DOE/RL-96-67
Rev. 0

200 Areas Soil Remediation Strategy - Environmental Restoration Program

Environmental Excellence
HANFORD

Prepared for the U.S. Department of Energy
Office of Environmental Restoration

Bechtel Hanford, Inc.
Richland, Washington

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EXECUTIVE SUMMARY

The remediation and waste management activities in the 200 Areas of the Hanford Site currently range from remediating groundwater, remediating source units (contaminated soils), decontaminating and decommissioning of buildings and structures, maintaining facilities, managing transuranic, low-level and mixed waste, and operating tank farms that store high-level waste. This strategy focuses on the assessment and remediation of soil that resulted from the discharge of liquids and solids from processing facilities to the ground (e.g., ponds, ditches, cribs, burial grounds) in the 200 Areas and addresses only those waste sites assigned to the Environmental Restoration Program. This strategy does not address tank farms, other facilities such as buildings or groundwater.

The 200 Areas remedial action effort is in the early stages of implementation. A series of workshops have been held by the Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office (Tri-Parties) to review the historical work performed to date in the 200 Areas and assess the most efficient and cost-effective way to achieve progress. A set of assumptions and constraints that apply to assessment and remediation of the waste sites and associated soil contamination was developed to provide a framework for this strategy. An evaluation of how the waste sites are grouped was then performed by brainstorming, developing criteria, and evaluating the options against those criteria. The evaluation established 23 initial waste site groupings that integrate the treatment, storage, and disposal and past-practice waste sites, and builds on the common chemical processes

and waste site types (cribs, ponds, ditches) that cross between operable units (OU). These 23 groupings are significantly less than the original 32 source OUs (does not include tank farm OUs).

When the Tri-Parties reviewed the required work plans for the 200 Areas remedial action effort, the number of work plans were reduced to 23, as compared to the original plan with a work plan for each of the 32 source OUs. Reducing the number of work plans is possible by incorporating the analogous site approach that has been effectively used in the 100 and 300 Area remediation activities. A limited number of representative sites will be identified for each waste site group and characterized under Limited Field Investigation (LFI) work plans. Characterized data, collected for representative sites associated with a particular group will provide the basis for reaching remedial action decisions for all sites within that waste site group. This analogous site approach builds on the common process history, contaminants of concern, etc., for sites within each group. Instead of requiring 32 source work plans for the 32 source OUs that include approximately 1,000 waste sites, the strategy will result in the approximately 1,000 waste sites being covered in 23 work plans that focus on characterizing a limited number of representative waste sites. Furthermore, the Tri-Parties recognized the need to streamline the documentation process by consolidation standard work plan material that would be common to all 200 Area work plans into a single document. This will allow future work plant to be relatively concise, and brief.

Characterization requirements outlined in the work plans will be implemented in the field using waste-group-specific LFI work plans. After the characterization activities are completed and remedies have been selected for representative sites, the remaining waste sites can be addressed by referencing the existing remedial action documentation. In this manner, the additional waste sites are integrated into the process used for the original waste sites. In the early stages of remedial design or the remedial action process, each waste site will have data collected that verify the applicability of the representative waste site conceptual model, as well as data that support remedial design/remedial action. The streamlining associated with these enhancements will result in a quicker and more efficient use of available resources and will allow actual remediation to occur in an expedited manner.

The remedial action documentation required to achieve remediation has also been streamlined, and the process outlined in this document has flexibility that can be used to apply the process. The *Resource Conservation and Recovery Act of 1976* and the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* requirements have been integrated into the documentation required to obtain a Record of Decision (ROD). Focus packages (a consolidation of paperwork that have been effectively used in the 100 Areas) have been identified to streamline the remediation process for waste sites. The explanation of significant difference approach or ROD amendments will be used to add waste sites to RODs that have already been developed, and removal actions will be emphasized to expedite remedial activities.

The implementation of the 200 Areas Soil Remediation Source Strategy is driven by the requirement to meet the year 2008 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestone (pre-ROD characterization complete) and the public's desire to proceed with remediation rather than additional study. The long-term goal of the strategy is to meet the 2018 Tri-Party Agreement milestone (complete remedial actions for all OUs) in a cost-effective manner. Priorities associated with characterization and remediation have also been established to develop a framework for sequencing work that meets these overall milestones.

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ACRONYMS

AAMS	Aggregate Area Management Study
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CMS	corrective measure study
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERA	expedited response action
ERC	Environmental Restoration Contractor
ESD	explanation of significant difference
FFS	focused feasibility study
FS	feasibility study
LFI	limited field investigation
NPL	National Priorities List
OU	operable unit
RARA	Radiation Area Remedial Action
RAWP	*Remedial Action Work Plan*
RCRA	*Resource Conservation and Recovery Act of 1976*
RI	remedial investigation
RFI	RCRA Facility Investigation
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
S&M	surveillance and maintenance
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and disposal

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1.0 INTRODUCTION

In November 1989, the U.S. Environmental Protection Agency (EPA) included the 200 Areas of the Hanford Site on the *National Priorities List* (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The 200 Areas, located near the center of the Hanford Site, are primarily the 200 West Area and 200 East Area, which contain reactor-fuel processing and waste management facilities. The 200 NPL Site encompasses these areas, as well as the 200 North Areas and select portions of the 600 Area and includes 42 operable units (OU), including 19 in the 200 East Area, 17 in the 200 West Area, 1 in the 200 North Area, and 5 isolated OUs.

In May 1989, the Washington State Department of Ecology (Ecology), U.S. Department of Energy (DOE), and EPA entered into an interagency agreement, the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990), which established a compliance and cleanup program for the Hanford Site. The agreement covers all CERCLA past practice, *Resource Conservation and Recovery Act of 1976* (RCRA) past practice, and RCRA treatment, storage, and disposal (TSD) activities on the Hanford Site.

The 1991 revision to the Tri-Party Agreement (Ecology et al. 1991) required that an aggregate area approach be implemented in the 200 Areas based on the *Hanford Site Past-Practice Strategy* (DOE-RL 1991). The *Hanford Site Past-Practice Strategy* was developed by Ecology, EPA, and DOE to streamline the existing remedial investigation/feasibility study (RI/FS) and RCRA facility investigation/corrective measure study (RFI/CMS) processes and emphasizes the use of interim actions to expedite the remediation process. The *Hanford Site Past-Practice Strategy* included three paths for interim decision making (expedited response action [ERA], interim remedial measure, and limited field investigation [LFI] paths) and a final remedy selection process. The *Hanford Site Past-Practice Strategy* uses analogous data to reduce the amount of assessment needed at individual waste sites by performing assessments for groups of similar waste sites. This concept of grouping waste sites is applicable to the 200 Areas, where many waste sites share similarities in geological conditions, function, and waste disposal practices (i.e., are analogous), including the types of waste received.

The aggregate-area approach was implemented in the 200 Areas through the conduct of Aggregate Area Management Studies (AAMS), which were similar in nature to the RI/FS scoping process, and were intended to maximize the use of existing data to allow a more limited and focused RI/FS. Ten AAMS reports were prepared, including eight source and two groundwater aggregate area reports. The source AAMS evaluated source terms on a plant-wide (e.g., U Plant, B Plant) scale.

The need for near-term action was identified for three groundwater plumes designated as candidates for interim action in the groundwater AAMS reports. No source sites were identified that needed near-term action. In 1994, Ecology, DOE, and EPA agreed (Ecology et al. 1994) to begin groundwater cleanup on the three high-priority groundwater contaminant plumes. As a

result, three pilot-scale pump-and-treat projects were implemented, two of which have or are leading to an interim action Record of Decision (ROD) requiring additional pumping and treating. In addition, an ERA using soil vapor extraction to remove carbon tetrachloride from the vadose zone began full-scale operations in 1992. With the most immediate need for action being addressed, the Environmental Restoration (ER) Program is focusing on the source strategy to streamline the assessment and remediation of source waste sites.

This source strategy is being developed for waste sites where liquids and solid waste have been discharged to or buried in the ground, and the source strategy is currently within the DOE-Richland Operations Office (RL) ER Program for assessment and remediation. This strategy does not address sites associated with tank farms, the Decontamination and Decommissioning (D&D) Program, or other waste management programs or buildings. Groundwater remediation is addressed in a separate document (DOE-RL 1995). This strategy recognizes the interrelationships between these programs and the need to ensure that integration is performed to successfully complete the final remedy selection process for the 200 Areas.

This strategy has been developed jointly by Ecology, EPA, and RL (known as the Tri-Parties) through a series of workshops and by building on existing technical information that has been developed in the 200 Areas and practices effectively used in the 100 and 300 Areas. Contributing workshop members represent a broad base of regulatory and technical knowledge and experience, including both source and groundwater. The purpose and intent of the strategy, as discussed above, has been captured in the following vision statement:

> The 200 Areas strategy is a cost effective streamlined process of getting to and performing remediation that is technically sound, protective of human health and the environment, and publicly acceptable.

The 200 Areas are in the early stages of assessment and remediation, and a need to develop a streamlined approach to assessment and remediation has been identified. To obtain a more cost-effective and efficient approach to assessment and remediation of lessons learned from 100 and 300 Areas assessment and remediation activities will be considered. The lessons learned include using the observational approach to adapt to actual site conditions during remediation, combining OUs, implementing the analogous group concept, and using interim actions and the "plug-in" approach to remediate high-priority waste sites quickly. This streamlined approach will also take advantage of the commonalities that exist between the different OUs and will build on the historical and scoping work already performed in the 200 Areas (e.g., AAMS). This strategy takes the historical work one step further by looking not only at each aggregate area individually, but looking collectively to identify commonalities between aggregate areas and provide a more integrated and streamlined program.

Current long-range plans show little activity in the near term for the ER Program in the 200 Areas due to the priority of emphasizing cleanup in the 100 and 300 Areas. Of the 32 source

OUs (does not include tank farm OUs) in the 200 Areas, work plans have been prepared and implemented only for the 200-BP-1 and 200-UP-2 , and no near-term remedial actions are planned. A work plan has also been prepared for the 200-BP-11 OU.

2.0 ASSUMPTIONS AND CONSTRAINTS

This section identifies the assumptions and constraints from which the foundation and framework of the 200 Areas strategy was developed. The workshop group considered key public values that were expressed in previously published 200 Area-related documents. Assumptions and constraints are discussed below.

Assumptions

- Near-term interim remedial measure focus is on worker protection and controlling the spread of contamination, and on long-term risk reduction/remedial action, when appropriate.

- A new way of grouping sites for characterization may be needed, and the groupings may or may not be the same for remediation.

- Applicable presumptive remedies, analogous sites, and the observational approach can be used, provided that characterization (which includes, but is not limited to, historical data) information supports the items.

- The *Hanford Site Past-Practice Strategy* (DOE-RL 1991), integrated with RCRA closure requirements, will provide process steps to be used in this strategy.

- Waste or contaminated media, including transuranic constituents and pre-1970 transuranic waste, may be left in place as long as the risk associated with this in-place remediation is acceptable to the Tri-Parties. Alternative technologies will continue to be assessed.

- The RL shall ensure that surveillance and maintenance (S&M) (i.e., RARA program) are adequate for addressing surface contamination migration.

- The Tri-Party Agreement and Long-Range Plan schedule dates may need to be reconciled. It is assumed that this is possible and the strategy will be the basis for these changes.

- The 200 Areas strategy will be developed within the scope of the environmental laws.

- Decay may be a viable alternative for short-lived (half-life of approximately 30 years or less, [e.g., Cs-137, Sr-90, Co-60]) radionuclides.

- Integration with other ER projects or Hanford Site programs will occur.

- Waste generated from remedial activities in the 200 Areas (except for transuranic waste) will be managed (to include treatment and/or disposal) on the Hanford Site.

Constraints

- Funding is a constraint to developing schedules, not to the strategy. The priority of 100 and 300 Areas is recognized.

- Commitments made for the Hanford site-wide permit modification schedule to year 2000.

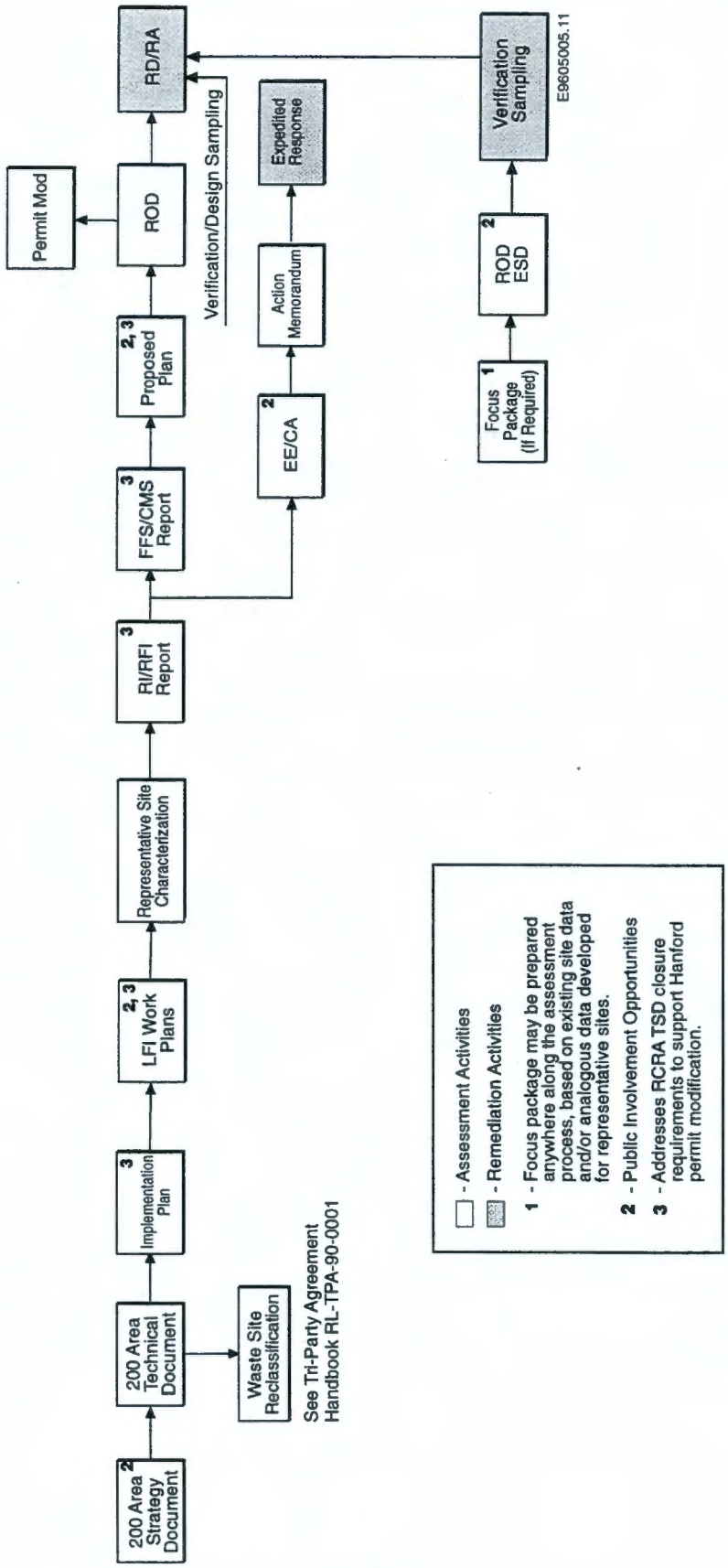
Certain assumptions have been applied or addressed directly in this strategy, whereas other assumptions and constraints will be applied at the appropriate step in the implementation process or will be applied during the long-term planning process.

3.0 WASTE SITE GROUPING OPTIONS AND EVALUATION CRITERIA

The grouping of waste sites is the first step in the assessment process following the 200 Areas Strategy document; the results will be identified in the Technical Document (Figure 1). Opportunities exist to streamline the remedial action process by applying the analogous site approach used in the 100 and 300 Areas to assemble waste site groups based on similar characteristics such as physical structure, function, and types of waste received. Historically sites were grouped into OUs resulting in 42 OUs (i.e., 32 source OUs, 6 tank farm OUs, and 4 groundwater OUs) in the 200 Area which were largely geographically based with approximately the same number of waste sites. Following the analogous site approach waste sites can be grouped across OUs, aggregate areas, or the 200 Areas. These groupings can be used to streamline the assessment process by focusing the characterization effort on a limited number of specific waste sites that represent the group. The representative site data can then be used to make remedial action decisions for all sites within a group. Sampling of individual waste sites is expected to be required before remedial design to confirm that remedial action decisions, based on the analogous site approach, are appropriate and to provide data needed to design the remedy.

As part of the grouping process, it is expected that sites may be identified that will not require characterization and/or remediation. In some cases, sites may be determined to be nonhazardous and nonradioactive, and it may be appropriate to remove them from further consideration under the Tri-Party Agreement (see Section 4.1.3). In other cases, minor actions (e.g., housekeeping) may be performed to remove contaminated or suspect contaminated debris and surface soil,

Figure 1. 200 Areas Implementation Flowchart.



substantially streamlining the CERCLA process. As these sites are identified, the waste site reclassification process being used in the 100 Areas will be used in the 200 Areas.

3.1 CHARACTERIZATION GROUPINGS

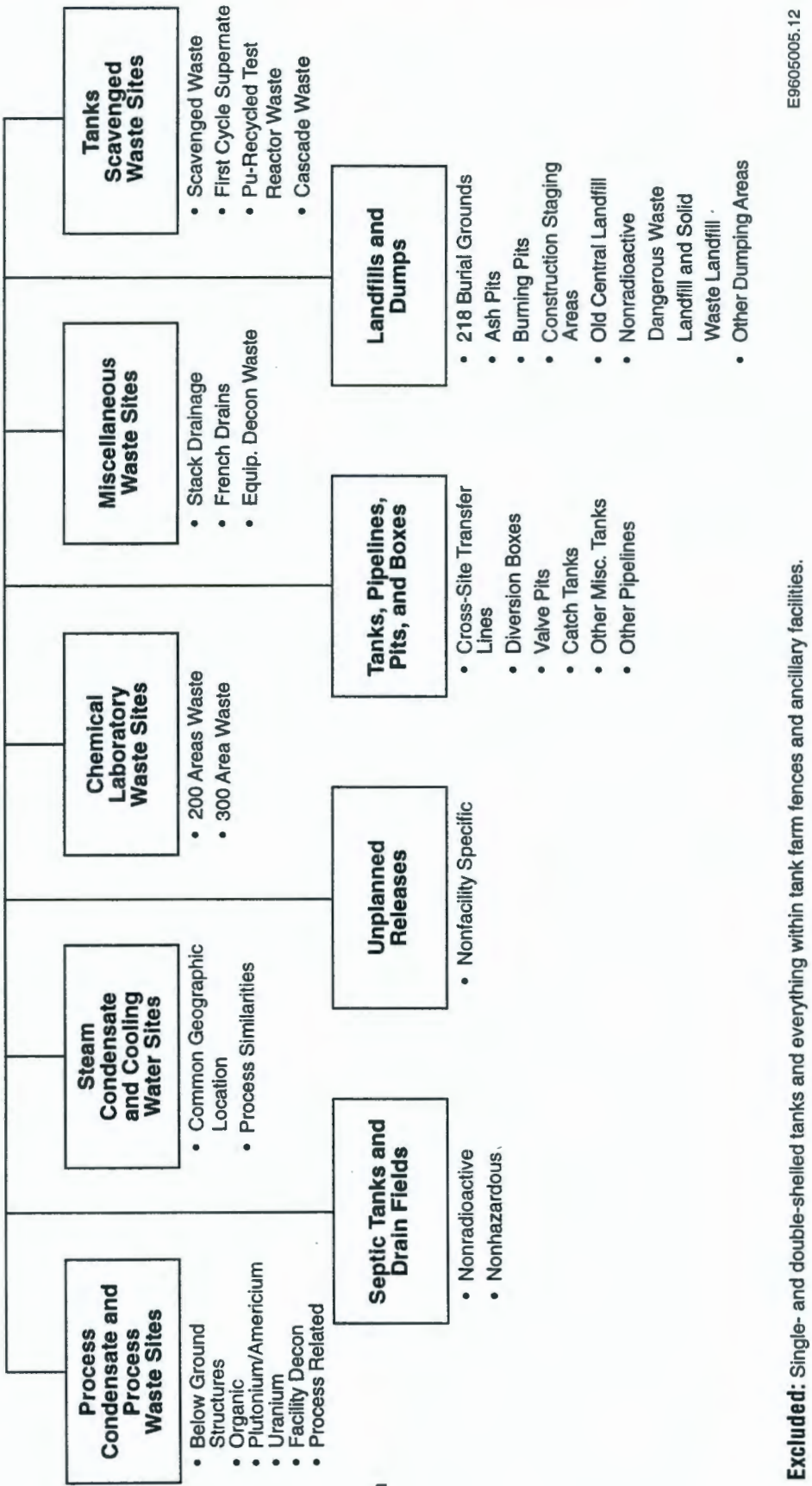
Waste site groupings will provide the basis for organizing characterization activities and can be assembled based on a set of criteria. These criteria are discharge type (e.g., solid waste, cooling water, process water), followed by waste-site type (e.g., pond, crib, ditch). It was determined that these criteria would provide the most efficient method of grouping waste sites, based on what is currently known about the facilities that generated the waste and the waste sites themselves.

Using this methodology, grouping the waste sites for characterization purposes resulted in nine broad categories (Figure 2). To provide flexibility in establishing specific conceptual models 23, preliminary groupings were developed within the broad categories of waste sites (Appendix A). These groupings were largely based on contaminant type (e.g., organic, acidic, uranium, plutonium, inorganic) and waste-site type.

Placing waste sites into groups will be performed using a systematic review of available historical data for every waste site, including the AAMS reports, the Waste Information Data System, and other related published documents. An initial review of all waste sites was performed for (1) description of where the waste came from (process or processes responsible), (2) type of contaminants discharged (inventory history), (3) type of waste site, (4) volume of liquid discharged, and (5) geohydrological conditions, such as potential driving forces in the vadose zone. A more extensive evaluation of the groupings will be performed before developing the work plans. Categories such as "miscellaneous sites" and "unplanned releases" may be eliminated (if all waste sites anticipated to be in these groups can be incorporated into the other groups) or other groups may be added (e.g., miscellaneous sites may expand into two groups). The refinement of the groups will be part of the more extensive evaluation. The rationale for establishing groups is discussed in Appendix A.

This evaluation will also include selection of representative sites, along with the refinement of the groups and placing waste sites into their respective groups. The representative sites will be selected based on existing information and how the waste sites fit as a "typical" or "worst-case" (i.e., has the greatest amount and extent of contamination) site for the waste sites within the group. Therefore, the data obtained from characterization of representative sites can be used for all sites within the group for remedial alternative evaluation and selection. More than one representative site is expected to be characterized for each waste group to ensure that all pertinent information can be collected.

Figure 2. 200 Areas Source Waste Site Groups.



3.2 REMEDIATION GROUPINGS

Data collected during characterization will be used to refine waste site groups for remediation. Groupings for remedial activities may be based on geographic location so the sites within a general area are remediated at the same time to reduce mobilization costs and to take advantage of economies of scale or to support the remediation of outlying areas (e.g., buffer zone). Groupings are also expected to be influenced by site priorities, the remedy selected, and coordination needs from other programs. Remediation waste site groups will build on the "plug-in" approach to remediation. The plug-in approach, developed by EPA (1993), is consistent with the analogous site approach and links sites that have similar characteristics or conceptual models (e.g., physical attributes, contaminants, and contaminated media). Knowledge gained from previous studies and actions provides the basis and justification for subsequent actions at similar sites. If an individual site is sufficiently similar to (or compatible with) sites for which alternatives have already been developed and analyzed, the subject site is said to "plug in" to the analysis for that group, and a full analysis for the subject site is not necessary.

4.0 STRATEGY APPROACH AND IMPLEMENTATION

The overall approach to the 200 Areas strategy has been captured in the flowchart shown in Figure 1. This flowchart breaks the strategy down into several broad, high-level steps. The detail within these steps is discussed in subsequent sections. The key elements of this flowchart are as follows:

- The Strategy Document develops the overall approach to assess and remediate the 200 Areas (Section 3.1).

- The Technical Document will identify the final waste groups, prioritize groups (for characterization), and identify representative sites to support future work plan development.

- The Implementation Plan and LFI Work Plans will describe the characterization approach and scope for representative sites identified in the Technical Document.

- Characterization data collected for each representative waste site will be documented in a LFI report and used to evaluate and select the remedy for all sites associated with (i.e., in same group) a representative site (focused feasibility study [FFS]/CMS report and proposed plan). This effort will support the issuance of a ROD (and will be supplemented by a permit modification, if needed). Waste site groupings developed for characterization would be modified to facilitate remediation (Section 3.2). If the characterization data indicate a need for an immediate action, a removal action will be performed supported by an engineering evaluation/cost analysis (EE/CA) and an action memorandum.

- For sites that do not have site-specific characterization data, verification sampling will be performed in parallel with the remedial alternative selection process (proposed plan and ROD) and/or in association with remedial design/remedial action. This verification sampling effort is performed on a site-by-site basis to verify that the site fits the representative waste site group, verifies the applicability of the conceptual model to the particular waste site, and will provide necessary data to support remedial design.

- The RI/RFI, FFS/CMS, and proposed plan information can be summarized in focus packages which can be used where sites (because of similarities) are able to benefit from existing site-specific and analogous data or documentation.

Pre-ROD characterization activities will be optimized by maximizing the use of geophysical techniques, field screening techniques, and test pits (in lieu of boreholes) to streamline the process. Characterization is intended to provide a technically sound basis for future decision making, will focus on the ultimate goal of remediation, and will consider this in the establishment of types and location of characterization sampling. Additional discussion on the level of characterization needed to support the strategy is provided in Appendix B.

Based on the strategy's concepts and approach (as outlined in Sections 3.0 and 4.1), the strategy workshop team considered that the current Tri-Party Agreement requirement of preparing a work plan for each OU was not consistent with the strategy. The workshop team developed and evaluated the following options to prepare work plans: (1) by major waste site category for a total of approximately nine work plans; (2) by plant (e.g., B Plant) or aggregate area for a total of approximately six work plans; (3) by a single, all-encompassing work plan; (4) by 200 East Area and 200 West Areas, except for burial grounds that would be addressed separately for a total of three work plans and five by waste site group for a total of approximately 23 work plans. The fifth option (23 work plans) was considered to be the most efficient way to apply the strategy while maximizing the number of documents produced and minimizing changes that would be required to the Tri-Party Agreement. Options 1 through 4 would necessitate the preparation of descriptions of work to provide the level of detail necessary to implement field activities.

4.1 ASSESSMENT

The documentation steps (starting with this strategy) that lead to a ROD, permit modification, or action memorandum (Figure 1) are considered part of the assessment phase of the ER Program. A discussion of each assessment step is provided below.

RCRA TSDs will be incorporated into the waste site grouping process and integrated into subsequent strategy documents (Figure 1). Appendix C identifies where CERCLA and RCRA past practice work plan, and RCRA TSD closure plan requirements will be addressed in 200 Areas Soil Remediation Strategy pre-ROD documents.

4.1.1 Technical Document

The Technical Document will identify the final waste site groupings and associated representative sites. The groups will be prioritized based on criteria outlined in Section 5.1. Finally, conceptual models will be prepared for each group to predict the nature, extent, fate, and transport of primary contaminants. Selecting representative sites and developing conceptual models in the Technical Document will provide the basis for the future 200 Area soil implementation plan and work plans. The RCRA TSD sites will be incorporated into the grouping process and where several representative sites can be used for characterization, the RCRA TSD sites will be given preference when final representative sites are selected. Integrating the RCRA TSDs is intended to meet the RCRA TSD closure characterization requirements.

4.1.2 Waste Site Reclassification

During the review of the sites for the Technical Document effort, all ER sites will be evaluated to determine whether there are any candidates that may be reclassified as "rejected," "closed out," "deleted from NPL," or "no action" sites. A procedure is currently being developed for the Tri-Party Agreement Handbook Guideline TA-MG-08 to reclassify sites. This procedure will be used when approved. Reclassified sites will be kept in a separate list for tracking purposes. Candidates for reclassification may include instances where (1) waste disposal facilities were constructed but not used, (2) duplicate labeling exists for a waste site produced by an unplanned release, (3) sites have been cleaned up, (4) the contamination has decayed to background levels, (5) sites were misclassified as a waste site, or (6) a voluntary action such as a housekeeping activity may be used to remediate a site. All reclassifications are expected to be based on data packages provided to the Tri-Party Agreement reclassification team and will require reclassification approval from the team.

4.1.3 Implementation Plan

The 200 Area soil implementation plan will describe the overall implementation process for the 200 Area soil remediation strategy and provide generic information and plans that would be common to all 200 Area work plans. In addition, the plan will establish site characterization needs by (1) evaluating existing data, (2) developing conceptual models, and (3) identifying data needs and data quality objectives. Data are generally needed to refine the conceptual model and support an initial assessment of risk. Based on the data quality objectives, investigation tasks, including sampling and analysis requirements, are defined and selection of representative sites refined. Recommendations for consolidation of documents (e.g., work plans, LFI reports, FFSs) or refinements to the waste site groupings will also be made. The RCRA TSD closure sites will be addressed (along with other past-practice sites) to ensure that they are integrated into the appropriate work/closure plan to satisfy RCRA TSD closure documentation needs (the format will follow the general structure of CERCLA work plans).

The implementation plans will describe the general approach to characterization of representative waste sites, addresses *National Environmental Policy Act of 1969* values, and will include Health and Safety, Quality Assurance Project, Data Management, and Project Plans. The Technical Document, AAMS reports, and other related scoping documents (such as the Aggregate Area Technical Baseline Reports) will be referenced to provide key information relating to waste site descriptions and contaminants of concern. If a presumptive remedy can be identified for a particular site early in the RI/FS process, the plan will focus on data collection to confirm the use and design of the presumptive remedy.

4.1.4 Limited Field Investigation Work Plans/Closure Plans

The LFI work plans provide site-specific details of field activities outlined in the implementation plan. For example, borehole or test-pit designs and locations are finalized and specific sample points are identified. The work plans will function as a guide to perform field work and identify specific methods and procedures. The work plans will be prepared based on waste site groups and therefore, focus on characterizing representative sites associated with a particular waste group. The work plans will include a schedule for subsequent assessment documentation for that particular waste group. Because a significant amount of information typically provided in work plans will be provided in the implementation plan, LFI work plans will be concise documents.

4.1.5 Limited Field Investigation Report

A LFI report documents the results of the field investigations, provides refinements to the conceptual model developed in the work/closure plans, updates the list of contaminants of concern, and provides a summary assessment of risks. The report may identify the need for interim actions if current risks are demonstrated to be unacceptable. The LFI report serves as a primary source of information to prepare a FFS/CMS and subsequent remedial action decision documents (e.g., proposed plan and ROD). If a RCRA TSD site is to be addressed, the report will be modified, as necessary, to include closure plan documentation requirements to support a permit modification.

Reports will be prepared once field activities are completed. The scope of these reports will focus on representative waste sites consistent with the implementation of fieldwork. If characterization of more than one waste group occurs in the same time frame, the results may be combined under a single report to minimize the number of documents.

4.1.6 Focused Feasibility Study/Corrective Measure Study

The purpose of FFSs or CMSs is to develop, screen, and analyze remedial alternatives. Developing viable remedial alternatives requires developing remedial action objectives and general response actions, identifying and screening of technologies and process options, assembling and screening remedial alternatives, and refining applicable or relevant and appropriate requirements. A detailed analysis of alternatives is performed and mainly consists of evaluating each alternative against EPA criteria (EPA 1988). The results of the detailed analysis

provide the basis to identify a preferred alternative and prepare a proposed plan. Where RCRA sites are included in waste groupings, the RCRA TSD closure requirements will be integrated into the FFS/CMS report.

The FFS/CMS will be developed using information contained in existing documentation and collected through work/closure plans. In particular, existing AAMS reports provide an initial level of alternative evaluation (similar to a Phase I FS) that generally addresses all waste sites in the 200 Areas and provides the basis for subsequent FFS/CMSs. This effort will establish the number of alternatives considered. If a presumptive remedy can be applied at a particular site, the range of alternatives would be limited to the presumptive remedy and no action. The reports will be based on representative waste sites that have been characterized for a particular group, but the results will apply to all sites within that group. Multiple groups may be addressed under a single report to minimize the number of documents.

4.1.7 Proposed Plan

The proposed plan provides the public with a summary of the work performed and alternatives considered (e.g., RI/RFI and FS/CMS) and proposes a remedial alternative for specific waste sites. If a RCRA TSD site or RCRA corrective action site is to be addressed by a proposed plan, the plan will include closure plan documentation requirements to support a permit modification. If the recommended alternative is no action, a separate closure plan will be prepared for RCRA TSD closure sites. Based on public comments regarding the proposed plan, the remedy selection process is finalized and documented in a ROD.

4.1.8 Focus Package

Focus packages may be used to further streamline the process for particular waste sites and can be applied anywhere along the assessment process. Focus packages are used when the work plan or characterization activities indicate that there is either minimal need for remediation or that remedial action would follow a similar path already performed at similar waste sites. The focus package explains why additional evaluation/analysis and documentation of remedial alternatives is not required, provides the site-specific information needed to complete the remedy selection process, and supports the issuance of a ROD or explanation of significant difference (ESD) to an existing ROD. This approach is applicable to analogous waste sites within a particular group where the associated representative sites have been characterized and remediated. In this case, verification sampling of the analogous sites may be required to demonstrate that analogous conditions exist.

4.1.9 Record of Decision, Explanation of Significant Difference, and Permit Modification

The RODs are decisional documents (prepared by the lead regulatory agency) that select the remedial alternative. Decisions for RCRA sites are also documented by modifying the Hanford site-wide permit. The decision documents (ROD, permit modification) will be structured to

provide a streamlined and flexible means of achieving remedial action. In particular, the ROD/permit modification will be structured so the decision document can contain waste sites from different work plans or characterization groups. It is expected that the ESD process or ROD amendments will be used where appropriate to incorporate additional waste sites into existing RODs to expedite the remedy selection process for these sites contingent RODs will be considered to allow selection of innovative technologies, the innovative technology requires further post-ROD testing and a proven technology is needed as backup. If new information becomes available after a ROD is issued that causes the Tri-Parties to reconsider the selected approach (e.g., a more effective technology is identified, the parties will repeat the ROD process by issuing a revised proposed plan and an amended ROD.

4.1.10 Engineering Evaluation/Cost Analysis and Action Memorandum

Emphasis will be placed on performing removal actions, in lieu of the remedial action process, to expedite remedial field activities. Removal actions are used when it is appropriate to accelerate remedial activities and the number of remediation options is limited. Removal actions have been successfully implemented at several locations on the Hanford Site. Three types of removal actions exist: emergency, time critical, and nontime critical. These actions may serve as an initial response or provide a final remedy for a site. For any removal action except an emergency action, an EE/CA is prepared to provide a rapid and focused evaluation of available technologies. Based on the evaluation, the EE/CA identifies the preferred response action, provides information on implementing the alternative, and is submitted to the regulators for review. If the response action is not time-critical, the EE/CA is made available for public review before implementing the action. An action memorandum is then issued authorizing initiation of cleanup activities. The removal action process allows actions to be completed within a relatively short timeframe.

4.1.11 Treatability Testing and Technology Needs

Treatability testing of particular technologies may be necessary to properly evaluate remedial alternatives. Treatability testing can generally involve laboratory and bench-scale tests to initially assess the feasibility of a technology or pilot-scale tests that provide data that are more representative of a full-scale process.

Decisions to conduct treatability tests can be made at any time during the assessment process; however, efficiencies can be realized if treatability testing is initiated early in the project, particularly if pilot-scale testing is needed. Pilot-scale testing can be used to initiate remedial activities, as demonstrated by the groundwater pump-and-treat projects in the 200 Areas.

The *Hanford Site Past-Practice Strategy* (DOE-RL 1991) recognizes that treatability testing can be costly and time consuming. As a result, the *Hanford Site Past-Practice Strategy* recommends that only a limited number of promising technologies be tested early in the cleanup schedule. A technology that has broad application and is currently being tested in association with the 200-BP-1 OU is engineered covers or barriers. The unique environment (i.e., arid) and design

requirements (e.g., up to 1,000 year design life) for covers in the 200 Areas (DOE-RL 1996b) necessitates the use of select materials that are atypical of the standard RCRA-type cover. The performance life of these materials/cover system has not been fully established and is recognized as a significant data gap. Other general technology development needs that have been identified for waste sites include in situ treatment of deep and mobile contaminants and advanced characterization methods, particularly those that apply nonintrusive techniques. Testing of promising technologies may require support from the DOE Office of Technology Development (Section 6.0).

4.2 REMEDIATION

The general approach to remediation is to cap waste in place for sites with high levels of contamination, to remove contamination at sites that exhibit high levels of spotty contamination or lower levels of persistent contamination over a broad area, and no action at sites where risks are demonstrated to be acceptable or where natural attenuation (e.g., decay of short-lived radionuclides) is an effective remedy. In general, this approach results in placing engineered barriers at sites located within the 200 Area fenceline and removal actions at sites outside the fenceline (i.e., 200 Area buffer zone). Sites that have mobile contaminants deep in the subsurface and have the potential to impact groundwater may require some level of treatment (preferably in situ).

The steps following the issuance of a ROD are considered part of the remediation phase of the ER Program and include verification sampling and remedial design/remedial action. A discussion of each of the remediation steps is provided below.

4.2.1 Verification/Design Sampling

For sites with decision documents, based on analogous site information, sampling will be performed to verify that analogous conditions exist and that the remedial alternative decision is appropriate. The approach to verification sampling will be to maximize the use of nonintrusive techniques and field screening analytical techniques. Alternatively, these data can be collected before issuing a ROD. In addition, the list of analytes to be addressed may be limited, relying on key constituents or indicator parameters. If the sampling is alternative-specific, these data should not be collected until there is reasonable assurance of the remedial alternative that will be selected. In addition to or in combination with verification sampling, sampling may also be performed to support remedial design.

4.2.2 Remedial Design Report/Remedial Action Work Plan

The primary purpose of the Remedial Design Report/Remedial Action Work Plan (RAWP) is to summarize the design and the implementation process for remedial actions required by a ROD. The Remedial Design Report and RAWP will be combined, consistent with 100 Area lessons

learned, to streamline the documentation process. The document will address all waste sites (included in the ROD) and will establish a project schedule.

5.0 PRIORITIES AND SCHEDULE

The 200 Areas remedial action work will span a multiyear time frame. A schedule is required to identify activities that will be focused on and given priority over other activities. Sites that pose an unacceptable risk will have the highest priority for characterization and remediation activities. The activity can range from performing a short-term solution as part of existing programs such as S&M (thus reducing its priority), performing a removal action to alleviate the problem, or including this work in the earliest possible ROD or other decision document. Other high-priority work will be associated with technical or technological development that is needed before implementing full-scale activities.

Once high-risk sites are addressed, sites with less priority (i.e., sites that will ultimately require remediation, but not immediately) will be prioritized according to criteria developed for the characterization and remediation groups.

5.1 CRITERIA FOR CHARACTERIZATION PRIORITIES

Criteria have been developed from which characterization priorities will be established for each waste site group. Characterization priorities will be established as part of the ranking process for waste site groups in the Technical Document.

Conditions that would rank a group high in priority are as follows: (1) sites within the group that will impact groundwater in the immediate future (i.e., will create a new groundwater plume) or (2) demonstrate a high potential for impacting groundwater because of the relatively high mobility of contaminants or waste associated with the sites. Groups that can be represented well by a small number of sites and groups that are relatively simple and straightforward to characterize or remediate would also receive a higher priority than groups without these characteristics.

Conditions of intermediate importance are as follows: (1) whether sites within the group are currently contaminating groundwater (i.e., groundwater plume already exists), (2) generally lack characterization data (including historical data), (3) located outside the 200 Area fenceline, or (4) exhibit low levels of contamination over a broad area and are suitable for testing promising treatment technologies.

Conditions that are considered to be of relatively lesser importance are as follows:
(1) groundwater that has been impacted in the past (i.e., sites no longer contribute to groundwater contamination) or (2) the presence of an external driving force or persistent contaminants. Sites

that pose a risk due to surface contamination would also not receive a priority for characterization because they would receive priority and be addressed through the Radiation Area Remedial Action (RARA) Program.

The specific criteria and associated rankings (high, medium, or low) are outlined in Table 1. Key assumptions that will serve as a guide in applying the criteria include the following:

- A site must exhibit a known driving force and contain a known inventory of mobile contaminants to be considered as a potential contributor to groundwater contamination.
- Future groundwater impacts are defined as impacts expected to occur in the next 5 to 10 years.
- A good representative site represents a large (maximum) number of sites rather than only a few sites.
- Only surface exposure and the associated risk to onsite workers should be considered when assessing current risks.
- When assessing the mobility of contaminants and understanding the chemistry, the assessment will be made for the group as a whole (not individual sites) and be limited to contaminants/constituents of concern. Both physical and chemical factors will be considered when assessing contaminant mobilities. The effect of chemical complexing on contaminant mobility will be assessed, when applicable.
- An easier site is one that is physically easier to characterize (e.g., only nonintrusive testing and a low level of worker protection is needed) such that characterization activities can be completed in a relatively short time frame. A site requiring boreholes and a high level of worker protection is considered difficult.

5.2 CRITERIA FOR REMEDIATION PRIORITIES

Remedial action prioritization criteria have been developed and grouped into primary and secondary criteria. The primary criteria shall be predominantly considered in establishing priorities.

The primary criteria are as follows:

- Sites that have high risk/current spread of contamination should be remediated first. (No sites have currently been identified in this category that are not already being addressed. If a site is identified in the future, then an evaluation of what appropriate action is needed will be performed. This evaluation will factor in the remaining remedial action prioritization criteria.)

- The proximity to other facilities/site infrastructure will establish remedial action priorities. (For those facilities that are being remediated, the waste sites near that facility should be included in the facility remediation. The waste sites that are near facilities/site infrastructure that will not be remediated in the near term should not be given a high priority. A waste site near existing facilities/infrastructure that, if remediated, could impact the existing facility operation would be given a low priority.)

- Waste site remediation that would show early progress should be a high priority.

- Focus on removing/stabilizing remedial actions for the short term and capping for the long term. (This criterion does not imply a preference to remove/stabilize over capping, but when a remedial alternative of remove/stabilize is selected, these remedial actions are preferred to be performed before remedial actions that involve a cap to emphasize removal actions relative to leaving waste in-place. The sites that require a cap should also be dealt with collectively and should be grouped such that a single or fewer caps will be used to address multiple waste sites. Remedial action selection for all waste sites is not anticipated to be completed before the start of remedial action in the 200 Areas.)

The secondary remedial action prioritization criteria are as follows:

- Prioritize remedial actions that allow for coordination of worker skills. (Remedial actions that require certain worker skills, such as vitrification, should be grouped together to maximize the efficient use of these worker skills.)

- Coordination with other programs is required. (Where a need arises due to other 200 Areas programs to delay or expedite a remedial action, these considerations need to be factored in when establishing the priorities for waste site remediation.)

- Where possible, waste sites should be remediated starting from the areas outside or within the buffer zone and working inward toward the waste management areas.

- Sites that are considered easier to implement remedial actions should be considered over sites that are more complex to remediate.

- Efficiency gained by remediating/consolidating large geographic areas should be considered in prioritizing waste site remediation. (Consolidating material to minimize cap area and prioritizing work so all work in a specific geographic location is performed at one time should be considered.)

Table 1. Characterization Priorities.

Specific Criteria	Criteria Ranking
Groundwater has been impacted in the past.	Low
Groundwater is presently being impacted.	Medium
Groundwater will be impacted in the immediate future (5 to 10 years).	High
Mobile constituents (versus less mobile constituents) are present.	Med-High
Driving forces exist that are external to the waste sites.	Low
Characterization information, including historical data, is limited or nonexistent.	Medium
The chemistry promoting contaminant migration (increasing mobility) is poorly understood.	Med-High
Good representative sites (maximum number of sites addressed) are available.	High
Long-lived (versus short-lived) contaminants are present.	Low
Sites pose a current risk (surface threat) - assumes RARA Program provides short-term action to lower its priority.	Low
Low levels of contamination are expected over a large area.	Medium
Sites are located near perimeter of plateau/outside the 200 Area fencelines (versus inside the fenceline).	Medium
Easier (versus more difficult) to characterize and/or remediate.	High
Suitable for testing promising technologies.	Medium

RARA = Radiation Area Remedial Action.

5.3 SCHEDULE AND MILESTONES

Figure 3 provides a conceptual schedule showing that the 200 Areas Soil Remediation Strategy can be effectively implemented. The implementation of the 200 Areas Soil Strategy is driven by the requirement to meet the year 2008 Tri-Party Agreement milestone for characterization. The schedule indicates that the year 2008 Tri-Party Agreement milestones to complete characterization activities can be met. The 216-U-12 Crib, 216-B-3 Pond, 216-B-63 Trench, and 216-A-29 Ditch will not be integrated into the strategy to accommodate the existing permit modification schedule. These RCRA TSDs will be addressed separately following the existing RCRA TSD closure process outlined in the Tri-Party Agreement.

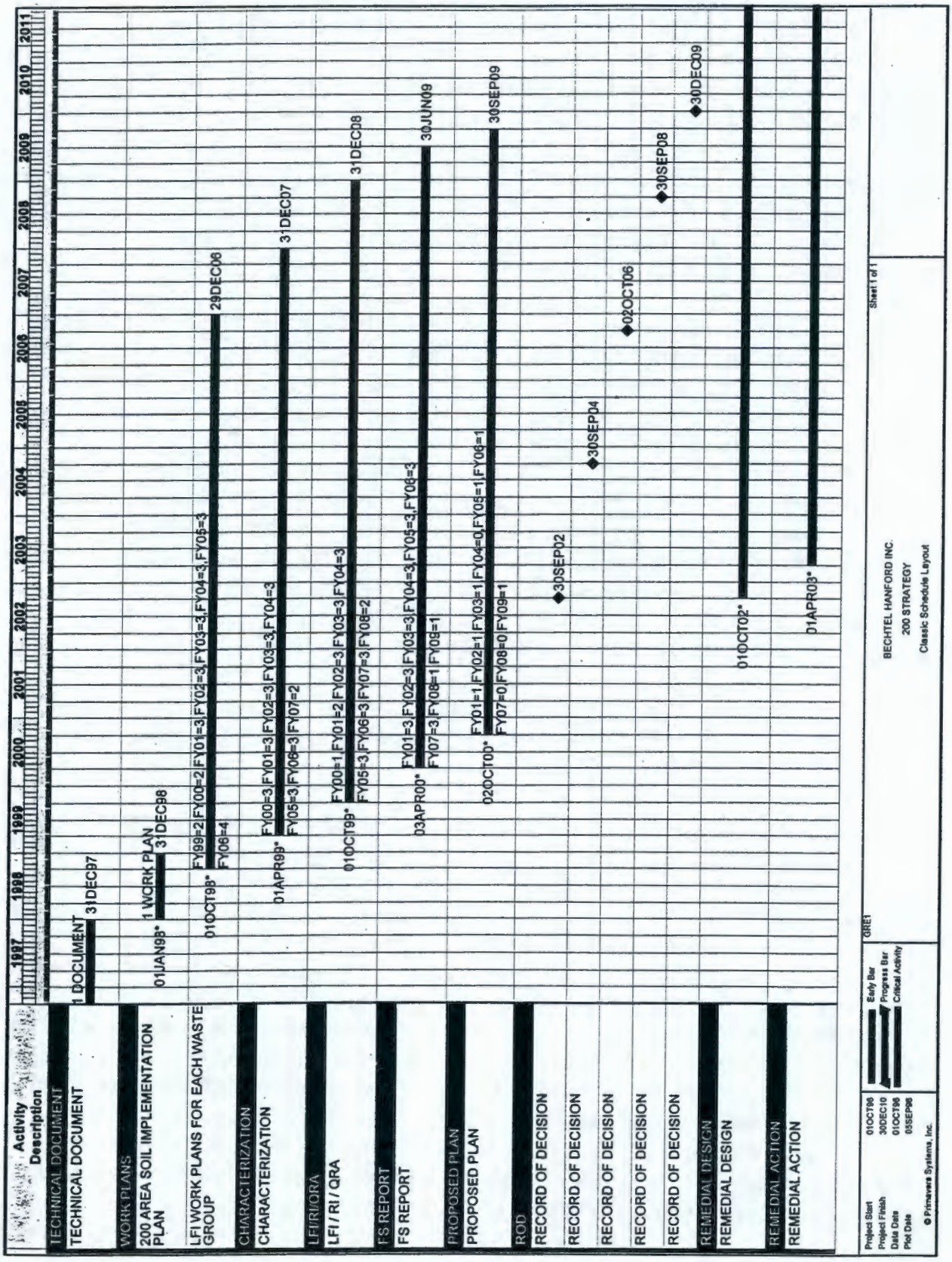
This strategy will serve as the foundation for realigning the Tri-Party Agreement. Currently, interim and major Tri-Party Agreement milestones are established based on the submittal of source OU work plans. A Tri-Party Agreement change package will be prepared to support the strategy and to inform the public. Additional text will be added to Section 7.2 of the Tri-Party Agreement that summarizes the strategy and its application in the 200 Areas. Existing major milestones (seven) that require submittal of a certain number of unspecified work plans per year (total of 22 work plans for the years 2000 - 2006) are not expected to change. These major milestones will be met by the submittal of 22 LFI work plans. Existing interim milestones specify particular OU work plans and TSD Closure/Post Closure Plans with submittal dates for the years 1998 - 2000. These interim milestones will be redefined to align with the implementation of the strategy.

The schedule (Figure 3) assumes that one implementation plan and 23 work plans will be prepared; however, the number of work plans ultimately required will be based on the waste site groups and document requirements established in the Implementation Plan. For planning purposes, 23 characterization activities, characterization reports, and FFSs are assumed. However, it is expected that additional consolidation of documents will occur consistent with the strategy. Six proposed plans and five RODs are also shown for planning purposes, after which additional streamlining of the decision process is expected by using ESDs and focus packages. Active remediation in the field starting in 2002 is supported by the schedule. The schedule assumes that additional funding needs will become available to support the schedule (i.e., current funding profile does not support the schedule). In addition to characterization funding needs, an additional $2 to $3 million per year will be needed, as a minimum, to sustain a cost-effective level of remediation starting in fiscal year 2002 through 2008.

To support the long-range planning process, several assumptions will be required to estimate costs. These assumptions will be based on the characterization and remediation approaches and criteria developed in Sections 4.0, 5.1, and 5.2.

The implementation process requires public involvement, which will be accomplished at various steps in the process (Figure 1). The general public will be initially informed of the strategy through the issuance of a Focus Sheet that summarizes the strategy and discusses the benefits to be gained. The public will also be informed through the Tri-Party Agreement change package process which will define enforceable milestones. The 200 Area's Soil Remediation Strategy and the Technical Document will be identified as supporting documents to the change package and will be available for public consumption. A presentation is planned to inform the Hanford Advisory Board of the strategy early in the process and to provide the strategy document to the board for review. Based on board comments on the strategy document and public comments received on the change package, the strategy may require revision. The Implementation Plan, following its completion, will be added to the administrative record and made available to the public. The LFI Work Plans will be primary Tri-Party Agreement documents subject to a public review. Other documents where public comment opportunities exist, include Proposed Plans, EE/CAs, and Remedial Design and Remedial Action Plans.

Figure 3. 200 Areas Soil Strategy Conceptual Schedule.



6.0 INTEGRATION NEEDS

Within the Hanford Site there are several ongoing programs that may impact or be impacted by ER (EM-40) activities. Although this strategy addresses only those waste sites and associated soil contamination assigned to the ER Program it does recognize the need to interface with the other programs. These programs include waste management (EM-30), Facility Transition and Management (EM-60), and Technology Development (EM-50) Programs. Several projects also exist in the ER Program that are active in the 200 Areas and require integration. Sections 6.1 and 6.2 provide a brief discussion of each program and identify mechanisms that are currently in place to integrate the programs.

The 200 Areas Source Strategy development team, which includes the Environmental Restoration Contractor (ERC), DOE, and regulatory agencies, provides a level of interface with other programs through their involvement in, or oversight of, other Hanford Site programs, projects, or work groups, such as the following examples:

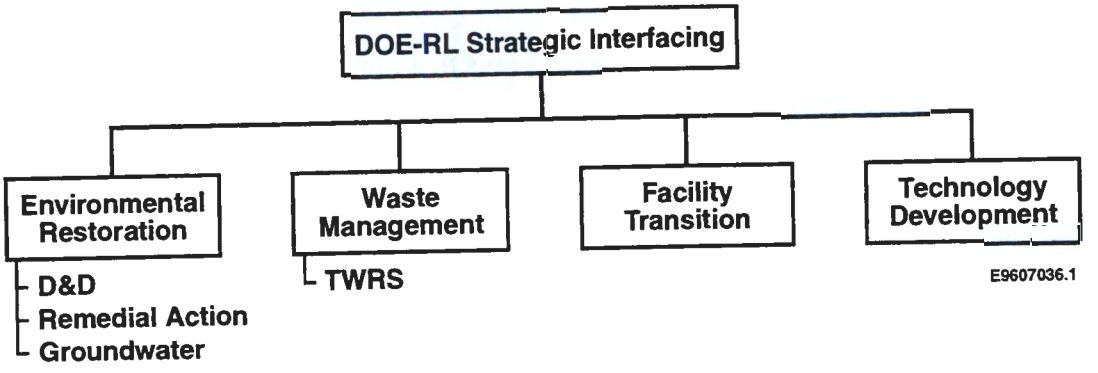
- D&D Strategy Work Group
- Facility transition supporting Tri-Party Agreement Amendment
- Canyon Initiative Team
- B-Plant Transition
- RCRA Closures and Permitting
- Groundwater Remediation
- Tank Waste Remediation System
- 100 and 300 Area Remediation Projects
- Environmental Restoration Disposal Facility
- Low-Level Burial Grounds
- B-Pond Closure.

Following completion of the 200 Areas Source Remediation Strategy, the information will be incorporated into the RL integration process (Figure 4) and other existing planning mechanisms identified below. Integration needs will be reviewed annually through meetings with the various programs and the strategic planning process to ensure integration issues are identified and managed.

6.1 ENVIRONMENTAL RESTORATION PROGRAM

The ER Program must assess and remediate inactive hazardous and radioactive facilities and waste sites, including past-practice and RCRA TSD closure sites. The ER Program consists of several projects, including Remedial Actions and Waste Disposal, Groundwater Remediation, N Area (100 Areas), and D&D Projects. The source waste sites addressed by this strategy are part of the Remedial Actions and Waste Disposal Project. The ER Project Long-Range Plan provides an integrated technical, cost, and schedule baseline for the various projects.

Figure 4. RL Programmatic Integration.



Integration needs have been identified at various levels within the ER Program. Several OUs have completed various levels of assessment work and include the 200-BP-1, 200-UP-2, and 200-ZP-2 source OUs, and 200-UP-1, 200-ZP-1, 200-BP-5 and 200-PO-1 groundwater OUs. To date, the 200 Areas source work has been based on the OU approach to organizing waste sites.

Sites within these source OUs will be included in the grouping process during the application of the 200 Areas Source Strategy implementation process. The exception being the 216-V-12 Crib in the 200-UP-2 OU; and the 216-B-3 Pond, 216-B-63 Trench, and 216-A-29 Ditch in the 200-BP-11 OU. These RCRA TSD sites will not be integrated into the strategy to accommodate the existing permit modification schedule. Previously characterized sites may serve as representative sites to take advantage of characterization work that has already been performed.

Interim groundwater remediation efforts are currently underway in the 200-UP-1 and 200-ZP-1 groundwater OUs and are being managed by the groundwater remediation project. Integrating source (i.e., waste sites and associated vadose zone contamination) and groundwater projects will primarily be required in the long term to implement final remedial decisions for the 200 Areas. However, a more immediate need for groundwater/source integration exists in the Z Plant area where extensive carbon tetrachloride contamination exists in the vadose zone and groundwater. The 200-ZP-2 vapor extraction ERA is currently limited to four cribs. However, an expanded treatment program may be needed to address other areas of carbon tetrachloride contamination in the vadose zone in the 200 West Area.

Integration with D&D projects occurs at three levels. One level is provided by the RARA Program, which performs S&M at selected waste sites and interim stabilization of select inactive waste sites, if required. An annual report supplies information on the past years' S&M activities. Interim stabilization that may be required at a particular waste site is planned to include project input to ensure that the activity is consistent with possible CERCLA remedial actions. The information in the annual report is used to update the Waste Information Data System to ensure that current status on waste sites is available. The second level of integration occurs during the facility transition process where the 200 Areas project manager is involved in the review and acceptance of waste sites associated with the facility. The third level occurs when the long-range plan is updated yearly and the planned CERCLA and D&D activities are reviewed for possible impacts. In addition, there is cross-project participation in strategy workshops, such as the current/ongoing canyon facility initiative team that is looking at alternatives for D&D of the canyon facilities.

6.2 OTHER HANFORD SITE PROGRAMS

The waste management program manages waste generated on the Hanford Site, including the storage, treatment, and processing of defense high-level radioactive waste, waste minimization efforts, and corrective actions at waste management facilities. Numerous subprograms within waste management exist on the Hanford Site, including Tank Waste Remediation System, Solid Waste Management, Liquid Effluent, Spent Nuclear Fuels, Landlord, Analytical Services, and

RCRA Operations and Monitoring. An initial integration meeting with the Tank Waste Remediation System has been held, and other meetings are planned with waste management programs.

The Facility Transition and Management Program must ensure that shutdown facilities are brought to a deactivated state, maintained, and eventually decontaminated and/or decommissioned or released for other uses.

The DOE Office of Technology Development must develop technologies to meet DOE's ER goals and work closely with other ER programs to identify, develop, and implement innovative technologies. The DOE Office of Technology Development has established five focus areas to address DOE's most pressing technology development needs, including (1) contaminant plume containment and remediation; (2) mixed waste characterization, treatment, and disposal; (3) high-level waste tank remediation; (4) landfill stabilization; and (5) D&D. Because of the unique nature of waste contamination and the lack of proven and cost-effective technologies, the need to evaluate promising technologies is recognized as an essential step to remediate the 200 Areas. The ER Program continues to actively work with the DOE Office of Technology Development to identify promising technologies and acquire the necessary support to evaluate/implement those technologies.

The Hanford Site Integrated Schedule identifies Hanford Site programmatic interfaces and site critical paths providing a high-level integrated plan. The Hanford Site Integrated Schedule provides a forum for dissemination of high-level summary schedule information between the various site programs, the stakeholders, and regulatory bodies. It provides a mechanism to integrate, analyze, and monitor Hanford Site programs.

The *Draft Hanford Mission Direction Document* (DOE-RL 1996a) recognizes that the diversity and duration of activities necessary to remediate the Hanford Site requires an overall perspective be taken in mission planning and execution. This document defines the scope, requirements, and interfaces for Hanford's mission, and discusses the strategic thinking done to date by RL, with support from the Hanford Site contractors. The document is designed to be periodically updated and provides a mechanism to incorporate the 200 Areas Source Strategy into the RL strategic planning process.

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9.0 GLOSSARY

Aggregate Area - A delineation of two or more waste sites, waste area groups, operable units or any other aggregation deemed appropriate by the parties to provide for more streamlined investigations, studies or remedial actions. For the 200 Areas NPL site, eight source (based on major plant operations including U, S, Z, T and B Plants, 200 North, Semi-Works, and PUREX) and two groundwater (200 West and East) aggregate areas were defined for the preparation of Aggregate Area Management Study Reports.

Aggregate Area Management Study - Evaluation of the existing information regarding past characterizations or environmental monitoring of sites within the aggregate area. Includes the collection, compilation, analysis, and interpretation of data to support decisions regarding the need for further actions in the defined aggregate area. Aggregate area management studies for the 200 Area aggregate areas were similar in nature to an RI/FS scoping study, the results of which were summarized in Aggregate Area Management Study Reports.

Analogous Approach - A methodology for streamlining investigations and remedial actions using a representative site to represent a waste site group or type. Sites of similar construction, operation, and/or disposal history are grouped; the site representing either the worst case or a typical case in terms of amount of waste, type and concentration of waste, and other factors is then investigated to develop or refine the conceptual model. The data from this representative site is extrapolated to the other sites in the group, to develop and evaluate remedial alternatives, and support remedial action decisions.

Characterization - The collection of data, either through intrusive or nonintrusive means and including historical data, for the purpose of developing or refining a conceptual model of a waste site or group of waste sites. Characterization is used to assess the nature and extent of contamination in environmental media (e.g., soil and groundwater) and supports the evaluation of potential remedial alternatives and the decision to proceed with remedial action.

Contaminant Type - A grouping of site contaminants based on physical, chemical, and toxic behavior of the specific contaminants. For example, metals as a group tend to be rather immobile, long-lived in the environment, and generally of ecological concern.

Conceptual Model - A comprehensive site description based on geological, hydrogeological, meteorological, physical, and other factors that presents the best estimate of contaminant type, location, concentration, and potential impacts to receptors. The conceptual model is refined through characterization, either at the specific site or at an analogous site, and through remediation at other sites.

Plug-In Approach - A methodology whereby a preselected or plug-in remedial action is assumed for a site based on evaluation at a similar or analogous site. For example, a removal action determined to be appropriate for a certain site can be assumed for a similar site or group of sites with little or no additional characterization. A set of criteria is used to determine if a site is sufficiently similar to the analogous site to allow the plug-in approach.

Presumptive Remedy - A remedy that is assumed for a certain type of site within a specific site profile. For example, based on site data and remedial evaluation, a removal action may be deemed appropriate for a specific site type such as a crib. Under presumptive remedy, cribs in the analogous group could be remediated with a removal action without exhaustive RI/FS documentation.

Representative Site - A site, under the analogous approach, that represents either the worst case or a typical case site from a waste site group based on contaminant inventory, process history, waste site type, or other factors. The representative site is considered the best choice for characterization of a waste group.

Source Operable Unit - A group of sites of similar process history, waste inventory, or geographical location that are grouped together to facilitate characterization and remedial activities. The source operable unit contains the waste disposal site(s) (such as cribs, trenches, and burial grounds) and support facilities (such as pipelines, diversion boxes, and other underground structures) and includes the vadose zone (i.e., soil) to groundwater under the waste site(s).

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APPENDIX A

WASTE SITE GROUPINGS

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In support of the strategy development process, workshop participants suggested grouping waste sites to streamline the assessment and remediation process. The group recognized that among OUs there are waste sites that are similar, and efficiencies could be realized using analogous conditions to reduce characterization needs and expedite the remediation process. The 200 Areas contain a large number of waste sites, but only a limited number of chemical separation processes (e.g., reduction and oxidation, UO_3) and waste disposal structures (e.g., burial ground, cribs, ponds) were used, providing a set of conditions that would allow for sites to be grouped.

A subteam with representatives from the ERC, Ecology, EPA, and RL was tasked to develop waste site categories. Chemical processes, type of contamination (e.g., uranium, plutonium, organics), and waste site type (e.g., pond, crib, burial ground) were identified as the primary factors used to categories sites. The following waste site categories were developed:

- Process Condensate and Process Waste Sites
- Steam Condensate, Cooling Water, and Chemical Sewer Sites
- Chemical Laboratory Waste Sites
- Miscellaneous Waste Sites
- Tanks Scavenged Waste Sites
- Septic Tanks and Drain Fields
- Unplanned Releases
- Tanks, Lines, Pits, and Boxes
- Landfills and Dumps.

The subteam systematically reviewed individual waste site data, including the following:

- Location
- Waste source and associated chemical process
- Volume of liquids received
- Type of contaminant(s) received and associated inventory
- Waste site type/structure.

Sites that were not addressed included those inside and ancillary to the double- and single-shell tank farms. The category Process Condensate and Process Waste Sites includes waste sites that are typically below-ground liquid disposal structures (e.g., cribs). Process condensate is generally water condensed from closed systems that was in direct contact with radioactive material and was commonly discharged to cribs. Process waste is low-level and/or hazardous waste that directly contacted radioactive material and may contain complexants that would enhance their mobility. This category was further subdivided into the six groups of sites based on the amount of organics, plutonium, uranium, fission products (e.g., cesium and strontium) the site received, and other process-related information.

The Steam Condensate, Cooling Water and Chemical Sewer Waste Sites category includes those sites that are typically above ground or uncovered liquid disposal/retention structures (e.g., ponds, retention basins). Condensate from steam and cooling water used to control processes

that did not directly contact radioactive material and had little potential for chemical or radionuclide contamination. Steam condensate and cooling water were commonly discharged to unlined ditches and/or ponds for evaporation and infiltration into the ground. However, steam condensate was also disposed to cribs and infiltrated into the ground. Chemical sewers (typically unlined ditches) were designed to receive nonradiological dilute chemical waste from major processing facilities. Accidental releases of contaminants to these types of waste streams have occurred, but represent only a small fraction of the volume discharged. This category was further subdivided into seven groups of sites based on geographic location and process similarities (i.e., cooling water, steam condensate, chemical sewer).

The Chemical Laboratory Waste Sites Category, includes sites that received laboratory and/or decontamination waste. Laboratory facilities provided analytical services for various process operations and generated waste (e.g., laboratory process, used/discarded reagents and chemicals) that was discharged to underground disposal structures, such as french drains. These same structures may have also received laboratory waste that originated from the 300 Area. This category was further subdivided into 200 Areas and 300 Area waste groups. The waste sites are grouped separately, because the nature of the laboratory waste originating from the 300 Area may be significantly different from the laboratory waste generated in the 200 Areas.

The Miscellaneous Waste Sites Category contains French drains, sites that received stack drainage, and equipment decontamination waste. The category has not been further subdivided into groups.

The Tank/Scavenged Waste Site Category contains sites that received high-level tank waste. Scavenged waste produced during the uranium recovery process contained the most concentrated radioactive and chemical waste disposed to the ground in the 200 Areas. This category was separated into scavenged waste, and unscavenged tank waste (cascade waste).

The Tanks/Lines/Pits/Diversion Boxes Waste Sites contain structures used to convey or control the conveyance of waste from the source facility to the waste disposal site. Ancillary facilities directly associated with a particular waste site will be assigned to that waste site's group. The category will be generally used to group conveyance structures associated with the tank farms but located outside tank farm operable unit boundaries.

All unplanned releases not specifically associated with a waste site were categorized under Unplanned Release Waste Sites. Unplanned releases that are associated with particular waste sites will be characterized with that particular waste site. No groups within this category were identified. The category Septic Tanks/Drain Fields Waste Sites contain sites that received nonradioactive, nonhazardous sanitary sewer waste. The Landfills and Dumps Waste Site Category contains solid waste burial and debris sites and was subdivided into the following groups: nonradioactive landfills and dumps, and radioactive landfills and dumps.

Table A-1 identifies the major waste site categories and associated waste site groups. This list is intended to provide an example of how the waste site groupings will occur and will be refined as part of the Technical Document development.

Table A-1. Liquid Waste Site Groupings.

Process Condensate/Process Waste Category
- Uranium-rich Process Condensate/Process Waste Group
- Plutonium-rich Process Condensate/Process Waste Group
- Plutonium/Organic-rich Process Condensate/Process Waste Group
- Organic-rich Process Condensate/Process Waste Group
- Fission Product-rich Process Condensate/Process Waste Group
- General Process Condensate/Process Waste Group

Steam Condensate/Cooling Water/Chemical Sewer Category
- Steam Condensate Group
- Chemical Sewer Group
- U Pond/Z-Ditches Cooling Water Group
- Gable Mtn/B-Pond & Ditches Cooling Water Group
- 200 North Pond and Trenches Group
- S Pond and Ditches Group
- T Pond and Ditches Group

Chemical Waste Category
- 200 Areas Chemical Laboratory Waste Group
- 300 Areas Chemical Laboratory Waste Group

Miscellaneous Waste Category
- Miscellaneous Waste Group

Tank/Scavenged Waste Category
- Tanks Waste Group
- Scavenged Waste Group

Tanks/Lines/Pits/Diversion Boxes Category
- Tanks/Lines/Pits/Boxes Group

Unplanned Releases - Nonfacility Specific
- Unplanned Releases Group

Septic Tank and Drain Fields Category
- Septic Tank and Drain Fields Group

Landfill and Dumps Category
- Radioactive Landfills and Dumps Group
- Non-radioactive Landfills and Dumps Group

APPENDIX B

LEVEL OF CHARACTERIZATION - ADDITIONAL DISCUSSION

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The characterization strategy is based on using a graded or phased approach that collects the appropriate data to (1) understand the physical conceptual model of the site, (2) support the evaluation of alternatives, and (3) select a remedy, as well as support the design of the remedy. As the project progresses, previously and newly collected data will be continuously evaluated for uncertainty and adequacy to support decisions or determine additional data needs. In general, the strategy envisions four phases of data collection:

- Review process knowledge and previously collected data
- Collect characterization data to understand/verify the physical conceptual model, evaluation of alternatives, and remedy selection
- Verify data collection at analogous sites to either ensure that the remedy is appropriate or verify that the remedy is effective
- Collect data to support remedial design activities.

The process for grouping the sites (e.g., analogous site approach) supports the optimum use of process knowledge and previous site investigations to determine the data needs for the characterization phase. Characterization requirements are defined as part of the data quality objective process. Data are generally needed for the following:

- Physical conceptual model refinement
- Treatability tests
- Risk assessments
- Remedial alternatives evaluation.

The data quality objective process is applied when preparing work/closure plans to define the types and quality of data needed to satisfy data needs. Process history and existing data will be used to optimize the amount of characterization performed. It is expected that initial data needs will focus on chemistry and physical soil property data (including contaminant mobility as the foundation for subsurface data). Chemistry data, including site-specific chemical and/or radionuclide analyses of affected media, will be needed to assess the nature, extent, and level of contamination. Physical properties include geologic structures, cation exchange capacity, unsaturated hydraulic conductivity, and moisture content. These properties will be used with contaminant characteristics (e.g., mobility and persistence) to assess the fate and transport of contaminants. Fate and transport analytical models (computer codes) may be used to facilitate this assessment. As the certainty increases, less direct (intrusive) and more indirect (nonintrusive) data collection techniques will be used to guide decisions on conceptual model validation, remedial design, and final verification.

General characterization principles that were identified while developing the 200 Areas Source Strategy, and are intended as a guide to establish the level of characterization needed to support the strategy, include the following:

- Boreholes are regarded as the most definitive data (high confidence data) collection activity at sites with the potential for a significant inventory of contaminants or a high potential for deep vadose zone contamination since direct contact is made with the interval of interest in a highly controlled manner. Boreholes provide for the collection of discrete, representative soil samples and provide access for in situ geophysical logging, such as spectral gamma-ray logging.

- Boreholes would be used at representative sites to gather data that are the foundation for the decision process. The use of process knowledge, existing data, and/or the conceptual model will be used to determine placement of boreholes and their depths.

- Boreholes would not be used at analogous sites unless data that contradicts the physical conceptual model is obtained.

- Test pit data typically have a lower level of certainty than borehole data, and data are limited to near surface depths. Test pits allow direct visual assessment of the geology. Because the soils are disturbed, physical property data may not truly represent the undisturbed soil conditions.

- Cone penetrometer test data represent the next level of certainty below test pits and offer the opportunity to use a variety of direct and indirect methods to collect data using field-screening techniques. These techniques range from collecting physical property data to soil gas surveys or to gamma spectral logging for radionuclides. The cone penetrometer would be used at sites where a high degree of confidence of the physical conceptual model exists.

- Surface geophysical techniques (e.g., ground penetrating radar, seismics, electrical resistivity) generally provide the lowest level of confidence data, but are nonintrusive. Several promising technologies may provide higher confidence data.

- Because the approach has inherent checks, site data will be continuously evaluated for uncertainty and adequacy to support decision making or to determine additional data needs. The number of samples required can be optimized to eliminate the collection of redundant data.

These principles should be applied during the data quality objective process associated with developing the work closure plan to ensure that the collection of data are focused on site remediation.

APPENDIX C

RCRA AND CERCLA DOCUMENTATION NEEDS

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C-1. Location of CERCLA and RCRA Past-Practice Work Plan, and RCRA TSD Closure Plan Information in 200 Area Soil Remediation Strategy Documents.

Documentation Needs		Location Under 200 Area Soil Remediation Strategy				
RCRA Closure Plan	**RI/FS and RFI/CSMWork Plan**	**Implementation Plan**	**LFI Work Plan**	**LFI Report**	**Focused Feasibility Study**	**Proposed Plan**
Introduction	Executive Summary; Introduction	X[4]				
Facility Description	Site Background	X[1,4]	X[2]	X[2]		
Process Description	Site Background; Initial Evaluation	X[1]	X[2]	X[2]		
Waste Characteristics	Initial Evaluation	X[1]	X[2]	X[2]		
Groundwater Monitoring	Initial Evaluation	X[1]	X[2,3]	X[2,3]	X[2]	X[2]
Closure Performance Standards	Work Plan Rationale; Remedial Alternative Development, Screening, and Analysis	X[1]			X[2]	
Closure Activities	Remedial Investigation; Schedule	X[1]	X[2]		X[2]	X[2]
Post Closure Plan					X[2]	
DQP Process	DQO Process	X				
Sampling and Analysis Plan	Sampling and Analysis Plan	X[1]	X[2]			
QA Plan	QA Plan	X				
Data Management Plan	Data Management Plan	X				

[1] General
[2] Group- or Site-Specific
[3] Document assesses groundwater impact concerns and associated soil characterization.
[4] General information contained in the Hanford site-wide permit will be referenced.

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ATTACHMENT 1

TECHNICAL ISSUES

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During the course of the strategy development process, several technical questions or issues were raised (some remain unresolved). These unresolved questions and issues are identified in Table A1-1 as a placeholder. The intent is to resolve these at the appropriate time or implementation step in the 200 Areas Strategy.

Table A1-1. Technical Issues.

Assigned to	Description	Status
ERC	Waste-site groupings need field review to see how they fit (reality check).	Items will be addressed as part of Technical Document Development, if approved.
ERC	Check to see what new information is available since the AAMS Report (geophysical logging).	Items will be addressed as part of Technical Document Development, if approved.
EPA/Ecology	Determine if a mechanism exists for RCRA acceptance of representative site data for a TSD closure.	--
--	100 mrem/yr basis	--
--	Land use (industrial standard?) • Does characterization drive land use or does land use drive characterization? • Does characterization drive remedial decisions or does remedial decision drive characterization?	Will be considered during Technical Document
--	Groundwater versus source correlations?	Prioritization issue. Hold pending priority discussion.
ERC	Assess alternative to fluid-applied asphalt.	Per DOE/RL-93-33
ERC	Develop biointrusion barrier design.	Per DOE/RL-93-33
ERC	Identify/obtain material sources for barrier construction.	Per DOE/RL-93-33
ERC	Identify modeling (i.e., contaminant transport) needs for 200 Areas source assessment.	--

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