the Rev.0 document is approved, a signed Certification page will be sent to the EPA and SCDHEC.
2. EPA and SCDHEC submit review comments within the number of days specified in Appendix I to the FFA after receipt of the Rev.0 Primary document. The EPA and SCDHEC will identify areas of the Rev.0 document that they cannot fully review during the Rev.0 phase due to document deficiencies. The EPA and SCDHEC will notify DOE as soon as possible about deficiencies which do not permit complete document review in order to minimize schedule delays. DOE will make every effort to expedite revision (revised and submitted as a Rev.1) of the document (and minimize schedule delays) in this case, since DOE may not be able to demonstrate just cause for a schedule extension.
3. Once comments are received, DOE FFA Project Manager and/or the WAG Manager and/or her/his designee (i.e., WSRC-ER Representative) will call the regulatory agencies to discuss any significant issues raised in the comments, clarify any comments submitted, and if necessary, arrange a comment resolution meeting .
4. SRS shall complete draft comment responses and submit them to the regulatory agencies at least one week prior to any comment resolution meeting or conference call. The draft comments responses should be submitted as soon as possible after receipt of comments to facilitate early identification of areas of disagreement and provide sufficient time for resolution. Early submission of the draft response to comments will facilitate further discussion between the agencies and the FFA Project Manager and/or WAG Manager of any other significant issues.
5. If possible, all comments will be resolved during the formal comment resolution meeting, identified in the implementation schedule conference call, or video conference. The formally agreed to set of responses submitted with the revised document will serve as a record of the resolution. If, however, all comments cannot be resolved, another meeting, conference call, or video conference may be scheduled.
6. Although the FFA provides for EPA and SCDHEC to notify SRS that they may take an additional 30 days to review/comment on a Rev.0, it is the three Parties' intent to expedite the process. If EPA and SCDHEC notify the SRS that the additional 30 days will be used, SRS may initiate an extension request for the subsequent milestones or Rev.0 document under the

terms of FFA Section XXXI.B.3, if just cause is demonstrated.

7. The SRS will submit to EPA and SCDHEC written responses to comments received during the review/comment period and a Revision.1 on or before the close of the Appendix I document-specific revision period, starting on the date of receipt of both the EPA and SCDHEC comments, which ever is last.
8. Although the FFA provides for SRS to notify the EPA and SCDHEC that they may take an additional 30 days on a Rev.1, it is the three Parties' intent to expedite the process. If SRS notifies EPA and SCDHEC that the additional 30 days will be used, the SRS may initiate an extension request for subsequent milestones or Revision 0 documents under the terms of FFA Section XXXI.B.6, if just cause is demonstrated.
9. Upon receipt of the Revision.1 document and responses to comments, the EPA and SCDHEC will determine if the SRS responded to all written comments received during the review/comment period.
 - If the EPA and SCDHEC determine that SRS has adequately responded and revised the Primary Document consistent with the response to comments, they will submit a written letter approving the document.
 - If the EPA and/or SCDHEC determine that DOE has not adequately responded to comments on the Rev.0 document and/or fails to adequately revise the Revision.0 (to a Rev.1) document in response to the comments, the EPA and/or SCDHEC will notify the DOE of the repeat deficiencies and the requirement to resubmit the response to comments and/or the Rev.1 document. If it is determined that DOE submitted inadequate comment responses or an inadequate document then just cause for an extension of subsequent milestones may not be warranted.
 - If the EPA and/or SCDHEC identify new comments during a review of a Rev.1 document that were not raised during the Rev.0 review, just cause for an extension of subsequent milestones may be warranted since revising the document in response to the new comments may constitute "additional work as agreed to by the parties," as provided in FFA Section XXXI.B.
 - Generally, if DOE fails to receive comments and/or approval on a document, in accordance with the implementation schedule or FFA Appendix I timeframes from the agencies, SRS will notify the agencies that an action is required in order to minimize potential schedule impacts.
 - Letters approving or submitting comments on a document will state the name of the document, its document number, revision number and date.

4.11 Scoping Work Priorities

Section XIX of the FFA outlines the process for scoping work priorities at SRS. In accordance with Appendix F of the FFA, the EPA computer program PREscore has been used to prioritize the waste units listed in Appendix C. The list is required to be updated annually. PREscore, a software program designed by the EPA for the uncontrolled hazard ranking of Superfund waste units is described in 40 CFR 300, Appendix B - Hazard Ranking System, and includes the comparison of the Superfund Chemical Data Matrix (SCDM) to the presence and extent of waste unit contaminants relative to human health and the environment. Radionuclide information, not available in the SCDM, is entered into the program manually. This hazard ranking for SRS waste units is

performed to allow better planning of waste unit scheduling and funding based on overall risk to human health and the environment. Appendix C.1 of the FFA contains the RCRA/CERCLA Units List sorted by PRescore.

4.12 Timetables and Deadlines

Section XX of the FFA addresses enforceable timetables and deadline commitments in Appendices D and E. The milestone list will provide enforceable dates for submittal of documents for EPA and SCDHEC review.

For the purpose of this document, timetables and deadlines shall refer to Appendices D and E of the FFA and schedules shall refer to approved implementation schedules.

4.12.1 Response Action Schedules

Implementation schedules in conjunction with approved Primary Documents provide the detailed compliance schedules which support the FFA Appendices D and E commitments. If an implementation schedule changes an existing Appendix D or E milestone, an extension request will be processed by SRS in accordance with Section XXXI of the FFA. Appendices D and E commitments incorporate the major milestones listed on the approved implementation schedules. If, in accordance with Section XX.B of the FFA, DOE is not funded for the current fiscal year milestones, DOE must request an extension to the approved Primary Documents implementation schedule and demonstrate that the just cause for the delay was due to funding limitations.

Primary Document implementation schedules are typically included in RFI/RI, CMD/RD, and CMI/RA plans. These schedules may also be prepared and submitted separate from the document, (for example, when extension or acceleration requests are processed). Upon DOE's receipt of EPA and SCDHEC approval of an RFI/RI, CMD/RA or CMI/RA Plan that contains an implementation schedule, DOE will, under separate cover, provide the EPA and SCDHEC a copy of the approved implementation schedule for their records. Attachment 3 includes a generic schedule illustrating the RI/FS and remedy selection tasks, their critical path schedules, and the Appendices D and E milestones for a complete RI/FS and final remedy selection for three varieties of typical OUs. The primary purpose of the generic schedules is for development of long-term Appendix E commitments and a guide for development of OU-specific implementation schedules. These schedules are to be considered baseline time frames (i.e., contain no bias for early action or streamlining efforts described in Section 3.5 included) and justification will be provided for any OU-specific implementation schedules exceeding these timeframes.

4.12.2 Submitting Annual Appendices and Their Relationships

As required under Section XX (Timetables and Deadlines) of the FFA, enforceable timetables and deadlines for current Fiscal Year (FY) commitments are contained in Appendix D of the FFA. Appendix E of the FFA provides projected submittal or milestone dates for FY + 1 and FY + 2 and the projected Record of Decision (ROD) dates for the FY + 3 and beyond. Table 4-2 presents submittals and response durations for FFA Appendices review requirements.

Appendix D

DOE will submit an Interim Appendix D for the current fiscal year by October 15 of each year. This interim appendix is submitted prior to budget allocation to reflect the impact of any approved extensions during the previous FY which impacted FY+1 (i.e., the new current FY). Following

Table 4-2. Protocol for Submitting Annual Appendices

Revision.0 Submittal	FFA Section	SRS Submittal Date	EPA/SCDHEC Response	Revision.1 Submittal
Appendix C	XIX.B	1 October	Within 120 days of receipt	Within 90 days of comment receipt
Interim Appendix D Appendix D	NA XX.B	15 October 30 business days after DOE-SR receives its annual budget allotment	Within 15 business days of receipt	Within 15 business days of receipt of comments
Appendix E Appendix G	XIX.D	15 November 1 October	By 31 December Within 120 days of receipt	31 January Within 90 days of comment receipt
Annual report on Status of Tanks being removed from service	IX.E.3	March 9	Review and approval necessary if report contains changes to existing plans and schedules	
Removal Action Report	XIV	1 January	No response required by the FFA**	
Notification of Budget Allotment	XX.B	Within 5 business days of receipt of allotment	No response required by the FFA**	
Annual Progress Reports	XXV	1 December	No response required by the FFA**	
Update of Administrative Record Files	XXXIV	1 December	Concurrence required, no time period specified**	
Operable Units	XIII	October 1	Within 120 business days of receipt	Within 90 business days of comment receipt

** Although responses are not required from the EPA or SCDHEC, they may submit comments or suggestions at their discretion; however, under the terms of the FFA, SRS is not obligated to provide formal responses to comments.

receipt of its annual budget allotment, DOE will notify the regulatory agencies and submit the Rev.0 Appendix D in accordance with Section XX of the FFA.

4.12.3 Tracking Appendices D and E Submittals and Milestones

SRS prepares and maintains the "Status of FFA Commitments Report" which lists primary document commitments and ensures their placement in the annual revision of Appendices D and E.

Upon receipt of written approval by EPA and SCDHEC of an Implementation Schedule, SRS will amend the Status of FFA Commitments Report to include the additions.

SRS uses multiple reports which are given to EPA and SCDHEC, to assist in tracking commitments and milestones. The following reports are used:

Status of FFA Commitments
Chronology of Commitments Report
Units on which RODs have been signed Report
Units on which Field Starts have been initiated Report
Status of Site Evaluations Report

In addition to the reports described above, a Two-Week Look Ahead Report is generated weekly to track commitments, needs, meetings and deliverables for the two week period.

4.13 Extensions

Under Section XXXI of the FFA, a request for an extension to a timetable and deadline or a schedule may be made by any of the three parties. The request must be made before the date of the timetable and deadline or schedule is reached. The extension request may be in writing or by verbal communication. In accordance with Section XXXI, a written follow-up request must follow a verbal request within 10 business days.

A request for an extension will contain the following information:

- The header or subject of the extension request will contain the words "extension request," and will identify the unit for which the extension is sought and the document(s) name and number, if the extension is for a document(s).
- The specifications required by Section XXXI of the FFA will appear as underlined headers, and the terms will be cited under each of the headers. The specifications are as follows:
 - XXXI.A.1 Schedule that is sought to be extended
 - XXXI.A.2 Length of extension sought
 - XXXI.A.3 Cause for the extension
 - XXXI.A.4 Related commitments or schedules that will be impacted by the granting of the extension

In addition to the above, proposed extensions impacting implementation schedules will include a proposed revised implementation schedule.

- SRS will submit revised "redline" copies of Appendices D and E when submitting an extension request.
- Regulatory approval of the extension request constitutes approval of the Appendices D and

E as a routine modification.

As required under the terms of the FFA all extension requests will be sent by a receipt method (hand delivered, obtaining a receipt, Certified Mail, Federal Express, facsimiles, or any similar method). All extension requests emanating from SRS will be signed by the DOE Project Manager or a designee.

Within 14 business days of receipt of the written request the EPA and DHEC shall notify SRS in writing of their position on the request. In the event that the EPA or DHEC do not respond within 14 business days, it will be deemed concurrence by that party.

4.14 Modifications

Modifications are defined as any change or addition to the text or an appendix of the FFA. Modification of the FFA is governed by the terms of Section XLIII. This section requires that all modifications be in writing. The terms are effective when signed by all three Parties. Modifications are designated as informal or major. An informal modification does not require a public comment period. Informal modifications are to be confirmed in writing within 10 calendar days following the effective date of the modification. A major modification is subject to a 45-day public comment period. EPA is the last signatory on any major modifications. Any one of the three parties may designate a modification as major. Two methods--Routine and Non-Routine--are used for modifying the FFA.

4.14.1 Routine

A routine modification is one that is made on an annual basis according to the terms of the FFA. The four types of routine modification are as follows:

- Appendix G (Section X)
- OUs List (Section XIII)
- Appendix C (Section XIX.B)
- Appendix E (Section XIX.C)
- Appendix D (Section XX)
- Changes to D and E as a result of an extension/acceleration request.

The SRS will submit the list or appendix according to the terms of the FFA. Upon receipt of written concurrence from EPA and SCDHEC, the revised list or appendix is incorporated and the FFA is modified. These modifications are considered informal and do not require a public comment period.

However, upon approval, the required annual update of Appendices C, D, E, and G will be public noticed in accordance with the SRS Community Relations Plan.

4.14.2 Non-Routine Modifications

Before initiating any modification, the requesting party will discuss the modification with the other two FFA Project Managers. If any one of the three Parties determines that the modification is major, the modification will be administered under formal modifications as described below. If the three Parties determine that the modification will not be declared major, the modification will be administered as described under informal modifications below.

Informal Modifications:

- The requesting Party fills out the FFA Modification Form, signs it, and dates it.
- The form is transmitted to the other Parties to be signed.
- The signed, original form is transmitted to SRS for entry into the Administrative Record Files.
- SRS will modify the FFA and disseminate the modified pages to the Parties within 10 working days of the receipt of the signed, original form.

Formal Modifications:

- The requesting Party transmits a letter to the other two Parties describing the modification and its justification. If the requesting party declares that the modification is major, they will so state in the letter.
- The other two Parties will concur, in writing, to the suggested modification. If one or both of the other two Parties determines the modification to be major, they will so state in the letter.
- Upon receipt of the two concurrence letters the SRS will contact the EPA and SCDHEC and the three Parties will plan the public comment period.
- After the close of the public comment period, the three Parties will agree upon the final language based on any information from the public comments. The three Parties will prepare a responsiveness summary to address public comments. SRS will prepare a modification form for signature by the three Parties.
- Within 10 business days after the modification form is signed, the SRS will provide public notice of the modification, the responsiveness summary, and issue the modification.
- The signed original modification, responsiveness summary and any supporting documentation will be provided to SRS for inclusion in the Administrative Record Files.

DOE, as the lead agency, is responsible for the maintenance of the FFA. SRS maintains the FFA as a "Controlled Document" to ensure that all persons on the distribution list receive all modifications.

4.15 Administrative Record Files

Section XXXIV of the FFA requires SRS to establish and maintain an Administrative Record for the site. The Administrative Record is the body of documents that forms the basis for the selection of a particular response at a RCRA/CERCLA Unit. The Administrative Record serves two purposes. First, the record contains those documents which form the basis for selection of a response action. Under CERCLA Section 113(j), judicial review of any issue concerning the adequacy of any response action is limited to the record. Second, CERCLA Section 113(k) requires that the Administrative Record act as a vehicle for public participation in selecting a response action.

Under the terms of the NCP and the FFA, DOE, as the lead agency, is responsible for the compilation and maintenance of the Administrative Record Files for the RCRA/CERCLA units at the SRS. The guidance that the SRS will follow in the compilation and maintenance of the

Administrative Records is *Final Guidance on Administrative Records for Selecting CERCLA Response Actions* (EPA,). This guidance clarifies the duties of the individuals involved in the compilation and maintenance of the Administrative Record. The SRS Administrative Record Coordinator is responsible for compiling and maintaining the Administrative Record. It is the responsibility of EPA, SCDHEC, and DOE Project Managers to decide which documents are included in a record file.

An Administrative Record File is established for a RCRA/CERCLA Unit or OU. The file is the ongoing collection of documents that are anticipated to constitute the Administrative Record when the selection of a response action is made. Upon signing the ROD, the file is closed and becomes the Administrative Record for that unit. The Administrative Record is the body of documents that was used to form the basis for the selection of a response action. Documents generated or received after the signing of the ROD are maintained in a post-decision document file. Post-decision documents are not added to the Administrative Record, except in accordance with 40 C.F.R. §300.825, "Record Requirements after the Decision Document is Signed."

An Administrative Record File for a RCRA/CERCLA unit or OU is established as follows:

- Upon approval of a work plan
- Upon issuance of a removal action for public comment
- Upon issuance of a Statement of Basis/Proposed Plan or IAPP for public comment, whichever comes first

In the case of Statement of Basis/Proposed Plans, IAPPs, and removal actions, the following activities will occur:

- SRS will update or prepare the index for the Administrative Record File for that unit.
- SRS will transmit the index to EPA and SCDHEC with the appropriate document (i.e., Rev.0 Statement of Basis/Proposed Plan.
- EPA and SCDHEC will review the index for completeness and issue letters of concurrence.
- SRS will place the index and any required documents in the Information Repositories in sufficient time to meet the agreed upon public comment period.

In Section XXXIV, the FFA requires that the SRS provide an annual update of the indices of the Administrative Record Files to EPA and SCDHEC. The Project Managers are required to review the indices to ensure that they are current and complete.

The following steps will be followed for all approved work plans and existing Administrative Record Files:

- SRS will update the indices to the files.
- SRS will submit the indices of the Administrative Record Files to EPA and SCDHEC.
- EPA and SCDHEC will provide written concurrence with the indices within 30 days of receipt.

- SRS will place the updated indices in the Information Repositories within 15 days of receipt of EPA and SCDHEC concurrence.

To the extent possible, the SRS will microfilm the documents that are included in the Administrative Record Files. The microfilm is an M-Type Cartridge. A copy will be provided to EPA, SCDHEC, and the Information Repositories. All documents contained in an Administrative Record File are or will be available to the public on microfilm or in hardcopy during the public comment period.

The indices to the Administrative Records and Administrative Record Files are maintained in the document, *Administrative Record Files and Information Repository Files for the Savannah River Site*. This document contains the indices to the Administrative Record File for the SRS and instructions on how to view the documents contained in the files. A copy of this document has been transmitted to EPA, SCDHEC, and the Information Repositories. When updated or when new Administrative Record File Indices are issued, the document is also updated.

The Parties agree that the signed original correspondence from the EPA and SCDHEC pertaining to the implementation of the FFA will be placed in the Administrative Record. EPA and SCDHEC will send this correspondence to the designated individual. In addressing correspondence, the Parties also agree on protocol as follows: SRS routine correspondence pertaining to project/waste units status will be sent by the designated individual. Nonroutine correspondence may be sent from the DOE-SR Manager or Assistant Manager to EPA and SCDHEC Section Management with all FFA Project Managers and designated individuals receiving copies.

Information Repositories for SRS are located at the University of South Carolina Aiken and Columbia campuses. The Administrative Record Index is located in the Augusta State University Library and the Savannah State College Library.

4.16 Project Managers Meeting

The Parties agree that Project Managers Meeting will be held in accordance with the requirements of Section XXII.E of the Federal Facility Agreement. Section XXII.E requires the Parties to hold Project Managers Meetings approximately every forty-five (45) days except as otherwise agreed by the Parties. At a minimum, the purpose of the meetings is to review and discuss the status of work being performed at SRS on the primary and secondary documents.

All reports generated by SRS for tracking undergo a detailed review by WSRC and DOE for accuracy and correctness.

4.16.1 Status Reports

To track the progress of work being performed at SRS under the terms of the FFA, SRS will prepare and distribute the following reports no later than two (2) weeks after the date of the last Project Managers Meeting.

Status of FFA Commitments Report - This status report provides the current status of outstanding FFA commitments. The content of the report is at the discretion of the three Project Managers. Generally, the report will include such entries as:

FFA Commitment
FFA Commitment Date

Document Number
Date on which:

EPA and SCDHEC received a Revision.0 submittal
EPA and SCDHEC review/comment period ends
SRS received EPA and SCDHEC comments
Revision.1 is due
Revision.1 is finalized

Status of Site Evaluation Report - This status report provides the current status of Appendix G.1 Areas undergoing investigation. The content of the report is at the discretion of the three Project Managers. Generally the report will include such entries as:

Site Evaluation Report Name
Document Number
Date of which:

EPA/SCDHEC received the report
EPA/SCDHEC 120-day comment period ends
SRS received EPA and SCDHEC comments
SRS 90-day response period ends
Date SRS Response to Comments was received by the EPA and SCDHEC
EPA and SCDHEC 30 day review of SRS Response to Comments
Dates the SRS received the EPA and SCDHEC letter of concurrence

FFA Project Managers Chronology Report - This report contains in chronological order, milestones and commitments for the current fiscal quarter + 2.

The SRS also submits on a weekly basis a Two Week Look Ahead Report. This is a brief listing of all commitments, transmittals, scheduled meetings and other deliverables each of the three parties has in the specified two week period. The report is updated weekly.

An annual interim list for scoping meetings will be submitted each year with the Interim Appendix D. The list will include the proposed scoping items and the suggested month for scoping. During the Project Managers meeting, the Project Managers will review the list.

4.16.2 General Meeting Process

The SRS is responsible for preparing meeting records. The records are meant to capture the essence of the meeting and to support the Project Managers in fulfilling their roles. All key decisions will be documented in written correspondence between the three Parties. The draft Meeting Record will be issued to EPA and SCDHEC no later than two (2) weeks after the date of the subject meeting. The Project Managers will correct the draft Record at the next Project Managers Meeting. The corrected record will be entered in the Information Repository Files for the SRS.

The SRS will prepare the agenda for each scheduled meeting. EPA and SCDHEC will notify SRS of topics they desire to be listed on the agenda. Approximately one (1) week prior to the scheduled meeting SRS will transmit the draft agenda along with materials that will be discussed at the meeting via facsimile (if not already provided via other methods).

5.0 PUBLIC INVOLVEMENT

Section 117 of CERCLA, and R.61-79.124 of the South Carolina Hazardous Waste management regulations, as amended, and Section XXXV of the FFA outlines public participation requirements. To meet these requirements, and those of the Superfund Community Relations Policy Memorandum of 1983 and the Community Relations in Superfund: A Handbook (EPA, 1992), SRS has developed the SRS Public Involvement Plan (DOE, 1994) and is currently revising this document and developing a Community Relations Plan for ER activities.

The SRS intent is to begin public participation in the remedial process as early as possible. This would hopefully eliminate public distress late in the remedial process.

To provide the public a greater opportunity to review and offer input to DOE, EPA and SCDHEC, the SRS CAB was formed by DOE. The CAB consists of 25 citizens, of varying background, from Georgia and South Carolina. It is chartered under the Federal Advisory Committee Act to provide DOE, EPA and SCDHEC with informed recommendations regarding environmental restorations, waste management, and other related SRS issues.

Currently, the CAB has decided that they do not need to scope all CMSs/FS documents. The CAB will decide which documents they want to scope and when. Other public participation method are being reviewed by SRS and the CAB for those CMS/FSs that the CAB ER subcommittee will not review.

Public meetings will be held, at a minimum, during the public comment period for significant actions. For the less than significant actions, meetings will not be held unless they are requested.

SRS is currently implementing several new initiatives to increase and improve these areas in the future.

SRS will go forward with the Information Exchange which was initiated in June, 1995. These meetings will be held quarterly, will be open to all residents of the CSRA and will focus on accomplishments, issues and risks associated with the Environmental Restoration program.

Another new strategy is the compilation and tracking of information requests from the general public. SRS has just begun building this database, which will help to ensure that all requests are addressed.

A related strategy just initiated at SRS is the creation of a database which tracks public feedback on our information exchange efforts. Response cards are collected from public meetings which solicit public recommendations on how to improve the program.

However, upon approval, the required annual update of Appendices C, D, E, and G will be public noticed in accordance with the SRS Community Relations Plan.

6.0 PROPERTY TRANSFER

DOE must, under Section 120(h) of CERCLA and Section XLVI of the FFA, meet certain conditions whenever it determines that it will terminate government operations by entering into a contract for the sale or transfer, including a lease, of any of the SRS. Prior to the termination of government operations, DOE is required to provide notice of the type and quantity of hazardous substances released, stored or disposed and the time at which such storage, release, or disposal occurred or identify if the property has had no hazardous substances stored, released or disposed. The notice or identification is in the form of an Environmental Baseline Survey (EBS) that will contain a statement of findings as to the environmental condition of the property and a certification of the survey results. The EBS is the primary document that supports the findings of suitability to transfer (FOST) or findings of suitability to lease (FOSL).

Per Section 120(h) of CERCLA, the identification is not complete until concurrence with the results of the EBS is obtained from the Region IV EPA Administrator. Per the Hall Amendment to the National Defense Authorization Act of Fiscal Year 1994, EPA has sixty (60) days to concur. If within 60 days after DOE requests concurrence and the EPA fails to submit to DOE a notice of concurrence with or a rejection of the determination, DOE may enter into a lease without such concurrence. Identification and concurrence required shall be made at least six (6) months prior to the termination of government operations. Notification to SCDHEC is also required prior to entering into any lease by DOE if the property upon which DOE plans to terminate government operations was found to have hazardous substances stored, released or disposed. This notification must include the length of the lease, the name of the person to whom the property is leased and a description of allowable uses under the lease. DOE shall also, per Section XLVI of the FFA, include notice of the FFA in any document transferring ownership or operation of SRS to any subsequent owner and/or operator. At least ninety (90) days prior to any sale or transfer of SRS, DOE shall notify EPA and SCDHEC of such sale or transfer.

The following checklist describes requirements that must be satisfied to be in compliance with the Community Environmental Response Facilitation Act (CERFA), or Panetta Bill (Public Law 102-426) of 1992, the National Defense Authorization Act of Fiscal Year 1994, or Hall Amendment (Public Law 103-160, Section 3154), and the Federal Facility Agreement (FFA) for SRS (Section XLVI. Property Transfer).

- (a) Conduct of a detailed search of government records pertaining to the property.
- (b) Review of the chain of title and other real property records to ascertain prior uses of the real property which may have involved hazardous substances or otherwise contaminated the property.
- (c) Review of aerial photographs that reflect the prior uses of real property and that are reasonable obtainable through state or local government agencies.
- (d) Conduct of a visual inspection of the property to determine or confirm the presence of an environmentally hazardous condition (i.e. unusual odors, stained soils, stressed vegetation, seeps, land features related to human activity, etc.) or wetlands.
- (e) Physical inspection of property adjacent to the real property, to the extent permitted by owners and operators of such property (if applicable).
- (f) Review of reasonably obtainable Federal, state, and local government records of each adjacent facility where there's a release of any hazardous substances and/or petroleum

- derivatives and which is likely to cause or contribute to a release or threatened release of any hazardous substance or petroleum product or its derivatives.
- (g) Conduct of interviews with current or former employees involved in operations on the real property.
 - (h) Review of all existing or completed surveys, or inspection reports regarding hazardous substance or any petroleum product or its derivatives (including aviation fuel and motor oil), asbestos, PCB's, underground and aboveground storage tanks and piping systems, and solid waste management units.
 - (i) Review of any applicable regulatory agency reports or notices of violations or non-compliance, or other similar records.
 - (j) Review of all current and/or discontinued permits pertaining to environmentally regulated activity.
 - (k) Identification of measures to be adopted or restrictive provisions that should be included in conditions of the lease to (1) mitigate the effects of contamination to reduce any environmental, health, occupational, or safety risks associated with the use of the property to legally acceptable levels and (2) to prevent interference with ongoing remediation activities.
 - (l) Notice of the SRS Federal Facility Agreement to the subsequent owner and/or operator of any portion of the SRS.
 - (m) Notice to EPA and SCDHEC of any sale or transfer at last ninety (90) days prior to such sale or transfer.
 - (n) No change in ownership in the SRS or any portion thereof or notice pursuant to Section 120(h)(3)(b) of CERCLA, 42 U.S.C. 9620(h)(3)(b), shall relieve DOE of its obligation to perform pursuant to the SRS FFA.
 - (o) No change of ownership of the SRS or any portion thereof shall be consummated without provisions for continued maintenance of any containment system, treatment system, or other response action(s) installed or implemented pursuant to the SRS FFA.

7.0 ITEMS TO BE DEVELOPED

This section contains issues which need to be discussed and resolved by the Three Parties and added to the FIP as the issues are resolved, the FFA is modified or new topics/methods are developed and employed. The following is a brief summary of issues which have not been fully developed/ resolved. Each issue in the list will be discussed and developed outside of the FIP. Once the Parties agree on an issue, it will initially be documented outside of the FIP. Only after the write-up on the issue is agreed upon will it be added to this document. This is being done to minimize impacts to the FIP document. As new issues and ideas come up, they will be added to the list.

The three parties will determine the priority of the issues and develop a schedule for completion of each issues at the FFA Project Manager's meeting. A standing item during the FFA Project Manager's meeting will be a FIP Bin List status.

1. Site Evaluation program
 - Revise FIP sections based on EPA role
 - Review prioritization process for SE areas
 - Consideration of "active" areas in the SE Process
 - Use of SSLs for screening data results
 - Incorporation of SE Areas into Appendix C and H actions
2. Remedial Action Objectives/Remedial Goal Options
 - Upon reaching three Party consensus over FIP Section 3.0 FFA cleanup program goal, and the management principles and expectations, specific strategies for cleanup of environmental media impacted by hazardous substance releases shall be defined. The strategy should consider soil - direct exposure; soil
 - EPA has developed a draft framework for evaluating soil as a source of ground water contamination. The approach is tiered and allows for a screening evaluation, generic or analytical modeling, and detailed or numeric modeling. An approach based on this method will be evaluated and possibly incorporated into the FIP.
 - use of 10^{-4} - 10^{-6} risk level as a point of departure or clean up goal
3. Ecological Risk Assessment Strategy
 - Consensus on this issue has nearly been achieved. Reevaluation of the approach to effective scoping of the RI to support the ecological portion of the risk assessment in a manner consistent with the approach to scoping RI for the human health assessment will be conducted.
4. RI Uncertainty Analysis
 - As discussed on numerous occasions among EPA, SCDHEC and DOE, the uncertainty analysis should not be limited to a perfunctory library search of the uncertainty of the toxic or carcinogenic effect of COCs. Rather, the uncertainty analysis should be developed in a thorough manner to support scoping/streamlining of the FS and effective management of uncertainty in the final risk management decision for each operable unit, in a manner consistent with principles of SAFER. Critical factors of uncertainty that must be addressed include:

- (1) characterization uncertainty in the nature (e.g., fate and transport) and extent (e.g., data quantity/quality limitations, distribution of predominant COCs, presence of other COCs) of hazardous substances per environmental media;
 - (2) calculation of the COPC concentration terms and COPC reduction for the quantitative risk assessment;
 - (3) toxic or carcinogenic effects of COCs;
 - (4) the use of frequency of detection in the COPC selection process.
 - This issue should be discussed during the Breakthrough Team's discussion of process improvements.
5. A Definitive Early Response Action Strategy
- The FIP expresses a bias for action yet a clear strategy is not included
 - This issue is being developed by the FPIT team during their development of the scoping process.
6. Primary Document Outlines
- The existing outlines will be updated to express a more detailed set of expectations for key portions of the outlines and to ensure that refinement of the CSM is clearly conveyed throughout the series of documents to include the proposed Plan, ROD and Post ROD documents.
 - Primary document templates are being developed by the FPIT team
7. Scoping Protocols for RFI/RI/BRA Reports, Statement of Basis/Proposed Plans, RODs, and Post-ROD Documents
- It is expected these protocols will be developed during the FFA Process Improvement Task Team meetings and will be included in the FIP when completed.
 - Revise appropriate sections that discuss scoping, based on the recommendations from the FFA Process Improvement Task Team.
8. Revise Section 4.6 to include RCRA Permit Modification Administrative Requirements
- Proposal (October 1996) from DOE to EPA/SCDHEC is under review
9. Revise Section 4.0 to include Sitewide Background Soil Study
- Need to add to FIP when strategy is finalized.
10. Develop protocol for:
- routine correspondence
11. Develop an overall groundwater remediation strategy
- secondary source; groundwater
 - direct exposure/natural resource; groundwater
 - secondary source; surface water
 - direct exposure/natural resource
 - appropriate use of mixing zones and ACLs (Section 3.0)
 - separation of groundwater from source OU (Section 4.0)
12. Review sitewide source OU remediation strategy

APPENDIX I

DEFINITIONS

Administrative Record is an official file of reports and other documents maintained by the lead agency regarding the Scoping, RI, FS, and Proposed Plan phases of the CERCLA process. Administrative Records support the remedial decisions reached and documented in the ROD. Established at CERCLA 113(k)(1). See 40 CFR 300.800 et seq.

Applicable or relevant and appropriate requirements are "legally applicable" or "relevant and appropriate" laws, standards, requirements, criteria, or limitations as those terms are used in Section 121(d) of CERCLA, 42 United States Code (USC) § 9621(d).

Applicable state laws include, but are not limited to, all laws determined to be ARARs as described in Section 121(d) of CERCLA, 42 USC § 9621(d). It is recognized that in some instances in which this phrase is used, there may be no applicable state laws.

Balancing criteria are five of the nine criteria established by the NCP for evaluating alternatives in the FS before proposing and selecting the remedy for a site or OU. The balancing criteria are listed at CERCLA 121(d)(4), and in the NCP at 40 CFR 300.430(f)(1)(i)(B) or 54 FR 8850-8851. The five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are considered for all alternatives that meet the two-threshold criteria (protection of human health and the environment and compliance with ARARs).

Baseline Risk Assessment is a formal risk assessment conducted as part of the RI according to EPA-prescribed procedures. The need for remedial action at a site is established in part on the results of the BRA.

CERCLA is the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.

Community relations means EPA's program to inform and encourage public participation in the Superfund process and to respond to community concerns. The term "public" includes citizens directly affected by the site, other interested citizens or parties, organized groups, elected officials, and potentially responsible parties.

Conceptual Site Model is a SAFER tool. A combination of text, source-pathway-receptor diagrams, and conceptual diagrams that together provide a qualitative understanding of how a site works.

Contingency Plan is a SAFER tool. A plan of action in case a potential deviation from the expected site conditions is encountered during remediation. A contingency plan is the primary means by which an uncertainty is managed.

Corrective Measures Study(s) means the study or report identifying and recommending, as appropriate, specific measures that will correct the release(s) identified during the RFI. The CMS shall include a corrective or remedial action plan(s), as appropriate.

Data gaps mean unavailable data that would be needed or useful in facilitating a complete understanding of the nature and extent of contamination at a site or OU, to construct a complete conceptual model of the site or OU, to complete a baseline risk assessment, and to select and implement a remedy. Not all data gaps are identified as data needs.

Data needs are unavailable data that are determined to be essential in completing the RI/FS, remedy selection and RD/RA at a site or OU.

Data quality objectives are a tool to determine the type, quantity, and quality of data needed to make defensible decisions during the CERCLA process for a site or OU. EPA established the DQO process, and guidance is available. The DQO process is incorporated in SAFER.

Days mean calendar days, unless business days are specified. Any submittal or written statement of dispute that under the terms of the FFA would be due on a Saturday, Sunday, or holiday shall be due on the following business day.

Decision rules is a SAFER tool. Decision rules establish the relationship between data to be collected and the use(s) for the data. Decision rules are generally "If..., then..." statements that establish what decisions or actions will be taken depending on how the data turn out once collected. Development of decision rules forces a focus on the real need for a particular type of data and tends to reduce the data collection to a minimum.

Environment as defined by Section 101(8) of CERCLA, means the navigable waters, the waters of the contiguous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Magnuson Fishery Conservation and Management Act; and any other surface water, groundwater, drinking water supply, land surface or subsurface strata, or ambient air within the United States or under the jurisdiction of the United States.

Evaluation criteria are the nine evaluation criteria established in the NCP for evaluation of remedial alternatives before remedy selection. The nine criteria are (1) protectiveness of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance. See 40 CFR 300.430(e)(9)(iii).

Exposure Assessment is the determination or estimation (qualitative or quantitative) of the magnitude, frequency, duration, and route of exposure.

Exposure pathway is a series of hypothetical events and agencies by which a contaminant can migrate to and be taken up by a human or environment receptor. A pathway is not complete unless all of the following elements are present: (1) source of contamination, (2) release mechanism, (3) transport medium, (4) exposure point, and (5) route of exposure (or uptake). In general, remedial actions seek to eliminate one or more of these elements from each complete pathway.

Feasibility Study means a study that fully evaluates and develops remedial action alternatives to prevent and mitigate the migration of the release of hazardous substances, pollutants, or contaminants at and from the site.

Groundwater as defined by Section 101(12) of CERCLA, means water in a saturated zone or stratum beneath the surface of land or water.

Hazard Ranking System means the method used by EPA to evaluate the relative potential of hazardous substance releases to cause health or safety problems, or ecological or environmental damage.

Integrator Operable Units at SRS have been defined in terms of the distinct hydrogeologic domains (e.g., A- and M-Areas). The SRS hydrogeology is primarily depicted by shallow to intermediate depth horizontal groundwater flow discharging to tributaries to the Savannah River or directly into the Savannah River. Also, the deep regional drinking water aquifer is affected by downward flow of groundwater from the above mentioned shallow to intermediate depth aquifers.

Interim remedial action is a remedial action that is taken at a site to address one or more the site problems, but not all of the site problems. IRAs are based on an RI/FS and selected in a ROD, just as final remedial actions are.

Limited field investigation is a short duration field sampling and measurement effort targeted to answer a limited range of specific questions. This kind of investigation may be conducted at any point in the RI/FS process, including the Scoping phase. Limited field investigations will frequently be used at DOE sites to support early actions.

Manageable uncertainty is a SAFER concept. An uncertainty is manageable and need not be resolved through data collection, if the potential deviations from expected conditions during remediation can be handled in the field through implementation of a contingency plan.

Management of migration means actions that are taken to minimize and mitigate the migration of hazardous substances or pollutants or contaminants and the effects of such migration. Measures may include, but are not limited to, management of a plume of contamination, restoration of a drinking water aquifer, or surface water restoration.

Media-specific response action is an alternative in an FS that does not address all of the problems identified at a site, OU or fundamental study, but is an action that is targeted at one or

more related problems. The three basic types of media-specific response actions at SRS include source control response actions, unsaturated zone response actions, and groundwater.

Monitoring plan is a SAFER tool. During remediation, the site is monitored to detect any of the reasonable (potential) deviations identified in the RI/FS. The monitoring plan is developed in concept during the FS and in detail during the RD phase.

National Contingency Plan is the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, and any amendments thereto.

National Priorities List means the list, compiled by EPA pursuant to CERCLA section 105, of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response.

Observational approach is an engineering approach to investigating and cleaning up contaminated sites in which uncertainties about actual site conditions are resolved only to the extent necessary to select a remedial approach and begin remediation. Adapted from the observational method in geotechnical engineering, the observational approach is incorporated in SAFER.

Operable Unit means a discrete action that comprises an incremental step toward comprehensively addressing site problems. This portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with the site. OUs may address geographical portions of a site, specific site problems, or initial phases of an action or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site. OUs will not impede implementation of subsequent actions, including final action at the site.

Operation and maintenance means measures required to maintain the effectiveness of response actions.

Preliminary assessment means review of existing information and an offsite reconnaissance, if appropriate, to determine if a release may require additional investigation or action. A PA may include an onsite reconnaissance, if appropriate. See 40 CFR 300.420(b).

PREscore is a software program designed by EPA for the hazard ranking of Superfund waste units. PREscore is used to rank existing waste units at the Savannah River Site. The function of this software is described in 40 CFR 300, Appendix A (Hazard Ranking System).

Presumptive Remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection.

Probable condition is a SAFER concept. Any physical, chemical, or regulatory condition (e.g., direction of groundwater flow, concentration of a contaminant in the river) assumed for a site and

that materially affects the protectiveness; ARARs compliance; effectiveness and permanence; ability to reduce toxicity, mobility, or volume of a waste; implementability; cost; or acceptability of a remedial alternative. The probable conditions are those on which the remedy is developed, selected, and designed; they are the conditions expected to be met in the field.

Project Manager(s) are the officials designated by EPA, DOE, and SCDHEC to coordinate, monitor, or direct corrective/remedial response actions at SRS.

Proposed Plan means the report(s) describing the corrective/remedial action(s) recommended for this site, Section 117(a) of CERCLA, 42 USC § 9617.

Public participation, see the definition for community relations.

RCRA Facility Investigation(s) means the investigation(s) performed in accordance with the RCRA permit to gather data sufficient to fully characterize the nature, extent, and rate of migration of actual and potential contaminant releases identified in the RCRA Facility Assessment(s).

Reasonable deviations are a SAFER concept. A deviation from the probable (expected) site conditions judged sufficiently likely to be encountered that a contingency plan should be developed for it.

Reasonable maximum exposure is one of the two exposure assumptions for which risks are calculated in the Baseline Risk Assessment. The other is the average or typical exposure case.

Record of Decision is the formal document in which the lead agency sets forth the selected remedy and the reasons for its selection. See 40 CFR 300.430(f)(5).

Release means any spilling, leaking, pumping, pouring, emitting, emptying, discarding, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers and other closed receptacles containing any hazardous substance or pollutant or contaminant), but excludes (1) any release which results in exposure to persons solely within workplace, with respect to a claim which such persons may assert against the employer of such person, (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine, (3) release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the AEA, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under Section 170 of the AEA, or, for the purposes of Section 104 of CERCLA or any other response action, any release of source byproduct, or special nuclear material from any processing site designated under Section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978, and (4) the normal application of fertilizer, and (5) the releases of petroleum as excluded under Section 101(14) and 33 of CERCLA, 42 USC § 9601(14) and (33).

Remedial Design means the technical analysis and procedures which follow the selection of remedy for a site and result in a detailed set of plans and specifications for implementation of the corrective/remedial action.

Remedial Investigation is an investigation conducted to fully assess the nature and extent of the release or threat of release of hazardous substances, pollutants, or contaminants and to gather necessary data to support the corresponding feasibility study.

Remedial Project Manager means the official designated by the lead agency to coordinate, monitor, or direct remedial or other response actions under subpart E of the NCP.

Remediation means any response action initiated to protect human health and the environment consistent with the requirements of CERCLA and RCRA. These actions may include, but not limited to, removal, treatment, engineering controls, and/or institutional controls.

Remedy or Remedial Action means the implementation of the RA Work Plan and the RD consistent with the NCP and the Superfund Remedial Design and Remedial Action Guidance (EPA) including onsite construction, treatment processes, removals, and any other tasks necessary.

Remove or removal as defined by Section 101(23) of CERCLA, remove or removal means the cleanup or removal of released hazardous substances from the environment; such actions as may be necessary taken in the event of the threat of release of hazardous substances into the environment; such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release. The term includes, in addition, without being limited to, security fencing or other measures to limit access; provision of alternative water supplies; temporary evacuation, and housing of threatened individuals not otherwise provided for; action taken under Section 104(b) of CERCLA; post-removal site control, where appropriate; and any emergency assistance which may be provided under the Disaster Relief Act of 1974. For the purpose of the NCP, the term also includes enforcement activities related thereto.

Respond or response as defined by Section 101(25) of CERCLA, means remove, removal, remedy, or remedial action, including enforcement activities related thereto.

Responsiveness Summary is one of the three sections in the standard format for an ROD. The Responsiveness Summary outlines the comments received on the FS and the proposed plan and the lead agency's responses to the comments. See CERCLA 117(b) and 40 CFR 300.430(f)(3)(F).

Risk assessment under CERCLA is a formal procedure by which quantitative risks for humans are calculated for a series of potential future exposure scenarios. Sometimes used to refer to the Baseline Risk Assessment.

Site inspection means an onsite investigation to determine whether there is a release or potential release and the nature of the associated threats. The purpose is to augment the data collected in the preliminary assessment and to generate, if necessary, sampling and other field data to determine if further action or investigation is appropriate.

Source control action is the construction or installation and startup of those actions necessary to prevent the continued release of hazardous substances or pollutants or contaminants (primarily from a source on top of or within the ground, or in buildings or other structures) into the environment.

Source control maintenance measures are those measures intended to maintain the effectiveness of source control actions once such actions are operating and functioning properly, such as the maintenance of landfill caps and leachate collection systems.

Stakeholders mean any person or group interested in or affected by an RI/FS project conducted at a DOE facility.

Streamlined Approach for Environmental Restoration is a complete streamlining methodology developed by DOE to speed remediation at DOE sites. It includes the elements of the DQO process and the observational approach and is tailored to the special challenges that DOE encounters at its sites.

Streamlining are any efforts to decrease the time and cost required to reach a remedial decision and complete restoration.

Threshold criteria are the two criteria that any alternative must meet to be considered for selection as a site or OU remedy: (1) overall protectiveness of human health and the environment and (2) compliance with ARARs.

To Be Considered means a criterion, advisory, guidance, or proposed standard that, while not legally binding and not a potential ARAR, is evaluated along with ARARs in setting protective cleanup targets. See 40 CFR 300.400(g)(3).

Toxicity assessment is the second of three phases of risk assessment in which the toxicity of each of the contaminants of concern is addressed. It follows the exposure assessment and is followed by the risk characterization.

Uncertainty means questions or gaps in knowledge that affect the ability to remediate the site. Uncertainty that does not impact remediation of the site is not of interest to SAFER. SAFER attributes uncertainty to measurement system limitations in accurately collecting, analyzing, and evaluating environmental data; incomplete knowledge of site conditions; inability to predict remedial technology performance; and changing or unclear regulatory requirements.

APPENDIX II

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1.0 Attachment

Off-Site Rule Acceptability Determination

The Off-Site Rule Acceptability Determination should be completed by the lead agency when waste are to be transported beyond the operable unit area of contamination. Ideally, the lead agency would submit the determination as part of the Record of Decision (ROD) for concurrence by the appropriate State and EPA. When exact waste disposition is not know at the time of the ROD, it may be more appropriate to submit the determination as an appendix to the Removal/Remedial Action Work Plan. The determination should be submitted to the appropriate Federal Facility Agreement Project Manager to facilitate EPA concurrence. EPA must concur with the determination prior to the occurrence of Off-Site waste transport.

OFF-SITE RULE ACCEPTABILITY DETERMINATION FOR CERCLA REMOVAL AND REMEDIAL ACTIONS

1. Is waste being sent to a receiving unit that in **NOT** in the areal extent of contamination of the operable unit or in the very near proximity of the operable unit? (YES or NO) If **NO**, then off-site rule does not apply. If **YES**, then continue acceptability determination for receiving unit by answering question number 2 below.

2. Is the receiving unit part of a RCRA Subtitle C Facility? (YES or NO) If **NO**, then answer question number 4 below. If **YES**, does the RCRA Subtitle C Facility have a land disposal unit? (YES or NO) If **NO**, then answer question number 3 below. If **YES**, then answer the following:

Has the receiving unit released any hazardous waste, constituent or substance? (YES or NO) If **YES**, then receiving unit fails acceptability determination. If **NO**, then answer the following:

Does the receiving unit meet the minimum technology requirements under RCRA Section 3004(O)? (YES or NO) If **NO**, then receiving unit fails acceptability determination. If **YES**, then answer the following:

Are all Facility units that have released hazardous waste, constituents or substances being addressed through and in compliance with a legally binding agreement or order? (YES or NO) If **NO**, Facility fails acceptability determination. If **YES**, then Facility and receiving unit meet acceptability determination criteria and can receive CERCLA off-site waste.

3. Has the receiving unit released any hazardous waste, constituent or substance? (YES or NO) If **YES**, then receiving unit fails acceptability determination. If **NO**, then answer the following:

Are all Facility units with environmentally significant releases of hazardous waste, constituents or substances being addressed through corrective action? (YES or NO) If **NO**, Facility fails acceptability determination. If **YES**, then Facility and receiving unit meet acceptability determination criteria and can receive CERCLA off-site waste.

4. Are all Facility units with environmentally significant releases of hazardous waste, constituents or substances being addressed through corrective action? (YES or NO) If **NO**, then Facility fails acceptability determination. If **YES**, then Facility and receiving unit meet acceptability determination criteria and can receive CERCLA off-site waste.

OFF-SITE ACCEPTABILITY CERTIFICATION

Based on the above determination, the off-site receiving unit meets the requirements of CERCLA Section 121(d)(3) and the Off-Site Rule [58 FR 49200]. **NOTE:** If this off-site transport does not constitute the final disposition for the waste, prior to subsequent transport to another facility or receiving unit, a new off-site acceptability certification must be made.

Appropriate DOE approving authority signature.

Appropriate State approving authority signature.

Appropriate EPA Region IV approving authority signature.

2.0 Attachment
Number of Required Copies

Document	EPA				SCDHEC				ARF	EREC	TOTAL			
	Hard Copy	Hard Copy Showing Changes	Doc. Disk	Data Disk	Hard Copy	Hard Copy Showing Changes	Doc. Disk*	Data Disk	Hard Copy	Data Disk	Hard Copy	Hard Copy Showing Changes	Doc. Disk	Data Disk
Site Evaluation Report	2	1	-	-	2	-	-	-	1	-	5	-	-	-
RFI/RI Workplan	Rev.0	4	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-
RFI/RI and BRA Report	Rev.0	5	-	-	5	-	-	1	1	1	10	-	2	3
	Rev.1	1	1	-	5	1	-	-	1	-	6	2	2	-
CMS/FS Report	Rev.0	4	-	-	5	-	-	1	1	1	10	-	2	3
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-
Treatability Study	Rev.0	4	-	-	5	-	-	1	1	1	10	-	2	3
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-
Proposed Plan	Rev.0	2	-	1	5	-	1	-	1	-	8	-	2	-
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-
Record of Decision	Rev.0	2	-	1	5	-	1	-	1	-	8	-	2	-
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-
CMI/RD Workplan	Rev.0	4	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	4	1	-	-	1	-	6	2	2	-

* SCDHEC to receive final approved documents on disk (after approval)

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Hard Copy Showing Changes - A hard copy of the document illustrating the changes made in response to EPA and/or SCDHEC comments, where feasible.

Doc. Disk - An IBM compatible disk containing the text of a document saved in Word Perfect 5.x. This disk may not contain all appendices, attachments, figures, and tables of the document.

Data Disk - A disk containing analytical data in accordance with FFA Appendix J.

Document	Rev.	EPA				SCDHEC				ARF	EREC	TOTAL			
		Hard Copy	Hard Copy Showing Changes	Doc. Disk	Data Disk	Hard Copy	Hard Copy Showing Changes	Doc. Disk	Data Disk	Hard Copy	Data Disk	Hard Copy	Hard Copy Showing Changes	Doc. Disk	Data Disk
CMI/RD Report	Rev.0	4	-	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	-	4	1	-	-	1	-	6	2	2	-
CA/RA Workplan	Rev.0	4	-	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	-	4	1	-	-	1	-	6	2	2	-
Post-Construction Report	Rev.0	4	-	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	-	4	1	-	-	1	-	6	2	2	-
Final Remediation Report	Rev.0	4	-	-	-	5	-	-	-	1	-	10	-	-	-
	Rev.1	1	1	-	-	4	1	-	-	1	-	6	2	2	-

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Data Disk - A disk containing analytical data in accordance with FFA Appendix J.

3.0 Attachment

Proposed Generic Document Outlines

- 3.1 Work Plan Format
- 3.2 RFI/RI & BRA Report Format
- 3.3 Corrective Measures Study/Feasibility
Study Format
- 3.4 Comment Response Formats

Attachment 3.1 Work Plan Format

FRONT MATTER and DOCUMENT HEADERS AS NEEDED- Document Title, Rev Number, etc.

Executive Summary

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1.0 Introduction

The purpose of the workplan is to present the following information: 1) the initial evaluation of the existing unit data; 2) relevant background information; 3) the regulatory framework for the unit investigation; 4) the evaluations and decisions made during the scoping process; and 5) the scope and objectives of the planned RI/FS activities.

1.1 RFI/RI Workplan Organization

Provides a description of the organization of the report.

1.2 Regulatory Background

1.2.1 RCRA Facility Investigation (RFI) Program

Provides a description of the regulatory background for the application of RCRA 3004(u) at SRS and for unit specific issues.

1.2.2 CERCLA Remedial Investigation (RI) Program

Provides a description of the regulatory background for the application of CERCLA at SRS and for unit specific issues.

1.2.3 Summary of Unit Description

Provides a brief, summary description of the unit history, characteristics, and setting. Unit setting includes physical location, ecological setting, geological setting, hydrological setting, demographics, and infrastructure description.

2.0 Preliminary Unit Evaluation

The purpose of this section is to provide the reader with a summary description of the existing information available for the unit.

2.1 Introduction

Provides a brief introduction of preliminary unit evaluation topics.

2.2 Unit Characteristics

Provides a discussion of the background information on the characteristics of the waste unit such as unit-specific geologic and hydrogeologic properties, climatic conditions, physical setting, waste composition (as appropriate), and history of the unit.

2.3 Existing/Previous Investigations

Provides a discussion of the history, chronology, and results of previous investigations.

2.4 Unit Evaluation Conclusions

Provides a discussion, based on the information from Sections 2.2 and 2.3, of whether or not the unit and surrounding media have been impacted in a general sense.

2.5 Potential ARARs and TBC Criteria

Provides a preliminary list of the applicable or relevant and appropriate requirements (legally binding laws and regulations) and “to-be-considered” factors (criteria, guidance, and proposed standards) for the unit. These are to be used to establish preliminary remediation objectives (e.g., cleanup goals) early in the RCRA/CERCLA process.

2.6 Potential Corrective Measures Study/Feasibility Study Options

Provides a preliminary list of corrective measures and/or feasibility study options that may be applicable to the unit.

2.6.1 Innovative Remedial Technologies

Provides a listing and a discussion of treatability study options that may be considered for the unit.

2.7 Potential Early and/or Interim Remedial Actions

Provides a discussion and a preliminary list of early and/or interim remedial actions that may be applied at the unit.

3.0 Data Quality Objectives (DQO)

The purpose of this section is to provide a discussion of DQOs. DQOs are quantitative and qualitative descriptions of the information required to achieve project goals. They apply to all unit remediation activities including, but not limited to, scoping for potential contamination, verifying contamination, characterizing the extent and concentration of contamination, risk assessment, evaluation and design of alternative clean-up remedies, and monitoring cleanup. The focus of the DQO development process is effective and efficient planning for data collection. The DQO process is participatory, encouraging input and consensus from all data users. The process is intended to encourage effective, efficient thinking about key data planning issues, thus bringing increased understanding and acceptance of project goals. The DQO process is a series of planning steps based on the Scientific Method (see 3.1.2 to 3.1.8 below) and are detailed in EPA540-R-93-071, “Data Quality Objectives Process for Superfund”. The DQO process provides a systematic, flexible approach to decision-making. The steps are portrayed sequentially, but the DQO process is iterative.

3.1 DQO Evaluation

3.1.1 Conceptual Site Model (CSM)

Provides a presentation of the known and suspected sources of contamination, the types of contaminants and potentially affected media, the known and potential routes of migration, and the known or potential human and environmental

receptors. In addition to assisting in identifying locations where sampling is, or is not (based on existing data) necessary, the CSM also assists in the identification of potential remedial technologies.

3.1.1.1 Exposure/Physical Attributes of (CSM)

Provides an expanded discussion and/or details of the physical and exposure attributes as presented in the CSM.

3.1.2 State the Problem

Provides a summary statement of the problem that will require new environmental data, and identifies the resources to resolve the problem.

3.1.3 Identify the Decisions

Provides a discussion of the decisions that require new environmental data to address the problem.

3.1.4 Identify the Inputs to the Decisions

Provides a discussion of the information needed to support the decision, and specifies which inputs require new environmental measurements.

3.1.5 Define the Boundaries of the Study

Provides a discussion of the spatial and temporal aspects of the problem that the data must represent in order to support the decision.

3.1.6 Develop Decision Rules

Provide the logical statements that define the conditions that would cause the decision maker to choose among alternative actions. These decision rules encompass the entire RCRA/CERCLA process.

3.1.7 Specify the Limits on Decision Errors

Provides a discussion of the specifies for the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.

3.1.8 Optimize Design for Obtaining Data

Provides a discussion of the most resource-effective sampling and analysis design for generating the data that are expected to satisfy the DQO process needs.

3.2 Summary of DQO Evaluation

Provides a summary discussion of the information developed in support of the DQO process.

4.0 Unit Assessment

4.1 Objectives

Provides a discussion of the unit characterization objectives as they address the CSM and meet the DQO process needs..

4.2 Primary Source Characterization

Provides a discussion of the specific investigation activities to be implemented and the analytical parameters to be obtained in order to characterize the primary source(s) of contamination as depicted by the CSM and as required by DQO process needs..

4.3 Secondary Source Characterization

Provides a discussion of the specific investigation activities to be implemented and the analytical parameters to be obtained to characterize the secondary sources as depicted by the CSM and as required by DQO process needs.

4.4 Exposure Media Characterization

Provides a discussion of the specific investigation activities to be implemented and the analytical parameters to be obtained to characterize the exposure media impacted as depicted by the CSM and as required by DQO process needs.

4.5 Physical Characteristics

Provides a discussion of the specific investigation activities to be implemented and the physical/analytical parameters to be obtained to provide the data needed to accommodate the CSM and as required by DQO process needs. (The DQO process will ensure feasibility and treatability study data needs are met.)

5.0 Schedule

Provides an explanation of the implementation schedule.

6.0 Safety, Health, and Emergency Response Plan

Provides a statement informing the reader that a unit specific health and safety plan, in accordance with 29 CFR 1910.120 and SRS health and safety requirements, will be generated for the specific characterization activities detailed in the Unit Assessment section.

7.0 Quality Assurance/Quality Control Plan

Provides a reference to the existing quality assurance/quality control documents that are in place and in use (e.g., WSRC IQ).

8.0 Data Management Plan

Provides a reference to the existing data management documents that are in place and in use (e.g., FFA Appendix J, Data Management Plan).

9.0 References

Provides a list of references used for the preparation of the document.

Appendices

Provides a place to include detailed supporting information.

Attachment 3.2 RFI/RI/BRA Format

FRONT MATTER and DOCUMENT HEADERS AS NEEDED- Document Title, Rev Number, etc.

Executive Summary
TABLE OF CONTENTS
LIST OF TABLES
LIST OF FIGURES
LIST OF ACRONYMS

1.0 Introduction

The purpose of this section is to provide the reader with an overview of the purpose and organization of the RFI/RI/BRA report. This section is also used to provide the reader with basic information about the unit, including its description and history.

1.1 RFI/RI/BRA Report Organization

Provides a description of the report content organization for the person who is unfamiliar with this type of document.

1.2 RFI/RI/BRA Purpose

Provides a description of the purpose of the RFI/RI/BRA report.

1.3 Unit Description

Provides a brief description of the unit history, location, and setting. This information can be copied from the workplan and updated, as necessary.

2.0 Conceptual Site Model and Study Area Investigation

The purpose of this section to provide the reader with a discussion of the conceptual site model for the unit. This includes a discussion of the known and suspected sources of contamination, identification of sources, the types of contaminants and potentially affected media, the known and potential routes of migration, and the known or potential human and ecological receptors.

2.1 Conceptual Site Model Application

Provides a discussion of the investigation as it addresses the CSM. Specifically states how each source/media and exposure pathway has been investigated

2.2 Investigation Objectives

Provides a discussion of the objectives of the investigation. These will include a summary of the objectives identified through the use of the DQO process evaluations as detailed in the workplan.

2.3 Unit Assessment Investigation

Provides a detailed description of the unit-specific assessment investigation activities. The following subsections will provide the number of and type of sampling and analysis conducted to characterize CSM sources/media and exposure pathways. The subsections will also segregate the data into groups that not only will support the CSM, but will also support the baseline risk assessment (BRA). These data groupings will include: 0-1', 0-

4', > 4', and groundwater per aquifer . Although unit specific conditions may dictate other grouping scenarios, deviations from the aforementioned will require three party authorization.

2.3.1 Background Investigation

Provides a discussion of the unit-specific background investigation activities that were conducted in order to establish baseline concentrations for the evaluation of unit contaminant and pathway information. Data from the background investigation will be segregated, as needed, into specific sets in order to accommodate the CSM, the DQO process, and the BRA requirements, as detailed in Section 2.3.

2.3.2 Primary Source Investigation

Provides a discussion of the unit-specific investigation activities conducted in order to characterize the primary source of contamination as identified by the CSM and the DQO process.

2.3.3 Secondary Source Investigation

Provides a discussion of the unit-specific investigation activities conducted in order to characterize the secondary source of contamination as identified by the CSM and the DQO process.

2.3.4 Exposure Pathway Investigations

Provides a discussion of the specific investigation activities conducted in order to characterize exposure pathways as identified by the CSM and the DQO process. This section will include, as appropriate, a discussion of potentially contaminated exposure media, including soil, groundwater, surface water, sediments, biota, and air.

2.3.5 Physical Characteristics Investigation

Provides a discussion of the specific investigation activities conducted in order to obtain physical (geotechnical) parameters that were used to accommodate the physical data needs of the CSM.

3.0 Physical Characterization of Study Area

The purpose of this section is to provide a discussion of the physical attributes of the waste unit as well as a discussion relating the unit to the regional physical framework. Historical data and the data results from the physical characteristics investigation activities are presented in the appropriate subsection for which the activity was conducted. For example; geologic data gathered via cone penetrometer technology and/or coring operations will be utilized to augment the Unit Specific Geology subsection.

3.1 Surface Features

Provides a description of the setting of the waste unit with respect to surface features (e.g. topography).

3.2 Meteorology

Provides a description of the typical weather conditions for the waste unit. A reference to existing sources that summarize SRS weather conditions can be used instead of a detailed discussion.

3.3 Surface Water Hydrology

Provides a description of the surface water hydrologic characteristics for waste unit including wetlands, streams, etc. This section is also to include a figure depicting the waste unit in its respective integrator/watershed operable unit along with any other waste units identified in the watershed.

3.4 Unit Soils

Provides a description of the soil characteristics associated with the waste unit that has been investigated.

3.5 Geology

3.5.1 Regional Geology

Provides a reference to the workplan (or appropriate Administrative Record source) for regional geology description, unless revised based on investigation.

3.5.2 Unit Specific Geology

Provides a brief description of the unit specific geology. This section is to include historical data as well as data obtained during investigation.

3.6 Hydrogeology

3.6.1 Regional Hydrogeology

Provides a reference to the workplan (or appropriate Administrative Record source) for regional hydrogeology description, unless revised based on investigation.

3.6.2 Unit-Specific Hydrogeology

Provides a description of the unit-specific hydrogeology. This section is to include historical data as well as data obtained during investigation.

3.7 Demography and Land Use

3.7.1 Demographics

Provides a reference to an appropriate source of information in the Administrative Record or a discussion of the appropriate data.

3.7.2 Land Use

Provides a description of the proposed/accepted land use for the area occupied by the waste unit.

4.0 Nature and Extent of Contamination/ Unit Assessment Investigation Results

This purpose of this section is to document the results of the unit investigation using illustrations, tables, and interpretive discussion of the type and both horizontal and vertical extent of contamination that have resulted from the activities at the waste unit. Soil contaminants evaluated will be based on exceedances of the following screens: first, EPA Region III residential risk based concentrations, and second, two times the background concentrations. Groundwater contaminants evaluated will be based on exceedances of the following screens: first, maximum concentration levels (MCL), second, EPA Region III residential risk based concentrations, and third, two times the background concentrations. The evaluation will be presented per the CSM (sources and pathways) as well as incorporating baseline risk assessment data groupings(0-1', 0-4', > 4', and groundwater by aquifer), as dictated by the waste unit and probable conditions.

The subsections will present and interpret the nature and extent of contamination with respect to sources and pathways, as identified below. Cross-sectional representations and planar maps depicting the data of concern will be provided along with appropriate data tables. In addition to plotting and/or tabulating contaminant data, other data will also be provided (i.e., non-detects, below 2 times background concentrations, not analyzed, etc.).

4.1 Background Investigation Results

The purpose of this section is to provide documentation of the results of the background investigation, including the following, as relevant:

- *background data segregated and interpreted per the CSM, DQO, and baseline risk assessment needs. Data to include appropriate historical/existing data available;*
- *soils [surface soils (0-1'), subsurface soils (0-4'), deep soils (> 4')];*
- *groundwater (per aquifer);*
- *sediment;*
- *surface water; and*
- *biota.*

4.2 Primary Source Investigation Results

Provides a presentation and interpretation of the data collected during the remedial investigation along with appropriate historical/existing data in order to depict the nature and extent of contamination for the primary source of the waste unit.

4.2.1 Primary Source Uncertainty

Provides a discussion of the uncertainty associated with the collection of the data, including spatial and temporal distributions, as appropriate. Provides a discussion of contamination detected in method blanks, counting errors, sampling errors and measurement errors, if significant. Discusses the ramification of the factors causing uncertainty for the data provided.

4.3 Secondary Source Investigation Results

Provides a presentation and interpretation of the data collected during the remedial investigation along with appropriate historical/existing data in order to depict the nature and extent of contamination for the secondary source of the waste unit.

4.3.1 Surface (0-1') Soil Data Presentation and Interpretation

Provides a presentation and interpretation of the data collected for the soil horizon. The discussion summarizes the extent and magnitude of contamination. The data interpretation and discussion includes the nature, aerial extent, trend, identification of primary contaminants, and application to the CSM.

4.3.2 Subsurface (0-4') Soil Data Presentation and Interpretation

Provides a presentation of the data for subsurface soil horizon, including the extent and magnitude of contamination. The extent of this interval will be determined per the CSM and probable conditions of unit. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants, and application to the CSM.

4.3.3 Deep Soil (> 4') Data Presentation and Interpretation

Provides a presentation of the data for this soil horizon, including the extent and magnitude of contamination. The extent of this interval will be determined per the CSM and probable conditions of unit. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants, and application to the CSM.

4.3.3.1 Secondary Source Uncertainty

Provides a discussion of the uncertainty associated with the adequacy of unit specific data, including spatial and temporal distributions. Also provides a discussion of contamination detected in method blanks, counting error, sampling error and measurement error, if significant and appropriate as well as the ramifications upon the data provided.

4.4 Exposure Pathway Investigation Results

Provides the presentation and interpretation of the data collected during the remedial investigation along with appropriate historical/existing data in order to depict the nature and extent of contamination for the exposure pathways of the waste unit.

4.4.1 Water Table (Aquifer I) Data Presentation and Interpretation

Provides a presentation of data for the water table aquifer and summarizes the extent and magnitude of contamination. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants, and application to the CSM. Maps depicting the extent of groundwater contamination are useful to include in this section.

4.4.1.1 Uncertainty Associated with Water Table Aquifer Data

Provides a discussion of the uncertainty associated with the adequacy of the unit specific data, including spatial and temporal distributions, as appropriate. Also contamination detected in method blanks, counting error, sampling error and measurement error, if significant and appropriate should be discussed and the ramifications upon the data provided.

4.4.2 Subsequent Aquifer(s) Data Presentation and Interpretation

Provides a presentation of data for the subsequent, deeper aquifer(s) and summarizes the extent and magnitude of contamination. Each aquifer will be presented as a separate exposure pathway. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants and application to the CSM. Maps and cross-sections depicting the extent of groundwater contamination are useful to include in this section.

4.4.2.1 Uncertainty Associated with Subsequent Aquifer(s) Data

Provides a presentation of the uncertainty associated with the adequacy of unit specific data, including spatial and temporal distributions, as appropriate. Also contamination detected in method blanks, counting error, sampling error and measurement error, if significant and appropriate should be discussed and the ramification upon the data provided.

4.4.3 Sediment Sample Data Presentation and Interpretation

Provides a presentation of data for the sediment samples and summarizes the extent and magnitude of contamination. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants and application to the CSM. Maps depicting the extent of contamination are useful to include in this section.

4.4.3.1 Uncertainty Associated with Sediment Data

Provides a discussion of uncertainty associated with the adequacy of unit specific data, including spatial and temporal distributions, as appropriate. Also contamination detected in method blanks, counting error, sampling error and measurement error, if significant and appropriate should be discussed and the ramification upon the data provided.

4.4.4 Ecological Sample Data Presentation and Interpretation

Provides a presentation of data for the biological samples and summarizes the extent and magnitude of contamination. The data presented should be interpreted with regard to nature, vertical, horizontal and aerial extent, trends, identification of primary contaminants and application to the CSM. Maps depicting the extent of contamination are useful to include in this section.

4.4.4.1 Uncertainty Associated with Ecological Data

Provides a discussion of the uncertainty associated with the adequacy of unit specific data, including spatial and temporal distributions, as appropriate. Also contamination detected in method blanks, counting error, sampling error and measurement error, if significant and appropriate should be discussed and the ramification upon the data provided.

5.0 Contaminant Fate and Transport

The purpose of this section is to provide the reader with a discussion of the fate of the unit contaminants in the environment. This includes a discussion of radionuclide decay, radionuclide daughter in-growth, biological and chemical degradation, natural attenuation, contaminant migration, and leachability through the vadose zone to the groundwater.

5.1 Physical and Chemical Properties of Contaminants

Provides the presentation of the physical and chemical properties that control the behavior of contaminants in the environment. This can include a narrative discussion of the general mobility of chemical classes within the environment as well as the pertinent physical constants affecting contaminant transport such as K_{oc} , K_{ow} , TOC, K_{ds} , half-lives, solubility, density, vapor pressure, and Henry's Law constants. The tables presenting the physical and chemical constants should be for the all constituents detected above two times background.

5.2 Contaminant Migration

Provides a discussion of the contaminant pathways in relationship to the CSM. Includes a discussion of the factors affecting contaminant migration for the media of importance (e.g., movement through groundwater, NAPLs etc.).

5.3 Soil Leachability Analysis

Provides a discussion of the application and underlying assumptions for the soil screening analysis. Generally all soil analytes that were evaluated in the Nature and Extent of Contamination (Chapter 4) and regardless of their depth, should be included in this analysis.

5.3.1 Comparison of Unit-Specific CSM to Soil Screening Level

Provides a comparison of the constituents that exceed two times background, to EPA Soil Screening Level guidance and contrasts important differences between the two. This will determine the potential for leachability to occur.

The following steps for soil leachability analysis will be followed:

- (1) Compare the maximum concentration of constituents that exceed two times background to the EPA generic SSL (with a DAF of 1). Eliminate those constituents from further analysis if the maximum concentration is less than the generic SSL.*

- (2) *For any constituent whose maximum concentration exceeds the generic SSL (with a DAF of 1), evaluate the site specific conditions to determine the site specific mixing zone and dilution attenuation factor (DAF).*
- (3) *Compare the maximum value for those constituents that exceed two times background to the EPA generic SSLs with a DAF that is based on site-specific conditions.*
- (4) *Calculate the average concentration for those constituents whose maximum concentration exceeded the generic SSL screen or for which no generic SSL value was available.*
 - *Decision point: At this point, a thorough evaluation of the data and site conditions is needed. Calculation of the average may vary depending on the site specific conditions. For example, if the constituents are in a small area and is not representative of the entire waste site, only the detected values may be used to calculate the average. Another example may exist if the constituents are in the entire soil column and the average calculation may be based on the detected values plus _ the nondetect values.*
- (5) *Compare the average concentration for the constituents to the generic SSLs selected in step 2. Eliminate those constituents from further analysis if the average concentration did not exceed the generic SSLs.*
- (6) *For those constituents whose average concentration exceeds the generic SSLs or for which no generic SSL was available, calculate the site specific SSLs. Eliminate those constituents from further analysis if the average concentration was less than the site specific SSLs.*

For some constituents, sufficient information (i.e., MCL, MCLG, RBCs) may not be available to calculate a site specific SSL. These constituents will be evaluated in Step 7.

- (7) *For the remaining constituents whose average concentration is greater than the generic and site specific SSLs or for which no generic or site specific SSL was available, more complex fate and transport modeling will be used.*

5.3.2 Input Data and Assumptions

Provides a discussion of the rationale for the parameters used in the SSL calculations.

5.3.3 Method and Calculations

Provides a presentation of the equations used to calculate the mixing zone, DAF, and soil screening levels. A simple table presenting the equations and each of the input parameters with their source (either unit-specific or a literature source) should be included in this section.

5.3.4 Results of Comparison to Soil Screening Levels

Provides documentation of the results of the screening, summarized and listed in a table indicating if the analyte passed or failed the soil screening level. The table should include the chemical specific parameters used in the equations (example parameters may include: Koc, Kd and Henry's Law Constant).

5.4 Detailed Unit-Specific Model

Provides a discussion of the detailed unit-specific fate and transport model(s) to be developed for any contaminants that fail SSL application(s). The fate and transport model(s) may consist of modeling software such as MEPAS or RESRAD or may be an Excel spreadsheet used to calculate transport in the vadose zone followed by dilution in the groundwater to determine the groundwater concentrations. Contaminant travel time, decay, and/or degradation will be evaluated in the selection of a unit-specific model. Detailed fate and transport model(s) should be discussed and presented in similar fashion as described in Section 5.3.

5.4.1 Input Data and Assumptions

Provides a discussion of the rationale for the selection of Kds, radionuclide activities, exposure pathways, and geotechnical parameters.

5.4.2 Method and Calculations

Provides a discussion of the equations utilized in the unit-specific model. Presentation includes references for where the equations can be found.

5.4.3 Results of Unit-Specific Model

Provides a discussion of the results of the unit-specific modeling.

5.5 Conclusions of Fate and Transport

Provides a discussion of the overall results of the SSL comparison and of how any detailed unit-specific modeling should be interpreted. The conclusion should definitively state whether residual contaminants will or will not contribute to future contamination in a set time period.

6.0 Baseline Risk Assessment

The baseline risk assessment (BRA) documents the analysis of the potential for adverse effects associated with exposure to contaminants likely to be present at the unit. Baseline risks are those risks to human health and the environment that can be anticipated to be present in the absence of any remedial efforts or institutional controls for the unit. This section summarizes the development of the data set and the selection of the constituents that are quantitatively evaluated in the BRA.

6.1 Selection of Constituents of Potential Concern and Exposure Groups

In this section, the Constituents of Potential Concern (COPC) for the unit are identified for each exposure group and the COPC process is conducted. COPCs are defined as constituents that are potentially unit related and whose data are of sufficient quality for use in the quantitative risk assessment. COPCs are the constituents that are selected in accordance with EPA Headquarters, EPA Region IV, and SCDHEC guidance.

6.1.1 Media of Potential Concern

In order to aggregate the analytical data by area, the data will be combined into various exposure groups. Exposure groups are defined as areas where human and ecological receptors are likely to be exposed to unit contaminants. Exposure groups at the operable unit are defined on the basis of 1) location of areas with similar exposure media (e.g., soil or surface water); 2) location of distinct sources of contamination; and 3) possible future remedial actions. Soil data are aggregated according to the depth at which the samples are collected.

6.1.2 COPC Selection Process Description

Provides an explanation of the screening process developed for the selection of COPCs for human health and ecological receptors by media and exposure group. This process has been developed for the screening of COPCs and subsequent elimination of incomplete exposure pathways.

6.2 Human Health Risk Assessment

The human health risk assessment is conducted in accordance with the process recommended by EPA and SCDHEC. Using this process, the human health risk assessment is organized into the following sections: (1) exposure assessment (2) toxicity assessment and (3) risk characterization.

6.2.1 Human Health Constituents of Potential Concern

Provides a description of the human health contaminants of potential concern (COPCs). The COPCs are contaminants that are carried through the risk assessment process. The regulators and SRS have developed a screening process to identify COPCs that are most likely to contribute to an unacceptable risk. This section documents the application of this process to the data obtained at the unit.

6.2.2 Exposure Assessment

Provides a description of the estimation of the type and magnitude of the potential human exposures to COPCs. For a given receptor group, this result is an estimate of chronic daily intake or dose that may occur from exposure to the COPCs in the various environmental media within each exposure group.

6.2.2.1 Land Use Assumptions and Potentially Exposed Receptors

Describes land uses at the unit and the human health receptors that may be exposed to contaminants. The risk assessment evaluates both current and potential future land uses.

6.2.2.2 Identification of Potential Exposure Pathways

Describes the course a chemical or physical agent takes from the source to the exposed individual. Four components comprise an exposure pathway: (1) a source and mechanism of chemical release; (2) a retention or transport medium; (3) a point of potential human contact with the contaminated medium; and (4) an exposure route.

6.2.2.3 Derivation of Exposure Point Concentrations

Provides a description of the concentrations of constituents in a given medium to which human receptors are exposed at the point of contact. Methods used to derive exposure point concentration are dependent upon the underlying shape of the distribution of the data set; therefore, the method selected is also described.

6.2.2.4 Development of Constituent Intakes

Provides information concerning the equations and exposure factors (i.e., assumptions) used to calculate constituent intakes.

6.2.2.4.1 Exposure Equations

Provides a description of the intake estimates developed for each COPC using corresponding exposure point concentrations. The risk assessment uses intake equations developed and applied in accordance to the risk assessment guidance.

6.2.2.4.2 Exposure Factors

Describes the exposure factors that are combined with the exposure point concentrations in order to calculate intake or dose. Where possible, site-specific assumptions are used for the exposure factors. There are two sets of exposure factors that can be used, central tendency and reasonable maximum exposures (RME). The regulators prefer SRS to use the RME.

6.2.3 Toxicity Assessment

The objectives of the toxicity assessment are to evaluate the inherent toxicity of the substances under investigation and to identify and to select toxicity values for use in the risk characterization.

6.2.3.1 Chemical Toxicity

Provides a description of the data to be used to characterize the toxicity of the individual contaminants for carcinogenicity and for chronic effects.

6.2.3.2 Radionuclide Toxicity

Provides a description of the data to be used to characterize the toxicity of the radionuclides for carcinogenicity and for chronic effects.

6.2.3.3 Contaminants without Toxicity Values

The toxicity assessment process is complicated by the fact that toxicity values are not readily available for all constituents or all exposure routes. In this section, a discussion of those contaminants is presented.

6.2.4 Risk Characterization

Risk characterization combines the exposure and toxicity assessments by comparing estimates of intakes or dose with appropriate toxicity values.

6.2.4.1 EPA Methods for Risk Characterization

Provides the results of the risk characterization as a separate evaluation of noncancer and cancer effects. EPA methods distinguish cancer from noncancer effects because organisms typically respond differently following exposure to noncarcinogenic or carcinogenic agents.

6.2.4.2 Interpretation of Risk Assessment Results

Provides a comparison of the calculated risk to the target risk levels that have been established by EPA for use in determining the need for remediation. COCs are identified based on the results of the comparison. COCs are the constituents that are carried into the feasibility study/corrective measures study and upon which remediation is focused.

6.2.4.3 Summary Of The Risk Characterization

The results of the risk characterization are presented in tabular format for each receptor and pathway by exposure group for the current and future land use scenario. Those COCs determined to contribute significantly to a pathway are identified as carcinogenic constituents of concern (COCs).

6.2.5 Uncertainty

Provides a discussion of the uncertainty that is inherent in the selection of key input parameters and in every step of the risk assessment process. The results of risk assessment may be understood only in light of the assumptions and methods used in the evaluation.

6.3 Ecological Risk Assessment

The purpose of the ecological risk assessment (ERA) component of the BRA is to evaluate the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to unit-related contaminants based on a weight of evidence approach. The methodology used in this assessment is based on and complies with the intent of EPA Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual (EPA, 1989), Framework for Ecological Risk Assessment (EPA, 1992), draft Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1994), and the draft Supplemental Guidance to RAGS: Region 4 Bulletins Ecological Risk Assessment (EPA Region 4, 1995). These documents do not provide a detailed step-by-step approach to ERAs. Instead, they discuss an overall approach to considering ecological effects and identify sources of information for ERAs. Thus, professional knowledge, experience, and interaction between SRS, EPA, and SCDHEC ecological risk assessors are important to compensate for this limited specific guidance and established methods.

The ecological risk assessment is conducted in accordance with the process recommended by EPA and SCDHEC. Using this process, the ecological risk assessment

is organized into the following sections: (1) problem formulation, (2) exposure assessment, (3) effects assessment, and (4) risk characterization."

6.3.1 Problem Formulation

The first step of EPA's approach to the ERA process, problem formulation, includes: (1) identification of the ecological COPCs; (2) characterization of ecological communities; (3) selection of assessment endpoints; (4) receptor selection; (5) presentation of a conceptual site model; and (6) selection of an analysis plan (including measures of effects).

6.3.1.1 Identification of Constituents of Potential Concern

COPCs are identified in each medium following qualification and evaluation of analytical data and comparison to ecologically risk-based screening values, unit-specific background concentrations, frequency of detection, and consideration of persistence, mobility, and/or bioaccumulation as described in Section 6.1.

6.3.1.2 Characterization of Ecological Communities

The methods for ecological characterization of the exposure groups, including field reconnaissance and habitat mapping, are described in this section. The study area for the evaluation is briefly described including the study area boundaries and approximate acreage. Plant communities and their associated wildlife are discussed as well as discussions regarding habitat quality.

6.3.1.3 Ecological Assessment Endpoint(s)

To assess whether significant adverse ecological effects have occurred or may occur at the operable unit as a result of ecological receptors' exposure to COPCs, ecological endpoints are selected. An ecological endpoint is a characteristic of an ecological component that may be affected by exposure to a stressor, such as a contaminant. Assessment endpoints represent environmental values to be protected.

6.3.1.4 Receptor Selection

Potential receptor species likely to be exposed to unit-related contaminants are judged by the assessment endpoint selection criteria as part of the assessment endpoint selection process. The results of this analysis indicate the most appropriate assessment endpoint species. The results of the selection process are discussed in this section.

6.3.1.5 Ecological Conceptual Site Model

The conceptual site model (CSM) presents the ecological receptors at the operable unit that are potentially exposed to hazardous substances in media across several pathways.

The dominant pathways from contaminant sources and exposure media through the food web to ecological receptors potentially exposed to

ecological COPCs are presented in a figure. A table indicates which receptors are exposed by which routes and those that are evaluated in the ERA. A unit-specific discussion of the CSM sources, release mechanisms, pathways, media, and generic receptors is discussed in this section.

6.3.1.6 Analysis Plan

The analysis plan is the final stage of problem formulation. In this step, risk hypotheses presented in the conceptual site model are evaluated to determine how these hypotheses will be assessed using unit-specific data. The section also identifies the selection of measurement endpoints to be used in the evaluation. Measurement endpoints are measurable responses to a stressor that are related to the valued characteristics chosen as assessment endpoints (EPA, 1992). Assessment endpoints generally refer to characteristics of populations and ecosystems, and it is usually impractical to measure changes in these characteristics as part of an assessment (Suter, 1993). Consequently, measurement endpoints are selected that can be measured and extrapolated to predict effects on assessment endpoints (EPA, 1992).

6.3.2 Exposure Assessment

The exposure assessment assesses potential exposure of ecological receptors to unit-related constituents through evaluation of the following: (1) description of the spatial distribution of COPCs; (2) description of spatial and temporal distribution of ecological receptors; and (3) quantification of exposure that may result from overlap of these distributions.

6.3.2.1 Chemical Distribution

This section provides a brief discussion of the extent of measured chemical contamination at the unit in relation to each exposure area and the approximate acreage of each exposure group. The magnitude of the chemical exposures that may be experienced by ecological receptors is affected by the degree of their spatial and temporal associations with the unit.

6.3.2.2 Receptor Distribution

Provides a discussion of the variety of factors that may affect the extent and significance of potential exposures. Receptor exposures are affected by the degree of spatial and temporal association with the unit. For example, the receptors' mobility may significantly affect their potential exposures to unit-related contaminants. Many species may only inhabit the study area during the seasonal periods (e.g., breeding season, non-migratory periods). Non-migratory species may remain in the vicinity throughout the year. These species, particularly those with longer life spans, have the greatest potential duration of exposure.

6.3.2.3 Quantification of Exposure

Provides details for the degree to which contaminant distributions and receptor distributions coincide at the unit and indicate which receptors are likely to have the greatest potential exposures to COPCs. In order to quantify exposures of terrestrial receptors to each COPC in soil or sediment, a daily intake of each chemical in each medium should be calculated. Conversion of the environmental concentration of each COPC in soil or sediment to an estimated daily intake for a receptor at the unit is necessary prior to evaluation of potential toxicity effects.

6.3.3 Effects Assessment

The effects assessment defines and evaluates the potential ecological response to the ecological COPCs in terms of the selected assessment and measurement endpoints. The effects assessment includes the derivation of toxicity reference values (TRVs) that are the basis of the comparison.

6.3.3.1 Methodology

This section describes the methodology used in assessing the COPCs' potential toxic effects to ecological receptors in the media of concern. Different assessment methodologies are followed for intake of non-radioactive contaminants and external exposure to radiation from radionuclides due to their essentially different mechanisms of toxicity.

6.3.3.1.1 Non-radioactive Contaminants

Describes the methodology for assessing the potentially toxic effects of non-radioactive COPCs that is based on the derivation of a toxicity reference value (TRV) for each COPC in each medium. The TRVs are derived to represent reasonable estimates of the chemical concentrations that, if exceeded in an environmental medium, may produce adverse toxicity effects in ecological receptors exposed to that medium. Ideally, TRV values would be based on unit-specific toxicity data. However, in the absence of unit-specific data, toxicity data from the literature are used by establishing data selection criteria such that TRVs would be as relevant as possible to assessment endpoints at the unit.

6.3.3.1.2 Radioactive Contaminants

Describes the radionuclides that may produce toxic effects as a result of their chemical properties as well as their radioactive properties. It is the radioactive emissions that are considered to be responsible for most of the biologically deleterious effects that may be produced in exposed organisms as a result of intake of radionuclides. In addition to intake, however, ecological receptors may also be affected by radionuclides through direct exposure to external radiation. Therefore, both routes of exposure are considered in evaluating potential toxicity effects from radioactive contaminants at the unit.

6.3.4 Risk Characterization

Risk Characterization integrates exposure(s) and effect(s) on receptors using hazard quotients (ratios of exposure and effect concentrations). The resulting data are used to define the magnitude of risk from ecological COPCs at each exposure group and to assess the risk to receptor individuals and populations. Risk characterization includes two main steps: risk estimation and risk description. Risk estimation uses the results of the exposure and effects assessments to calculate a hazard quotient (HQ) for each COPC. Risk description summarizes the conclusions of the risk estimation and discusses confidence in the risk estimates based on weight of evidence and the uncertainties involved in the assessment. Any COPCs for a given exposure group and medium that are identified as likely to pose significant risk to receptors are thereby classified as ecological constituents of concern (COCs).

6.3.4.1 Risk Estimation

Estimation of the potential for COPCs to pose significant risk to receptors is based on the magnitude of the HQ value calculated for each chemical, as well as other factors such as the bioaccumulation/biomagnification potential, mechanism of toxicity, physicochemical characteristics, environmental fate, and ecological relevance of each chemical. An HQ is a ratio of the estimated exposure dose (for terrestrial receptors) or exposure concentration (for aquatic receptors) of a chemical to the TRV. Generally, the greater this ratio, or quotient, the greater the likelihood of an effect. A quotient of 1 is considered the threshold level at which effects may occur.

6.3.4.2 Risk Description

The risk description has two main elements: 1) the ecological risk summary, which summarizes the results of the risk estimation and uncertainty analysis and assesses confidence in the risk estimates based on weight of evidence and 2) the interpretation of ecological significance, which describes the magnitude of the identified risks to the assessment endpoint(s).

6.3.4.3 Ecological Risk Summary

The risk estimation step resulted in the identification of a subset of COPCs for each exposure group and medium for both current and hypothetical future conditions. These subsets of COPCs include those contaminants estimated to have the potential to pose adverse effects to the assessment endpoints selected. These COPCs are further evaluated based on weight of evidence, and a determination will be made as to whether any have a high likelihood of being a significant risk to the receptor population analyzed for this risk assessment or the ecological community that encompasses the study area.

6.3.5 Uncertainty

Discusses the uncertainty that is inherent in each step of the ecological risk assessment process. Major factors contributing to uncertainty in this risk assessment are discussed qualitatively in the document.

7.0 Remedial Goal Options (RGOs)

Provides the link between the final step of the risk assessment process, which is the determination of the unit COCs and the cleanup levels for the unit. An RGO is developed for each COC, and may be risk-based or ARAR based. Human health remedial goal options (HHRGOs) are estimates of protective cleanup levels based on risk to human receptors. In a similar manner, ecological RGOs (ERGOs) are also based on risks to ecological receptors. Final cleanup levels are selected by risk managers so that they are protective of both human and ecological health, as well as in compliance with state and federal ARARs.

RGO's would be developed for non-radiological contaminants posing a cumulative carcinogenic risk in excess of 10^{-4} , for radiological contaminants where the cumulative site exposure exceeds 15 mrem/yr above background, for contaminants with non-carcinogenic hazard quotients in excess of 1, and for contaminants which pose potential adverse environmental impacts.

8.0 Summary and Conclusions

This chapter provides a summary of the results of the field investigation, including the nature and extent of contamination present at the unit, the expected fate and transport of the contaminants, fate and transport modeling results, if applicable, the results of the human health risk assessment, and the results of the ecological risk assessment. Any revision to the conceptual site model (CSM) based on the results of the study area investigation will be presented in this chapter.

8.1 Summary of Primary Source

This section provides a summary and interpretation of the data obtained for the primary source.

8.2 Summary of Secondary Sources

This section provides a summary and interpretation of the data obtained for the secondary source(s), e.g., surface soils, subsurface soils, deep soils.

8.3 Summary of Exposure Pathways

Provides a summary discussion and interpretation of the data obtained for exposure pathways (e.g., surface water, sediments, groundwater) .

8.4 Summary of Human Health Risk Assessment

Provides a summary discussion of the results of the human health risk assessment for the current and future human receptors based on the current and future land uses.

8.5 Summary of Ecological Risk Assessment

Provides a summary discussion of the likelihood of the occurrence of harmful effects to the environment or to ecological receptors due to exposure to contaminants from the unit.

8.6 Summary of Uncertainty

Provides a discussion of uncertainty concerns for the risk manager that will be of value while making decisions about the future of the unit. This section should identify any potential problem or situation where the unit may not have been properly characterized based on either bad analytical data or on not having adequate data to make a sound management decision.

8.7 Remedial Action Objectives and Preliminary Remedial Alternatives

Provides contaminant-specific remedial goal options which are actually concentration goals for individual constituents for specific medium and land use combinations at the unit. From the RGOs, the risk manager selects Remediation Levels for the COCs, which will be finalized in the record of decision (ROD).

References

This section provides a list of all the references that are used to prepare each section of the document.

Attachment 3.3 Corrective Measures Study/Feasibility Study Template

1.0 Introduction

The purpose of this section is to provide the reader with information that can be used to develop a basic understanding of the unit. This basic information includes the units history and the nature and extent of contamination that has resulted from activities at the unit. This section also provides a description of the organization of the documentation of the analysis of alternatives.

1.1 Purpose and Organization of Report

Provides a description of the purpose of the CMS/FS report and of the organization of the report for readers who may be unfamiliar with this type of a document. A reference that directs the reader to the more extensive information available in the RFI/RI/BRA report should be included.

1.2 Background Information

Provides a summary of the information available about the unit in order to give the reader a basic understanding of the history of the unit and the nature and extent of contamination that has resulted from activities at the unit.

1.2.1 Unit Description

Provides a brief description of the unit, including its location, size, geography, and environmental setting.

1.2.2 Unit History

Provides the reader with a brief description of the activities that have taken place at the unit.

1.2.3 Nature and Extent of Contamination

Provides a discussion of the contamination that has resulted from the unit activities.

1.2.4 Contaminant Fate and Transport

This section provides a discussion of the mobility, in-growth, and decay of the unit contaminants.

1.2.5 Baseline Risk Assessment

This section provides a summary of the results of the analysis performed and documented in the baseline risk assessment.

2.0 Identification and Screening of Technologies

The purpose of this section is to provide the reader with a description of the remedial technologies that are available and reasonably expected to be suitable for use at the unit. Note that this section will be significantly streamlined for ASCAD sites and focused CMS/FS reports.

2.1 Introduction

Provides an introduction to the reader of the type of technologies that have been identified for consideration in the CMS/FS.

2.2 Remedial Action Objectives

This section provides a description of the range of objectives that will be considered. The following sections address the concerns for each medium of interest.

2.2.1 Contaminants of Interest

Provides a listing and description of the contaminants that are being considered for remedial action.

2.2.2 Allowable Exposure Based on Risk Assessment

This section provides a summary of the regulatory guidelines governing the development of risk based contaminants levels.

2.2.3 Development of Remediation Goals

This section provides a listing of the remediation goals for the unit.

2.3 General Response Actions

Provides a discussion of the actions that could be used to address contaminants at the unit. For each medium of interest, a description of the estimate of the area or volume to which treatment, containment, or exposure technologies may be applied.

2.4 Identification of Screening of Technology Types and Process Options

Provides a description of the universe of potentially applicable technology types and process options.

2.4.1 Identification and Screening of Technologies

Provides a discussion of the technology types that are suitable for use at the unit as well as a discussion of the viable process options.

2.4.2 Evaluation of Technologies and Selection of Representative Technologies

Provides an evaluation of how reasonable the use of the technologies will be at the site using the broad categories of effectiveness, implementability, and cost as criteria. Describes the technologies that have been selected to represent the suitable technology types.

3.0 Development and Screening of Alternatives

The purpose of this section is to provide the reader with a description of the range of alternatives under consideration and the documentation of the evaluation of each alternative using the broad categories of effectiveness, implementability, and cost as criteria. Note that this section will be significantly streamlined for ASCAD sites and focused CMS/FS reports.

3.1 Development of Alternatives

Provide a description of the alternatives developed by assembling combinations of technologies and the media to which they apply.

3.2 Screening of Alternatives

In this section, the alternatives will be described and evaluated for use at the unit in question.

3.2.1 Introduction

Provide any relevant introductory information.

3.2.2 Alternative 1

3.2.2.1 Description

Provide a description of the alternative.

3.2.2.2 Evaluation

Provide an evaluation of how reasonable the use of the alternative will be for the unit.

3.2.3 Alternative 2

3.2.3.1 Description

Repeat from above for each alternative developed.

3.2.3.2 Evaluation

Repeat from above for each alternative developed.

4.0 Detailed Analysis of Alternatives

The purpose of this section is to provide the reader with a discussion of the detailed analyses and evaluations performed in order to evaluate each alternative.

4.1 Introduction

Provide any introductory information needed.

4.2 Individual Analysis of Alternatives

Provide a detailed analysis of each alternative for each of the following evaluation criteria:

- *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*
- *community acceptance*
- *state acceptance*

4.2.1 Alternative 1

4.2.1.1 Description

Provides the description of alternative number 1.

4.2.1.2 Assessment

Provides the description of the assessment of alternative number 1.

4.2.2 Alternative 2

4.2.2.1 Description

Repeat from above for each alternative developed.

4.2.2.2 Assessment

Repeat from above for each alternative developed.

4.3 Comparative Analyses

Provides a discussion of the relative strengths and weaknesses of the alternatives with respect to each of the evaluation criteria.

Bibliography

Provides a listing of the resources used in the development of the CMS/FS report.

4.0 Attachment

Generic RI/FS Schedules

NOTE: ELECTRONIC COPIES OF THE GENERIC SCHEDULES ARE NOT AVAILABLE AT THE TIME THIS DOCUMENT IS BEING AVAILABLE ON ERD HOME PAGE. PLEASE CONTACT HOWARD HICKEY FOR HARD COPIES

5.0 Attachment

SRS DQO Scoping Process Example

HYPOTHETICAL ENVIRONMENTAL RESTORATION SITE

PESTICIDE PIT

Prepared to Support Implementation of the Data Quality Objectives Process at the Savannah River Site

February 22, 1996

INTRODUCTION

The Savannah River Site (SRS) is currently evaluating and remediating over 300 historical waste units that are potentially contaminated with toxic organic compounds, radionuclides, and heavy metals. SRS technical staff and project managers are working closely with South Carolina Department of Health and Environmental Control (DHEC) and U.S. Environmental Protection Agency (EPA) Region IV staff to develop a focused, streamlined approach for scoping the work plan phase of the field investigation. This approach is based on input provided by DHEC and EPA, site-specific experience, information obtained from other facilities undergoing remediation, and guidance provided in EPA and U.S. Department of Energy (DOE) publications on development of data quality objectives (DQO) and streamlining the remedial investigation and feasibility study (RI/FS) and remedial action and remedial design (RD/RA) processes.

A key component of the DQO process is the implementation of innovative field investigation techniques for units with minimal existing data. This includes methods such as expedited site characterization (ESC), phased field investigations, development of DQO worksheets, and reliance on a focused scoping process. For sites with a large volume of existing data, innovative techniques can include the use of a detailed physical model and development of DQOs to minimize the amount of additional data that may need to be collected.

This document provides a summary of a hypothetical environmental restoration site at SRS (pesticide pit). As shown in the supporting documentation, the field investigation in the hypothetical example will be driven by the use of DQO worksheets, and the resulting work plan will include ESC and phase 1 and 2 field investigations. Investigations at actual waste units are expected to rely on similar approaches.

HYPOTHETICAL PESTICIDE PIT SITE

SITE DISCOVERY

During a site evaluation investigation at SRS, environmental restoration staff discovered a vegetated area that indicated past soil disturbance. In addition, the top of at least one metal, 55-gallon drum was seen protruding above the surface of the soil. Health and safety trained workers in level B protection were brought in to take surface readings with radiological and organic vapor instruments. Radiological measurements appeared to be consistent with SRS background levels. However, organic vapors were detected. An intensive literature search, review of past aerial photographs, and interviews revealed that, during the 1960s, a pit (about 20 feet wide by 50 feet long, and about 10 feet deep) was located in the current location of the suspect disposal area. Local retirees stated that the pit was used primarily for the disposal of empty containers, including pesticide containers. However, at least one individual recalled that, at times, off-spec or outdated product may have been put in the pit. Overall, the types of pesticides included several organophosphates and organochlorine compounds, including DDT. The result of the site evaluation indicated that action should be taken immediately at this unit.

DEVELOPMENT OF THE DQO WORKSHEETS AND IMPLEMENTATION OF FIELD WORK

This section describes how existing data are used to complete the DQO worksheets, and how the worksheets are used to develop field activities.

PHASE 1 INVESTIGATION

The objectives and data needs of Phase 1 are to determine the number and location of drums and principal threat source material, to identify the need for an early action, and to determine reasonable worst case impacts of any releases. Geophysical surveys, including ground penetrating radar (GPR) and electromagnetometer (EM) testing, would be used to identify drum locations. Soil sampling during Phase 1 will use definitive levels of data quality to quantify concentrations in hot spots. Results of Phase 1 will be used to define and focus the contaminant list for Phase 2 (which will be completed following removal of the principal threat source material). The Phase 1 investigation includes analyses for geotechnical and geochemical parameters that will be used to support analytical models of the soil to groundwater pathway. The DQO worksheets for this phase focus on (1) identification and removal of the principal threat source material throughout the volume of the pit and (2) assessment of contaminated soils from 0-to-4 and 4-to-10 foot depths (the depth intervals are based on agreed-upon risk assessment scenarios and the depth of the pit). The completed worksheets will be used to define decision rules and to determine the need for an early action and numbers and locations of samples. The results of Phase 1 are anticipated to be a removal action or interim remedial action to remove the drums.

Field work for Phase 1 is driven by completion of the DQO worksheets. This includes identification of the source, probable conditions, exposure pathway and/or release mechanisms, data needs and DQOs including engineering and physical processes, field activities including

removal and characterization, field parameters, and potential remedial action alternatives. Following completion of the DQO worksheet, decision rules and associated uncertainties are also developed based on the probable conditions, characterization activities, and parameters identified in the DQO worksheets. An example worksheet for the Phase 1 investigation and associated decision rules are included with this document.

PHASE 2 INVESTIGATION

Phase 2 will focus on residual risks of soil (via direct exposure and the groundwater pathway) following drum removal during Phase 1. Overall, this phase will rely on greater numbers of samples collected at lower levels of data quality (screening levels), with confirmation at a fixed laboratory of about 10 percent of the samples. These data will be used to (1) determine concentrations of contaminants that could potentially leach to groundwater, and (2) provide data on the characteristics and volume of contaminated soil that may require remediation. The soil to groundwater pathway will be addressed initially by comparison of soil contaminant concentrations to generic or site-specific soil screening levels (SSL) considered protective of groundwater. For contaminants that exceed SSLs modeling will be conducted using an analytical model with a saturated flow component to provide potential concentrations at expected well locations. The soil to groundwater pathway can be modeled using a one-dimensional flow and transport approach; however, a two-dimensional transport with a uniform groundwater flow solution may be more appropriate for the saturated zone. A range of values will be used for groundwater modeling parameters (for example, a source term that is based on average contaminant values and the 95th upper confidence limit on the mean).

Empirical data would be compared to modeled data when quantifying potential current and future groundwater risks. As appropriate, empirical data can be used to calibrate the model. If potential groundwater risks are found to be unacceptable, then DQOs for groundwater remediation would be developed to support the groundwater RD/RA effort. Completion of Phase 2 worksheets and decision rules would follow the same format as that provided in the examples for Phase 1.

**DQO WORKSHEET FOR HYPOTHETICAL PESTICIDE PIT
PRINCIPAL THREAT SOURCE MATERIAL (PHASE 1)**

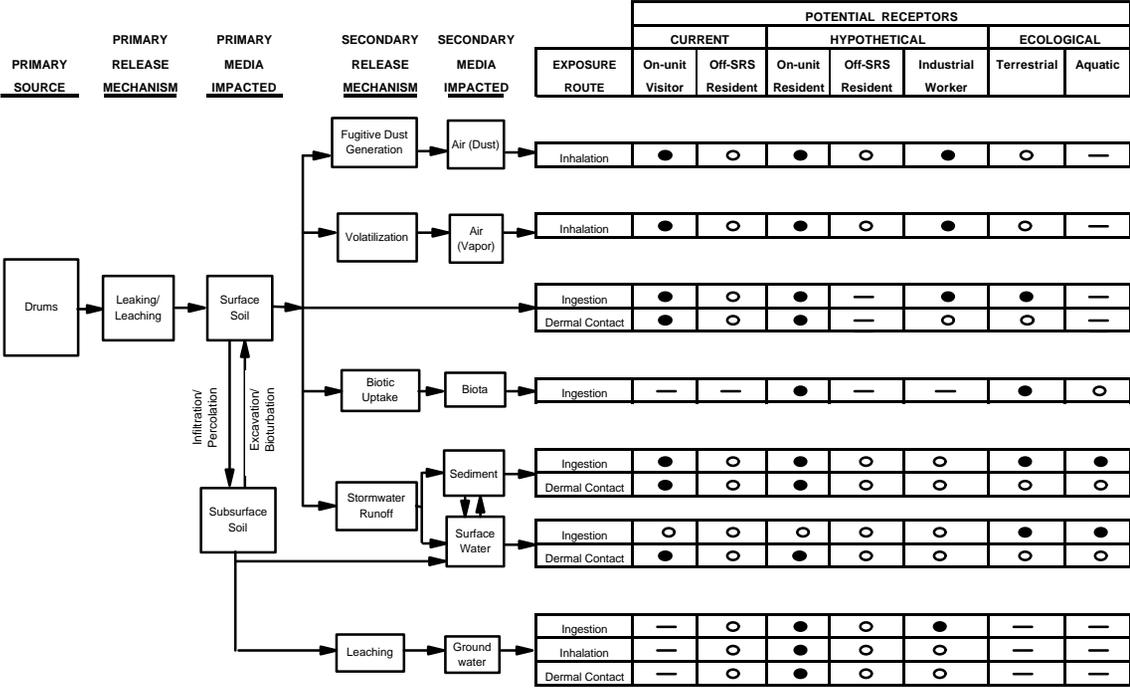
Source	Probable Conditions	Exposure Pathway and/or Release Mechanisms	Data Needs & DQO's Including Engineering/Physical Processes	Field Activities Including Removal & Characterization	Parameters	Potential Remedial Action Alternatives
<p>Deteriorated containers containing organophosphate and organochlorine pesticides. Containers are located from near surface to approximately ten foot depth.</p>	<p>Leaking containers are contaminating adjacent soils. Natural processes such as infiltration, wind erosion, surface, wind erosion, surface water runoff, and bioturbation are dispersing contaminants.</p> <p>Based on chemical/physical properties of source and Hydrogeologic conditions of unit, groundwater contamination may not have occurred.</p>	<p>Incidental ingestion of contaminated soil; potential inhalation of vapor phase and particulates; dermal contact; potential uptake by biota.</p> <p>Potential leaching to groundwater overtime</p>	<p>Identify drum locations for potential removal or interim action.</p> <p>Confirm drum contents to address waste management issues (including storage and disposal of IDW and remediation waste)</p> <p>Collect soil samples to provide preliminary risk assessment and risk management information including preliminary data on soil to groundwater pathway.</p> <p>Specific data needs related to groundwater will be developed during Phase 2.</p>	<p>Field observations of SE team and historical records</p> <p>Geophysics</p> <p>Excavate pit and conduct drum removal. As appropriate, sample drum contents and soils.</p> <p>Conduct test pit and analyze drum contents</p> <p>Grab samples during excavation and drum removal. Additional characterization data to be collected during Phase 2.</p> <p>See above. Additional data to be collected during Phase 2.</p>	<p>Field notes</p> <p>GPR, EM, magnetometer</p> <p>Onsite analysis for SVOCs, ship off-site for TCL, TAL, rad indicators, and TCLP.</p> <p>Analyze for contaminants (such as SVOCs and other parameters as determined by drum contents) and for geotechnical parameters (pH, CEC, bulk density, porosity, TOC).</p> <p>See above. Additional data to be collected during Phase 2.</p>	<p>Time-critical or non-time-critical removal actions or IRA</p> <p>Temporary storage prior to final treatment which would probably involve incineration at permitted incinerator</p> <p>Additional excavation of soil to await soil sampling results, and results of Phase 2. Treatment could include additional excavation and off-site treatment, in-situ stabilization, or institutional controls.</p> <p>Remedial alternatives related to groundwater will be developed during Phase 2.</p>

March 6, 1996

HYPOTHETICAL PESTICIDE PIT DECISION RULES AND ASSOCIATED UNCERTAINTIES

Decision Rule Number	Decision Rule	Uncertainties (includes those associated with probable conditions, characterization activities, and parameters)
1-1A, Using Geophysical Techniques to Identify Potential Drum Locations	If field notes and historical records indicate presence of buried containers, proceed with geophysical methods to confirm presence of buried containers	Minimal uncertainty associated with presence of containers in pit. Minimal uncertainty associated with geophysical techniques indicating presence of buried containers. Medium to high uncertainty with precise locations of buried containers.
1-2A, Remove Drums	If geophysics indicates presence of buried containers, proceed with pit excavation, and drum removal.	Uncertainty associated with locations of buried containers is minimal as excavation proceeds. However, uncertainty associated with use of backhoe is high and has health and safety considerations. Excavation should begin using hand tools.
1-2A, Address Waste Management Issues	If excavation produces IDW and remedial waste, stage these materials at temporary waste storage areas. Proceed with characterization activities as shown in DQO worksheet.	Minimal uncertainty associated with direct sampling of source material.
1-3A, Characterize Drum Contents	If excavation produces remedial waste, proceed with characterization of drum contents as shown in DQO worksheet.	Minimal uncertainty associated with direct sampling of source material.
1-4A, Conduct Soil Sampling for Contaminant Concentrations	Collect grab soil samples from areas around drums as excavation proceeds. If drum characterization resulted in definitive data, analyze for specific pesticides and breakdown products. Collect screening-level data for other parameters. Log all sample locations.	The uncertainty associated with using these grab samples for nature and extent and risk assessment purposes is high. Exposure unit will not be adequately defined (defer to phase 2).
1-4B, Analyze Soil Samples for Geotechnical Parameters (Soil to Groundwater Pathway)	If drum characterization data indicate that the soil to groundwater pathway is viable, analyze soil samples for geotechnical parameters as shown on DQO worksheet.	The uncertainty associated with using these grab samples to model the soil to groundwater pathway is high. Modeling should be completed during Phase 2.

Conceptual Site Model for the Pesticide Pit



LEGEND

- = Pathways, both current and historical
- = Principal Pathways for quantitative evaluation
- = Pathways for qualitative evaluation
- = Incomplete pathways

6.0 Attachment

Technology Demonstration Agreement

Technology Demonstration Agreement

between

**The United States Environmental Protection Agency
The South Carolina Department of Health and Environmental Control
The United States Department of Energy
Savannah River Operations**

on

**Technology Demonstrations at Hazardous Waste Units
at the Savannah River Site**

1. OBJECTIVE

The objective of this Technology Demonstration Agreement is to establish a cooperative relationship between the United States Department of Energy Savannah River Operations Office (**DOE-SR**), the United States Environmental Protection Agency (EPA), and the South Carolina Department of Health and Environmental Control (**SCDHEC**) to implement field demonstrations of **innovative** technologies at hazardous/radioactive waste sites located on the Savannah River Site (**SRS**). Herein these agencies will be referred to as the agencies. Implementation of technology demonstrations through this agreement will enable evaluation of emerging and promising technologies, while enhancing the achievement of **remediation** goals at SM.

This agreement is in keeping with the intent of and references the Technology Demonstration Agreement between the EPA and DOE on Hazardous and Mixed Waste Cleanup and Minimization **RD&D** (January 2, 1990). Additionally, this Agreement supports the Federal Facility Agreement (**FFA**) for the Savannah River Site, wherein the overall goal is to clean the SRS waste sites.

II. PROCESS

To achieve the stated objective, the agreeing agencies will jointly: (a) determine **aremediation** need(s) or contaminant category(s) of mutual interest; (b) **identify** one or more target waste sites for the purpose of technology demonstration; and (c) select suitable technologies for demonstration at the targeted waste site(s). Essential to this process is the creation of a schedule for initiation and completion of the demonstration(s).

Technology Demonstration Agreement

Emphasis will be given during the application of the technology demonstration to achieve more efficient **remediation** with respect to time required as well as degree or completeness of contamination treatment. The implementation of this Agreement will enhance the goals of the FFA and allow additional utilization of proven technologies at the SRS and other sites through technology transfer.

The purposes for cooperation and coordination are: to **identify** roles and responsibilities, mutually **identify** target contaminant types and characteristic waste sites, and mutually facilitate the demonstration of **innovative** technologies. By promoting creative and **innovative** application of new technology at SRS, technology demonstrations can include, but not be limited to, **remediation** technologies including stabilization, containment, treatment, characterization technologies (including construction and data validation) and performance monitoring. Expectations for technology demonstrations under this Agreement are to improve upon **future** remedial efforts by seeking more timely, suitable, and cost effective waste site **remediation**. Support will be provided by the agencies identified within this Agreement for continued application, **further** improvement testing and expansion of the new technology's use elsewhere. The added value for this initiative is to achieve waste site **remediation** while demonstrating technologies.

Upon final mutual selection of a technology demonstration an attachment will be **affixed** to a copy of this Agreement and maintained on file for review, **identifying** the selected site(s), the contaminant or need along with the technology selected for demonstration.

III. AUTHORITIES

This Agreement is intended to facilitate cooperative and streamlined deployment of technology demonstrations at waste sites on the Savannah River Site. The statutory authorities and established responsibilities of the **DOE-SR**, the EPA and the **SCDHEC** will remain in effect and will not be encumbered, superseded, voided nor altered by this Agreement.

IV. ROLES AND RESPONSIBILITIES

A. THE **DOE-SR** agrees:

1. To provide the lead role in identification and screening of suitable demonstration waste sites and in the selection of potential technologies for demonstration.

Technology Demonstration Agreement

2. To establish and lead a working group(s) to expeditiously participate in the selection of the demonstration site and to facilitate and monitor the demonstration tasks and progress.
3. To provide leadership in seeking finding to support the technology demonstration(s).
4. To perform the technology demonstration within the agreed schedule.

B. The Regulating Agencies (EPA and SCDHEC) agree:

1. To participate with the DOE-SR in reviewing and concurring with the waste site screening/selection and the selection of technology demonstrations at the Savannah River Site.
2. To promote and support reasonable and mutually acceptable schedules for the performance of the technology demonstration.
3. To provide timely staff support in the selection processes including review and approval of applicable regulatory documents and the use of the most expeditious regulatory **framework**.

C. The EPA SCDHEC and DOE-SR mutually agree:

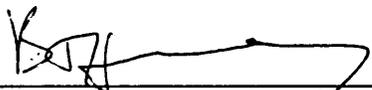
1. That this Agreement will be referenced in any supplemental agreements, amendments or letters or agreement prepared to document details of cooperative efforts carried out by the three organizations.
2. That either party will provide proposed press releases or other public **affairs** information related to joint efforts or projects for review and concurrence by the other parties, prior to release.
3. That each party will seek to ensure **sufficient** finding to **carry** out projects and activities that are mutually agreed upon under this Agreement.
4. The parties to this agreement will negotiate and agree to an appropriate regulatory mechanism/document (e.g., **Treatability** Studies, Work Plans, etc.) to allow the technology demonstration(s) to be conducted.
5. In the event of conflicts, the parties to this agreement will meet and resolve all conflicts, assuring continued progress toward successful demonstrations.

OCT 02 1996

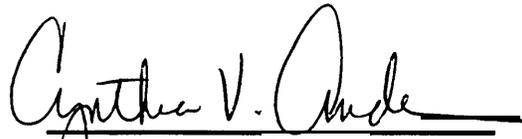
Technology Demonstration Agreement

V. **AUTHENTICATION**

This Agreement is hereby agreed to by the parties so indicated and will become effective upon the **date** of signature by all parties and shall remain in effect for five (5) years or until or unless mutually terminated or amended by **all** parties in writing or at the written request of either party with **ninety** (90) days prior notice.



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Department of Energy
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