REMEDIAL INVESTIGATION WORK PLAN
ANNOTATED OUTLINE
CONTENTS

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
BJC	Bechtel Jacobs Company LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
FSP	Field Sampling Plan
HSWA	Hazardous and Solid Waste Amendments
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act of 1976
RI	remedial investigation
RIWP	Remedial Investigation Work Plan
ROD	Record of Decision
SVOC	semi-volatile organic compound
TDEC	Tennessee Department of Environment and Conservation
VOC	volatile organic compound

This annotated outline was written to be used as a guide for preparation of Remedial Investigation Work Plans (RIWPs) in Oak Ridge under the U.S. Department of Energy (DOE) Oak Ridge Operations Environmental Management program. This document addresses preparation of an RIWP for a particular project; study area; operable unit; watershed; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) area; or release site, hereinafter referred to as the "site." This outline has not been approved by the Environmental Protection Agency (EPA) or the Tennessee Department of Environment and Conservation (TDEC) and may be modified to meet their needs.

RIWPs may be divided into different sections of a single document, a primary work plan document with appendices for accompanying plans, or different volumes for each plan, depending on project requirements.

EXECUTIVE SUMMARY

An executive summary must be included in all RIWPs. The executive summary appears on a separate page in the front matter of the document and briefly describes the site under investigation, the project, the data quality objectives (DQOs) process, and the sampling rationale. The executive summary should be on blue paper. The summary should reference the resulting plans included in the RIWP (i.e., Field Sampling Plan, Quality Assurance Project Plan, Environmental Safety and Health Plan, Waste Management Plan, and Data Management Plan). Much of the information can be taken from the Information Assessment Report generated for the DQO sessions.

1. INTRODUCTION

1.1 REGULATORY INITIATIVE

Briefly describe agreements, orders, regulatory drivers and permits applicable to the Oak Ridge Reservation (ORR) for the work addressed in the document. These will include the Federal Facility Agreement (FFA); the Resource Conservation and Recovery Act of 1976 (RCRA); the Hazardous and Solid Waste Amendments (HSWA) Permit; CERCLA; National Environmental Policy Act; National Oil and Hazardous Substances Pollution Contingency Plan; DOE Orders; and any other state and federal requirements.

1.2 ORR REMEDIATION PROGRAM

Describe the overall approach for the remediation of the ORR and how this project fits into the strategy. Include a brief discussion of the roles and responsibilities of DOE and its contractors.

1.3 FACILITY-SPECIFIC REMEDIATION PROGRAM

Describe the approach being used to address the remediation work at the specific facility (Oak Ridge National Laboratory, Oak Ridge Y-12 Plant, or East Tennessee Technology Park) to support the overall approach addressed in Sect. 1.2 and the overall objective of the facility's program.

Explain how the facility is divided to complete investigations and how the separate investigations are integrated. State the priority of the site that is the subject of the present RIWP. State whether all media will be addressed in the remedial investigation (RI) or whether groundwater, or another medium, will be addressed as part of a separate integrated investigation for the site.

1.4 INTENT AND SCOPE OF THE RI WORK PLAN

Describe the scope to be implemented in this RI for this site. Detail the specific regulations to be addressed during this work and how this work supports the overall facility remediation approach. This discussion should include: what has happened at the site previously, why this site is in the RI/Feasibility Study (FS) process, how the proposed sampling supports the most probable remedial technology, and what is to be accomplished by this RIWP. Identify studies/reports and actions expected to follow this RIWP. Be as specific as possible about how the work will be approached. For example, state whether more than one RI phase is expected, whether treatability studies will be necessary, and whether the investigation will be pursued to a certain point and then suspended until work at another site or sites is advanced before proceeding (and why). Address the implications of the scale of ecological investigations. State whether data collected from this site will be considered in larger-scale investigations. Address the specific concerns/resolutions raised in scoping meetings with the EPA, TDEC, and/or the public held prior to generation of the RIWP.

Discuss the management of uncertainties in the RI/FS process to support decision making in the Record of Decision (ROD). Emphasize that the intent of the RI is not to fully characterize the site to eliminate all uncertainties, because uncertainty is inherent in all hazardous and radioactive waste management. Indicate that the intent is instead to bound the uncertainties sufficiently (1) to allow meaningful description of the most probable site conditions and possible variations in those conditions, and (2) to develop and compare alternative remediation technologies to address the hazards to receptors posed by the site. Uncertainties will be addressed in the ROD through identification of remedial actions to determine the most probable conditions and contingent actions to address reasonable deviations from those conditions.

1.5 SPECIAL PROBLEMS

Discuss any problems that will require special attention. Problems may include classification issues, occupancy of buildings, the geographic location of the site, the nature of the waste, conflicting regulatory drivers, presence of critical habitats for threatened or endangered species, areas protected as DOE National Environmental Research Parks, protected habitats, historic or archaeological sites, safety issues and/or issues raised by the regulators or members of the public in the scoping meeting.

1.6 OVERALL PROJECT OBJECTIVES

Discuss the decisions that need to be made at the site by this project. The decisions are more general in this section but will become more specific in later sections.

1.7 DATA QUALITY OBJECTIVES

Describe the DQOs process that is included in *Data Quality Objectives Process for Superfund* (EPA 1993). This section should describe the overall seven-step process used during planning and scoping, and

Sect. 6.1 of this outline should describe the specific DQOs for the project. Appendix I-4 of the FFA has ORR-specific requirements for DQOs.

1.8 SCHEDULE

A schedule for the RI work should reflect contingencies based upon funding and approval. The schedule should reflect milestones for the site included in Appendix E of the FFA.

1.9 QUALITY ASSURANCE

1.9.1 Program Planning and Implementation

The overall planning and implementation of quality assurance (QA) and quality control (QC) activities for each project are governed by the *Quality Assurance Program Plan for Environmental Management and Enrichment Facilities at Oak Ridge, Tennessee, Portsmouth, Ohio, and Paducah, Kentucky* (BJC/OR-43), which addresses the guidance in EPA's *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* [EPA-600/4-83-004 (QAMS-005/80)] and the specifications of the Bechtel Jacobs Company LLC (BJC) Quality Procedures Manual, and applicable DOE Orders. Reference these procedures and discuss the overall program QA plan.

1.9.2 Project-Specific Planning

The QA Program Plan (BJC/OR-43) will be supplemented by project-specific QA Project Plans (QAPjPs) for each investigative, monitoring, or measuring project (including RIs) undertaken by BJC or its subcontractors. State here that the format and requirements of project-specific QAPjPs are based on the elements of QAMS-005/80 and will integrate other elements of BJC/OR-43 as needed. All QAMS-005/80 QA/QC and BJC/OR-43 requirements must be addressed in the project-specific QAPjP or noted where they are presented.

In cases where specific QA/QC requirements are addressed as an integral part of other program or project documents (e.g., a technical work plan), it is only necessary to cite the document and section where the requirements are addressed.

2. SITE BACKGROUND

The main purpose of this chapter is to describe the site under investigation, explain why the investigation is taking place, and justify the types of sampling needed to determine the presence of contamination by describing the operations that have taken place there, the materials used, and/or the wastes disposed of.

2.1 SITE DESCRIPTION

Describe the location of the site under study in relation to major features within the watershed or facility. Provide a list of relevant FFA Appendix C CERCLA Areas and HSWA permitted solid waste management units that are included in the site under study. Include nearby sites that are also being investigated or that may be potential contaminant sources, as well as construction details such as dates, type of construction (if applicable), and materials used. Discuss topographic modifications (site grading,

cut-and-fill activities, etc.). Include references to any available architectural or engineering drawings depicting the structural nature of the site. Also, include as much information on the past use of the site as possible. Use any available records and recollections of workers to determine the types and locations of potential contaminants. If historic photographs are available, include them also.

2.2 SITE OPERATIONAL HISTORY

Describe the various types of operations that have taken place in or near the site. Include as much information on the nature of these different operations as possible, and describe the products or results of each operation and the waste control used in the operation, such as drains, cleaning options, or burials. Missing or lost operational disposal records should be noted.

Describe any known or suspected releases of contamination in this section. Include the quantity, location, and nature of the material and the date(s) of the release(s). State the reason for the release(s), such as an accident, error, or routine operation performed under different regulatory environments.

3. CHARACTERIZATION OF ENVIRONMENTAL SETTING

Describe the site on a regional and local scale including its relationship with the surrounding area. In describing the environmental setting, identify the gaps in data needed for subsequent analyses. Include a brief evaluation of any data (historical, compliance monitoring, etc.) that may exist for the site. The conclusions drawn from this evaluation should provide the basis for determining any existing data gaps. Analysis of existing data also provides the basis for developing a conceptual site model. This site model will be used to design the sampling plan.

Discuss potential routes of contaminant migration from the site within the watershed as a whole and their interaction with one another. Include physical and chemical characteristics associated with each medium that could inhibit or enhance the migration/transport of contamination. Use figures, maps, and cross-sections whenever possible. Include the following sections to the extent applicable. Details should be included to the extent practical. RIWPs of large areas may not reasonably include all suggested information.

3.1 GEOGRAPHY

Describe the location of the site within the facility or reservation and supplement with state, regional, and local maps. Provide a site-specific map depicting surface characteristics (topography) and structures.

3.2 CLIMATE

Include meteorological data that can be used for predicting air dispersion of contaminants, for health and safety planning, and for assessing contaminant fate and hydrologic transport. Summarize precipitation, temperature, wind rose data, wind directions and maximum velocities, inversion layers, humidity, and site-specific air sampling data.

3.3 DEMOGRAPHY

Provide relevant information on demography to characterize the human populations potentially exposed to contaminants released from the site. Present information on population size and location, sensitive groups of people, land use, transportation systems, and growth patterns.

3.4 SOURCE AREAS

Describe the known or suspected source areas within the site (e.g., sludge in tanks, sediments in impoundments, buried wastes in disposal areas). Discuss any existing waste inventories or sampling data from source areas, including sampling locations, analytical results and conclusions drawn from them.

3.5 GEOLOGY AND SOILS

Site geology affects the release and movement of contaminants. Include a summary description of the unconsolidated overburden (thickness, areal extent, mineralogy, and particle size) and the bedrock (type, lithology, structure, and discontinuities). The surface soils also influence the type and rate of contaminant transport. Obtain and report soil characteristics (type, temperature, and engineering properties), soil chemistry (cation exchange capacity, solubility, leachability, etc.), and vadose zone characteristics (permeability, porosity, and chemical characteristics). Also describe bedrock type and structure, with emphasis on transport characteristics—permeability, fracture zones, and other secondary porosity (solution cavities).

Describe any existing soil sampling data for the unit, including, at a minimum, the sampling locations, the method of collection and analysis, and the sampling depth. Include a brief description of the results of any physical characterization testing or analytical testing and the conclusions drawn from them.

3.6 RADIOLOGICAL SURVEY

Because of the nature of activities on the ORR, include existing radiological survey data for the unit under study in a section separate from measured environmental concentration data. Describe the survey and the results in this section. Environmental sampling activities conducted as a result of the survey or as part of an ongoing investigation will be discussed subsequently in the appropriate media-specific chapter on sampling and analysis.

3.7 GROUNDWATER

Provide aquifer boundaries and locations, direction and velocity of flow, location of discharge and recharge area, lithology, porosity, confining layers, conductivity, and existing and potential uses. Briefly evaluate the existing analytical results to determine whether a contaminant plume is present and whether the contaminants are as expected or have migrated from an upgradient source. Describe any limitations of the existing data.

Describe any groundwater data that may exist for the site, and include the following information in a table in an appendix: (1) well locations, (2) the date of collection, and (3) a description of well construction, including screened intervals, the total depth of wells, and whether wells monitor the unconsolidated zone or the bedrock aquifer. Report water level data for each sample taken.

3.8 SURFACE WATER AND SEDIMENTS

Surface water provides a pathway for the transport of contaminants and an integration point within the watershed. Identify ditches, streams, ponds, lakes, and erosion patterns and their flow rates and dimensions. Because the sediments in surface water may be contaminated, present existing data on sediment transport. Also, discuss flow characteristics, including losing/gaining reaches, base flow characteristics, and potential for overload flow to streams. Describe characteristics relevant to aquatic communities, including depth, pool and riffle structure, substrate texture, etc. In addition, cite or review any available information on background water quality. (Such information will not necessarily be site-specific if the site is small.) Include major ion chemistry as well as ambient concentrations of possible contaminants.

Report on any surface water or storm flow data that may exist, including any collected in accordance with a National Pollutant Discharge Elimination System permit. Include sampling locations, dates of collection, and, if appropriate, the flow rate during the sampling.

Describe any data concerning the quality and contamination of sediments. It is important to distinguish surface sediments from buried sediments, suspended sediments from bed sediments, and analyses of sediment pore water from solid phase. Discuss the analytical results and state whether the contaminants are likely from sources within the site or whether there is evidence that they might have migrated from another source upstream.

3.9 ECOLOGY

Ecological information is required as input for both ecological and human health risk assessments. Identify the flora and fauna on the site, critical habitats, endangered and threatened species, species in the human food chain, wetlands, flood plains, wildlife refuges, migratory patterns, and biomonitoring data. Discuss stressed flora and fauna, if appropriate, and in the case of disturbed sites, describe the native habitat of the area. Describe any biological monitoring data that may exist for the unit, and include the types of samples collected, the analyses performed, the analytical results, and any conclusions drawn from the data.

4. SITE CONCEPTUAL MODEL

A conceptual model is a statement of probable site conditions that serves as a paradigm against which observations can be compared. The conceptual site model, which is developed as part of the DQOs, spawns the decisions that need to be made regarding contaminants at the site and their transport to potential receptors. Investigations of the site are conducted to provide information that will, in essence, either verify the conceptual model or identify deviations from it. At the end of any characterization investigation, a new or modified conceptual model describes the probable site conditions on which remediation decisions should be based.

The most prominent components of a conceptual site model include:

- contaminant source areas,
- hydrogeologic setting,
- site-related chemicals,
- contaminant transport pathways,
- human and ecological receptors, and

- potential human and ecological exposure pathways.

4.1 SOURCE AREAS

The likely sources of environmental contamination should be identified using information on past site operations and activities, site maps and photos, and available historical environmental data. All potential source areas should be identified spatially on a current site map. If available, information on the potential volume, mass and/or area, and depth of the source should be documented in as much detail as possible.

Table 4.1. Example source area information

Waste burial area	Dimensions	Depth	Waste types
Area A	70 × 275 ft	10 to 12 ft	noncombustible trash and some contaminated equipment, placed between 1950 and 1968; closed in 1968
Area B	60 × 170 ft	6 to 7 ft	noncombustible, contaminated and uncontaminated trash and equipment; closed in 1968
Area C	60 × 160 ft	6 to 7 ft	noncombustible, contaminated and uncontaminated trash and equipment, placed between 1950 and 1972
Area D	15 × 140 ft	6 to 7 ft	contaminated concrete, placed between 1956 and 1972
Area E	15 × 100 ft	6 to 7 ft	contaminated concrete; closed in 1986
Area F	four areas ~30 × 60 ft each	6 to 7 ft	uranium-contaminated scrap metal and equipment;
Area G	30 × 120 ft	6 to 7 ft	Unknown

4.2 HYDROGEOLOGY

The site conceptual model should include a detailed understanding of the hydrogeologic features of the site that would contribute to releases exiting the source area(s) and moving through the environment. These features include: site geology, rainfall conditions, and a water balance indicating the water reservoirs at the site under equilibrium conditions.

To the extent possible, a quantitative understanding of these issues should be developed, including the depths to various geological layers, hydraulic conductivity values, water table and associated gradients and flow directions, the porosity of the subsurface media, and the geochemical conditions of the subsurface that could effect contaminant sorbtion. Special considerations should be identified, such as man-made conditions that could affect rainfall infiltration or that could control surface water or groundwater movement.

Development of a comprehensive understanding of these conditions during the DQO process will ensure that any critical data gaps be addressed during the site investigation.

4.3 SITE-RELATED CHEMICALS

Information on site-related chemicals may come from site records, process knowledge, and previous field investigations. In general, it is helpful to identify all possible chemical groups that may exist at the site [e.g., volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs);

polychlorinated biphenyls (PCBs); inorganic elements, radionuclides and other]. This will help identify analyses required during the site investigation.

4.4 CONTAMINANT TRANSPORT

The goal of identifying contamination transfer pathways is to determine the path that contaminants from the source areas could be transported to receiving environmental media, and eventually to human and ecological receptors at a location distant from the source area. Shutting down these pathways is a major goal of any environmental remediation.

Transport of contaminants away from source areas is often a complex interaction of a number of factors. These factors have mainly to do with movement of water, including volatilization, surface water migration, and groundwater migration, and the mobility of the probable contaminants in water. In some cases detailed information is available to determine the contaminant transport pathways (e.g., samples collected at nearby springs or groundwater wells). In many cases the issue of multiple sources contributing to a single medium complicates the interpretation of transport pathways.

4.5 HUMAN RECEPTORS AND EXPOSURE PATHWAYS

The conceptual site model must identify the human population both at and surrounding the source area(s). Human receptors may include industrial, residential, and recreational users of the area, as well as special populations, such as Native Americans, or sensitive subpopulations such as children in nearby day care facilities. The analysis should include receptors living and working in areas downgradient of the source (e.g., receptors whose potable water source is downgradient of the site).

For each receptor type at each receptor location, all potential exposure pathways should be systematically identified (e.g., inhalation of dust, ingestion of drinking water). More detailed information on human ingestion pathways is developed as part of the Baseline Risk Assessment.

4.6 ECOLOGICAL RECEPTORS AND EXPOSURE PATHWAYS

Discuss threatened or endangered species in the area and normal populations present at or near the site. Indicate any relevant or appropriate biological monitoring. Identify ecological endpoint species that will be addressed in the ecological risk assessment, as well as additional species that could affect the endpoint species (e.g., prey of the endpoint species).

Describe the routes of exposure that potentially contribute to ecological hazards. Describe the physical relationship of the endpoint biota and the sources of exposure, including the means by which exposure potentially occurs, such as (1) direct ingestion, (2) indirect ingestion through the food chain, (3) oral cleaning of pelt or plumage, (4) respiring water, or (5) root uptake.

5. IDENTIFICATION OF INVESTIGATION REQUIREMENTS

5.1 IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND PRELIMINARY REMEDIATION GOALS (PRGs)

Identification of ARARs is an iterative process that will be ongoing during the RI process. The intent is to identify ARARs and other "to-be-considered" criteria that could be used to assist in the selection of remedial alternatives. Identify chemical-specific and location-specific ARARs in this section or in an appendix based on existing information. Include a list of chemicals of concern rather than a list of all analytes detected. Likewise, identify human health-based and ecological-based criteria for the possible range of land uses and levels of protection (10^{-4} – 10^{-6} excess lifetime cancer risk for carcinogens).

Note that for each contaminant of concern and for each medium of concern, the PRGs should be provided for the following: (1) health-based criteria for carcinogenic effects or for systemic toxic effects, (2) the most-stringent chemical-specific ARAR, (3) ecologically-based criteria, and (4) background concentrations.

5.2 IDENTIFICATION OF POTENTIAL REMEDIAL TECHNOLOGIES

Identify the types of media that could be contaminated at the site and the potential remediation technologies applicable to each medium. If a land use has already been accepted for the site, the range of technologies identified should be compatible. If there is no land use agreement, represent the range of possibilities through a range of technologies. Identify the types of data needed to support evaluation of each technology. For example, British thermal unit (Btu) value of wastes may be needed to evaluate thermal destruction technologies. Geochemical parameters or microbial population counts may be needed to evaluate natural attenuation technologies. Toxicity characteristic leachate procedures may be needed to evaluate waste disposition requirements.

6. SITE DATA NEEDS

Summarize the data and associated reporting requirements necessary to perform human health and ecological risk assessments and feasibility studies. In general, the following data needs are likely to be useful for some or all of the above activities: (1) contaminant concentrations in specific media; (2) factors affecting fate and transport of contaminants (e.g., physical parameters, bioaccumulation factors); and (3) background concentration data. Frequently, treatability studies may be needed to support the FS. Typically these studies will be planned under a separate work plan. It is imperative that all activities through the ROD be addressed by the RI, if at all possible, so that all relevant data are accessible to all parties concerned. In some cases, samples should be analyzed in a specific way, and these specific needs must be highlighted in the sampling plan.

6.1 DATA QUALITY OBJECTIVES

Summarize the DQOs for the site following the process described in Sect. 1.8 and in BJC-ES-1004, *Implementing and Documenting the Data Quality Objectives (DQO) Process for Environmental Restoration (ER) Projects*. DQOs may be summarized in table format, but should clearly provide the

logic and rationale for any data collection and subsequent data use. Summarize the following steps for the media, site areas, contaminant types, and identified data users:

- Statement of the problem to be resolved,
- Identification of decisions to be made,
- Identification of decision input,
- Limitation of study boundaries,
- Decision rule development,
- Development of uncertainty constraints, and
- Data design optimization.

6.2 PHYSICAL CHARACTERIZATION ACTIVITIES

Describe the information needed to complete environmental characterization, such as flow measurement of seeps and springs, geologic mapping, or walkover surveys for physical characteristics or radiation. Other physical characterization data may include dye-tracer or aquifer tests, geophysical logs, water table elevation measurements, ecological surveys, and/or wetlands assessments. Identify the use and anticipated reporting of this information.

Describe the level of detail of ecological studies proposed for the site. If specific detailed ecological investigations are not warranted (i.e., if the site does not support threatened or endangered species or protected habitats or if it does not provide any habitat for biota and, therefore, has no impact on nonhuman populations), then justify the decision not to perform an ecological risk assessment and note that if relevant larger-scale ecological assessments identify ecological concerns, then possible contaminant releases from a smaller level site will be considered in those assessments.

For example, ecological risk assessments may require (1) sediment pore water concentrations, (2) concentrations of dissolved forms of contaminants in surface water, (3) whole body concentrations of contaminants in fish and wildlife (rather than concentrations in fillets), and (4) concentrations in native vegetation as well as crops. In addition, minimum required detection limits may be lower for ecological concerns than for human health concerns in some cases. Contaminants that pose a greater threat to ecological rather than human health will need to be analyzed with more precision than would otherwise be required. Certain water quality parameters, such as pH and oxygen levels, are also likely to be more important for ecological assessments. Biosurvey data and ambient toxicity test data may be required for detailed ecological risk assessments.

6.3 SAMPLING AND ANALYTICAL REQUIREMENTS

Include a map or maps showing the locations of all samples proposed for the investigation. All sampling locations shown on the map(s) should be clearly identified with a unique station identifier. Estimate the numbers of samples and analytical requirements for each sample or set of samples for all relevant media at each individual station. Include any assumptions used to calculate the estimates, such as depth of soil or sediment. Include associated QA samples for each sampling event in the total sample estimate.

6.4 DATA EVALUATION AND INTERPRETATION

Include in this section the methods of data evaluation and interpretation anticipated for completion of investigation activities. These methods might include, but should not be limited to, analytical and field data reviews, mapping of contaminant concentrations, statistical evaluation of trends with time and/or space, and geologic mapping from borehole data.

6.5 RISK ASSESSMENT METHODOLOGY

Describe the kind of risk assessment planned for the site, such as screening level or baseline, and/or ecological risk assessment. Include a statement that the sampling and analytical activities proposed in this RIWP will address the data needs of the anticipated risk assessment.

The methodology used to conduct the baseline or screening-level human health and ecological risk assessments will follow the directions and guidelines set forth in the *Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual* (EPA/540/1-89/002), the *Risk Assessment Guidance for Superfund Volume II, Environmental Evaluation Manual* (EPA/540/1-89/001), and *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Manual* (EPA/600/3-89/013). The approach utilized for the ecological risk assessment should be designed to satisfy the requirements set forth in the U.S. Department of Interior Natural Resources Damage Assessment rule.

6.6 FEASIBILITY STUDY

In this section, and with a fair amount of detail, address the sufficiency of data to support the FS to evaluate the effectiveness, implementability, and cost of the most probable remedial alternatives or potential remediation technologies. Describe how the data can be used to estimate volumes, flow rates, treatment additives or by-products, and waste streams and their disposition. Address the sufficiency of data to evaluate and compare potential containment, in situ treatment and removal, and ex situ treatment alternatives.

7. REFERENCES

Include a list of references used to develop the RIWP in the format shown here. The following are general references for inclusion in an RIWP.

U.S. Department of Energy (DOE) 1991. *Natural Resource Trusteeship and Ecological Evaluation for Environmental Restoration at Department of Energy Facilities*, DOE/EH-0192, EH-231 Guidance Document, June.

U.S. Environmental Protection Agency (EPA) 1989. *Preparing Perfect Project Plans*, EPA/600/9-89/087, Office of Research and Development, Risk Reduction Engineering Laboratory, October.

EPA 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (Interim Final), EPA/540/G89/004, Office of Emergency and Remedial Response, October.

EPA 1989a. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)* (Interim Final), EPA/540/1-89/002, Office of Emergency and Remedial Response, December.

EPA 1989b. *Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual* (Interim Final), EPA/540/1-89/001, Office of Emergency and Remedial Response, March.

EPA 1990. *Guidance for Data Usability in Risk Assessment* (Interim Final), EPA/540/G-90/008, Directive 9285.7-05, Office of Emergency and Remedial Response, October.

EPA 1991a. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)* (Interim), Publication 9285.7-01B, Office of Emergency and Remedial Response, December.

EPA 1991b. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives)* (Interim), Publication 9285.7-01C, Office of Emergency and Remedial Response, December.

EPA 1993. *Data Quality Objectives Process for Superfund*, EPA/540/G-93/071, Publication 9355.9-01, Office of Emergency and Remedial Response, September.

APPENDIX A
FIELD SAMPLING PLAN

The sampling and analysis plan can be prepared as a stand-alone document, assuming that it includes the field sampling plan (FSP) along with the Quality Assurance Project Plan (QAPjP). In order to address the requirements of QAMS-005/80, information common to both the FSP and QAPjP (e.g., project organization, responsibilities, and project description) is included in the FSP. The FSP requires an approvals page.

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

This appendix should present the project-specific Quality Assurance Project Plan (QAPjP) for both field and laboratory data collection. The QAPjP requires an approvals page.

APPENDIX C
ENVIRONMENTAL SAFETY AND HEALTH PLAN

The Environmental Safety and Health Plan requires specific approval signatures. Reference general health and safety plans for the specific facility if available and BJC requirements for preparation of ES&H Plans (Exhibit G in subcontract documents). The Health and Safety Plan will be a stand-alone document.

APPENDIX D
WASTE MANAGEMENT PLAN

Prepare a waste management plan consistent with BJC guidance on the preparation of waste management plans and the most recent EPA guidance on "investigation-derived waste". The waste management plan requires a separate approvals page.

APPENDIX E
DATA MANAGEMENT PLAN

Prepare a data management plan. BJC Procedure BJC-ES-1003, "Developing, Implementing, and Maintaining Data Management Implementation Plans" specifies requirements and provides a template to follow in preparing Data Management Plans.