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EPA Superfund
Record of Decision:

OAK RIDGE RESERVATION (USDOE)
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OAK RIDGE, TN
11/02/1999

DOE/OR/01-1791&D3

OU-13
Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee

This document has received the appropriate reviews for release to the public.

DOE/OR/01-1791&D3

Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee

Date IssuedCNovember 1999

Prepared by
Jacobs EM Team
under subcontract to Bechtel Jacobs Company LLC

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

PREFACE

This *Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee* (DOE/OR/01-1791&D3) was prepared in accordance with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to present the public with the selected remedy for the disposal of waste expected to be generated by cleanup of the Oak Ridge Reservation and associated sites. This work was performed under Work Breakdown Structure 1.12.01.06.08.01 (Project Baseline Summary 48101, "Environmental Management Waste Management Facility"). This record of decision documents the selected remedy agreed on by the U.S. Department of Energy, the Tennessee Department of Environment and Conservation, and the U.S. Environmental Protection Agency. This document summarizes and relies on information from the remedial investigation/feasibility study (DOE/OR/02-1637&D2), its addendum (DOE/OR/02-1637&D2/Al), and proposed plan (DOE/OR/01-1761&D3).

ACRONYMS

ACAP	Atomic City Auto Parts
ALARA	as low as reasonably achievable
AOC	area of concern
ARAP	aquatic resource alteration permit
ARAR	applicable or relevant and appropriate requirement
BHHRA	baseline human health risk assessment
BYBY	Boneyard/Burnyard
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DWI	David Witherspoon Inc.
EM	Environmental Management (Program)
Envirocare	Envirocare of Utah, Inc.
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ETTP	East Tennessee Technology Park
FFA	Federal Facility Agreement
FML	flexible membrane liner
FR	*Federal Register*
FS	feasibility study
FY	fiscal year
GCL	geosynthetic clay liner
HI	hazard index
HSWA	Hazardous and Solid Waste Amendments of 1984
ILCR	incremental lifetime cancer risk
K_d	solid-to-liquid distribution coefficient
LDR	land disposal restrictions
LLW	low-level (radioactive) waste
LUC	land use control
LUCAP	Land Use Controls Assurance Plan
LUCIP	Land Use Controls Implementation Plan
MOU	Memorandum of Understanding
mrem	millirem
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NT	north tributary
NTS	Nevada Test Site

OREPA	Oak Ridge Environmental Peace Alliance
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
OU	operable unit
RAWP	remedial action work plan
RCRA	Resource Conservation and Recovery Act of 1976
RI	remedial investigation
ROD	record of decision
S&M	surveillance and maintenance
SARA	Superfund Amendments and Reauthorization Act of 1986
Site	East Bear Creek Valley Site
SSAB	Site Specific Advisory Board
STP	site treatment plan
SWMU	solid waste management unit
TBC	to be considered
TCA	*Tennessee Code Annotated*
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranic
TSCA	Toxic Substances Control Act of 1976
USC	*United States Code*
VOC	volatile organic compound
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant
WMI	Waste Management Inc.

PART 1. DECLARATION

SITE NAME AND LOCATION

U.S. Department of Energy
Oak Ridge Reservation
Environmental Management Waste Management Facility
Oak Ridge, Tennessee

STATEMENT OF BASIS AND PURPOSE

This record of decision (ROD) presents the selected remedy for disposal of wastes from cleanup of the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) and associated sites. This action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) [42 *United States Code* (USC) Sect. 9601 et seq.] and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 *Code of Federal Regulations* (CFR) 300]. This document serves as the ROD under both CERCLA and NEPA, in accordance with the DOE Secretarial Policy on National Environmental Policy Act of 1969 (NEPA) (DOE 1994).

This decision is based on the Administrative Record for the evaluation of disposal options for ORR CERCLA waste, including the remedial investigation (RI)/feasibility study (FS) (DOE 1998a), its addendum (DOE 1998b), the proposed plan (DOE 1999a), and other documents. In addition, DOE has considered all comments received on the proposed plan in preparing this ROD.

DOE is the lead agency for this action. The U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) are supportive agencies as parties to the Federal Facility Agreement (FFA) for this action. They concur with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from operable units (OUs) at ORR and associated sites outside the ORR boundary, if not addressed by response actions, may present a substantial endangerment to public health, welfare, or the environment. Remediation of such sites will generate large quantities of contaminated waste that in turn must be disposed of in a manner that

is protective of public health, welfare, and the environment. The response action selected in this ROD facilitates sitewide remediation by providing disposal capacity for wastes that will be generated from response actions at individual sites, thereby protecting public health, welfare, and the environment.

DESCRIPTION OF THE SELECTED REMEDY

This ROD presents the design, construction, operation, and closure of an on-ORR disposal facility as the selected remedy for on-site disposal capacity. This response action supports the overall ORR cleanup strategy by proactively addressing the need for disposal capacity for waste that will be generated from cleanup of ORR and associated sites. CERCLA response actions for ORR will be defined in RODs scheduled for approval beginning in FY 1999. It was estimated in the FS that implementation of these RODs will generate between 223,000 and 1.1 million yd^3 of waste. It is now estimated that approximately 280,000 yd^3 will be generated by implementing these RODs. As demonstrated by the evaluations conducted for the FS, larger waste volumes requiring disposal are more cost-effectively disposed of on site.

The selected remedy addresses principal threats at ORR and associated sites by providing for the permanent disposal of radioactive, hazardous, and mixed wastes that present unacceptable risks to human health and the environment in their current setting. The selected remedy provides for constructing an engineered waste disposal facility at a site in ORR's East Bear Creek Valley and implementing long-term institutional controls for that facility. This remedial decision is based on the expectation that most waste coming from future CERCLA response actions at ORR (with treatment when appropriate) will be disposed at this new facility, which will accept waste that meets facility-specific waste acceptance criteria (WAC) from ORR sites and associated sites outside the ORR boundary (but all from locations within the state of Tennessee), which have been contaminated by the receipt or transport of material from past ORR operations. A relatively small volume of waste from these future CERCLA response actions is expected to be disposed of at approved off-site facilities. Individual RODs for each future CERCLA response action will determine the type and amount of waste generated from that action, which will be disposed of in the new on-site facility and/or approved off-site facilities.

Disposal capacity provided by this remedy will support timely and cost-effective sitewide cleanup. The following are the major components of the selected remedy:

- Construction and operation of an engineered, above-grade, earthen disposal cell and supporting facilities located west of the Oak Ridge Y-12 Plant in East Bear Creek Valley,

with an initial total capacity o f at least 357,000 yd^3, large enough to hold a minimum of 223,000 yd^3 of waste, plus daily cover and void filler, and considering swell when the waste is removed from the ground or buildings.

- Facility designed to receive low-level (radioactive) waste (LLW), hazardous waste as defined under the Resource Conservation and Recovery Act of 1976 (RCRA), waste as defined under the Toxic Substances Control Act of 1976 (TSCA), and mixed waste consisting of combinations of these waste types. The cell will meet or exceed all ARARs except for the TSCA requirement that the bottom of a landfill liner be 50 ft above the historical high groundwater table for which requirement a waiver is being invoked upon signature of this ROD. Although minimum technical requirements for landfills under RCRA [40 CFR Part 264, Subpart N; and *Rules of the Tennessee Department of Environment and Conservation,* Chap. 1200-1-11.06(14)] will be met or exceeded, the facility will not be permitted by the TDEC Division of Solid Waste Management because waste to be disposed of at the facility will come only from ORR CERCLA response actions within areas being treated together with the disposal facility as a single site pursuant to CERCLA Section 104(d)(4).

- Development of final WAC for the facility during the design process in accordance with ARARs, risk/performance assessments, and worker protection requirements. On approval by EPA and TDEC, these criteria will govern what wastes can be disposed of in the facility. Contaminant-specific WAC are being established by estimating contaminant concentrations for each type of waste such as soil/soil-like, stabilized, solidified and debris. Applying these WAC to wastes dispositioned in the cell will ensure that risk to a hypothetical groundwater user, a resident farmer located between the facility and Bear Creek, will not exceed acceptable thresholds established under CERCLA. Appendix B of this ROD contains the "draft" WAC for the facility as well as the methodology for its development and application. This information reflects agreements reached between the FFA parties to date.

- Implementation of a waste certification program in accordance with the WAC attainment plan, a post-ROD primary document, will ensure only waste certified for disposal will be accepted for on-site disposal.

- Disposal of waste that cannot be treated to meet the on-site disposal facility's WAC at DOE, or as appropriate, EPA-approved off-site facilities.

- Closure of the on-site cell by placing an enhanced RCRA-compliant cover over the waste. The cover enhancements will further prevent direct exposure to the waste and will include systems designed to minimize infiltration of rain water, resist erosion, and resist penetration by burrowing animals. The cover will be designed and constructed to minimize the potential for intrusion by future human excavation.

- Long-term institutional controls, air and groundwater monitoring, and surveillance and maintenance (S&M). Engineering controls and media monitoring will be implemented during construction and operations and will continue after closure to restrict public access and verify cell performance. Long-term S&M will be implemented indefinitely to detect and repair any damage to the cover or other problems with the facility. DOE has defined controls on the future use of the land required to implement this remedy to ensure its protectiveness. The elements of the controls are to prohibit construction of any kind on the disposal facility that could damage the final cover, preclude residential use of the area, and prevent unauthorized access to groundwater in the area.

- Facility design will contain contingencies for shallow groundwater collection and treatment. A shallow/deep groundwater monitoring program will be established. If groundwater ARARs are exceeded (i.e., radionuclides in groundwater in concentrations that exceed an effective dose equivalent of 25 mrem/year from all pathways), a response action would be implemented. Determinations of exceedances of ARARs will be made in accordance with the operations plan during the operations phase, and the post-closure plan after facility closure. These plans will address all activities required to ensure the performance and compliance of the facility with design and regulatory criteria.

Based on current information, the on-site disposal alternative appears to be the best alternative when evaluated under CERCLA criteria. This alternative offers protection comparable to the off-site alternative at lower cost and with less transportation risk. Within the level of accuracy for CERCLA RI/FS cost estimates (+50 to -30 percent), costs for the on- and off-site alternatives are not significantly different for the low-end scenario. However, the cost difference is significant for the high-end scenario, with the cost for on-site disposal almost $300 million lower than that for off-site disposal.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, and is cost-effective. It complies with federal and state requirements that are legally applicable relevant and appropriate

(ARARs), except for the TSCA requirement that the bottom of a landfill liner be at least 50 ft above the historical high groundwater table [40 CFR 761.75(b)(3)] for which a waiver is being invoked in this ROD. This waiver is justified based on CERCLA Section 121 (d)(4)(D), which authorizes waiver of an ARAR if "the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation through the use of another method or approach." The combination of design and site conditions at the selected site is expected to provide groundwater protection equivalent to groundwater protection mandated by TSCA requirements. EPA–Region 4 has granted waivers of this requirement for chemical waste landfills constructed in the southeastern United States.

This remedy uses permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The permanent solution is an engineered disposal cell. It does not directly meet the statutory preference for treatment as a principal element because it does not establish waste treatment requirements; however, some waste streams will require treatment to meet the disposal facility WAC. Specific waste treatment will be the responsibility of individual response actions as defined in their CERCLA decision documents.

CERCLA Sect. 104(d)(4) states where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, these related facilities may be treated as one for the purpose of conducting response actions. The preamble to the NCP clarifies that Sect. 104(d)(4) can be used when noncontiguous facilities are reasonably close to one another and wastes at the sites are compatible for a selected treatment or disposal approach. Section 104(d)(4) allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Under this authority, the on-ORR disposal facility site and noncontiguous sites contaminated by past ORR operations (including associated sites in the vicinity of ORR within the state of Tennessee, but outside ORR boundaries that were contaminated by the receipt or transport of material from past ORR operations) where future CERCLA response actions will generate waste requiring disposal will be considered as a single facility for response purposes.

This remedy will result in the management of hazardous substances that are above health-based levels; therefore, a review will be conducted within 5 years after commencement of this action and thereafter every 5 years as mandated by CERCLA to ensure that the remedy continues to adequately protect human health and the environment.

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APPROVALS

Rodney R. Nelson, Assistant Manager — Date
Oak Ridge Operations
U.S. Department of Energy

11-2-99

Earl C. Leming, Director — Date
U.S. Department of Energy Oversight Division
Tennessee Department of Environment and Conservation

11/2/99

Richard D. Green, Director — Date
Waste Management Division
U.S. Environmental Protection Agency–Region 4

PART 2. DECISION SUMMARY

SITE NAME, LOCATION, AND DESCRIPTION

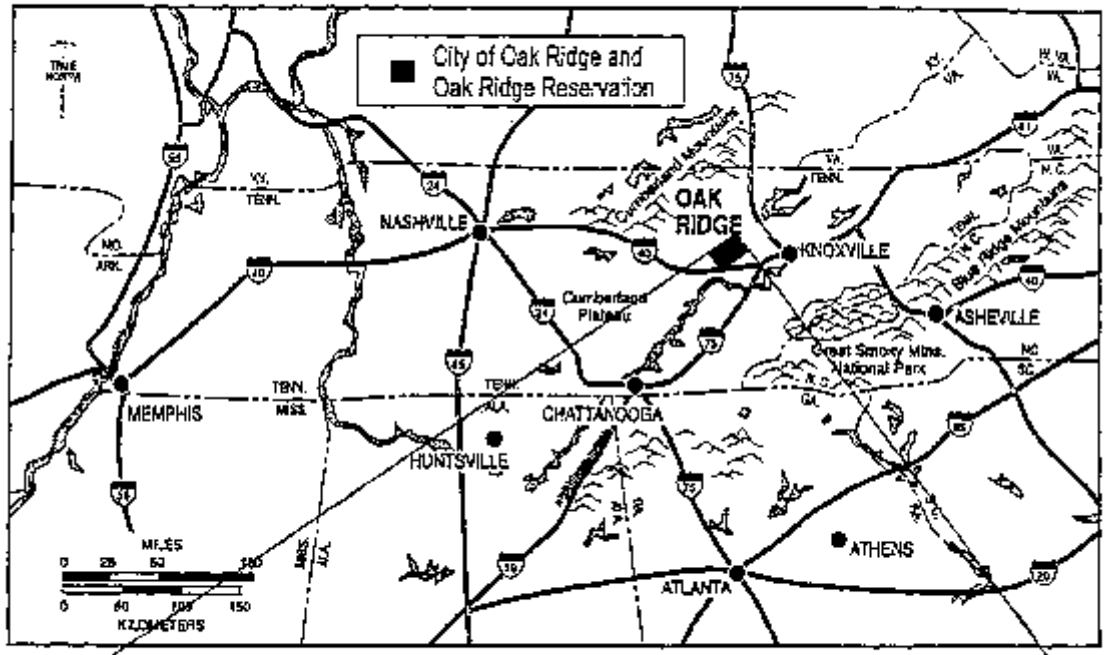
The 34,516-acre ORR is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson counties (Fig. 2.1). Oak Ridge is located approximately 12.5 miles west–northwest of Knoxville, 12 miles southwest of Clinton, and 10 miles northeast of Kingston. ORR lies within the western portion of the Valley and Ridge Province, characterized by a series of northeast-southwest trending parallel ridges divided by relatively broad, intervening valleys. ORR is bounded to the east, south, and west by the Clinch River (Melton Hill Lake) and by the developed portion of the city of Oak Ridge.

ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (ETTP) (formerly the Oak Ridge K-25 Site), Oak Ridge National Laboratory (ORNL) (formerly X-10), and the Oak Ridge Y-12 Plant. Historical activities at these facilities have generated wastes that have been managed, stored, and disposed of by various methods. Approximately 750 acres on ORR are currently dedicated for waste management activities related to waste and scrap materials, including handling, storage, incineration, and disposal.

This ROD presents design, construction, and operation of an on-site disposal facility as the selected remedy for disposal of most waste that will be generated from the sitewide cleanup of ORR under CERCLA. This facility will be located in East Bear Creek Valley [East Bear Creek Valley Site (Site)] just west of the Oak Ridge Y-12 Main Plant Area, immediately south of Pine Ridge, and north of Bear Creek (Fig. 2.2). Since acquisition by the government, portions of ORR have been used for a variety of support missions to the Y-12 Plant, including waste storage and disposal.

The disposal facility will require 64–98 acres to accommodate the disposal cell, leachate collection and transfer facility, support facilities, access roads, stormwater detention basins, and monitoring systems. The permanently committed cell "footprint" will require 22–44 acres. Environmentally sensitive areas are located within and around the proposed facility location, including wetlands along tributaries that border or traverse the Site. The southernmost portion of the site encroaches upon the Bear Creek floodplain. No historical or archaeological resources have been identified at the Site.

SOURCE: ORNL-DWG 94M-8368R2



SOURCE: ORNL-DWG 93M-9816R2

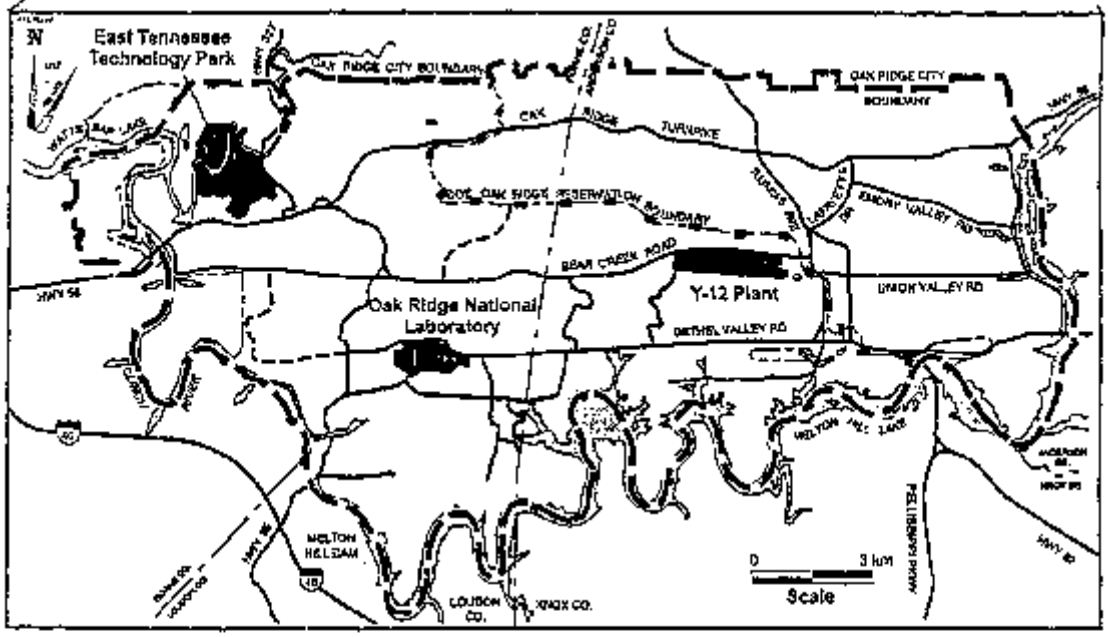


Fig. 2.1

Location of Oak Ridge Reservation

DOE - Oak Ridge Reservation - Oak Ridge, Tennessee

DOCUMENT ID: [illegible] 0125-30 7/6/95	DRAWING ID: 97-1446D.CDR	DRAWING DATE: JULY 29 1959 TG

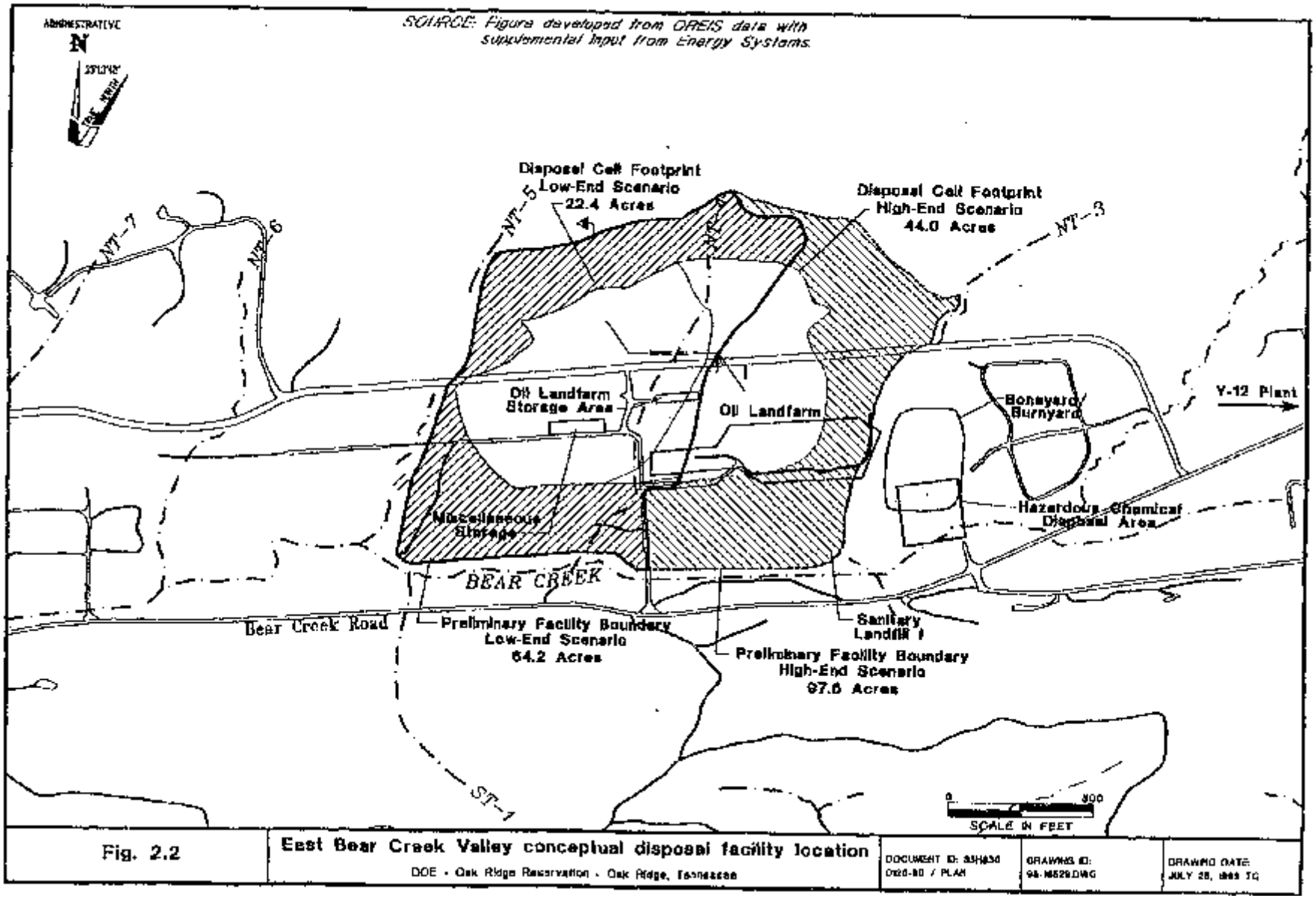


Fig. 2.2	East Bear Creek Valley conceptual disposal facility location DOE - Oak Ridge Reservation - Oak Ridge, Tennessee	DOCUMENT ID: 35H830 0120-80 / PLAN	DRAWING ID: 95-M529.DWG	DRAWING DATE: JULY 28, 1995 TG

SITE HISTORY AND ENFORCEMENT ACTIVITIES

OAK RIDGE RESERVATION

ORR was established in 1942 for the large-scale production of fissionable materials as part of the U.S. Army's Manhattan Project. The three main ORR facilities, the Y-12 Plant, ETTP (then the K-25 Site), and ORNL (then X-10), were constructed in 1943. Uranium enrichment has been the principal mission of ETTP. ORNL has hosted a variety of research and development facilities and nuclear reactors. The Y-12 Plant has served several missions, hosting facilities used for uranium enrichment, lithium refining, nuclear weapons component manufacturing, and weapons disassembly. Since the end of the Cold War, the missions of ORR facilities have shifted to accommodate a peacetime emphasis.

For more than half a century, government missions, operations, and research vital to the nation's strategic energy and defense plans have been the primary drivers for the development of Oak Ridge. Historical and current ORR activities have generated various wastes that have been managed, stored, and disposed of by different methods. These activities have in some cases resulted in the release of contaminants to the environment. The transfer of materials from ORR has also contaminated sites outside ORR, where waste and materials have been processed, stored, transported, or disposed of. Because of contaminant releases, ORR was placed on the EPA National Priorities List (NPL) established under CERCLA [54 *Federal Register* (FR) 48184, December 21, 1989]. As listed on the NPL, ORR includes the reservation and off-site waterways that have been contaminated by releases from DOE facilities. In addition to environmental investigation and restoration activities underway at the three main ORR facilities, DOE has participated in voluntary cleanup of sites located off ORR that have been affected by past activities, including Atomic City Auto Parts (ACAP) in Oak Ridge and the David Witherspoon, Inc. (DWI) 901 Site and DWI 1630 Site in south Knoxville.

Until 1984, most environmental activities at ORR followed guidelines established by the U.S. Atomic Energy Commission tinder the authority of the Atomic Energy Act of 1954. In 1984, DOE waste management activities became subject to RCRA, and EPA was given jurisdiction over ORR, The Hazardous and Solid Waste Amendments of 1984 (HSWA) extended EPA authority by adding further restrictions on land disposal of RCRA hazardous materials and requiring corrective actions for releases from solid waste management units (SWMUs). In 1986, EPA issued a RCRA HSWA permit to DOE under RCRA Sect. 3004(u). This permit required that DOE implement a corrective action program including the investigation and cleanup of SWMUs. All state-regulated treatment,

storage, and disposal units, as well as historic waste management units where releases of solid, hazardous, or mixed waste have occurred, were considered SWMUs potentially subject to the corrective action provisions of the ORR HSWA permit.

ORR facilities were in the process of meeting RCRA permit requirements when ORR was placed on the NPL. With the listing of ORR on the NPL, CERCLA became the primary regulatory mechanism to address historical contamination. To coordinate regulatory oversight of ORR, an oversight agreement was formulated between DOE and TDEC, called the Tennessee Oversight Agreement.

In 1992, the FFA (DOE 1992), an interagency agreement among DOE, EPA, and TDEC, became effective and provides the context for coordination of remedial activities at ORR. The FFA expanded the scope of investigatory and remedial activities to include releases not covered by the RCRA permit, such as releases or potential releases of radionuclides.

The Oak Ridge Operations (ORO) EM Program is responsible for sitewide waste management and environmental restoration activities at ORR. To fulfill this responsibility, the DOE-ORO EM Program strives to manage risks to human health and the environment posed by contaminated sites and facilities in the most cost-effective and responsible manner possible to provide for future beneficial reuse. The goal of the EM Program with regard to CERCLA/RCRA integration is to ensure that investigations and remedial actions are performed in a manner consistent with both regulatory bodies, where applicable.

To more effectively define and address the impact of areas of concern (AOCs) (including SWMUs), and to facilitate the comprehensive cleanup of ORR consistent with land-use goals, the DOE strategy is to investigate AOCs on a watershed basis. A watershed is defined as a surface drainage basin that includes an AOC or group of AOCs. Watersheds are logical groupings for investigation because the primary means of contaminant transport at ORR is migration through the groundwater and surface water system. Remedial decisions at ORR will be based on RODs expected to be issued beginning in FY 1999.

By a separate Memorandum of Understanding (MOU), EPA, TDEC, and DOE have agreed to implement facilitywide, certain periodic site inspections, certification, and notification procedures set forth in the Land Use Controls Assurance Plan (LUCAP). These procedures are designed to ensure maintenance by DOE of any specific land use controls (LUCs) set forth in individual RODs for ORR and deemed necessary for future protection of human health and the environment. A

fundamental premise underlying execution of the MOU is that, through DOE's substantial good-faith compliance with the procedures called for the LUCAP, reasonable assurances would be provided to EPA and TDEC as to the permanency of those remedies, which include the use of waste-unit specific LUCs at the ORR.

The terms and conditions of the LUCAP, or MOU, are not specifically incorporated or made enforceable herein by reference. However, it is understood and agreed by DOE, EPA, and TDEC that the contemplated permanence of the remedy reflected herein is dependent in part upon DOE's substantial good-faith compliance with the specific LUC maintenance commitments reflected herein. Should such compliance not occur or should the MOU be terminated, it is understood that the protectiveness of the remedy concurred may be reconsidered; consequently, additional measures may need to be taken to assure adequate, necessary, future protection of human health and the environment.

EAST BEAR CREEK VALLEY SITE

The East Bear Creek Valley Site and surrounding area have been used for forestry and a variety of missions to support the Y-12 Plant, including waste storage and disposal, oil landfarming, and sanitary waste disposal. Waste management areas include Boneyard/Burnyard (BYBY), the Oil Landfarm, and Sanitary Landfill 1. The Boneyard was used from 1943 to 1970 for disposal of toxic, ignitable, sanitary, and possibly radioactive waste. Trenches in the Burnyard were used from 1943 to 1968 to dispose of empty pesticide containers, metal shavings, solvents, oils, and laboratory chemicals. Soil was not remediated before capping in 1980. The Oil Landfarm. was used until 1982 to biologically degrade waste oil and machine coolants, and was closed under RCRA in 1990 after removal of the top 12–18 in. of soil. Sanitary Landfill 1 was used from 1968 to 1980 to dispose of combustible/decomposable solid waste and possibly toxic waste, and was capped in 1985.

Soil, surface water, and groundwater in East Bear Creek Valley are known to be contaminated with hazardous and radioactive contaminants. Contamination associated with these waste disposal units is the subject of a CERCLA RI/FS for the Bear Creek Valley OU (DOE 1996a, 1997). A decision for remediating contaminated media in Bear Creek Valley is being made independently of the decision documented in this ROD.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

DOE has presented the CERCLA waste disposal project at various public meetings, including semiannual ORR sitewide briefings, and in fact sheets made available to the public. In April 1996, DOE began holding regular public briefings with the Site Specific Advisory Board (SSAB), a

citizen's panel advising the DOE EM Program. The ORR End-Use Working Group, a subcommittee of the SSAB, was established in 1996 to provide recommendations to DOE on postremediation ORR land use, cleanup assumptions and goals, and beneficial reuse of portions of ORR. DOE, TDEC, and EPA consider this input for revising the FFA schedules, scheduling and planning future CERCLA watershed evaluations, and implementing remediation. Defining ORR end use, together with establishing Paths to Closure planning and assumptions, are the two parallel, integrated initiatives through which the comprehensive remediation strategy for ORR is being developed.

Input from organizations, such as the city of Oak Ridge, Environmental Quality Advisory Board, Local Oversight Committee, SSAB, the Oak Ridge Environmental Peace Alliance (OREPA), and Friends of ORNL, as well as the general public, has been valuable in identifying alternatives and selecting the DOE proposed disposal option. Comments received throughout the evaluation process have influenced the approach, content, and conclusions of the CERCLA decision documents. SSAB, OREPA, Local Oversight Committee, the city of Oak Ridge, and Friends of ORNL have each voiced support for construction of the on-site disposal facility (Appendix A and "Responsiveness Summary").

EPA and TDEC formally approved the proposed plan for ORR CERCLA waste disposal (DOE 1999a) for public release on January 20, 1999. DOE publicly announced the availability of the proposed plan and the Administrative Record in *The Oak Ridger* on January 22, 1999, *The Knoxville News-Sentinel* on January 24, 1999, and *The Roane County News*, *The Clinton Courier-News*, and the *Lenoir City News-Herald* on January 25, 1999. The announcement set a public comment period of January 25 to March 11, 1999. At the request of the city of Oak Ridge, the public comment period was extended to April 9, 1999. A public meeting was held February 23, 1999, to present the preferred alternative described in the proposed plan and to solicit public input. All written comments received during the public comment period were considered in the development of this ROD. These comments are identified and addressed in the "Responsiveness Summary," Part 3 of this document.

This decision document presents the selected remedial action for the disposal of wastes that will result from the cleanup of ORR. This action was chosen in accordance with CERCLA, as amended by SARA, and the NCP. This decision is based on the Administrative Record for this project. The principal documents supporting this ROD are:

- *Identification and Screening of Candidate Sites for the Environmental Management Waste Management Facility, Oak Ridge, Tennessee* (DOE/OR/02-1508&D1) (DOE 1996c);

- *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE/OR/02-1637&D2) (DOE 1998a);

- *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE/OR/02-1637&D2/A1) (DOE 1998b); and

- *Proposed Plan for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE/OR/02-1652&D3) (DOE 1999a).

These and other documents/information considered in selecting the remedial action are housed at the Information Resource Center, 105 Broadway Avenue, Oak Ridge, Tennessee, 37830, (423) 241-4592.

SCOPE AND ROLE OF ACTION

The selected remedy provides on-ORR capacity for the permanent, consolidated disposal of CERCLA radioactive, hazardous, and mixed wastes that will be generated from the cleanup of ORR sites that present unacceptable risks. The action consists of construction and operation of an engineered, above-grade, earthen disposal cell and supporting facilities in East Bear Creek Valley (including temporary staging of wastes at the facility prior to disposal); disposal of most CERCLA waste from ORR cleanup in the on-site facility; disposal of waste that cannot be treated to meet the on-ORR facility WAC in DOE-approved, or as appropriate, EPA-approved off-site facilities; closure of the cell by covering with a RCRA-compliant cap; and implementation of postclosure S&M, institutional controls, and media monitoring that will continue indefinitely. Specific remedial decisions (including disposition of remediation wastes) at ORR will be made at the site, OU, or watershed level following evaluation of alternatives in the appropriate CERCLA documentation. These evaluations will include public input and agreement from regulatory agencies. Individual RODs for these areas will identify the type and amount of waste to be placed in the disposal facility. These RODs will be signed by DOE and the regulators.

This response action supports the overall ORR cleanup strategy by proactively addressing the need for disposal capacity for waste generated from cleanup of ORR and associated sites within the state of Tennessee. Construction and operation of a new on-site waste management facility is a cornerstone assumption of the ORR cleanup strategy. This strategy emphasizes timely,

coordinated, cost-effective sitewide cleanup, and transition of portions of ORR to the private sector for beneficial use. On-site disposal is the most cost-effective way to safely dispose of waste generated from implementation of this comprehensive strategy. The presence of local disposal capacity will allow available cleanup resources to focus on principal threats, including those posed by associated sites outside the ORR boundary where waste and materials have been processed, stored, transported, or disposed of.

The East Bear Creek Valley Site, selected for construction of the on-site waste management facility, is within the Bear Creek Valley watershed. Areas within and around the Site have been the subject of the Bear Creek Valley OU RI (DOE 1996a) and FS (DOE 1997), which address contamination in various waste disposal units within the Bear Creek Valley watershed. Depending on its dimensions, which will in turn be determined by the volume of waste ultimately disposed of, the permanent disposal cell may overlap a portion of the Oil Landfarm. It is assumed that remediation of the Oil Landfarm would not be required before cell construction. Construction and operation of the on-site disposal facility is not contingent on final remedial decisions for the Bear Creek Valley OU.

SUMMARY OF SITE CHARACTERISTICS

ORR ENVIRONMENTAL SETTING

ORR is located in the central region of the southern Appalachian Mountains in the western portion of the Valley and Ridge Province. ORR topography is dominated by a series of northeast–southwest trending parallel ridges divided by relatively broad, intervening valleys. This topography results from the geology of ORR, which displays an inclined layer-cake stratigraphy with carbonate-dominated rock groups interbedded with predominantly clastic shale groups. The individual units are repeated in a series of thrust sheets separated by major regional thrust faults. The combination of inclined stratigraphy, numerous and regular thrust faults, and pervasive, systematic fracture systems controls ORR geomorphology, which results from the regular differential weathering of the geologic formations. Valleys tend to be underlain by less-resistant shales, while ridges are supported by more resistant lithologies such as sandstones and dolomites.

Study of ORR groundwater monitoring wells shows that groundwater presence and flow on ORR is predominantly near-surface and is controlled by topography, surface cover, geologic structure, and lithology. Fractures largely direct bedrock groundwater flow and play an important role in the hydrogeology of ORR. ORR hosts two fundamental hydrostratigraphic units: the Knox aquifer, which readily transports water, and the ORR aquitards, which transmit relatively small amounts of water at low rates. Both the Knox aquifer and ORR aquitards are typically overlain by

unconsolidated materials that transmit the majority of groundwater. In addition to the percolation of water through this often-thick, near-surface vadose zone, bedrock groundwater flows through solution conduits in bedrock where large amounts of water are stored and transmitted. This type of aquifer is referred to as a "karst" aquifer and has the potential for rapid transport of water and contaminants.

Tributaries on ORR form a weakly developed "trellis" pattern, reflecting the geology and topography, and define watersheds. Most of the northern and central portions of ORR lie within the watershed of East Fork Poplar Creek and that of its tributary, Bear Creek (Fig. 2.3). All of the southern portion of ORR either lies within the White Oak Creek watershed or drains via short tributaries directly to the Clinch River. Stream flow in tributaries across ORR varies greatly depending on seasonal precipitation and subsurface geology. All water that drains from ORR enters the Clinch River and eventually the Tennessee River. Wastewater discharges, surface runoff, and discharge of contaminated groundwater affect water quality on ORR. Although bedrock characteristics differ somewhat in the various watersheds, most of the observed differences in water quality can be attributed to different contaminant loadings.

The Southern Appalachian ecosystem is widely recognized as one of the most diverse in a temperate region, hosting more than 20,000 species of plants and animals. ORR forms an important part of this ecosystem because of its relative isolation from widespread impacts since its formation in the 1940s. While other areas of the Valley and Ridge Province became increasingly developed and impacted by a growing population, most of ORR remained undeveloped, with large connected tracts becoming reforested. Because of its relative isolation from impacts and its location in the Valley and Ridge Province, ORR is unique in the Southern Appalachians offering a glimpse of the relationships among various biological habitats and providing habitat for species that require large, undisturbed tracts.

SITE CONTAMINATION

More than 50 years of operation, production, and research activities at ORR have resulted in a legacy of contaminated inactive facilities, research areas, and waste disposal areas. Five watersheds have been identified for analysis under the coordinated ORR sitewide cleanup strategy: White Oak Creek—Bethel Valley portion; White Oak Creek—Melton Valley portion; ETTP sitewide; Upper East Fork Poplar Creek; and Bear Creek Valley (Fig. 2.3). In addition to these five ORR watershed analyses, DOE is addressing sites outside the ORR boundary where the sale or disposal of materials has resulted in contamination.

ORNL operations in Bethel Valley and Melton Valley have resulted in contaminated burial trenches; landfills; buried waste tanks and transfer pipelines; liquid-waste seepage trenches and pits;

inactive radiochemical processing facilities; and contaminated soil and groundwater. Contaminants of concern include metals, PCBs, and radionuclides, primarily ^{90}Sr, ^{137}Cs, and ^{3}H. Radiological contaminants are a significant problem, as shown by human health and ecological risk assessments.

Uranium enrichment operations at ETTP have generated a variety of radioactive and hazardous wastes, some of which have entered the environment, contaminating soils and groundwater. Uranium and other radioactive contaminants, primarily ^{99}Tc, are widespread. Uranium-contaminated waste and process equipment are contained in several burial grounds, and the interiors of numerous buildings are contaminated. VOCs used in large quantities as cleaners and degreasers are the principal contaminants of concern in the groundwater. Other site contaminants include PCBs at electrical switchyards and process buildings, and chromate associated with cooling towers, their basins, and associated piping.

The Upper East Fork Poplar Creek watershed contains the developed Y-12 Plant including waste processing, storage, and disposal areas. In 1991, groundwater monitoring results indicated a VOC contamination plume in the eastern portion of the watershed containing carbon tetrachloride, chloroform, trichloroethene, and tetrachloroethene. Carbon tetrachloride is present in both groundwater and, surface water at concentrations that exceed EPA drinking water regulations. Other organic and inorganic constituents have been detected in groundwater, springs, and surface water. Contaminants of concern in the western portion of the watershed include mercury, nickel, and nitrates.

The Bear Creek Valley watershed contains the site for the on-site disposal facility. This watershed contains waste disposal sites used by the Y-12 Plant. The three main disposal sites, the S-3 Ponds, Oil Landfarm Area, and Bear Creek Burial Grounds, were used to dispose of various liquid and solid waste contaminated with radionuclides and chemicals. Large volumes of contaminated soil and buried waste remain in place. Soil, surface water, and groundwater are known to be contaminated with hazardous and radioactive contaminants. Major contaminants detected include uranium isotopes, PCBs, and VOCs.

Associated sites located outside the ORR boundary that are currently being addressed by POE are ACAP in Oak Ridge and the DWI 901 Site and DWI 1630 Site in South Knoxville. ACAP purchased scrap material and equipment from DOE for resale, some of which was later determined to be contaminated. The DWI 901 Site received scrap metal from DOE, including metal contaminated with mercury from the Y-12 Plant. The 50-acre DWI 1630 Site, currently used as a salvage storage yard, received surplus equipment and scrap metal purchased from DOE and other industrial sources, including radioactively contaminated equipment. A 3- to 4-acre portion of the site contains an inactive landfill with PCB-contaminated waste, industrial waste, and radioactively

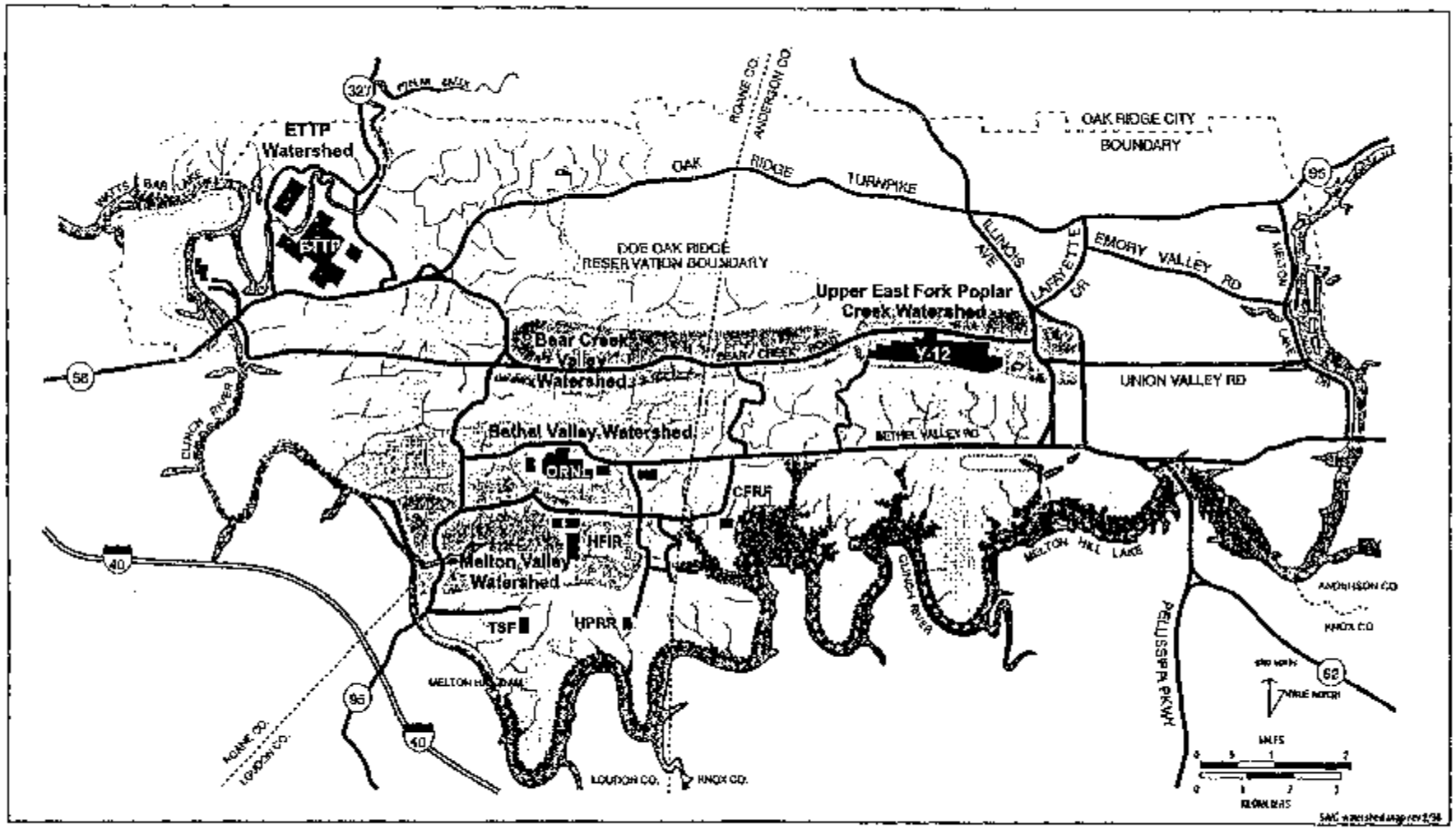


Fig. 2.3	ORR watershed map DOE - Oak Ridge Reservation - Oak Ridge, Tennessee	DOCUMENT ID: 35T089 0125-70 / ROD	DRAWING ID: 96-15345.CDR	DRAWING DATE: JULY 28, 1999 TG

contaminated metal. A TDEC Commissioner's Order (Division of Superfund) directed a site radiological survey and the removal of contaminated materials. Additional sites outside the ORR boundary affected by past DOE operations requiring investigation and possible cleanup could be identified in the future.

WASTE VOLUME AND CHARACTERISTICS

Cleanup of various sites, areas, structures, and media will generate soil, construction and demolition debris, and sediments containing a range of chemical and radioactive contaminants. The specific volume and composition of waste from future CERCLA actions cannot be fully defined before those actions begin. To address uncertainties relative to the amount and nature of future-generated waste, low- and high-end waste volume estimates and expected waste characteristics were used in the FS (DOE 1998a) as bounding conditions to evaluate disposal alternatives. The FS volume estimates delineated candidate waste streams by both waste types (regulatory classifications) and waste forms (e.g., soil and debris). Candidate waste types include LLW, RCRA-defined hazardous waste, waste as defined under TSCA, and mixed wastes consisting of combinations of these waste types. As-generated candidate waste forms include soil, debris, sediment/sludge, miscellaneous solids, and personal protective equipment/trash.

Development of the estimated volume range relied on reasonable assumptions for proposed future remedial actions. The actual in situ waste volume ultimately generated would likely fall between the low- and high-end estimates of 223,000 and 1.1 million yd^3 respectively (Table 2.1). The total amount of waste ultimately requiring disposal will depend on decisions and circumstances associated with individual response actions, which are outside the scope of this ROD.

The low-end volume estimate was taken from the *Environmental Restoration 10-Year Plan Solid Contaminated Waste Generation Forecast for the Oak Ridge Reservation* (Energy Systems 1996), for remediation sites expected to generate candidate waste streams. This waste forecast is based on remediation assumptions in the DOE July 1996 draft Ten Year Plan (DOE 1996d). The high-end volume estimate assumed more aggressive remedial actions, where appropriate, on a project-by-project basis. This estimate also assumed that a greater percentage of the total volume of waste generated would be contaminated rather than recyclable, industrial, or sanitary waste. The high-end volume estimate does not represent the maximum volume of waste that could possibly be generated by remedial actions, but is a reasonable upper bound for evaluation purposes. The return of ORR to "greenfield" conditions would generate many times more waste than this high-end volume estimate.

Because detailed characterization data do not exist for many of the proposed remediation sites, characterization of future waste streams was estimated from data for CERCLA sites that have

already been investigated. This methodology relies on the assumption that available data reasonably represent the waste types and concentrations for sites that lack data. Using the estimated as-generated waste form volumes, contaminants of potential concern (COPC) concentrations, volumes of waste expected to require treatment, and the types of treatment expected, an estimate was developed for the volumes, waste forms, and COPC concentrations for waste as it will be disposed of in the cell (as-disposed waste forms). The as-disposed waste projection provides an estimate of the final volumes, forms, and characteristics of waste to be contained in the cell, and was used as the basis for the preliminary WAC development. Detailed estimates for as-disposed waste forms and types for the low- and high-end volume estimates, and details regarding specific COPCs and concentrations, can be found in the RI/FS report (DOE 1998a).

EAST BEAR CREEK VALLEY SITE ENVIRONMENTAL SETTING AND CONTAMINATION

The East Bear Creek Valley Site is located just west of the Y-12 Main Plant Area in Bear Creek Valley. The Site is relatively level to the south with a series of knolls to the north, and is transected by Bear Creek North Tributary 4 (NT-4). The Site is underlain by rock units of the Conasauga Group, consisting primarily of moderately to steeply dipping, weakly resistant shales and limestones. Bedrock at the Site is typically overlain by soils 10–50 ft thick, consisting of unconsolidated material including organic soil, residuum, alluvium, colluvium, and fill (Bechtel 1984). Groundwater at the Site ranges from < 2 ft deep in the topographically lower area to the south, to > 60 ft deep at higher elevations near the toe of Pine Ridge. Groundwater movement is relatively slow with discharge to Bear Creek and its tributaries. Natural resources present include portions of forest, wetlands, and ecologically sensitive areas. Two plant species listed as Tennessee-threatened (Bechtel Jacobs Co. 1998a) and one fish species designated as in-need-of-management (*Tennessee dace*) (Bechtel Jacobs Co. 1998b) are present at or near the Site.

The area around and including parts of the Site has been the subject of an RI (DOE 1996a) and an FS (DOE 1997) addressing contamination in various waste disposal units associated with the Y-12 Plant. Contaminants from these units, including the Oil Landfarm, BYBY, and Sanitary Landfill 1, have impacted the Site. Soil, surface water, and groundwater are known to be contaminated with hazardous and radioactive constituents. The major contaminants detected include uranium isotopes, nitrates, and VOCs.

Table 2. 1. Waste generation forecast for solid contaminated waste, ROD for disposal of ORR CERCLA waste, Oak Ridge Tennessee*

Material Type	LLW	LLW/RCRA	LLW/TSCA	LLW/RCRA/TSCA	Hazardous	Total
			Low-end volume (yd³)			
Soil	65,186	25,871	0	31,344	11	122,412
Debris	60,025	22,386	0	4,057	0	86,468
Miscellaneous solids	8,192	150	6	0	261	8,609
PPE/trash	1,148	245	74	103	37	1,608
Sediment/sludge	1,328	2,548	0	0	0	3,875
Total	**135,879**	**51,200**	**80**	**35,505**	**309**	**222,972**
			High-end volume (yd³)			
Soil	134,660	108,749	0	44,169	11	287,589
Debris	422,326	67,524	0	17,973	0	507,823
Miscellaneous solids	7,857	19,901	771	0	261	28,790
PPE/trash	930	716	74	103	37	1,861
Sediment/sludge	117,032	157,983	0	3,968	0	278,983
Total	**682,805**	**354,875**	**845**	**66,213**	**309**	**1,105,047**

*The values presented in this table should be interpreted as having no more than two significant digits.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
LLW = low-level (radioactive) waste
ORR = Oak Ridge Reservation
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976
ROD = record of decision
TSCA = Toxic Substances Control Act of 1976
yd = yard

SUMMARY OF RISKS

Baseline human health risk assessments (BHHRAs) are conducted for the no action alternative as part of the CERCLA RI/FS process to determine the need for action and to provide a baseline for comparison against alternatives that involve remedial action. Because the purpose of the remedial action is to address the need for comprehensive disposal capacity for sitewide cleanup waste and not a specific remediation site, a conventional BHHRA was not relevant to the FS evaluation. The no action baseline risk for this action was, instead, established by collective analysis of all sites expected to generate waste for which BHHRAs are available. All but one of these sites present an estimated ILCR in excess of 1×10^{-4} and/or a toxic HI of 1 (DOE 1999a). Because the EPA target risk limits for carcinogenic and systemic toxicity are exceeded at these sites, CERCLA actions that will generate waste will likely be required. Ecological risk assessments conducted for these sites indicate potential risks to some ecological receptors.

DESCRIPTION OF ALTERNATIVES

Two action alternatives were evaluated for the disposal of future-generated wastes from the sitewide cleanup of ORR: (1) on-site disposal in a newly constructed facility and (2) disposal at DOE-approved, or as appropriate, EPA-approved off-site facilities. Both of these alternatives support site wide ORR cleanup through the permanent placement of waste in engineered disposal cells. Evaluation of the no action alternative is required under both CERCLA and NEPA for comparison with other alternatives.

For all three alternatives, the waste generator would be responsible for removal of waste during cleanup actions; waste characterization; waste segregation, compaction, or shredding; treatment as. necessary to meet disposal facility WAC; waste packaging; and interim storage, as required, for waste that cannot be treated to meet the disposal facility WAC. Except for the cost of waste containers, costs associated with these elements are not included in the estimates developed for the disposal alternatives.

NO ACTION

Under the no action alternative, a sitewide strategy for disposing of waste from future ORR cleanup would not be implemented. No new centralized waste facility would be constructed on ORR, and no infrastructure would be developed for a large-scale off-ORR shipment campaign to

accommodate waste resulting from CERCLA response actions. The no action alternative involves no direct costs under this evaluation. Waste disposal would be addressed on a project-by-project basis. Therefore, the cumulative disposal costs of multiple CERCLA response actions over time could equal or exceed the costs of either of the two consolidated disposal alternatives.

ON-SITE DISPOSAL

The on-site disposal alternative proposes the disposal of most future-generated CERCLA waste in a newly constructed engineered disposal facility on ORR. Candidate waste types include LLW, RCRA-defined hazardous waste, waste as defined under TSCA, and mixed waste consisting of combinations of these waste types. Liquid waste, transuranic (TRU) waste, spent nuclear fuel, and sanitary waste are not considered candidate wastes. Waste that could not be treated to meet the on-site disposal facility WAC would be transported to DOE-approved, or as appropriate, EPA-approved off-site disposal facilities or placed in interim storage until treatment or disposal capacity became available. Waste generated after cell closure would also be shipped to suitable DOE-approved, or as appropriate, EPA-approved off-site disposal facilities. Disposal of waste at off-site facilities under this alternative is the same as described for the off-site disposal alternative.

The proposed disposal facility would consist of a disposal cell with sufficient capacity to accept the anticipated waste, and ancillary facilities to support staging and decontamination. The total disposal cell capacity is projected to be a minimum of 357,000 yd^3 for the low-end conceptual design and 1.7 million yd^3 for the high-end design. These capacities include volume increases to the in situ low- and high-end waste estimates to account for swell resulting from removal, clean fill volumes used for daily cover, uncertainties in volume estimates at waste generator sites, and inclusion of other sites not considered in current CERCLA remediation plans.

Selection of the Site for the Disposal Facility

As part of the on-site disposal alternative, DOE performed a site screening study in 1996 that identified 35 candidate sites on ORR. These sites were evaluated for their suitability for construction of an on-site waste disposal facility. Candidate sites were identified using previous waste disposal facilities siting efforts, siting efforts for other projects, and identification of potentially suitable “brownfield” sites. A top-down screening methodology was applied to the candidate sites. Preliminary screening, which was primarily a paper study, eliminated 19 sites from further consideration including sites that were too small, sites that were subject to development of karst features, and/or sites that had steep topography. Secondary screening was a more detailed process consisting of site visits, discussions with personnel involved with previous siting efforts, and evaluation of additional data. The criteria used for preliminary screening were reapplied, in addition to applying modifying criteria such as existence of surface water features, floodplains, wetlands, geologic and geographic buffers, and location with respect to waste generators. This screening

eliminated 12 sites from further consideration, narrowing the candidate sites to 4. One of the four sites (K-1070-C/D Classified Burial Ground) was eliminated from consideration during the final screening because decisions regarding site remediation and long-term land use would not be resolved in a time frame consistent to support the possible construction of an on-site disposal facility at that location. Three final candidate sites remained following this screening (Fig. 2.4). This site identification and screening process is documented in *Identification and Screening of Candidate Sites for the Environmental Management Waste Management Facility, Oak Ridge, Tennessee* (DOE 1996c).

The three final candidate sites supporting the on-site disposal alternative (East Bear Creek Valley, West Bear Creek Valley, and White Wing Scrap Yard) were presented in the FS. As part of the CERCLA evaluation of the disposal alternatives, a comparison of the three sites was conducted and the results, summarized in the RI/FS, were presented to the public and the regulators at a series of public meetings and workshops. All three sites were determined to be protective of human health and the environment and all sites would meet ARARs (except the TSCA requirement for a 50-ft buffer between the bottom of the cell and groundwater). Table 2.3 in the Summary of Comparative Analysis of Alternatives presents the results of this evaluation.

In general, NEPA values, which parallel many of the CERCLA evaluation criteria, relate to impacts to the affected environment. NEPA values and public involvement procedures were incorporated into the site selection process as well as the remedy selection process (see "Summary of Comparative Analysis of Alternatives"). While there are no differentiating elements of some of the NEPA values (e.g., irreversible and irretrievable commitment of natural resources and noise), others do provide a difference among the sites. Based on this evaluation, the cumulative impacts associated with the East Bear Creek Valley Site are the lowest of the three final candidate sites. Additionally, impacts to the affected environment associated with the East Bear Creek Valley Site are the lowest of the three final candidate sites. Because the public does not have access to the East Bear Creek Valley Site, nor future access following closure and the Site is in an area used for industrial purposes, committing this land as a waste management facility in the future would have the least impact to the socioeconomic and land-use status. Impacts to socioeconomic and land-use status would occur at the other two sites because they are both located in areas that eventually could be used for future development. Additionally, the East Bear Creek Valley Site has the smallest area of influence, (i.e., the area that would be cleared or otherwise impacted by operations) than the other candidate sites.

Protection of the community during response action and short-term environmental impacts are most favorable for the East Bear Creek Valley Site. This is because the Site is isolated from the public and the fact that the Site, currently used for industrial operations, has already been largely

cleared. Construction and operations of the disposal facility at this location would not be visible from nearby communities; therefore, there is less chance for visible impacts. Further, restricted access to the East Bear Creek Valley Site will result in reduced vehicular impacts to the local community. While access to the other sites is restricted, they are both located near public access highways. Because the East Bear Creek Valley Site is located away from public access roadways, fewer traffic problems and associated accidents would occur, resulting in an overall enhanced protection of the community.

Short-term environmental disturbances associated with the East Bear Creek Valley Site would occur; however, the impacts would be reduced over time. While construction at this Site could require rerouting a current tributary to Bear Creek to divert surface water around the facility with a resultant elimination of associated wetlands, a mitigation plan will address the overall aquatic resources in Bear Creek Valley (see "Environmental Mitigation" section in "Summary of Comparative Analysis of Alternatives"). Because the Site is largely cleared, there will be less loss of woodland habitat than the other two sites, which are located within currently forested areas. DOE, considering the results of its site evaluations and regulator and public input, is selecting the East Bear Creek Valley Site as the location to implement the on-site disposal alternative.

Design of the Engineered Disposal Cell

The facility would be constructed with an initial footprint (total area including support facilities) of 64 acres, equivalent to the requirements for the low-end waste volume. The high-end footprint would range up to 98 acres. The disposal cell would occupy between 22 and 44 acres. Construction of the cell would require rerouting and partially eliminating NT-4. To provide borrow soil for construction of the on-site disposal facility, the Y-12 Plant West End Borrow Area (Fig. 2.4) would require expansion, including the clearing of 12–18 additional acres. Other sources of borrow soil could be used during implementation. Construction of the facility and associated activities would constitute irretrievable and irreversible commitments of resources. Following completion of construction, the borrow area will be stabilized, regraded, and revegetated.

The central element of the on-site disposal alternative is the engineered disposal cell. The cell would comply with substantive EPA and TDEC requirements for disposal of RCRA-hazardous waste and TDEC and DOE requirements for disposal of LLW. The cell would also comply with the substantive requirements of TSCA, with the exception of the requirement that a landfill liner be 50 ft above the historical high groundwater table. A CERCLA waiver is being invoked for this TSCA requirement. The justification for this waiver can be found in the section titled "Compliance with ARARs" on page 2-50.

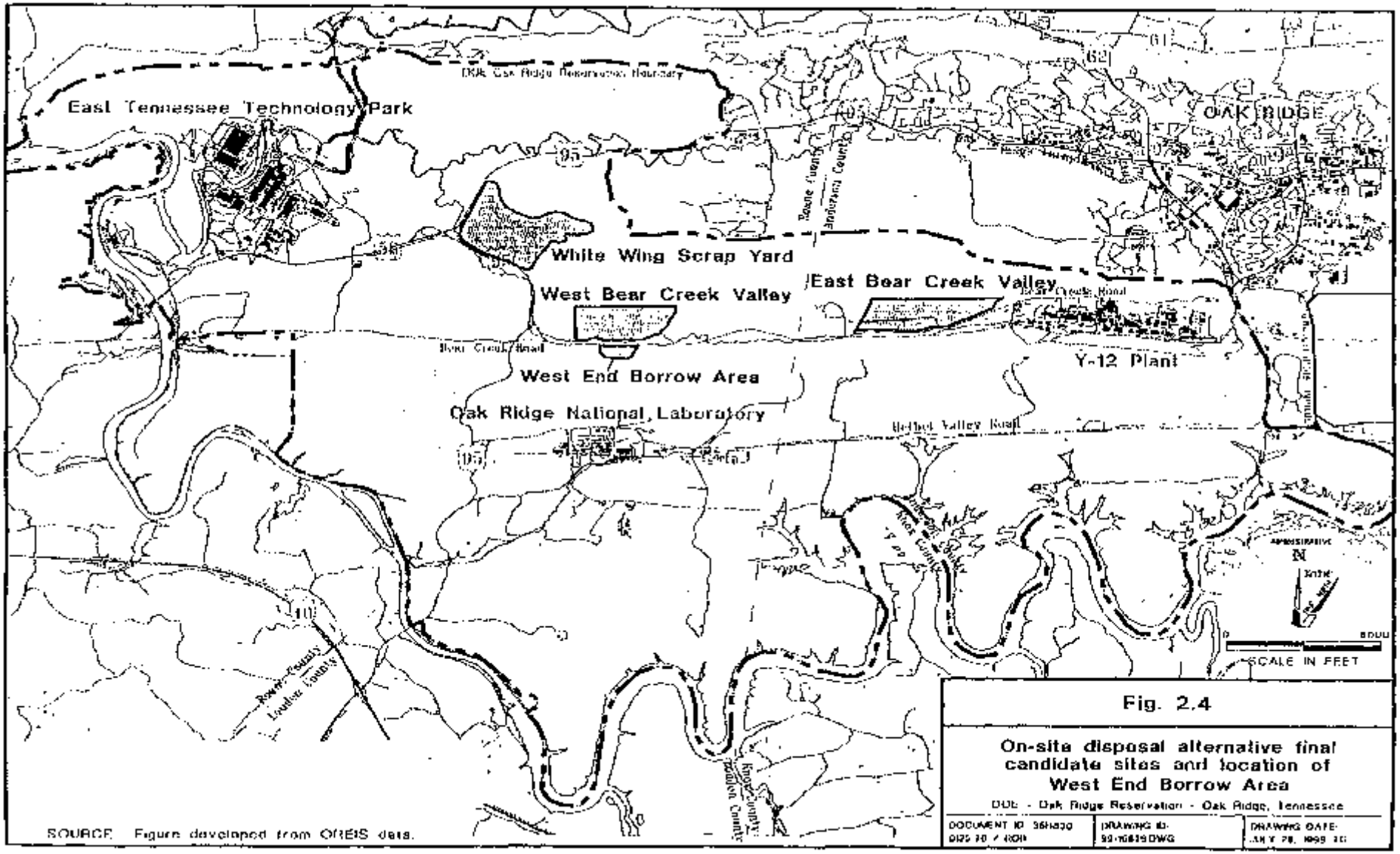


Fig. 2.4

On-site disposal alternative final candidate sites and location of West End Borrow Area

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Key elements of the FS conceptual design include a clean-fill dike to laterally contain the waste, a multilayer basal liner with a double leachate collection/detection system to isolate the waste from groundwater, and a multilayer cap to reduce infiltration and isolate the waste from human and environmental receptors. The design will include contingencies that will be implemented in the event that compliance limits for radionuclides in shallow groundwater are ever triggered. Because groundwater is relatively shallow at the site, the conceptual design also calls for construction of a clay-fill geologic buffer up to 10 ft thick below the basal liner to provide added protection. The conceptual cell design may be modified during final design or construction based on the final WAC, improvements in design, or field conditions encountered.

Meeting the facility's WAC would ensure that the total ILCR from the cell would meet EPA and TDEC guidelines for protection of human health and the environment. Final WAC are functionally dependent on the engineered disposal cell design and the final waste forms (i.e., soil or cement) that require disposal. The draft disposal facility WAC are addressed in detail in Appendix B.

Appropriate engineering controls and construction practices would be implemented during construction and operation of the on-site disposal facility to minimize the potential for adverse effects. Dust emission controls, leachate removal and treatment, stormwater runoff and sediment controls, and access restrictions would ensure short-term protection of workers, the public, and the environment. Mitigative measures would be implemented during construction and operations, or after cell closure, as needed.

During development of the support facilities, monitoring (e.g., groundwater and air) of the disposal facility and its environs would begin. Predisposal monitoring data would be used to develop a baseline for comparison with postoperational monitoring results. After facility closure, S&M and long-term media monitoring would be continued to ensure the performance of the cell. Physical and administrative access and use restrictions would also be imposed. Deed restrictions would prohibit residential use of the property, construction of any facility that could damage the cover, or installation of groundwater extraction wells (for purposes other than monitoring). These deed, restrictions would also identify other administrative controls necessary to protect the public and the integrity of the disposal cell and would be attached to the deed description and filed with the appropriate local governmental authority.

Total Project Present Worth Cost (includes S&M costs of $650,000/year):

- Low-end: $99.8 million
- High-end: $167.5 million

Time to Implement:

- Low-end: 1999–2011 (small off-site shipments would continue through 2030)
- High-end: 1999–2033

OFF-SITE DISPOSAL

The off-site disposal, alternative would provide for the transportation of future-generated ORR CERCLA waste to one or more DOE-approved, or as appropriate, EPA-approved off-site facilities for permanent disposal. Wastes would be transported via rail or truck, depending on economics and the capabilities of the receiving facility. Packaging options would be dictated by the mode of transportation selected, the characteristics of the wastes, U.S. Department of Transportation (DOT) regulations, the disposal facility's requirements, and economic considerations. Waste that could not be treated to meet the WAC for any off-site facility would require interim storage until treatment or disposal capacity became available. Interim storage for such waste would remain the responsibility of the waste generator. Figure 2.5 shows the off-site disposal elements and responsible entities.

The representative disposal facilities chosen to support the FS were Envirocare of Utah, Inc. (Envirocare) for the disposal of LLW and mixed waste, and Waste Management Inc. (WMI)–Emelle for disposal of RCRA-hazardous and TSCA wastes. Envirocare is located in Clive, Utah, approximately 75 miles west of Salt Lake City. It is licensed and permitted to dispose of naturally occurring radioactive material, LLW, uranium/thorium mill tailings, and mixed waste. Envirocare offers a variety of mixed waste treatment processing options. Waste can be transported to the facility by highway or railway, but shipment of the large volumes of LLW and mixed waste expected from the cleanup of ORR would be more economical by rail. Transport by rail also reduces the risk to the public compared with truck transport. The Blair Road rail spur facility at ETTP, refurbished in 1993, could be used to transfer, load, and ship wastes to Envirocare.

The WMI facility in Emelle, Alabama (WMI–Emelle), receives hazardous and TSCA wastes for disposal. All RCRA-restricted waste must be treated to meet RCRA land disposal restrictions (LDRs) before disposal at WMI–Emelle. Waste generators may ship treated waste to WMI–Emelle for disposal or may ship untreated waste for treatment and disposal. WMI–Emelle is capable of receiving truck shipments only. The nearest rail line is approximately 20 miles from the facility, and truck transportation would be required from the rail line to the facility.

ORR has used the WMI–Emelle facility in the past for hazardous waste disposal but has not shipped waste there since DOE Headquarters issued guidance directing DOE field offices to cease shipment of RCRA- or TSCA-contaminated waste originating from radiologically controlled areas

to commercial facilities not licensed by the Nuclear Regulatory Commission (NRC) or an Agreement state (DOE 1991). This moratorium was to be in effect until site-specific procedures to verify whether a waste is radioactive or nonradioactive could be approved. Although these procedures have been approved for ORR, no waste is currently being shipped from ORR to WMI–Emelle; however, disposal of ORO waste at this facility is considered administratively viable.

While the Envirocare and WMI–Emelle facilities were used for alternative development and evaluation, other facilities could be considered. For example, the DOE disposal facility at the Nevada Test Site (NTS) is not currently accepting ORO waste, but this could change pending issuance of the NEPA ROD for DOE program-wide LLW disposal, and the addition of ORO to the list of approved waste generators for NTS.

Total Project Present Worth Cost:

- Low-end: $133.4 million
- High-end: $450.1 million

Time to Implement:

- Low-end: 1999–2030
- High-end: 1999–2030

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The comparative analysis evaluates the relative ability of the alternatives to meet the CERCLA evaluation criteria and project-specific remedial action objectives. In accordance with the DOE Secretarial Policy on NEPA (DOE 1994), NEPA values are incorporated into the CERCLA process. Accordingly, these NEPA values become part of the alternatives evaluation.

EPA has identified nine criteria for evaluating remedial action alternatives. These criteria are used as the basis for the individual and comparative analyses to determine the most suitable alternative. The first two criteria *overall protection of human health and the environment and compliance with ARARs,* are the threshold criteria that must be met by any alternative considered for implementation. The next five criteria form the primary balancing criteria: *short-term effectiveness; long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; implementability;* and *cost*. They are used to compare technical and cost aspects of the alternatives. The last two criteria, *state acceptance* and *community acceptance*, are evaluated after state review and public comment.

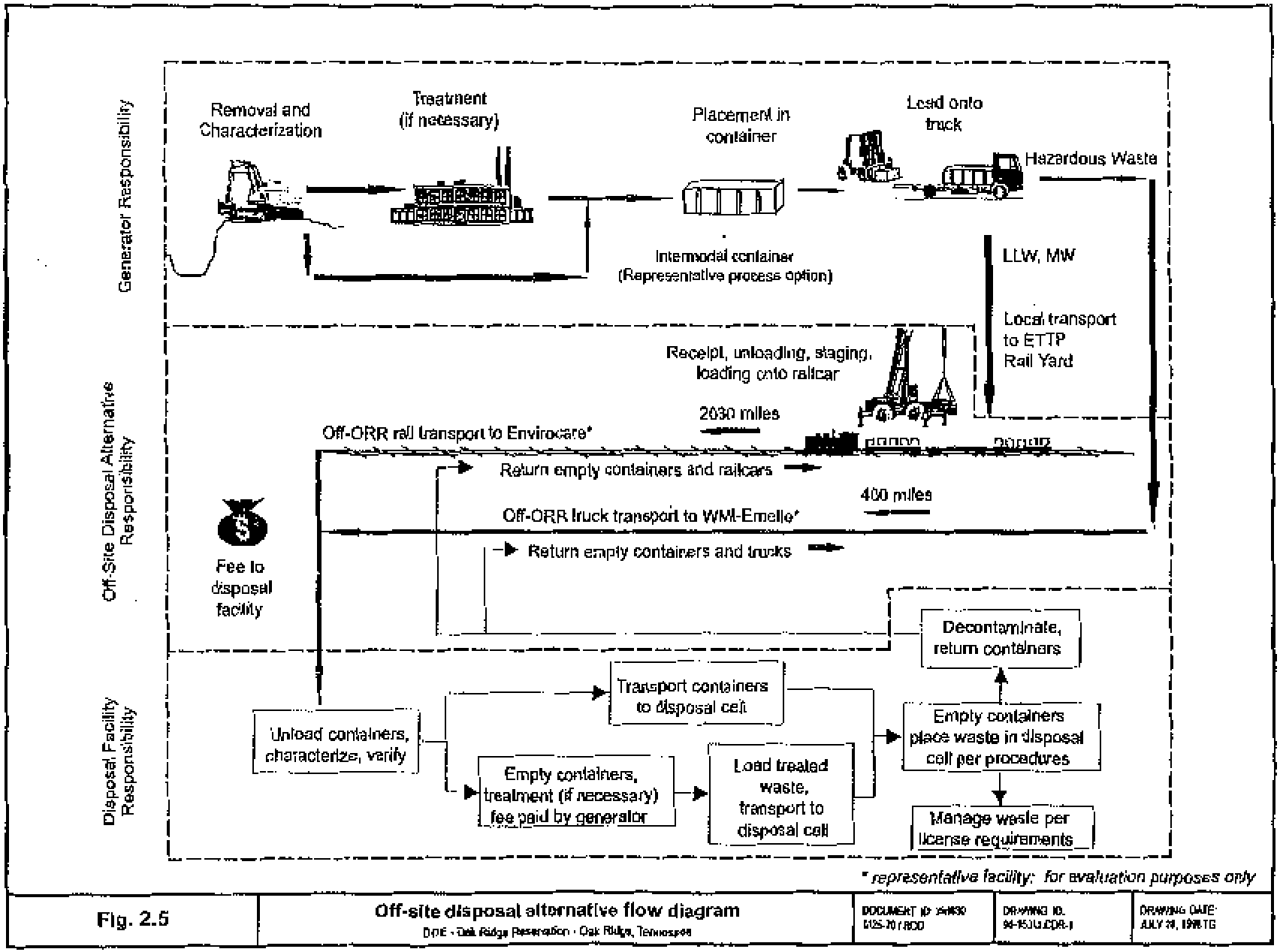

Fig. 2.5 Off-site disposal alternative flow diagram

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NEPA values are incorporated into the discussion of the CERCLA process, and are particularly relevant to certain CERCLA evaluation criteria. Issues related to the affected environment-including ecological resources, cultural resources, archaeological resources, land use and socioeconomics, existing transportation systems, visual aesthetics, and ambient noise-are incorporated into *long-term effectiveness and permanence* and *short-term effectiveness*. Specific NEPA values addressed in the evaluation of disposal options include irreversible and irretrievable commitment of resources, unavoidable adverse impacts, short-term uses and long-term productivity, and cumulative impacts.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Over the long term, removal of waste and disposal under either the on- or off-site disposal alternative would reliably protect human health at the remediation sites and, depending on eventual land-use decisions, could allow environmental recovery at these sites. Waste disposed of off site in an arid, remote location could isolate the wastes more effectively than the on-site alternative after 1000 years or more, but long-distance waste transportation in the short-term could result in more accident-related injuries or fatalities. Transportation risks would be greater if truck transportation were used instead of rail. Selection of either the on- or off-site disposal alternative could also provide additional protectiveness, indirectly, by encouraging more waste removal from individual contaminated sites.

Under the no action alternative, OU- or site-specific remedial decisions, including those concerning waste disposal options, would be made without the benefit of an ORR sitewide disposal strategy or infrastructure. While protective remedies would be implemented, higher disposal costs could ultimately result because DOE would not be able to take advantage of cost savings from a comprehensive acquisition of disposal capacity for large waste volumes. The no action alternative could be least protective of the three alternatives if the lack of a coordinated disposal program resulted in an increased reliance on management of waste in place at CERCLA remediation sites.

COMPLIANCE WITH ARARs

No ARARs are directly associated with the no action alternative; ARARs would be identified for each site-specific CERCLA action. However, lack of a coordinated disposal program may make it more difficult for CERCLA actions at individual remediation sites to comply with some regulatory requirements, such as those for interim. waste storage.

The on-site disposal alternative, as an engineered facility, would meet all ARARs for LLW, RCRA-hazardous waste, mixed waste, and TSCA waste with the exception of the TSCA requirement that the bottom of the landfill be 50 ft above the historical high groundwater table [40 CFR

761.75(b)(3)]. The ARARs incorporate the pertinent, substantive federal and state requirements for siting, design, construction, operation, closure, and postclosure of a hazardous waste land disposal facility under RCRA and licensing requirements for land disposal of radioactive waste at a commercial disposal facility under Rules of the TDEC for protection against radiation. With exception of the 50-ft requirement, the facility will meet the design, operation, and monitoring requirements for a TSCA chemical waste landfill at 40 CFR 761.75. An "equivalent protectiveness" waiver of this 50-ft ARAR is available for the on-site alternative in accordance with CERCLA Sect. 121 (d)(4)(D), which parallels TSCA regulations at 40 CFR 761.75(c)(4) allowing the EPA Regional Administrator to waive the requirement if protectiveness can be demonstrated. The on-site disposal alternative would also meet those DOE Order requirements identified as TBC. The as low as reasonably achievable (ALARA) principle to minimize any potential exposure to radiation would be strictly followed. Certain location-specific ARARs would require mitigation of potential adverse effects (e.g., for wetlands and sensitive species). These mitigation requirements are expected to be met readily and completely through avoidance, minimization, and compensation. For example, wetlands in Bear Creek Valley impacted by this action will be addressed in a wetlands mitigation and revegetation plan as part of the remedial action work plan (RAWP), which is an FFA primary document.

The off-site disposal alternative assumes that facilities receiving LLW and mixed wastes would have, or would be able to obtain, authorization to dispose of TSCA-regulated solid waste. The off-site alternative would comply with all ARARs, assuming that any off-site receiving facilities are approved by EPA for receipt of CERCLA waste (40 CFR 300.440).

LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence incorporates the criteria of the magnitude of residual risk, the adequacy and reliability of controls, long-term environmental effects, socioeconomics and land use, and the irreversible and irretrievable commitment of resources. The long-term period is considered to begin following closure of the on-site cell or off-site disposal of all waste, and storage of all waste that cannot be disposed of. Under the no action alternative, this criterion applies to individual cleanup sites only. Because long-term effectiveness and permanence will be dependent on actions of these sites, this criterion was not evaluated for the no action alternative.

Preventing exposure to contaminants placed in the on-site disposal cell over the long term depends on engineered barriers and institutional controls. The cell cover and intrusion barrier would discourage penetration, and institutional controls would restrict access to the site and prohibit actions that could compromise the cover integrity and expose the waste. Barring extraordinary efforts to penetrate the cover, it should remain effective for thousands of years. While the cover remains in

place, migration of contaminants into groundwater and surface water is the only credible pathway for exposure. Modeling indicates that risk associated with potential exposures downgradient of the disposal cell would not exceed EPA criteria under CERCLA.

Off-site disposal relies on the same basic engineering and institutional controls as the on-site disposal facility. Therefore, the risk of direct exposure to the waste would be comparable to the onsite alternative. However, waste disposed of in an arid, remote location (such as in the western United States) could offer a higher level of long-term protectiveness because the climate and hydrogeology would offer a greater potential for permanence of containment.

If the availability of a coordinated sitewide disposal option under the on- or off-site disposal alternative encourages more aggressive remediation at individual sites, the long-term effectiveness and permanence at individual CERCLA sites could be enhanced.

Other than replacement of woodland and aquatic (NT-4) habitat with grass and shrub habitat at the on-site disposal cell, long-term environmental effects for the on-site alternative would be minimal. The long-term environmental effects for the off-site alternative associated with the incremental increase in disposal volume at the existing facilities would be negligible.

The cell "footprint" would depend on the volume of waste. This area, which would be restricted and maintained in the future, would be removed from the ORR land area available for other activities. Other areas outside the footprint that were used during construction and operations could be released for other uses after facility closure. If either the on- or off-site disposal alternative encourages more thorough remediation of CERCLA environmental restoration sites than the no action alternative, reduction or elimination of restrictions at those sites could have a positive effect on socioeconomics and land use.

REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

The disposal alternatives evaluated do not directly establish waste treatment requirements. The reduction of toxicity, mobility, or volume of waste from individual sites will be evaluated in site-specific CERCLA documentation. Treatment will be required for some waste streams to meet the selected disposal facility WAC.

SHORT-TERM EFFECTIVENESS

Short-term effectiveness includes protection of the community and workers during remedial action, environmental effects, and socioeconomics and land use. The short-term period ends upon closure of the on-site cell or disposal of all waste off site, and storage of all waste that cannot be disposed of.

Under all the alternatives evaluated, risks to workers and the community from actions at the remediation sites and disposal facilities would be controlled to acceptable levels through compliance with regulatory requirements and health and safety plans. The most significant risks to the public would result from waste transportation. Compared to the off-site disposal alternative, traffic problems, impacts, and associated accidents involving the public should be lower because construction and operation of the on-site disposal facility would occur on the ORR, resulting in fewer miles traveled and fewer hours spent on major public roads. The risk from exposure to radiation during transportation would be extremely low for both on- and off-site disposal and is not a discriminating factor between the alternatives. Additional risk of injury or fatality for the off-site alternative results from the added transportation miles, and the risks greatly increase if trucks rather than railcars are used for off-site waste transport. Transportation risks for the no action alternative cannot be estimated because these risks would depend on the cumulative transportation resulting from uncertain cleanup and disposal decisions at multiple sites.

Short-term environmental effects would be least for the no action alternative, minimal for the off-site disposal alternative, and greatest for the on-site disposal alternative. For the no action alternative, no specific environmental impacts other than those associated with individual actions would be expected. The minimal amount of new construction required for off-site disposal would be in areas already dedicated to industrial use. Construction and operation of the on-site disposal facility would cause local short-term environmental effects associated with a large construction project. Potential short-term effects include the rerouting and partial elimination of NT-4 at the East Bear Creek Valley Site. Disturbance to terrestrial resources would be expected, including temporary losses of habitat and displacement of wildlife adjacent to the construction areas. Direct effects on environmental resources would be nonexistent or small. Additional assessments of effects on protected resources, if identified at the site, would be performed and mitigative measures would be identified and implemented in consultation with the appropriate state or federal agencies. (Refer to "Environmental Mitigation" for a more detailed discussion of environmental impacts at the East Bear Creek Valley Site.)

The on-site disposal alternative would have the greatest effect on socioeconomics and land use. Construction and disposal actions for on-site disposal would increase the number of jobs locally, but the maximum increase (approximately 100 jobs) would not be significant relative to the total current workforce, Construction and operation of the on-site disposal facility does not affect any environmental justice issues [Executive Order (EO) 12898] because there are no off-site impacts. The permanent commitment of land at the disposal site could be at least partially offset by reductions in restrictions at remediation sites, but it is possible that the same improvements in land-use opportunities could occur under the no action or off-site disposal alternative without the commitment of ORR land for waste disposal. The effects of implementing the no action alternative

would depend on decisions at individual sites, but could result in less beneficial reuse of the individual sites if more waste is managed in place because of the lack of coordinated disposal capacity. Implementation of the off-site disposal alternative would have only minor socioeconomic impact (that is, no new jobs would be created).

IMPLEMENTABILITY

All three alternatives are administratively feasible. Disposal facilities similar to that proposed under the on-site disposal alternative have been constructed at other DOE sites. Agreements have been made in the past with state agencies for interstate shipment of waste and receipt for disposal, and future agreements are viable. While the feasibility of off-site waste transportation and disposal is demonstrated by past operations, challenges to the administrative feasibility of waste shipment could result from future changes in state acceptance of waste transport and disposal. Administrative feasibility of disposal activities for the no action alternative would be considered under CERCLA decisions for individual sites.

The technical components of on- or off-site disposal would be straightforward to implement using existing and readily available technologies, but construction of the on-site disposal facility presents greater technical challenges than transporting waste off site for disposal. Once the wastes are disposed of under either alternative, the need for additional future actions would be extremely unlikely. Under either alternative, waste retrieval, if ever required, would be difficult to implement and very costly. The technical implementability of disposal activities for the no action alternative would be considered under CERCLA decisions for individual sites.

Services and materials needed for construction and operation of the on-site disposal facility or for shipment and disposal of waste under the off-site alternative are readily available. Off-site disposal capacity is available for waste that could not be treated to meet the on-site facility WAC, and storage capacity would be available for waste not meeting any facility's WAC. The continued availability of any current commercial facilities for the duration of waste generation is uncertain. Because of state equity issues, public concerns regarding shipments outside Tennessee could affect the future availability of disposal facilities. Other events, such as court challenges or changes in internal DOE policies, directives, or Orders, could delay or prevent some or all off-site shipments. These concerns could affect off-site transport or disposal of waste. The on-site disposal alternative provides a greater assurance of long-term disposal capacity. The availability of services and materials does not apply to the no action alternative.

CUMULATIVE IMPACTS

Cumulative impacts are defined as "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable

future actions regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (Council on Environmental Quality, 40 CFR 1508.7). DOE addresses cumulative impacts in keeping with its policy of incorporating NEPA values into the CERCLA process.

Long-term cumulative impacts from waste disposed of at the new on-site facility were evaluated in a composite analysis (DOE 1999a). A composite analysis is required for all operating and proposed disposal facilities under the purview of DOE. This policy was implemented in response to a Defense Nuclear Facilities Safety Board recommendation (Recommendation 94-2). The composite analysis estimates the total radiation dose to a member of the public from all radiological sources within a watershed, including disposal areas. The composite analysis for the on-site disposal cell estimated total potential future exposure under two scenarios. The first scenario assumed that existing disposal sites within Bear Creek Valley were not remediated. The second scenario assumed that remedial action under Alternative 5a of the Bear Creek Valley proposed plan (DOE 1998e) was implemented. The exposed member of the public was assumed to be a resident farmer living as close to the sources of contamination as allowed under the future land use recommendations presented in the Bear Creek Valley proposed plan. The composite analysis projected that the on-site disposal cell would comprise only a small portion of the radiation dose received by a member of the public. Estimated doses from the disposal facility were 0.11 mrem/year for 0 to 1000 years and 1.1 mrem/year beyond 1000 years, while the total dose from all sources within Bear Creek Valley including the disposal cell was estimated at 28.7 mrem/year under the nonremediation scenario and 4.0 mrem/year under Alternative 5a.

The primary adverse environmental effect of implementing the on-site disposal alternative would be the permanent dedication of land for the disposal cell and the expansion of the Y-12 West End Borrow Area. The woodland habitat of the disposal cell site would be replaced with grass and shrub habitat. The woodland surrounding the borrow area would be destroyed and then replaced by grasses and other low cover. Forest could eventually reoccupy the area. Long-term cumulative impacts to the forest would depend on future land-use decisions.

The overall cumulative impacts in East Bear Creek Valley would be minor because the area is currently used for waste management and industrial activities which have impacted the land and Bear Creek. The current DOE strategy is to continue using East Bear Creek Valley for waste management and industrial activities; in part because conditions resulting from past activities will require continuing institutional controls for the foreseeable future. Presence of the on-site disposal facility will have little cumulative impact on anticipated future land use.

Cumulative impacts from the off-site alternative would be caused primarily by increased traffic along the transportation corridor. The incremental impact from disposal of ORR waste at off- site facilities would be minor.

If the cleanup and release of remediation sites is encouraged by either on- or off-site disposal, cumulative environmental benefits could result on ORR.

COST

The estimated total project present worth costs for the on-site disposal alternative are $99.8 million and $167.5 million for the low- and high-end waste volume scenarios, respectively. The estimated total project present worth costs for the off-site disposal alternative are $133.4 million and $450.1 million. The estimated present worth cost of on-site disposal is about $34 million and $283 million less than off-site disposal for the low- and high-end scenarios, respectively. The cost per unit volume for both action alternatives depends on the total waste volumes disposed of. Because the support facilities and other infrastructure for the on-site disposal alternative would be similar regardless of the disposal cell capacity, the unit disposal costs would decrease as total volumes increase. For off-site disposal, it is assumed that a large-volume discount would apply, but a less pronounced reduction in unit disposal costs for greater volumes would result for the off-site alternative than for the on-site alternative.

The $34 million differential between the on- and off-site alternatives for the low-end volume scenario, as a percentage of the total present worth cost, is less than the level of accuracy of the estimate and does not represent a significant cost difference. The $283 million differential for the high-end scenario is very significant and reflects the high cost of transportation and efficiencies of large-scale on-site disposal.

While there would be no costs directly associated with implementation of the no action alternative for this project, the cumulative cost for waste disposal and institutional controls at individual sites could be greater than for either the on- or off-site disposal alternative. Disposal costs would depend on the individual actions taken at the CERCLA remediation sites. If lack of a coordinated disposal program under the no action alternative encourages management of wastes in place at individual sites, rather than removal and disposal, disposal costs would be avoided. If on- or off-site disposal is selected, the removal, ex situ treatment, and local transport portion of alternatives requiring disposal may be more costly than in situ remedial actions at a remediation site. For those CERCLA sites that select removal and disposal without the benefit of a coordinated ORR-wide disposal program, transport costs and disposal fees could be higher because each project would have to negotiate separate contracts for these services and there would be no economies of scale.

STATE ACCEPTANCE

The state of Tennessee concurs with the selected remedy.

COMMUNITY ACCEPTANCE

The "Highlights of Community Participation" section summarizes community participation in evaluating ORR CERCLA waste disposal options. Based on input at various public meetings held by DOE, the public supports construction of an on-site disposal facility for the permanent disposal of waste generated by cleanup of ORR. Community-based organizations, including the SSAB, OREPA, Local Oversight Committee, the city of Oak Ridge, and Friends of ORNL, have expressed support of on-site disposal (see letters in Appendix A and "Responsiveness Summary," Part 3 of this ROD). The selected remedy is the same as the preferred alternative presented in the proposed plan and was not modified in response to public comments. The "Responsiveness Summary," Part 3 of this ROD, presents DOE responses to comments on the proposed plan received during the public comment period.

COMPARATIVE ANALYSIS SUMMARY

The comparative analysis of alternatives is also summarized in the two following tables. Table 2.2 summarizes evaluation of the three alternatives conducted in the RI/FS (DOE 1998a). Table 2.3 presents the results of an evaluation of three final candidate sites identified during development of the on-site disposal alternative conducted to support the proposed plan (DOE 1999a).

SELECTED REMEDY

DOE, with concurrence of EPA and TDEC, has determined that the preferred alternative presented in the January 1999 proposed plan is the most appropriate remedy for disposal of ORR CERCLA waste. This remedy, on-site disposal, appears to be the best alternative when evaluated under the CERCLA criteria. The selected remedy will provide for the overall protection of human health and the environment, will comply with ARARs orjustify a waiver, and is cost-effective. This remedy is consistent with the end use criteria recommended for Bear Creek Valley by the SSAB. The disposal facility will be in an industrial zone for current and future land use. Institutional controls, including deed restrictions, will be maintained to ensure long-term protectiveness until they are deemed unnecessary.

In accordance with the MOU, a LUCAP for ORR has been developed. The selected alternative for the disposal of ORR CERCLA-generated waste includes LUCs to protect the public.

A Land Use Controls Implementation Plan (LUCIP) for the on-site disposal facility will be submitted as part of the remedial action work plan (RAWP) in accordance with the schedule to be presented in the forthcoming remedial design work plan. The LUCIP will specify how DOE will implement, maintain, and monitor the LUC elements of the remedy identified in this ROD to ensure that the remedy remains protective of human health and the environment. On regulatory approval of the LUCIP (in conjunction with review and approval of the RAWP), the ORR CERCLA Waste Disposal LUCIP will be added to Appendix B of the ORR LUCAP (draft document).

The LUC elements identified to ensure the protectiveness of the selected remedy are to prohibit construction of any kind on the disposal facility that could damage the final cover, preclude residential use of the area and prevent unauthorized access to groundwater in the area. The institutional controls selected to prevent unauthorized access to the disposal facility include the following: a perimeter fence surrounding the facility; controlled access through the facility ORR security gate and fences and the site use/site clearance program; general maintenance of the facility, including installation of warning signs and visible markers, to identify the disposal facility and types of materials disposed; and deed restrictions for use of the property. In addition, a description of the boundary to which LUCs apply will be prepared and included with the remedial action report after facility closure.

The selection of this remedy is based on the comparative analysis of alternatives detailed in the FS and summarized in this ROD. This remedy uses permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. It does not directly meet the statutory preference for treatment as a principal element because the on-site disposal cell is not a waste treatment facility; however, some waste streams will be treated, as necessary, to meet the disposal facility WAC.

The on-site disposal action consists of construction and operation of a disposal facility in East Bear Creek Valley that will receive CERCLA waste from cleanup of ORR and associated sites that meet the facility WAC; closure of the disposal cell by placing an enhanced RCRA-compliant cover over the waste; and long-term institutional controls, media monitoring, and S&M. Cell design and compliance with the WAC will ensure continued protectiveness. Some changes may be made to the remedy during the remedial design and construction process. The conceptual cell design may be modified based on the final WAC, improvements in design, or field conditions encountered. In turn, final WAC, which may be functionally dependent on the final disposal cell design and waste forms, will be reviewed and approved through post-ROD primary documentation.

The on-site disposal facility will include the disposal cell, a leachate collection and transfer facility, waste staging area, support facilities, access roads, stormwater detention basins, and monitoring systems. All aspects of final facility design will be presented in post-ROD primary documentation. The facility footprint at the East Bear Creek Valley Site will range from 64 to

Table 2.2. Comparative analysis summary, ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Evaluation criteria	No action alternative	On-site disposal alternative	Off-site disposal alternative
Overall protection of human health and the environment	Protective	Protective	Protective
Compliance with ARARs	There are no ARARs for the no action alternative	CERCLA waiver of the TSCA requirement for a 50-ft buffer between the bottom of the cell and the groundwater will be necessary. Meets all other ARARs	Meets all ARARs, provided that disposal facilities are in compliance with license requirements
Short-term effectiveness (*construction and operations of a disposal facility*)	Criterion applicable to individual cleanup sites only	Adverse environmental effects at the on-site disposal facility from construction and operations would be minimized by regulatory requirements and good engineering practices	Transportation risks would be greater than for the no action or on-site alternative. If wastes were shipped by truck, risk from vehicular accidents would increase significantly
Long-term protection and permanence (*after cell closure*)	Criterion applicable to individual cleanup sites only	Protective of human health and the environment; loss of natural habitat would result at the disposal cell site	Protective of human health and the environment
Reduction of toxicity, mobility, or volume through treatment	Not a relevant criterion. Alternatives evaluated would not directly establish waste treatment requirements	Not a relevant criterion. Waste treatment criteria would be addressed in the CERCLA decision documents for the waste sites from which wastes would be sent to this facility for disposal	Not a relevant criterion. Waste treatment criteria would be addressed in the CERCLA decision documents for the waste sites from which wastes would be sent to this facility for disposal
Implementability	No implementation presently required	Administrative requirements would be stringent, but are considered achievable. Construction and operations are straightforward. Services and materials are readily available	Administrative and technical requirements are implementable. Disposal relies on commercial facilities for which continued operation is uncertain. Concerns raised by receiving states, and states along selected transportation route, could affect the implementability of the off-site disposal alternative because of the need to ship large volumes of radioactive and mixed wastes.
State acceptance	Not acceptable	Acceptable	Not acceptable
Community acceptance	Not acceptable	Acceptable	Not acceptable

Table 2.2. (continued)

Evaluation criteria	No action alternative	On-site disposal alternative	Off-site disposal alternative
Cost	There is no present cost for the no action alternative. Disposal costs would be incurred in the future as a result of site-by-site remedy selection and implementation. If significantly more waste is managed in place, cost could be less than for the disposal alternatives. However, if a significant amount of wastes is disposed of by individual projects, overall disposal costs could equal or exceed those under the disposal alternatives over time	**Total project present worth cost[a,b]:** Low end: $99.8 million High end: $167.5 million	**Total project present worth cost[a]:** Low end: $133.4 million High end: $450.1 million

[a]Cost estimates do not include removal of waste during cleanup; waste characterization and certification; waste segregation, compaction, or shredding; treatment to meet waste acceptance criteria; local transport; or interim storage.

[b]includes annual S&M costs of $650,000/year

ARAR = applicable or relevant and appropriate requirements
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
ft = foot
ORR = Oak Ridge Reservation
ROD = record of decision
S&M = surveillance and maintenance
TSCA = Toxic Substances Control Act of 1976

Table 2.3. Comparative analysis summary for the three final candidate sites, ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Evaluation criterion	East Bear Creek Valley Site	West Bear Creek Valley site	White Wing Scrap Yard site
Overall protection of human health and the environment	Protective of human health at the facility boundary. This Site would be most protective because it is furthest away from public access and within a current industrial land use area. Site effectively isolates waste from ecological receptors	Protective of human health at the facility boundary; although, site is close to public access and within a potentially unrestricted use area. Site effectively isolates waste from ecological receptors	Protective of human health at the facility boundary; although, site is close to public access and within a potentially unrestricted use area. Site effectively isolates waste from ecological receptors
Compliance with ARARs	Requires CERCLA waiver of TSCA requirement for 50-ft buffer between bottom of cell and groundwater. Meet all other ARARs	Requires CERCLA waiver of TSCA requirement for 50-ft buffer between bottom of cell and groundwater. Meet all other ARARs	Requires CERCLA waiver of TSCA requirement for 50-ft buffer between bottom of cell and groundwater. Meet all other ARARs
Long-term effectiveness and permanence			
• Magnitude of residual risk	By design, meeting the facility WAC would ensure that risk would not exceed acceptable thresholds established under CERCLA	By design, meeting the facility WAC would ensure that risk would not exceed acceptable thresholds established under CERCLA	By design, meeting the facility WAC would ensure that risk would not exceed acceptable thresholds established under CERCLA
• Adequacy and reliability of controls	Controls and S&M are adequate to protect human health. Controls are more reliable because Site is furthest away from public access and within a controlled industrial area	Controls and S&M are adequate to protect human health. Controls may be less reliable because site is close to public access and within a potentially unrestricted use area	Controls and S&M are adequate to protect human health. Controls may be less reliable because site is close to public access and within a potentially unrestricted use area
• Long-term environmental effects	Loss of approximately 20 acres of woodland habitat within facility footprint and partial loss of Tributary NT-4 and associated wetlands	Loss of approximately 50 acres of woodland habitat within facility footprint and loss of one wetland along NT-15.	Loss of approximately 60 acres of woodland habitat within facility footprint. Wetlands along ET-3 and ET-4, including Hembree Marsh (a Tennessee state-registered natural area), would be impacted
Reduction of toxicity, mobility, or volume through treatment	Not applicable to Site. Waste treatment criteria would be addressed in CERCLA decision documents for future response actions	Not applicable to site. Waste treatment criteria would be addressed in CERCLA decision documents for future response actions	Not applicable to site. Waste treatment criteria would be addressed in CERCLA decision documents for future response actions

Table 2.3. (Continued)

Evaluation criterion	East Bear Creek Valley Site		West Bear Creek Valley site		White Wing Scrap Yard site	
Short-term effectiveness						
• Protection of the community during remedial action	Protection of the community would be greatest because Site is furthest away from public access; ORR commuter traffic impacted along Bear Creek Road (which is restricted public access		Risks to the community would be higher than for the East Bear Creek Valley site because this site is closer to public access; ORR commuter traffic impacted along Bear Creek Road (which is restricted public access)		Risks to the community would be the highest because site is closest to public access; minor traffic would increase on SR95, a public highway	
• Protection of workers during remedial action	Workers would be protected through compliance with H&S plans and BMPs		Workers would be protected through compliance with H&S plans and BMPs		Workers would be protected through compliance with H&S plans and BMPs	
• Short-term environmental effects •	Impacts to surface water resources during construction (such as sediment loading) could result in Bear Creek affecting breeding of Tennessee dace; however, impacts will be minimized through use of BMPs		Impacts to surface water resources during construction (such as sediment loading) could result in Bear Creek affecting breeding of Tennessee dace; however, impacts will be minimized through use of BMPs		Use of this site would impact unique and sensitive resources within the Nature Conservancy's Landscape One Complex; surface water at ET-3 and ET-4 may suffer adverse impacts during construction. A new haul road would be required impacting forest environment and wetlands	
• Duration of remedial action	Construction, operation, and closure is estimated to be 12 years for the low-end scenario and 33 years for the high-end scenario		Construction, operations, and closure is estimated to be the same as for East Bear Creek Valley site		Construction, operation, and closure is estimated to be the same as for the other two sites	
Implementability	Administrative requirements would be stringent, but are considered achievable. Construction and operations are straightforward and readily implementable. Services and materials are readily available		Implementability would be the same as for the East Bear Creek Valley site		Implementability would be the same as for the other two sites	
Cost	**Low end[a]**	**High end[a]**	**Low end[a]**	**High end[a]**	**Low end[a]**	**High end[a]**
	147.2[b] 0.65[c] 99.8[d]	503.9[b] 0.65[c] 167.5[d]	141.2[b] 0.65[c] 95.3[d]	495.6[b] 0.65[c] 162.7[d]	152.8[b] 0.65[c] 103.3[d]	514.9[b] 0.65[c] 173.4[d]
State acceptance	Acceptable		Not acceptable		Not acceptable	
Community acceptance	Acceptable		Not acceptable		Not acceptable	

Table 2.3 (continued)

[a]Cost ($ millions).
[b]project cost (escalated).
[c]100-year S&M (annual).
[d]Present worth.

ARAR = applicable or relevant and appropriate requirement
BMP = best management practice
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
$ = dollar
ET - east tributary
FS = feasibility study
ft = foot
H&S = health and safety
NT = north tributary
ORR = Oak Ridge Reservation
RI = remedial investigation
ROD = record of decision
S&M = surveillance and maintenance
TSCA = Toxic Substances Control Act of 1976
WAC = waste acceptance criteria

98 acres, correlating to the projected low- and high-end scenarios. The area of the disposal cell that requires permanently committed land is projected to range from 22 to 44 acres.

Disposal Cell Design. The design for the waste disposal cell will meet regulatory criteria as defined in the ARARs for this action with the exception of the TSCA requirement that the bottom of the landfill be 50 ft above the high groundwater table, which has been waived based on equivalent protectiveness grounds; protect human health and the environment by ensuring acceptable long-term risk; minimize human, animal, and plant intrusion; and minimize the potential for settlement and slope failure under both normal and seismic (earthquake) conditions, and the 1000-year flood. The FS presents the conceptual design used for evaluation of disposal alternatives (Fig. 2.6).

This conceptual design includes a perimeter dike; a natural or constructed underlying geologic buffer (clay liner) up to 10 ft thick; a 6-ft multilayer base liner system consisting of man-made and natural materials, double leachate collection and detection systems, and a protective soil layer; and a 16-ft multilayer cell cover. The perimeter dike provides stability and guards against erosion. The geologic buffer and multilayer base system reduces the potential for contaminants leaching into the groundwater. The permanent cover minimizes liquid penetration into the closed disposal cell over the long term; promotes drainage and minimizes erosion or abrasion of the cover; accommodates settling and subsidence to maintain the cover's integrity; discourages intrusion of humans, animals, and plants; and minimizes maintenance requirements. Beginning with preliminary design, contingencies will be made that will address shallow groundwater collection and treatment in the event that compliance limits (i.e., radionuclides in groundwater in concentrations that exceed an effective dose equivalent of 25 mrem/year from all pathways) are ever triggered. The final design and size of the cell will depend on the actual amount of waste anticipated, additional information on the geotechnical aspects of the Site, and the final waste forms to be disposed of. While components may differ from the FS conceptual design, cell performance will not be compromised.

Waste Streams and Draft WAC. The disposal cell will be designed to receive LLW, hazardous waste, TSCA waste, and mixed waste consisting of combinations of these waste types. Liquid wastes, TRU wastes, spent nuclear fuel, and sanitary waste are not considered candidate waste streams for on-site disposal. The following waste streams and categories are also excluded from on-site disposal; this list is not all-inclusive:

- TRU waste is excluded because it will be disposed of at Waste Isolation Pilot Plant (WIPP).

- Industrial/sanitary (nonregulated) waste is excluded because there are less expensive options for its disposal.

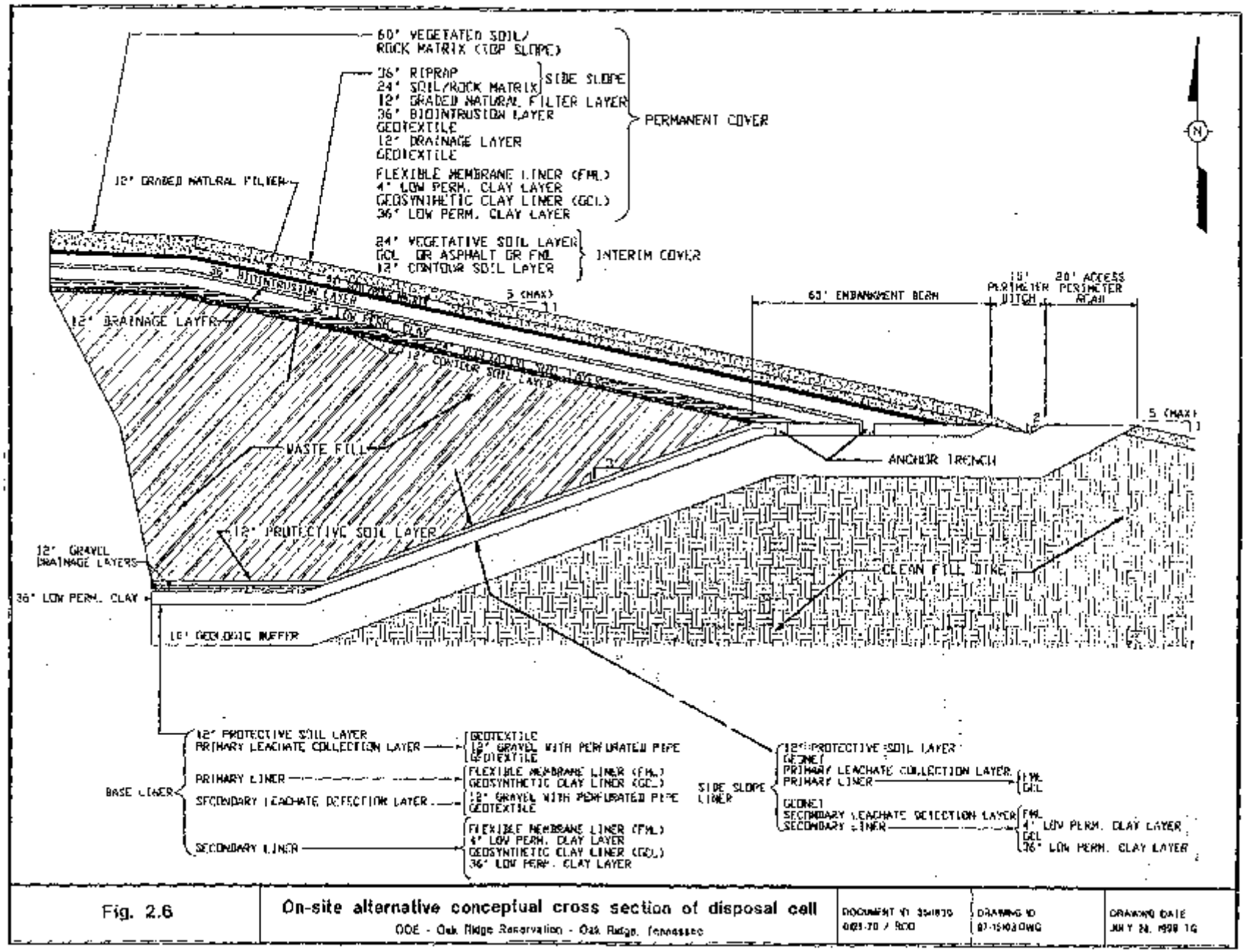

Fig. 2.6

On-site alternative conceptual cross section of disposal cell

DOE - Oak Ridge Reservation - Oak Ridge, Tennessee

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- Sludge waste from the Gunite and Associated Tanks project is excluded because of its probable transfer to the Melton Valley Storage Tanks and, subsequently, to WIPP. (This is the only waste stream removed from the Ten Year Plan waste projection baseline that would otherwise be considered a candidate for the disposal evaluation.)

In addition to siting and designing the facility to minimize environmental impacts, DOE will conservatively evaluate all wastes before acceptance to confirm their eligibility for disposal in the on-site facility. The screening criteria, or waste acceptance criteria (WAC), includes both physical and contaminant limitations for the protection of human health and the environment.

Physical restrictions on waste will be imposed to preserve the integrity of the disposal cell. For example, some wastes may require modification to meet compaction specifications defined to minimize the potential for waste subsidence and size requirements for debris may be defined to facilitate disposal operations.

Contaminant limitations will ensure that operation of the disposal cell does not result in contamination of groundwater resources. Accordingly, contaminant-specific WAC are being established by estimating contaminant concentrations for each type of waste such as soil/soil-like, stabilized, solidified and debris. Applying these WAC to wastes dispositioned in the cell will ensure that risk to a hypothetical groundwater user, a resident farmer located between the facility and Bear Creek, will not exceed acceptable thresholds established under CERCLA. Thus, the WAC concentration is the maximum permissible concentration per constituent that satisfies a specified health-based criterion for protection of human health.

A draft WAC concentration for each contaminant identified in the projected waste inventory was determined by modeling its release from a given waste form, assumed to occupy the entire disposal cell, and its subsequent transport to and uptake by the hypothetical receptor. However, it is unlikely that a single waste type will occupy the entire facility. Rather, the disposal cell will ultimately contain many waste forms, each having a specific volume of radiological and chemical contaminants. To accommodate these different waste forms, an approach to apply the contaminant-specific WAC to various waste streams has been developed to ensure that the performance objectives of the disposal cell are attained.

The purpose of these WAC is to allow the disposal of only those wastes which could be safely managed within the facility. Wastes that do not meet the WAC will require off-site disposal or. receive treatment. Appendix B provides a detailed discussion of the development of the contaminant-specific WAC and the preliminary contaminant limitations. A process, reviewed by DOE, EPA, and TDEC, that ensures the wastes generated by CERCLA response action projects meet the WAC will be developed before operation of the facility begins. The WAC will be finalized in a post-ROD primary document under the Oak Ridge FFA.

Facility Construction. Construction of the on-site disposal facility will include site development, disposal cell construction, and construction of support facilities. As currently envisioned, the disposal cell will be constructed in two phases, with the first phase being completed and covered with an interim cap as the second phase is developed. Phase I will include site clearing and preparation; relocation of a power line that crosses the site; rerouting of tributary NT-4 to NT-5; and construction of support facilities, stormwater detention basins, and a portion of the disposal cell with a total capacity of at least 357,000 yd^3, large enough to hold a minimum of 223,000 yd^3 of waste. Phase II. will include construction of the remainder of the clean-fill dike and an expanded cell. Groundwater, surface water, and air quality will be monitored during construction to ensure protection of human health and the environment. Specifics of the construction, including the construction quality assurance program will be contained in post-ROD design documentation.

Facility Operation. Facility operation will consist of receiving and inspecting waste, staging waste as necessary, placing waste into the disposal cell, decontaminating waste containers and transport vehicles (if necessary), and maintaining the disposal facility. Maintenance will include leachate collection and treatment (if necessary) and beneficial reuse, equipment maintenance, mowing, support facility maintenance, dust control, and record keeping. Environmental monitoring conducted during construction will continue throughout facility operations.

At the disposal cell, waste will be placed on active working faces. Bulk waste will be placed in layers approximately 1-ft thick and compacted. Void spaces in debris and between containers will be filled with waste soil, clean soil, or flowable fill such as grout. A temporary cover of soil or foam may be placed on inactive working faces following operations. This cover will reduce emissions and prevent rain from contacting waste in the cell. Waters collected from contact stormwater collection sumps may be used for dust control purposes within the cell as a waste minimization measure. Facility operations will be detailed in post-ROD design documentation.

Facility and Cell Closure. Closure will include removal of support facilities and placement of contaminated materials into the cell, installation of the final cover, and site restoration. Site restoration will include grading and seeding of disturbed areas in and around the disposal cell. Most of the area between the disposal cell and the institutional control boundary will be allowed to return to forest. Only areas around remaining features such as roads, fences, and monitoring wells will be maintained. Details of closure will be contained in post-ROD design documentation.

Long-Term Institutional Controls. Physical barriers (such as a perimeter fence with warning signs) will prevent public access to the disposal cell indefinitely. S&M will be performed for as long as required to maintain the closed facility site in a protective manner. Regular inspections will verify the condition and performance of the cell. Maintenance will include such activities as clearing plant growth from the cell cover and side slopes, repairing and clearing surface

water drainages, and maintaining fences and signs. Groundwater, surface water, air, and biota will be routinely monitored for the presence of contaminants. The long-term S&M program will be defined in post-ROD documentation.

Schedules. Timely decision and implementation of the on-site disposal alternative will support cleanup actions. For both the low- and high-end scenarios, waste disposal is expected to begin in 2001. Under the low-end scenario, on-site waste disposal would end in 2009 with cell closure by 2011. Under the high-end scenario, on-site waste disposal would end in FY 2030 with closure by 2033. Under either scenario, actual facility closure will occur following completion of the scope of the CERCLA program at ORR and associated sites. Additionally, monitoring and long-term S&M are assumed to continue indefinitely.

Risk. Facility operations will present little risk to workers or the public. Regulatory requirements, DOE requirements, construction practices, and engineering controls will ensure that risk to workers from radiation and industrial hazards remains as low as reasonably achievable. Estimates show that virtually no additional cancer risk as a result of exposure to waste constituents will result from facility operation or reasonable natural phenomena. The risk from vehicle accidents, including off-site shipment of some waste, will be very low. An estimate of risk resulting from a tornado striking the open disposal cell shows that the risk associated with dust releases will also be low. The facility design and waste acceptance criteria will ensure that EPA protection standards are met. While there are no regulatory limits for radiation exposure to animals, science has found no living organisms that are significantly more sensitive to radiation than humans. Therefore, exposure limits that protect humans are generally considered to protect animal populations.

Environmental Mitigation. Natural resources at the East Bear Creek Valley Site in the area of influence include portions of forest, wetlands, tributaries to Bear Creek, and ecologically sensitive areas. Figure 2.2 presents the conceptual disposal facility to be located between NT-3 and NT-5, well north of Bear Creek. The facility will straddle Haul Road that runs east to west, just north of the Oil Landfarm. Between 22 and 44 acres of permanently committed land area will be required to accommodate the disposal cell, depending on the final size. The area south of Haul Road is cleared grassland, while that to the north is forested up the slope of Pine Ridge. Construction of the disposal facility will require elimination of approximately 20 acres of woodland habitat. However, this area represents a very small portion of the total habitat for terrestrial wildlife on ORR.

Wetlands exist in several areas along NT-4 and in an area east of the Oil Landfarm. Because construction of the facility will require rerouting approximately 1000 ft of NT-4, the associated wetlands (approximately 1 acre) will require mitigation. A programmatic wetlands mitigation plan to cover all activities in Bear Creek Valley will be included as part of the RAWP, which is a post ROD primary document. This includes mitigation of wetlands impacted by the disposal facility as well as other remedial activities in Bear Creek Valley.

The *Tennessee dace*, a fish species identified as being in need of management is present in portions of Bear Creek and in several tributaries, including NT-4. While portions of NT-4 will be eliminated, suitable compensation for this stream will be incorporated into the wetlands mitigation plan for Bear Creek Valley. Additionally, appropriate measures will be taken during construction and operation of the facility to minimize impacts to other areas of aquatic environment for this fish species as much as possible.

Several applicable or relevant and appropriate requirements have been identified that specify protection of aquatic resources, wetlands, floodplains, and endangered, threatened or rare species of plants; and animals (see "Compliance with ARARs"). Compliance with these requirements during design, construction, operation, and closure will be continually evaluated to ensure protection of the environment.

Habitat areas will be considered during design and construction to minimize losses. Controls will be used during construction and operations to minimize dust, noise, and erosion. Environmental monitoring will be conducted during construction, operations, and postclosure. Following construction, disturbed areas would be graded and revegetated. Habitat and wetlands restoration, if needed, will be carried out in conjunction with appropriate federal and state agencies.

Cost. Depending on the volume of waste ultimately disposed of and the period for which the facility remains operational, total present worth costs are projected to range from $99.8 million to $167.5 million, correlating to the projected low- and high-end waste volume scenarios (Table 2.4).

STATUTORY DETERMINATIONS

Under CERCLA Sect. 121, selected remedies must be protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified and granted), be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that significantly and permanently reduces the volume, toxicity, or mobility of hazardous wastes as their principal elements.

CERCLA, "ON-SITE" DETERMINATION CERCLA

Sect. 104(d)(4) states where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, these related facilities may be treated as one for the purpose of conducting response actions. The preamble to the NCP [at 55 Fed. Reg. 8690 (March 8, 1990)] clarifies that Sect. 104(d)(4), discretionary authority to treat noncontiguous facilities as one site, can be used

Table 2.4. Cost estimate for on-site disposal alternative, ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Project cost item	Low end ($)	High end ($)
Capital costs (escalated $ millions)		
Direct cost:		
Site development	15.0	16.8
Disposal facilities	22.7	58.6
Support facilities	4.0	4.2
Capping and closure	12.2	55.1
Total direct cost	**53.9**	**134.7**
Indirect cost:		
Remedial design (including RD work plan and regulatory interactions)	6.0	6.3
Remedial action work plan	0.3	0.3
Construction management	7.5	18.8
Project integration[a]	9.8	25.3
Total indirect cost	**23.6**	**50.7**
Total capital cost	**77.5**	**185.4**
Present worth costs ($ millions)		
Capital and operations total cost (present worth)[b]	**91.4**	**164.2**
Long-term S&M and monitoring cost–annual cost (FY 1997 $, assumed for 100 years)	0.65/year	0.65/year
S & M cost (present worth)[b]	**8.4**	**3.3**
Total project cost (present worth)[b]	**99.8**	**167.5**

Note: All costs are rounded.

[a]Includes Title III inspection activities, field construction and support activities, independent certification, and project management associated with design and construction.
[b]Present worth costs based on Building Life-Cycle Cost analysis (version 4.20-95) (National Institute of Standards and Technology. 1995.
Building Life-Cycle Cost Programs, Version 4.20-95. Developed by Stephen R. Petersen, Office of Applied Economics and Applied Mathematics Laboratory, National Institute of Standards and Technology. Gaithersburg, MD.).

CERCLA= Comprehensive Environmental Response, Compensation, and Liability Act of 1980
$ = dollar
FY= fiscal year
ORR = Oak Ridge Reservation
RD = remedial design
ROD = record of decision
S&M = surveillance and maintenance

when noncontiguous facilities are reasonably close to one another and wastes at the sites are compatible for a selected treatment or disposal approach. Because of the proximity of the ORR site selected for the disposal facility to those noncontiguous contaminated sites on or in the vicinity of ORR from which CERCLA response actions will generate waste sharing a common origin in past ORR operations and compatibility for disposal in the on-site cell, those sites are being considered a single unit for response purposes under discretionary authority of CERCLA Sect. 104(d)(4). Because they are treated as one site for the purpose of conducting response actions, CERCLA Sect. 121(e)(1) allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. The on-site disposal cell will accept CERCLA waste that meets the facility-specific WAC from ORR sites and associated sites outside the ORR boundary that have been contaminated by the receipt or transport of material from past ORR operations conducted by DOE and its predecessors.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment by preventing direct contact with waste or exposure to waste, and preventing the migration of contaminants to the environment, by effectively isolating the waste. The design of the cell, including an armored cap, will reasonably prevent physical penetration and will greatly limit infiltration. It is anticipated that there will be no access to waste in the cell or contaminant releases from the cell for the foreseeable future.

The facility-specific WAC will ensure that risk to a hypothetical groundwater user and a resident farmer located between the facility and Bear Creek will not exceed acceptable thresholds established under CERCLA. Institutional controls will prevent use of groundwater that could be impacted by any release from the cell. Implementation of this remedial action will not pose unacceptable short-term risks to site workers or members of the public.

COMPLIANCE WITH ARARs

The selected remedy will comply with all ARARs that are identified for this remedy (Tables 2.5, 2.6, and 2.7) with the exception of one requirement for which DOE must obtain a CERCLA waiver. A waiver from the TSCA hydrologic requirement that specifies that the bottom of a chemical waste landfill must be located 50 ft above the historic high groundwater mark [40 CFR 761.75(b)] is being invoked upon signature of this ROD for the selected remedy. An “equivalent protectiveness” waiver of this 50-ft ARAR is available for the on-site alternative in accordance with CERCLA Sect. 121(d)(4)(D), which parallels TSCA regulations at 40 CFR 761.75(c)(4) allowing the EPA Regional Administrator to waive the requirement if protectiveness can be demonstrated.

This requirement is being waived because equivalent protectiveness has been demonstrated for the disposal cell. The TSCA chemical waste landfill requirements generally follow the RCRA landfill design requirements. However, TSCA leachate and collection requirements specified in.

40 CFR 761.75 (b)(7) were not identified as applicable or relevant and appropriate because the RCRA minimum technology requirements for leachate collection are more stringent and are therefore ARARs for this remedy. Application of these more stringent requirements under RCRA results in a facility the meets or exceeds the protectiveness anticipated under TSCA. The language of the TSCA requirement does not provide a true performance standard that can be evaluated. For example, gravel and highly fractured rock can have a hydraulic conductivity of as low as 1×10^{-1} cm/second, compared to a conductivity of up to 1×10^{-7} cm/second for clay. For a continuous 50 ft layer, the range of time for permeation could be anywhere from 4.2 hours (gravel) to 482 years (clay). The engineered cell will use a multiple liner system that will incorporate flexible membranes (FMLs), geosynthetic clay liners (GCLs) and low permeability clay. The range of hydraulic conductivities for these materials range from $< 1 \times 10^{-7}$ cm/second for low permeability clay, 5×10^{-9} cm/second for GCLs; and between 1×10^{-11} and 1×10^{-13} cm/second for FMLs depending on the type of materials used. In addition to a leachate collection/detection system overlying a 3-ft thick clay foundation layer, 10-ft geologic buffer composed of clay will be used to isolate the disposal cell from the groundwater table. The liner system will be designed to meet a compliance period of 1000 years consistent with the regulatory time frames considered in DOE guidance for a composite analysis and in DOE Order 435.1. Also, performance modeling of the cell has been conducted for time frames beyond 1000 years for uncertainty/sensitivity analyses and to assess and demonstrate confidence in the disposal cell design.

Additionally, this TSCA requirement is commonly waived in the southeast because of high groundwater tables; EPA-Region 4 has waived this requirement in the past. Waste treatment prior to disposal in the cell is not included as part of this action. Waste generators at individual remediation sites will be responsible for treating wastes, if required, to meet WAC for the on-site disposal facility.

Chemical-Specific ARARs. Chemical-specific ARARs set health, or risk-based concentration limits, or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants. These requirements generally set protective cleanup levels for the chemicals of concern in the designated media or indicate a safe level of discharge that may be incorporated when considering a specific remedial activity. Because there is no particular OU or medium being remediated, there are no chemical-specific ARARs for cleanup levels for this action.

Chemical-specific ARARs limiting exposure to radioactivity will be met and are enumerated in Table 2.5. Compliance will be demonstrated using data from environmental monitoring to be described in the environmental monitoring plan, which is part of the RAWP a post-ROD primary document. Radiological exposures of individual members of the public are limited to an EDE of 100 mrem/year from all pathways and all sources exclusive of background radiation, medical administration, or voluntary participation in research programs [10 CFR 20.1301(a)]. The

overriding principle that all exposures of members of the public to radiation shall be as low as reasonably achievable (ALARA) will be met through the use of procedures and engineering controls [10 CFR20.1101(b)]. The release of radioactivity in effluents to the general environment must also be maintained at ALARA levels per Rules of the TDEC, Chap. 1200-2-11-.16(2). This performance standard specifies that concentrations of radioactive material which may be released to the general environment in groundwater, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.

Location-Specific ARARs. Location-specific requirements restrict the concentration of hazardous substances or the conduct of activities solely because they are in special locations (55 FR 8741, March 8, 1990). Location-specific ARARs for the East Bear Creek Valley Site are enumerated in Table 2.6. Additional location considerations (i.e., siting requirements) are addressed as action-specific requirements in the sections that follow.

Federal actions that involve potential impacts to, or take place within, wetlands or a floodplain must consider, avoid, and mitigate these impacts per 10 CFR 1022 for DOE actions, and per 40 CFR 230.10 for actions that involve the discharge of dredged or fill material into water of the U.S. Additionally, the TDEC Division of Water Pollution Control requires aquatic resource alteration permits (ARAPs) for alterations of waters of the state, including wetlands [TCA 69-3-108(b) and TDEC ARAP General Permit Program Requirements]. Typical actions that trigger these requirements include the impoundment, diversion, stream location, or other control or modifications of any body of water or wetland.

Wetland areas have been identified and delineated within the Bear Creek Valley and along Bear Creek tributaries within the Bear Creek floodplain (Rosensteel and Trettin 1993 and Rosensteel 1998). DOE plans to provide compensation for any unavoidable adverse impacts to these wetlands by enhancing and creating wetlands for this and other CERCLA response actions within the Bear Creek Valley watershed at a suitable mitigation site from the selected remedy site. The RAWP, including a mitigation plan, will be prepared and implemented as part of the design and construction phase of the wetlands mitigation project. Measures that will be implemented at the site for the selected remedy will include the use of BMPs, erosion and sedimentation controls, and site restoration. Portions of the East Bear Creek Valley Site are located within the 100- and 500-year floodplain. Because the conceptual disposal cell footprint is sited near and above the small tributary's headwaters, impacts to the associated floodplain are expected to be minimal. These will be addressed if construction which could impact the floodplain is actually a part of the facility's design.

The potential effects of water-related projects to fish and wildlife must be considered, minimized, and mitigated under the Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et

Table 2.5. Chemical-specific ARARs and TBC guidance for the ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Medium/action	Requirements	Citation
Releases of radionuclides into the environment	Exposure to individual members of the public from radiation shall not exceed a total EDE of 0.1 rem/year (100 mrem/year), exclusive of the dose contributions from background radiation, any medical administration the individual has received, or voluntary participation in medical/research programs – **relevant and appropriate**	10 CFR 20.1301(a)
	Shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve doses to members of the public that are ALARA – **relevant and appropriate**	10 CFR 20.1101(b)
	Concentrations of radioactive material which may be released to the general environment in groundwater, surface water, air, soil, plants or animals must not result in an annual dose exceeding an equivalent of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ. Reasonable effort shall be made to maintain releases of radioactivity in effluents to the general environment ALARA – **relevant and appropriate**	TDEC 1200-2-11-.16(2)

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = *Code of Federal Regulations*
EDE = effective dose equivalent
mrem = millirem
ORR = Oak Ridge Reservation
ROD = record of decision
TBC = to be considered
TDEC = Tennessee Department of Environment and Conservation

Table 2.6. Location-specific ARARs and TBC guidance for the ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Location characteristic(s)	Requirements	Prerequisite	Citation
	Floodplains/Wetlands		
Presence of floodplain as defined in 10 CFR 1022.4(i)	Avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains. Measures to mitigate adverse effects of actions in a floodplain include, but are not limited to: minimum grading requirements, runoff controls, design and construction constraints, and protection of ecology-sensitive are as provided in 10 CFR 1022.12(a)(3)	Federal actions that involve potential impacts to, or take place within, floodplains – **applicable**	10 CFR 1022.3(a)
	Potential effects of any action taken in a floodplain shall be evacuated. Identify, evaluate, and implement alternative actions that may avoid or mitigate adverse impacts on floodplains		10 CFR 1022.3(c) and (d)
	Design or modify selected alternatives to minimize harm to or within floodplains and restore and preserve floodplain values		10 CFR 1022.5(b)
Presence of wetlands as defined in 10 CFR 1022.4(v)	Avoid, to the extent possible, the long- and short-term adverse effects associated with destruction, occupancy and modification of wetlands. Measures to mitigate adverse effects of actions in a wetland include, but are not limited to: minimum grading requirements, runoff controls, design and construction constraints, and protection of ecology-sensitive areas as provided in 10 CFR 1022.12(a)(3)	Federal actions that involve potential impacts to, or take place within, wetlands– **applicable**	10 CFR 1022.3(a)
	Take action, to extent practicable, to minimize destruction, loss or degradation of wetlands, and to preserve, restore, and enhance the natural and beneficial values of wetlands		10 CFR 1022.3(b)
	Potential effects of any new construction in wetlands that are not in a floodplain shall be evaluated. Identify, evaluate, and, as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on wetlands		10 CFR 1022.3(c) *and* (d)

Table 2.6. (continued)

Location characteristic(s)	Requirements	Perquisite	Citation
	Aquatic resources		
Within an area potentially impacting "waters of the State" as defined in TCA 69-3-103(33)	Must comply with the substantive requirements of the ARAP for erosion and sediment control to prevent pollution	Action potentially altering the properties of any "waters of the State"–**applicable**	TCA 69-3-108 (b)(1)(j)
	Erosion and sediment control requirements include, but are not limited to: • Limit clearing, grubbing, and other disturbances in areas in or immediately adjacent to waters of the State to the minimum necessary to accomplish the proposed activity • Unnecessary vegetation removal is prohibited and all disturbed areas must be properly stabilized and revegetated as soon as practicable • Limited excavation, dredging, bank reshaping, or grading to the minimum necessary to install authorized structures, accommodate stabilization, or prepare banks for revegetation • Maintain the erosion and sedimentation control measures throughout the construction period • Upon achievement of final grade, stabilize and revegetate, within 30 days, all disturbed areas by sodding, seeding, or mulching, or using appropriate native riparian species	Action potentially altering the properties of any "waters of the State"–**TBC**	TDEC Aquatic Resource Alteration General Permit Program Requirements
Within area impacting stream or any other body of water -*and*- presence of wildlife resources (e.g., fish)	The effects of water-related projects on fish and wildlife resources and their habitat should be considered with a view to the conservation of fish and wildlife resources by preventing loss of and damage to such resources	Action that impounds, modifies, diverts, or controls waters, including navigation and drainage activities– **relevant and appropriate**	Fish and Wildlife Coordination Act (16 *USC* 661 *et seq.*)

Table 2.6. (Continued)

Location characteristic(s)	Requirements	Perquisite	Citation
Location encompassing aquatic ecosystem as defined in 40 CFR 230.3(c)	Except as provided under Section 404(b)2 of the CWA, no discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact	Action that involves the discharge of dredged or fill material into "waters of the U.S.", including jurisdictional wetlands – **applicable**	40 CFR 230.10(a)
	No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps per 40 CFR 230.70 *et seq*.have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem		40 CFR 230.10(d)
	Cultural resources		
Presence of archaeological resources	May not excavate, remove, damage, or otherwise alter or deface such resource unless by permit or exception	Action that would impact archaeologic resources on public land–**applicable**	43 CFR 7.4(a)
	Must protect any such archaeological resources if discovered	Excavation activities that inadvertently discover archaeologic resources – **applicable**	43 CFR 7.5(b)(1)
Presence of human remains, funerary objects, sacred objects, or objects of cultural patrimony for Native Americans	Must stop activities in the area of discovery and make a reasonable effort to secure and protect the objects discovered	Excavation activities that inadvertently discover such resources on federal lands or under federal control– **applicable**	43 CFR 10.4(c)
	Must consult with Indian tribe likely to be affiliated with the objects to determine further disposition per 40 CFR 10.5(b)		43 CFR 10.4(d)
	Endangered, threatened or rare species		
Presence of Tennessee nongame species (Tennessee dace) as defined in TCA 70-8-103	May not take (i.e., harass, hunt, capture, kill or attempt to kill), possess, transport, export, or process wildlife species	Action impacting Tennessee nongame species, including wildlife species which are "in need of management" (as listed in TWRCP 94-16 and 94-17)–**applicable**	TCA 70-8-104(c)
	May not knowingly destroy the habitat of such wildlife species		TWRCP 94-16(II)(1)(a) and TWRCP 94-17(II)

Table 2.6. (continued)

Location characteristic(s)	Requirements	Perquisite	Citation
	Upon good cause shown and where necessary to protect human health or safety, endangered or threatened species may be removed, capture, or destroyed		TCA 70-8-106(e) TWRCP 94-16(II)(1)(c)
Presence of Tennessee-listed endangered or rare plant species as listed in TDEC 0400-6-2-.04	May not knowingly uproot, dig, take, remove, damage or destroy, possess or otherwise disturb for any purposes any endangered species	Action impacting rare plant species including but not limited to federally listed endangered species– **relevant and appropriate**	TCA 70-8-309

ARARs = applicable or relevant and appropriate requirements
ARAP = Aquatic Resource Alteration Permit
CERCLA = Comprehensive Environmental Response, Compensation, and Liability act of 1980
CFR = *Code of Federal Regulations*
ORR = Oak Ridge Reservation
ROD = record of decision
TBC = to be considered
TCA = *Tennessee Code Annotated*
TDEC = Tennessee Department of Environment and Conservation
TWRCP = Tennessee Wildlife Resources Commission Proclamation
USC = *United States Code*

Table 2.7. Action-specific ARARs and TBC guidance for the ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Action	Requirements	Prerequisite	Citation
	Site preparation, construction and excavation activities		
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne. Reasonable precautions shall include, but are not limited to the following:	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)–**applicable**	TDEC 1200-3-8-.01(1)
	• Use, where possible, of water or chemicals for control of dust in demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land;		TDEC 1200-3-8-.01 (1)(a)
	• Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts;		TDEC 1200-3-8-.01(1)(b)
	Shall not cause or allow fugitive dust to be emitted in such a manner to exceed 5 minute/hour or 20 minute/day beyond property boundary lines on which emission originates		TDEC 1200-3-8-.01(2)
Activities causing radionuclide emissions	Exposures to the public from all radiation sources released into atmosphere from DOE facility shall not cause EDE > 10 mrem (0. 1 mSv) per year	Radionuclide emissions from point sources at a DOE facilities– **applicable**	40 CFR 61.92 TDEC 1200-3-11-.08(3)
Activities causing stormwater runoff	Implement good construction management techniques, sediment and erosion, structural, and vegetative controls to ensure stormwater discharge:	Stormwater discharges associated with construction activities at industrial sites-disturbance of $ 5 acres	40 CFR 122 TDEC 1200-4-10-.05(6)
	• does not contain distinctly visible floating scum, oil, or other matter;	total–**applicable**; < 5 acres– relevant and appropriate	TDEC 1200-4-10-.05(6)(n)
	• does not cause an objectionable color contrast in the receiving stream;		TDEC 1200-4-10-.05(6)(o)
	• results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream		TDEC 1200-4-10-.05(6)(p)

Table 2.7 (continued)

Action	Requirements	Prerequisite	Citation
	The following conditions apply to all land disturbance work:		
	• clearing and grubbing must be held to the minimum necessary for grading and equipment operation;		TDEC 1200-4-10-.05(6)(a)
	• construction must be sequenced to minimize the exposure time of cleared surface area;		TDEC 12004-10-.05(6)(b)
	• construction must be staged or phased for large projects, areas of one phase must be stabilized before another can be initiated; stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rainfall impacts and runoff;		TDEC 12004-10-.05(6)(c)
	• erosion and sediment control measures must be in place and functional before earth moving operations begin, and must be constructed and maintained throughout the construction period;		TDEC 1200-4-10-.05(6)(d)
	• all control measures shall be checked, and repaired as necessary, weekly in dry periods and within 24 hr after any rainfall of 0.5 inches with a 24-hr period, during prolonged rainfall, daily checking and repairing is necessary;		TDEC 12004-10-.05(6)(e)
	• pre-construction vegetative ground cover shall not be destroyed, removed, or disturbed more than 20 calendar days prior to grading or earth moving;		TDEC 12004-10-.05(6)(g)
	• appropriate cover (e.g. grass, sod, straw, mulch, fabric mats) shall be applied within seven days on areas that will remain unfinished for more than 30 calendar days;		TDEC 12004-10-.05(6)(h)
	• permanent soil stabilization with perennial vegetation shall be applied as soon as practicable after final grading;		TDEC 1200-4-10-.05(6)(i)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	• all surface water flowing toward the construction area shall be diverted by using berms, channels, or sediment traps, as necessary;		TDEC 1200-4-10-.05(6)(j)
	• erosion and sediment control measures shall be designed according to the size and slope of disturbed or drainage areas, to detain runoff and trap sediment;		TDEC 1200-4-10-.05(6)(k)
	• discharges from sediment basins and traps must be through a pipe or lined channel so that the discharge does not cause erosion; and		TDEC 1200-4-10-.05(6)(l)
	• muddy water to be pumped from excavation and work areas must be held in settling basins or treated by filtration prior to its discharge into surface waters and water must be discharged through a pipe or lined channel so that the discharge does not cause erosion and sedimentation		TDEC 1200-4-10-.05(6)(m)
	Shall develop and implement stormwater management controls to minimize the discharge of pollutants and to ensure the discharge:	Stormwater discharges associated with industrial activity from a landfill **- applicable**	TDEC 1200-4-10-.04(5)(b)
	• does not contain distinctly visible floating scum, oil, or other matter;		TDEC 12004-10-.04(8)(a)
	• results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream; and		TDEC 1200-4-10-.04(8)(b)
	• does not cause an objectionable color contrast in the receiving stream.		TDEC 1200-4-10-.04(8)(d)
	Shall develop and maintain a stormwater pollution prevention/control plan which includes a description of potential pollutant sources and paths to outfalls and otherwise contains information required under this section.		TDEC 1200-4-10-.04(5)(a)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Shall monitor at least semi-annually the identified stormwater outfalls for the parameters specified in 1200-4-10-.04(7)(b)(1) and (2)(iv)		TDEC 12004-10-.04(7)(a)
	Shall address runoff in a monitoring plan as required in 1200-4-10-.04(5)(i), indicating sampling locations, parameters and monitoring procedures		TDEC 1200-4-10 .04(7)(b)(2)(iv)
	Waste generation/management		
Characterization of solid waste (e.g., contaminated PPE, equipment, wastewater)	Must determine if that waste is hazardous waste or if waste is excluded under 40 CFR 261.4; and	Generation of solid waste as defined in 40 CFR 261.2– **applicable**	40 CFR 262.11(a) TDEC 1200-1-11 .03(l)(b)(l)
	Must determine if waste is listed under 40 CFR Part 261; or		40 CFR 262.11(b) TDEC 1200-1-11- .03(1)(b)(2)
	Must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used. If waste is determined to be hazardous, it must be managed in accordance with pertinent provisions of 40 CFR 261-268		40 CFR 262.11(c) and (d)TDEC 1200-1-11- .03(l)(b)(3)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis of a representative sample of the waste(s) which at a minimum contains all the information which must be known to treat, store, or dispose of the waste in accordance with 40 CFR applicable 264 and 268	Generation of RCRA hazardous waste for storage, treatment or disposal– **applicable**	40 CFR 264.13(a)(1) TDEC 1200-1-11-.06(2)(d)
	Must determine if the waste is restricted from land disposal under 40 CFR 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste		40 CFR 268.7 TDEC 1200-1-11-.10(1)(g)
Characterization of LLW (e.g., contaminated PPE, equipment, wastewater)	Shall be characterized using direct or indirect methods and the characterization documented in sufficient detail to ensure safe management and compliance with the WAC of the receiving facility	Generation of LLW for storage or disposal at a DOE facility–**TBC**	DOE M 435.1-1 (IV)(I)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Characterization data shall, at a minimum, include the following information relevant to the management of the waste:		DOE M 435. I-I (IV)(1)(2)
	• physical and chemical characteristics;		DOE M 435. 1-1 (IV)(I)(2)(a)
	• volume, including the waste and any stabilization or absorbent media;		DOE M 43 5. 1-1 (IV)(1)(2)(b)
	• weight of the container and contents;		DOE M 435.1-1 (IV)(I)(2)(c)
	• identities, activities, and concentrations of major radionuclides;		DOE M 435. 1-1 (IV)(I)(2)(d)
	• characterization date;		DOE M 435. 1-1 (IV)(I)(2)(e)
	• generating source; and		DOE M 435. 1-1 (IV)(I)(2)(f)
	• any other information which may be needed to prepare and maintain the disposal facility performance assessment, or demonstrate compliance with performance objectives		DOE M 435. 1-1 (IV)(I)(2)(g)
Management of PCB waste (e.g., contaminated PPE, equipment wastewater)	Any person storing or disposing of PCB waste must do so in accordance with 40 CFR 761, Subpart D	Generation of waste containing PCBs at concentrations $50 ppm–**applicable**	40 CFR 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found	Generation of PCB remediation waste as defined in 40 CFR 761.3–**applicable**	40 CFR 761.61

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Storage		
Temporary storage of hazardous waste in containers (e.g., PPE, rags, etc.)	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10– **applicable**	40 CFR 262.34(a) TDEC 1200-1-11-.03(4)(e)
	• waste is placed in containers that comply with 40 CFR 265.171-173 (Subpart 1); and • container is marked with the words "hazardous waste" or; • container may be marked with other words that identify the contents	Accumulation of 55 gal or less the contents of RCRA hazardous waste at or near any point of generation–**applicable**	40 CFR 262.34(c)(1) TDEC 1200-1-11 -.03(4)(e)(5)
Use and management of hazardous waste in containers	If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition	Storage of RCRA hazardous waste in containers–**applicable**	40 CFR 264.171 TDEC 1200-1-11-.05(9)(b)
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired;		40 CFR 264.172 TDEC 1200-1-11-.05(9)(c)
	Keep containers closed during storage, except to add/remove waste;		40 CFR 264.173(a) TDEC 1200 -1-11-.05(9)(d)(1)
	Open, handle and store containers in a manner that will not cause containers to rupture or leak		40 CFR 264.173(b) TDEC 1200-1-11-.05(9)(d)(2)
Design and operation of a RCRA container storage area	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or containers must be elevated or otherwise protected from contact with accumulated liquid	Storage of RCRA hazardous waste in containers that do not contain free liquids– **applicable**	40 CFR 264.175(c) TDEC 1200-1-11-.06(9)(f)(3)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Area must have a containment system designed and operated as follows:	Storage of RCRA hazardous waste with free liquids or F020, F02l, F022, F023, F026 and F027 in containers–**applicable**	40 CFR 264.175(a); TDEC 1200-1-11-.06(9)(f)
	• a base must underly the containers which is free of cracks or gaps and is sufficiently impervious to contain leaks, spills and accumulated precipitation until the collected material is detected and removed;		40 CFR 264.175(b)(1) TDEC 1200-1-11-.06(9)(f)(2)(i)
	• base must be sloped or the containment system must be otherwise designed and operated to drain and remove liquids resulting from leaks spills or precipitation, unless the containers are elevated or are otherwise protected form contact with accumulated liquids;		40 CFR 264.175(b)(2) TDEC 1200-1-11-.06(9)(f)(2)(ii)
	• must have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater;		40 CFR 264.175(b)(3) TDEC 1200-1-11-.06(9)(f)(2)(iii)
	• run-on into the system must be prevented unless the collection system has sufficient capacity to contain along with volume required for containers; and		40 CFR 264.175(b)(4) TDEC 1200-1-11-.06(9)(f)(2)(iv)
	• spilled or leaked waste and accumulated precipitation must be removed from the sump or collection area in a timely manner as or necessary to prevent overflow		40 CFR 264.175(b)(5) TDEC 1200-1-11.06(9)(f)(2)(v)
Temporary storage of LLW	Ensure that radioactive waste is stored in a manner that protects the public, workers, and the environment and that the integrity of waste storage is maintained for the expected time of storage	Management of LLW at a DOE facility–**TBC**	DOE M 435.1-1 (IV)(N)(1)
	Shall not be readily capable of detonation, explosive decomposition, reaction at anticipated pressures and temperatures, or explosive reaction with water		DOE M 435.1-1 (IV)(N)(1)
	Shall be stored in a location and manner that protects the integrity of waste for the expected time of storage		DOE M 435.1-1 (IV)(N)(3)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Shall be managed to identify and segregate LLW from mixed waste		DOE M 435.1-1 (IV)(N)(6)
Packaging of LLW (e.g., PPE, rags)	Shall be packaged in a manner that provides containment and protection for the duration of the anticipated storage period and until disposal is achieved or until the waste has been removed from the container	Storage of LLW in containers at a DOE facility–**TBC**	DOE M 435.1-1 (IV)(L)(1)(a)
	Vents or other measures shall be provided if the potential exists for pressurizing or generating flammable or explosive concentrations of gases within the waste container		DOE M 435.1-1 (IV)(L)(1)(b)
	Containers shall be marked such that their contents can be identified		DOE M 435.1-1 (IV)(L)(1)(c)
Temporary storage of PCB waste (e.g., PPE, rags) in a container(s)	Container(s) shall be marked as illustrated in 40 CFR 761.45(a)	Storage of PCBs and PCB Items at concentrations $ 50 ppm for disposal–**applicable**	40 CFR 761.40(a)(1)
	Storage area must be properly marked as required by 40 CFR 761.40(a)(10)		40 CFR 761.65(c)(3)
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked non-leaking container(s)		40 CFR 761.65(c)(5)
	Container(s) shall be in accordance with requirements set forth in DOT HMR at 49 CFR 171-180		40 CFR 761.65(c)(6)
Storage of PCB waste and/or PCB/radioactive waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 CFR 761.65(b)(1) provided unit:	Storage of PCBs and PCB items designated for disposal–**applicable**	40 CFR 761.65(b)(2)
	• is permitted by EPA under RCRA '3004, or		40 CFR 761.65(b)(2)(i)
	• qualifies for interim status under RCRA '3005; or		40 CFR 761.65(b)(2)(ii)
	• is permitted by an authorized state under RCRA '3006 and,		40 CFR 761.65(b)(2)(iii)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	• PCB spills cleaned up in accordance with subpart G of 40 CFR 761		40 CFR 761.65(c)(1)(iv)
Storage of PCB/radioactive waste in containers	For liquid wastes, containers must be nonleaking	Storage of PCB/radioactive waste in containers other than those meeting DOT HMR performance standards–**applicable**	40 CFR 761.65(c)(6)(i)(A)
	For nonliquid wastes, containers must be designed to prevent buildup of liquids if such containers are stored in an area meeting the containment requirements of 40 CFR 761.65(b)(1)(ii); and		40 CFR 761.65(c)(6)(i)(B)
	For both liquid and nonliquid wastes containers must meet all regulations and requirements pertaining to nuclear criticality safety		40 CFR 761.65(c)(6)(i)(C)
	Treatment/Disposal		
Treatment of LLW	Treatment to provide more stable waste forms and to improve the long-term performance of a LLW disposal facility shall be implemented as necessary to meet the performance objectives of the disposal facility	Generation for disposal of LLW at a DOE facility–**TBC**	DOE M 435.1-1(IV)(O)
Disposal of LLW at an off-site disposal facility or in the EMWMF	LLW shall be certified as meeting waste acceptance requirements before it is transferred to the receiving facility	Generation for disposal of LLW-TBC	DOE M 435.1-1(IV)(J)(2)
Disposal of RCRA/TSCA waste at an off-site commercial facility	Meet authorized limits established in accordance with basic dose limits and consistent with guidelines contained in DOE-EH guidance prior to release	Release of hazardous wastes potentially containing residual radioactive material throughout the volume-**TBC**	DOE Order 5400.5(II)(5)(c)(6) and 5400.5(IV)(5)(a)
	Authorized limits shall be consistent with limits and guidelines established by other applicable Federal and State laws		
Disposal of bulk PCB remediation waste	Shall be disposed of: • in a hazardous waste landfill permitted by EPA under '3004 of RCRA,	Bulk PCB remediation waste (as defined in 40 CFR 761.3) which has been de-watered and with a PCB concentration $50 ppm–**applicable**	40 CFR 761.61(a)(5)(i)(B)(2)(iii)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	• in a hazardous waste landfill permitted by a State authorized under '3006 of RCRA, or • in a PCB disposal facility approved under 40 CFR 761.60		
Performance-based disposal of PCB remediation waste	May dispose by one of the following methods:	Disposal of nonliquid PCB remediation waste–**applicable**	40 CFR 761.61(b)(2)
	• in a high-temperature incinerator approved under Section 761.70(b), • by an alternate disposal method approved under Section 761.60(e), • in a chemical waste landfill approved under Section 761.75,		40 CFR 761.61(b)(2)(i)
	• in a facility with a coordinated approval issued under Section 761.77, or • through decontamination in accordance with Section 761.79		40 CFR 761.61(b)(2)(ii)
Disposal of PCB cleanup wastes (PPE, rags, non-liquid cleaning materials)	Shall be disposed of either: • in a facility permitted, licensed or registered by a State to manage municipal solid waste under 40 CFR 258 or nonmunicipal, nonhazardous waste subject to 40 CFR 257.5 thru 257.30; or • in a RCRA Subtitle C landfill permitted by a State to accept PCB waste, or • in an approved PCB disposal facility, or • through decontamination under 40 CFR 761.79(b) or (c)	Generation of nonliquid PCBs at any concentration during and from the cleanup of PCB remediation waste–**applicable**	40 CFR 761.6 1 (a)(5)(v)(A)
Disposal of PCB cleaning solvents abrasives, and equipment	May be reused after decontamination in accordance with 761.79	Generation of PCB wastes from the cleanup of PCB remediation waste–**applicable**	40 CFR 761.6 1 (a)(5)(v)(B)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
Performance-based disposal of PCB bulk product waste	May dispose of by one of the following: • in an incinerator approved under Section 761.70;	Disposal of PCB bulk product waste as defined in 40 CFR 761.3–**applicable**	40 CFR 761.62(a) 40 CFR 761.62(a)(1)
	• in a chemical waste landfill approved under Section 761.75;		40 CFR 761.62(a)(2)
	• in a hazardous waste landfill permitted by EPA under 3004 of RCRA or by authorized state under 3006 of RCRA;		40 CFR 761.62(a)(3)
	• under alternate disposal approved under section 761.60(e);		40 CFR 761.62(a)(4)
	• in accordance with decontamination provisions of 761.79;		40 CFR 761.62(a)(5)
	• in accordance with thermal decontamination provisions of 761.79(e)(6) for metal surfaces in contact with PCBs		40 CFR 761.62(a)(6)
Disposal of RCRA hazardous waste in a land-based unit	RCRA-restricted waste May be land disposed only if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal	Land disposal, as defined in 40 CFR 268.2, of RCRA restricted waste–**applicable**	40 CFR 268.40 TDEC 1200-1-11.10(3)(a)
	Prior to land disposal, soil contaminated with hazardous waste may treated according to meet the alternative treatment standards of 40 CFR 268.49(c)		40 CFR 268.49(b)
Disposal requirements for particular RCRA waste forms and types	Must not be placed in a landfill unless the waste and the landfill meet applicable provisions of 40 CFR Part 268; and • the resulting waste, mixture or dissolution of material no longer is reactive or ignitable; and • 40 CFR 264.17(b) is complied with (see below)	Disposal of ignitable or reactive RCRA waste– **applicable**	40 CFR 264.312(a) TDEC 1200-1-11-.06(14)(m)(1)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	May be landfilled without meeting 40 CFR 264.312(a), provided wastes are disposed of in such a way that they are protected from any materials or conditions which may cause them to ignite; Must be disposed of in non-leading containers which are carefully handled and placed so as to avoid heat, sparks, rupture, or any other condition that might cause ignition of the wastes; Must be covered daily with soil or other non- combustionable material to minimize the potential of ignition; Must not be disposed of in cells that contain or will contain other wastes which may generate heat sufficient to cause ignition of the waste; and	Disposal of ignitable or reactive RCRA waste [except for prohibited wastes which remain subject to treatment standards in 40 CFR 268.40 *et seq*.]–**applicable**	40 CFR 264.312(b) TDEC 1200-1-11-.06(14)(m)(2)
	Must not be placed into a cell unless 40 CFR 264.17(b) is compiled with (see below)	Disposal of incompatible wastes in a RCRA landfill–**applicable**	40 CFR 264.313 TDEC 1200-1-11-.06(14)(n)
Treatment and Disposal of ignitable, reactive, or incompatible RCRA wastes	Must take precautions to prevent reactions which: • generate extreme heat, pressure, fire or explosion, or produce uncontrolled fumes or gases which pose a risk of fire or explosion; • produce uncontrolled toxic fumes or gases which threaten human health or the environment; • damage the structural integrity of the device or facility	Operation of a RCRA facility that treats, stores, or disposes of ignitable, reactive, or incompatible wastes–**applicable**	40 CFR 264.17(b) TDEC 1200-1-11-.06(2)(h)(2)
Disposal of bulk or noncontainerized liquids in a RCRA landfill	May not dispose of bulk or noncontainerized liquid hazardous waste or hazardous waste containing free liquids in any landfill	Placement of bulk or noncontainerized RCRA hazardous waste–**applicable**	40 CFR 264.314(b) TDEC 1200-1-11-.06(14)(o)(4)
Disposal of containers in RCRA landfill	May not place containers holding free liquid in a landfill unless the liquid is mixed with an absorbent, solidified, removed, or otherwise eliminated	Placement of containers containing RCRA hazardous waste in a landfill–**applicable**	40 CFR 264.314(d) TDEC 1200-1-11-.06(14)(o)(4)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Sorbents used to treat free liquids to be disposed of in landfills must be nonbiodegradable as described in 264.315(e)(1)		40 CFR 264.314(e) TDEC 1200-1-11-.06(14)(o)(5)
	Unless they are very small, containers must be either at least 90% full when placed in the landfill, or crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial in the landfill		40 CFR 264.315 TDEC 1200-1-11.06(14)(p)
Decontamination/disposal of equipment	During the partial and final closure periods all equipment, structures, etc. must be properly disposed of or decontaminated unless otherwise specified	Closure of RCRA landfill–**applicable**	40 CFR 264.114 TDEC 1200-1-11-.06(7)(e)
Treatment of uranium and thorium bearing LLW	Such wastes shall be properly conditioned so that the generation and escape of biogenic gases will not cause exceedance of Rn-222 emission limits of DOE Order 5400.5(IV(6)(d)(1)(b) and will not result in premature structure failure of the facility	Placement of potentially biodegradable contaminated wastes in a long-term management facility–**TBC**	DOE Order 5400.5(IV)(6)(d)(1)(c)
Disposal of TSCA PCB wastes	PCBs and PCB items shall be placed in a manner that will prevent damage to containers or articles	Disposal of PCBs or PCB Items in chemical waste landfill–**applicable**	40 CFR 761.75(b)(8)(i)
	Other wastes that are not compatible with PCBs shall be segregated from the PCBs throughout the handling and disposal process		
	Bulk liquids not exceeding 500 ppm PCBs may be disposed or provided such waste is pretreated and/or stabilized (e.g., chemically fixed, evaporated, mixed with dry inert absorbent) to reduce its liquid content or increase its solid content so that a nonflowing consistency is achieved to eliminate the presence of free liquids prior to final disposal		
	May be disposed of if container is surrounded by an amount of inert sorbent material capable of absorbing all of the liquid contents of the container	Disposal of PCB container with liquid PCB between 50 ppm and 500 ppm–**applicable**	40 CFR 761.75(b)(8)(ii)
Packaging of LLW for disposal (e.g., PPE, sludges)	Must not be packaged for disposal in cardboard or fiberboard boxes	General of LLW for disposal at a LLQ disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(1)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Must be solidified or packaged in sufficient absorbent material to absorb twice the volume of liquid	Generation of liquid LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(2)
	Shall contain as little free standing and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume	Generation of solid LLW containing liquid for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(3)
	Must not be capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures or of explosive reaction with water	Generation of LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(4)
	Must not contain, or be capable of generating, quantities of toxic gases, vapor, or fumes	Generation of LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(5)
	Must not be pyrophoric	Generation of LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(a)(6)
	Must have structural stability either by processing the waste or placing the waste in a container or structure that provides stability after disposal	Generation of LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(b)(1)
	Must be converted into a form that contains as little free standing and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1 percent of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5% of the volume of the waste for waste processed to a stable form	Generation of liquid LLW or LLW containing liquids for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(b)(2)
	Void spaces within the waste and between the waste and its package must be reduced to the extent practicable	Generation of LLW for disposal at a LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(7)(b)(3)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	General facility requirements		
Security System	Must prevent the unknowing entry and minimize the possibility for unauthorized entry of persons or livestock onto active portion of the facility or comply with provisions of 40 CFR 264.14(5)(b) and (c)	Operation of a RCRA landfill –**applicable**	40 CFR 264.14 TDEC 1200-1-11.06(2)(e)
	Unless a natural barrier adequately deters access by the general public, either warning signs and fencings must be installed and maintained or requirements of 40 CFR 61.154(c)(1) and (2) must be met	Operation of an active waste disposal site that receives asbestos-containing material from a source covered under 40 CFR 61.145–**applicable**	40 CFR 61.154(b)
	Warning signs must be displayed at all entrances and at intervals of 330 ft or less along the property line of the site		40 CFR 61.154(b)(1)
	The warning signs must:		
	• be posted in a manner and location that a person can easily ready the legend;		40 CFR 61.154(b)(1)(i)
	• conform to the requirements of (20 in. x 14 in.) upright format signs in 29 CFR 1901.145(d)(4); and		40 CFR 61.154(b)(1)(ii)
	• display the legend in the lower panel with letter sizes and styles • of a visibility at least equal to those specified in this paragraph		40 CFR 61.154(b)(1)(iii)
	The perimeter of the disposal site must be fenced in a manner adequate to deter access by the general public		40 CFR 61.154(b)(2)
	A 6-ft woven mesh fence, wall or similar device shall be placed around the site to prevent unauthorized access	Construction of a TSCA chemical waste landfill– **applicable**	40 CFR 761.75(b)(9)(i)
	Roads shall be maintained to and within the site which are adequate to support the operation and maintenance of the site without causing safety or nuisance problems or hazardous conditions		40 CFR 761.75(b)(9)(ii)
	Site shall be operated and maintained to prevent hazardous conditions resulting from spilled liquids and windblown materials		40 CFR 761.75(b)(9)(iii)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
General Inspections	Must inspect facility for malfunctions and deterioration, operator errors, and discharges, often enough to identify and correct any problems	Operation of a RCRA landfill–**applicable**	40 CFR 264.15(a) TDEC 1200-1-11-.06(2)(f)(1)
	Must remedy any deterioration or malfunction of equipment or structures on a schedule that ensures that the problem does not lead to an environmental or human health hazard	Operation of a RCRA landfill–**applicable**	40 CFR 264.15(c) TDEC 1200-1-11-.06(2)(f)(3)
Personnel training	Must ensure personnel adequately trained in hazardous waste, emergency response, monitoring equipment maintenance, alarm systems procedures, etc	Operation of a RCRA landfill –**applicable**	40 CFR 264.16 TDEC 1200-1-11-.06(2)(g)
Construction quality assurance program	Must develop and implement a Construction Quality Assurance Program to ensure that the unit meets or exceeds all design criteria and specifications for all physical components including: foundations, dikes, liners, geomembranes, leachate collection and removal systems, leak detection systems and final covers in accordance with remaining provisions of 40 CFR 264.19	Operation of a RCRA landfill –**applicable**	40 CFR 264.19 TDEC 1200-1-11-.06(2)(j)
Contingency plan	Must have contingency plan, designed to minimize hazards to human health and the environment from fires, explosions or other unplanned sudden releases of hazardous waste to air, soil, or surface water in accordance with 40 CFR 264.52	Operation of a RCRA landfill –**applicable**	40 CFR 264.51 TDEC 1200-1-11-.06(4)(b)
	Must be at least one emergency coordinator on the facility premises responsible for coordinating emergency response measures in accordance with 40 CFR 264.56	Operation of a RCRA landfill –**applicable**	40 CFR 264.55 TDEC 1200-1-11-.06(4)(f)
Preparedness and prevention	Facilities must be designed, constructed, maintained, and operated to prevent any unplanned release of hazardous waste or hazardous waste constituents into the environment and minimize the possibility of fire or explosion. All facilities must be equipped with communication and fire suppression equipment and undertake additional measures as specified in 40 CFR 264.30 et seq	Operation of a RCRA hazardous waste facility–**applicable**	40 CFR 264.30-264.37; TDEC 1200-1-11-.06(3)
Inventory requirements	The location, dimensions, contents, and location of each cell must be recorded in reference to permanently surveyed benchmarks	Operation of a RCRA landfill –**applicable**	40 CFR 264.309 TDEC 1200-1-11-.06(14)(j)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Maintain, until closure, records of the location, depth and area, and quantity in cubic yards of asbestos containing material within the disposal site on a map or diagram	Operation of an active waste disposal site that receives asbestos-containing material from a source covered under 40 CFR 61.145–**applicable**	40 CFR 61.154(f)
	Disposal records shall include information on the PCB concentration in the liquid wastes and the three dimensional burial coordinates for PCBs and PCB items	Operation of a TSCA chemical waste landfill–**applicable**	40 CFR 761.75(b)(8)(iv)
	The boundaries and locations of each disposal unit must be accurately located and mapped by means of a land survey.	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11-.17(3)(g)
Surface water monitoring	The groundwater and surface water from the disposal site area must be sampled prior to commencing operation for use as baseline data	Construction of TSCA chemical waste landfill–**applicable**	40 CFR 761.65(b)(6)(i)(A)
	Disposal Site Suitability Requirements		
Siting of a RCRA landfill	A facility located in a 100 year floodplain [as defined in 40 CFR 264.18(b)(2)] must be designed, constructed, operated and maintained to prevent washout of any hazardous waste, unless can demonstrated that procedures are in effect which will cause the waste to be removed safely, before flood waters can reach the facility	Construction of a RCRA hazardous waste landfill–**applicable**	40 CFR 264.18(b)(1) TDEC 1200-1-11-.06(2)(i)
Siting of a TSCA landfill	The landfill must be located above the historical high groundwater table. The bottom of the landfill liner shall be at least 50 ft above the historical high water table	Construction of a TSCA chemical waste landfill–**applicable**	40 CFR 761.75(b)(3)
	There shall be no hydraulic connection between the site and standing or flowing surface water		
	Flood plains, shorelands and groundwater recharge areas shall be avoided		
	Shall provide diversion structures capable of diverting all surface water runoff from a 24-hour, 25-year storm	Construction of a TSCA chemical waste landfill (above the 100-year floodwater elevation)–**applicable**	40 CFR 761.75(b)(4)(ii)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	The landfill site shall be located in an area of low to moderate relief to minimize erosion and to help prevent landslides or slumping	Construction of a TSCA chemical waste landfill– **applicable**	40 CFR 761.75(b)(5)
Site of a LLW disposal facility	Disposal site shall be capable of being characterized, modeled, analyzed, and monitored	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(b)
	Areas must be avoided having known natural resources which, if exploited, would result in failure of the cell to meet performance objectives	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(d)
	Disposal site must be generally well drained and free of areas of flooding and frequent ponding	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(e)
	Waste disposal shall not take place in a 100-year floodplain or wetland		
	Upstream drainage areas must be minimized to decrease the amount of runoff which could erode or inundate the disposal unit	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(f)
	The disposal site must provide sufficient depth to the water table that ground water intrusion, perennial or otherwise, into the waste will not occur	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11.17(1)(g)
	If it can be conclusively shown that disposal site characteristics will result in molecular diffusion being the predominant means of radionuclide movement and the rate of movement will result in the performance objectives of Rules of the TDEC 1200-2-11-.16 being met, wastes may disposed below the water table. In no case will waste disposal be permitted in the zone of fluctuation of the water table		
	The hydrogeologic unit used for disposal shall not discharge ground water to the surface within the disposal site	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11.17(1)(h)
	Areas must be avoided where tectonic processes such as faulting, folding, seismic activity may occur with such frequency to affect the ability of the site to meet the performance objectives	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11.17(1)(i)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	Areas must be avoided where surface geologic processes such as mass wasting, erosion, slumping, landsliding or weathering may occur with such frequency and extent to affect the ability of the disposal site to meet performance objectives or preclude defensible modeling and prediction of long-term impacts	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(j)
	The disposal site must not be located where nearby activities or facilities could impact the site's ability to meet performance objectives or mask environmental monitoring	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(1)(k)
	A preoperational monitoring program must be conducted to provide basic environmental data on the disposal site characteristics	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11.17(4)(a)
Design, construction, and operation of a mixed (RCRA hazardous, TSCA chemical and low-level) waste landfill			
Liner and leachate collection design for a RCRA landfill	Must install two or more liners and a leachate collection and removal system above and between such liners	Construction of a RCRA landfill–**applicable**	40 CFR 264.301(c) TDEC 1200-1-11-.016(14)(b)(3)(i)(I)
	The liner system must include: • a top-liner, designed and constructed of materials (e.g., geomembrane) to prevent the migration of hazardous constituents into the liner during active life and the postclosure period; and		40 CFR 264.301(c)(1)(i); TDEC 1200-1-11-.016(14)(b)(3)(i)(I)I
	• a composite bottom liner consisting of at least two components: - upper component must be designed and constructed of materials to prevent migration of hazardous constituents into this component during the active life and postclosure period; and - lower component designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur; - constructed of at least 3 ft of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/second		TDEC 1200-1-11-.06(14)(3)(i)(I)II

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• liners must comply with paragraphs (a)(1)(i), (ii), and (iii) of this section		TDEC 1200-1-11-.06(14)(b)(3)(i) (I)III
	The liner must be:		40 CFR 264.301(a)(1)
	• constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste or leachate to which are exposed, climatic conditions, or stress from installation or daily operation;		TDEC 1200-1-11-.06(14))(b)(1)(i)(I) 40 CFR 264.301(a)(1)(i)
	• placed on a foundation or base capable of supporting the liner and resistance to the pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression or uplift; and		40 CFR 264.301(a)(1)(ii) TDEC 1200-1-11-.06(14)(b)(1)(i)(II)
	• installed to cover all areas likely to be in contact with the waste or leachate		40 CFR 264.301(a)(1)(iii) TDEC 1200-1-11-.06(14)(b)(1)(i) (III)
Top leachate collection and removal system	Must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and postclosure period and ensure that the leachate depth over the liner does not exceed 30 cm; and	Construction of a RCRA landfill– **applicable**	40 CFR 264.301(c)(2) TDEC 1200-1-11-.06(14)(b)(1) (ii)
	Leachate collection system must be constructed of materials that are:		TDEC 1200-1-11 .06(14)(b)(1) (ii)(I)
	• chemically resistant to waste managed in landfill and leachate generated; and		TDEC 1200-1-11 .06(14)(b)(1) (ii)(I)I
	• sufficient strength and thickness to prevent collapse under pressures exerted by overlying wastes, waste cover materials, and by any equipment used		TDEC 1200-1-11 .06(14)(b)(1) (ii)(I)II
Bottom leachate collection and removal system/leak detection system	Leachate collection and removal system must be capable of detecting, collecting, and removing leachate from all areas of the landfill during active life and the postclosure care period. Requirements for a leak detection system are satisfied by installation of a system that is:	Construction of a RCRA landfill– **applicable**	40 CFR 264.301(c)(3) TDEC 1200-1-11-.06(14)(b)(3) (iii)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• constructed with a bottom slope of 1% or more;		40 CFR 264.301(c)(3)(i) TDEC 1200-1-11- .06(14)(b)(3)(iii)(I)
	• constructed of granular drainage materials with a hydraulic conductivity of 1 x 10^{-2} cm/second and a thickness of 12 in. or more or synthetic or geonet drainage materials with a transmissivity of 3 x 10^{-5} m^2/sec;		40 CFR 264.301(c)(3)(ii) TDEC 1200-1-11- .06(14))(b)(3)(iii)(II)
	• constructed of material that are chemically resistant to waste managed and expected leachate to be generated, and structurally sufficient to resist pressures exerted by waste, cover, and equipment used at the landfill;		40 CFR 264.301(c)(3)(iii) TDEC 1200-1-11- .06(14)(b)(3) (iii)(III)
	• designed and operated to minimize clogging during the active life of the facility and postclosure care period;		40 CFR 264.301(c)(3)(iv) TDEC 1200-1-11- .06(14)(b)(3) (iii)(IV)
	• constructed with sumps and liquid removal methods (e.g., pumps) adequate to prevent the backup of liquids into the drainage layer and capable of measuring and recording the volume of liquids present in the sump and liquids present in the sump and of liquids removed		40 CFR 264.301(c)(3)(v) TDEC 1200-1-11- .06(14)(b)(3) (iii)(V)
	Must collect and remove liquids in the leak detection system sumps to minimize the head on the bottom liner	Operation of a RCRA landfill–**applicable**	40 CFR 264.301 (c)(4) TDEC 1200-1-11 .06(14)(b)(3)(iv)
	If the leak detection system is located below the seasonal high water table, a demonstration must be made that the system will not be adversely affected by groundwater	Construction of a RCRA landfill–**applicable**	40 CFR 264.301(c)(5) TDEC 1200- 1 -11 .06(14)(b)(3)(v)
Leachate collection monitoring system for TSCA landfill	A leachate collection monitoring system shall be installed above the chemical waste landfill. Acceptable system includes compound leachate collection	Construction of a TSCA chemical waste landfill–**applicable**	40 CFR 761.75(b)(7)
	Compound leachate collection system consists of a gravity flow drainfield installed above the waste disposal facility liner and above a secondary installed liner		40 CFR 761.75 (b)(7)(ii)
Run-on/runoff control systems	Run-on control system must be capable of preventing flow onto the active portion of the landfill during peak discharge from a 25-year storm event	Construction of a RCRA landfill–**applicable**	40 CFR 264.301(g) TDEC 1200-1-11- .06(14)(b)(7)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	Run-off management system must be able to collect and control the water volume from a runoff resulting from a 24-hour, 25-year storm event.		40 CFR 264.301(h) TDEC 1200-1-11-.06(14)(b)(8)
	Collection and holding facilities must be emptied or otherwise expeditively managed after storm events to maintain design capacity of the system	Operation of a RCRA landfill–**applicable**	40 CFR 264.301(i) TDEC 1200-1-11-.06(14))(b)(9)
Wind dispersal control system	Must cover or manage the landfill to control wind dispersal of particulate matter	Operation of a RCRA landfill–**applicable**	40 CFR 264.301(j) TDEC 1200-1-11-.06(14)(b)(10)
	Must be no visible emissions to the outside air; or	Operation of an active waste disposal site that receives asbestos-containing material from a source covered under 40 CFR 61.145–**applicable**	40 CFR 61.154(a)
	At the end of each operating day, or at least every 24-hour period while the site is in continuous operation, cover the asbestos containing waste with:		40 CFR 61.154(c)
	• at least 6 in. of compacted nonasbestos containing material, or		40 CFR 61.154(c)(1)
	• a resinous or petroleum based dust suppression agent that effectively binds dust and controls wind erosion in the manner and frequency specified by the manufacturer		40 CFR 61.154(c)(2)
Monitoring and inspection of liners, leak detection, run-on/run-off systems during the active life of the facility	During construction or installation, liners and cover systems must be inspected for uniformity, damage and imperfections (e.g., holes, cracks, thin spots, etc.)	Construction of a RCRA landfill–**applicable**	40 CFR 264.303(a) TDEC 1200-1-11-.06(14)(d)
Post-construction Inspection	Immediately after construction or installations:	Construction of a RCRA landfill–**applicable**	40 CFR 264.303(a)(1) TDEC 1200-1-11-.06(14)(d)(1)(i)
	• synthetic liners and covers must be inspected to ensure; tight seams and joints and the absence of tears, punctures or blisters;		
	• soil based and mixed liners and covers must be inspected for imperfections including lenses, cracks, channels or other structural non-uniformities		40 CFR 264.303(a)(2) TDEC 1200-1-11-.06(14)(d)(1)(ii)
	Must inspect landfill weekly and after storm events to ensure proper functioning of:	Operation of a RCRA landfill – **applicable**	40 CFR 264.303(b); TDEC 1200-1-11-.06(14)(d)(2)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• run-on and runoff control systems • wind dispersal control systems • leachate collection and removal systems		
	Must record the amount of liquids removed from the leak detection system sumps at least weekly during the active life and closure period	Operation of a RCRA landfill– **applicable**	40 CFR 264.303(c)(1) TDEC 1200-1-11- .06(14)(d)(3) (ii)
Response actions for leak detection system	Must have a response action plan which sets forth the actions to be taken if action leakage rate has been exceeded	Operation of a RCRA landfill leak detection system– **applicable**	40 CFR 264.304(a) TDEC 1200-1-11-.06(14)(e)(1)
	Must determine to the extent practicable the location, size and cause of any leak	Flow rate into the leak detection system exceeds action leakage rate for any sump–**applicable**	40 CFR 264.304(b)(3) TDEC 1200-1-11- .06(14)(e)(2) (iii)
	Must determine whether waste receipt should cease or be curtailed; whether any waste should be removed from the unit for inspection, repairs, or controls or closure		40 CFR 264.304(b)(4) TDEC 1200-1-11- .06(14)(e)(2) (iv)
	Must determine any other short or long-term actions to be taken to mitigate or stop leaks		40 CFR 264.304(b)(5) TDEC 1200-1-11-.06(14)(e)(2) (v)
	Must assess the source and amounts of the liquids by source;	Leak and/or remediation determinations required– **applicable**	40 CFR 264.304(c)(1) TDEC 1200-1-11-.06(14)(c)(3) (i)
	Conduct analysis of the liquids to identify sources and possible location of the leaks; and		
	Assess seriousness of leaks in terms of potential for escaping into the environment; or		
	Document why such assessments are not needed		40 CFR 264.304(c)(2) TDEC 1200-1-11 .06(14)(e)(3) (ii)
Liner design requirements for a TSCA landfill	Shall be located in thick, relatively impermeable formations such as large area clay pans. Where this is not possible, the soil shall have a high clay and silt content with the following parameters:	Construction of a TSCA chemical waste landfill– **applicable**	40 CFR 761.75(b)(1)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• In place soil thickness, 4-ft or compacted soil liner thickness, 3-ft;		40 CFR 761.75(b)(1)(i)
	• Permeability (cm sec), equal to or less than 1 x 10^{-7};		40 CFR 761.75(b)(1)(ii)
	• percent soil passing No. 200 sieve > 30;		40 CFR 761.75(b)(1)(iii)
	• Liquid limit, > 30; and		40 CFR 761.75(b)(1)(iv)
	• Plasticity Index > 15; or		40-CFR 761.75(b)(1)(v)
	Synthetic membrane liners shall be used when the hydrologic or geologic conditions at the landfill require such in order to achieve the permeability equivalent to the soils Adequate soil underlining and cover shall be provided to prevent excessive stress or rupture of the liner. The liner must have a minimum thickness of 30 mils		40 CFR 761.75(b)(2)
Performance objectives for LLW disposal facility	Disposal facility must be sited, designed, operated, closed and controlled after closure so that reasonable assurance exists that exposures to humans are within limits established in the performance objectives in 1200-2-11-.16(2) and (5)	Operation and Closure of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.16(l)
LLW disposal site stability	The disposal facility must be sited, designed, used, operated and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required		TDEC 1200-2-11-.16(5)
LLW disposal facility design	Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11-.17(2)(a)
	The disposal site design and operation must be compatible with the disposal site closure and stabilization plan and lead to disposal site closure that assures compliance with the performance objectives	Land disposal of LLW–**relevant and appropriate**	TDEC 1200-2-11-.17(2)(b)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	The disposal site design must compliment and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives are met	Land disposal of LLW– **relevant and appropriate**	TDEC 1200-2-11-.17(2)(c)
	Surface features must direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require on-going active maintenance in the future	Construction of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(2)(c)
LLW disposal operations	Wastes must be emplaced in a manner that maintains the package integrity during emplacement, and minimizes the void spaces to be filled	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(3) (d)
	A buffer zone of land must be maintained between the disposal unit and disposal boundary and beneath the disposed waste	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(3) (h)
	The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities		
	Void spaces between waste packages must be filled with earth or other material to reduce future subsidence within the disposal unit	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(3)(e)
	Closure and stabilization measures must be carried out as each disposal unit is filled and covered	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(3)(i)
	Active waste disposal operations must not have an adverse effect on completed closure and stabilization measures	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(3)(j)
Monitoring of LLW disposal facility	During site construction and operation, shall maintain a monitoring program, including a monitoring system. The monitoring system must be capable of providing early warning of releases of radionuclides from the disposal unit before they leave the site boundary	Operation of LLW disposal facility–**relevant and appropriate**	TDEC 1200-2-11-.17(4)(c)
Surface water monitoring	Designated surface water course shall be sampled at least monthly when the landfill is being used for disposal and on a frequency of no less than once every six months after final closure of the disposal area	Operation of a TSCA chemical waste landfill–**applicable**	40 CFR 761.75(b)(6)(i)(B) & (C)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	As a minimum, all samples shall be analyzed for the following parameters: • PCBs • PH • specific conductance • chlorinated organics Sampling methods and analytical procedures for these parameters shall comply with those specified in 40 CFR Part 136, as amended in 41 Federal Register 52779 on December 1, 1976		40 CFR 761.75 (b)(6)(iii)
Facility design, construction	Systems structures and components must be designed, constructed and operated to withstand the effects of natural phenomena as necessary to ensure confinement of hazardous material, the operation of essential facilities, and the protection of government property	Construction of new nonnuclear facility under DOE-STD-1027-92–**TBC**	DOE Order 420.1
	Closure		
Closure of RCRA landfill	Must close the unit in a manner that: • minimizes the need for further maintenance, and • controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to ground or surface waters or to the atmosphere, and • complies with the closure requirements of 40 CFR 265.310	Closure of a RCR.A hazardous waste management facility– **applicable**	40 CFR 265.111 TDEC 1200-1-11-.05(7)(b)
	Must cover the landfill or cell with a final cover designed and constructed to: • provide long-term minimization of migration of liquids through the closed landfill; • function with minimum maintenance;		40 CFR 265.310(a) TDEC 1200-1-11-.05(14)(k)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• promote drainage and minimize erosion or abrasion of the cover; • accommodate settling and subsidence so that the cover's integrity is maintained; and • have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present		
Closure of a LLW disposal facility	Covers must be designed to minimize the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface geologic processes and biotic activity	Land disposal of LLW – **relevant and appropriate**	TDEC 1200-2-11-.17(2)(d)
Closure of an inactive asbestos waste disposal site	Either discharge no visible emissions to the outside air; or	Disposal of asbestos-containing waste material– **applicable**	40 CFR 61.151 (a)(1)
	Cover the asbestos-containing waste with at least (6 in.) of compacted nonasbestos-containing material, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos containing waste; or		40 CFR 61.151(a)(2)
	Cover the asbestos-containing waste with at least (2 ft) of compacted nonasbestos-containing material, and maintain it to prevent exposure of the waste		40 CFR 61.151 (a)(3)
	Maintain warning signs and fencing (if installed as specified in 40 CFR 61.154(b)		40 CFR 6 1. 151 (b)(1)
Clean closure of RCRA container storage area	Must close the facility in a manner that: • minimizes the need for further maintenance; • controls, minimizes or eliminates, to the extent necessary to protect human health and environment, postclosure escape of hazardous waste, hazardous constituents, contaminated run-off or hazardous waste decomposition products to ground or surface waters or to the atmosphere; and • complies with closure requirements of 40 CFR 264.178	Management of RCRA hazardous waste in containers –**applicable**	40 CFR 264.111 TDEC 1200-1-11-.06(7)(b)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	Must remove all hazardous waste and residues from containment system. Remaining containers, liners, bases and soil containing or contaminated with hazardous waste or residues must be decontaminated or removed		40 CFR 264.178 TDEC 1200-1-11-.06(9)(i)
Clean closure of TSCA storage facility	A TSCA/RCRA storage facility closed under RCRA is exempt from the TSCA closure requirements of 40 CFR 761.65(e).	Closure of TSCA/RCRA storage facility–**applicable**	40 CFR 761.65(e)(3)
Closure of RCRA/TSCA groundwater monitoring well(s)	Shall be completely filled and scaled in such a manner that vertical movement of fluid either into or between formation(s) containing ground water classified pursuant to rule 1200-4-6-.05(1) through the bore hole is not allowed Shall be performed in accordance with the provisions for Seals at 12004-6-.09(6)(e), (f), and (g), for Fill Materials at 1200-4-6-.09(6)(h) and (i), for Temporary Bridges at 1200-4--6-.09(6)(j), for Placement of Sealing Materials at 1200-4-6-.09(7)(a) and (b), and Special Conditions at 1200-4-6-.09(8)(a) and (b), as appropriate	Permanent plugging and abandonment of a well–**relevant and appropriate**	TDEC 1200-4-6-.09(6)(d)
	Postclosure Care		
Survey plat	Must submit to the local zoning authority or the authority with jurisdiction over local land use, a survey plot applicable indicating the location and dimensions of landfill cells, with respect to permanently surveyed benchmarks. The plat must contain a note, prominently displayed which states the owner/operator obligation to restrict disturbance of the landfill	Closure of a RCRA landfill–**applicable**	40 CFR 264.116 TDEC 1200-1-11-.06(7)(g)
	Within 60 days of closure record, in accordance with State law, a notation on the deed to the facility property and on any other instrument that would normally be examined during a title search that: • the land has been used for disposal of asbestos-containing waste; • survey plat and record of location and quantity of waste disposed within the site required in 40 CFR 61.154(f) have been filed; and • the site is subject to 40 CFR Part 61 subpart M	Closure of an asbestos-containing waste disposal site–**applicable**	40 CFR 61.151(e)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
Duration	Postclosure care must begin after closure and continue for at least 30 years after that date	Closure of a RCRA landfill– **applicable**	40 CFR 264.117(a) TDEC 1200-1-11-.06(7)(h)
Protection of facility	Post-closure use of property must never be allowed to disturb the integrity of the final cover, liners, or any other components of the containment system or the facility's monitoring system unless necessary to reduce a threat to human health or the environment		40 CFR 264.117(c) TDEC 1200-1-11- .06(7)(h)(3)
Post-closure plan	Must have a written post-closure plan which identifies planned monitoring activities and frequency at which they will be performed for groundwater monitoring, containment systems and cap maintenance	Closure of a RCRA landfill – **applicable**	40 CFR 264.118 TDEC 1200-1-11-.06(7)(i)
Post-closure notices	Must submit to the local zoning authority a record of the type, location, and quantity of hazardous wastes disposed of within each cell of the unit	Closure of a RCRA landfill– **applicable**	40 CFR 264.119(a) TDEC 1200-1-11-.06(7)(j)
	Must record, in accordance with State law, a notation on the deed to the facility property - or on some other instrument which is normally examined during a title search - that will in perpetuity notify any potential purchaser of the property	Closure of a RCRA landfill– **applicable**	40 CFR 264.119(b) TDEC 1200-1-11-.06(7)(j)(2)
General post-closure care	Owner or operator must:	Closure of a RCRA landfill– **applicable**	40 CFR 264.310(b) TDEC 1200-1-11-.06(14)(k)
	• maintain the effectiveness and integrity of the final cover including making repairs to the cap as necessary to correct effects of settling, erosion, etc.;		40 CFR 264.310(b)(1) TDEC 1200-1-11-.06(14)(k)(2)(i)
	• continue to operate the leachate collection and removal system until leachate is no longer detected;		40 CFR 264.310(b)(2) TDEC 1200-1-11-.06(14)(k)(2) (ii)
	• maintain and monitor the leacbate detection system in accordance with 40 CFR 264.301(a)(3)(iv) and (4) and 40 CFR 264.303(c);		40 CFR 264.310(b)(3) TDEC 1200-1-11-.06(14)(k)(2) (iii)
	• maintain and monitor a ground water monitoring system and comply with all other applicable provisions 40 CFR 264, Subpart F;		40 CFR 264.310(b)(4) TDEC 1200-1-11-.06(14)(k)(2) (iv)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	• prevent run-on and run-off from eroding or otherwise damaging final cover; and		40 CFR 264.310(b)(5) TDEC 1200-1-11-.06(14)(k)(2) (v)
	• protect and maintain surveyed benchmarks used to locate waste cells		40 CFR 264.310(B)(6) TDEC 1200-1-11-.06(14)(k)(2) (vi)
Operation of leachate collection system	Must record the amount of liquids removed from the leak detection system at least monthly after the final cover is installed and thereafter as specified in 40 CFR 264.303(c)(2).	Closure of a RCRA landfill–**applicable**	40 CFR 264.303(c)(2) TDEC 1200-1-11-.06(14)(d)(3) (ii)
	Shall be monitored monthly for quantity and physicochemical characteristics of leachate produced	Operation of a TSCA chemical waste landfill–**applicable**	40CFR 761.75(b)(7)
	Water analysis shall be conducted as provided in 40 CFR 761.75(b)(6)(iii)(see above)		
	The leachate should be either treated to acceptable limits for discharge or disposed of by another approved method		
General groundwater monitoring requirements	The groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield sample from the uppermost aquifer that:	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.97(a) TDEC 1200-1-11-.06(6)(h)
	• represent the quality of background groundwater;		
	• represent the quality of groundwater passing the point of compliance; and		
	• allows for the detection of contamination when the hazardous waste or constituents have migrated form the waste management area to the uppermost aquifer		
	If underlying earth materials are homogenous, impermeable, and uniformly sloping in one direction, only three sampling points shall be necessary	Operation of TSCA chemical waste landfill groundwater monitoring program–**applicable**	40 CFR 761.75(b)(6)(ii)(A)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	These three points shall be equally spaced on a line through the center of the disposal area and extending from the area of highest water table elevation to the area of the lowest water table elevation		
Monitoring well construction	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary to enable collection of groundwater sampler. The annular space above the sampling depth must be sealed to prevent contamination of groundwater and samples	Construction of RCRA groundwater monitoring well –**applicable**	40 CFR 264.97(c) TDEC 1200-1-11 .06(6)(h)(3)
	All monitoring wells shall be cased and the annular space between the monitor zone (zone of saturation) and the surface shall be completely backfilled with Portland cement or an equivalent material and plugged with Portland cement to effectively prevent percolation of surface water into the well bore. The well opening at the surface shall have a removable cap to provide access and to prevent entrance of rainfall or stormwater runoff	Construction of a TSCA groundwater monitoring well – **applicable**	40 CFR 761.75(b)(6)(ii)(B)
Monitoring program	Groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of groundwater quality below the waste management area	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.97(d) TDEC 1200-1 -11 - .06(6)(h)(4)
	Groundwater monitoring program must include sampling and analytical methods that are appropriate and accurately measure hazardous constituents in groundwater samples	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.97(e) TDEC 1200-1-11 - .06(6)(h)(5)
	Groundwater monitoring program must include a determination of the groundwater surface elevation each time groundwater is sampled	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.97(f) TDEC 1200-1-11 - .06(6)(h)(6)
Sample collection	The number and size of samples collected to establish background and measure groundwater quality at the point-of-compliance shall be appropriate for the form of statistical test employed following generally accepted statistical principles and otherwise comply with the provisions of this section	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.97(g) TDEC 1200-1-11- .06(6)(h)(7)

Table 2.7. (Continued)

Action	Requirements	Prerequisite	Citation
	The groundwater monitoring well shall be pumped to remove the volume of liquid initially contained in the well before obtaining a sample for analysis	Operation of TSCA groundwater monitoring wells – **applicable**	40 CFR 761.75(b)(6)(ii)(B)
	The discharge shall be treated to meet applicable State or Federal standards or recycled to the chemical waste landfill		
	As a minimum, all samples shall be analyzed for the following parameters: • PCBs • pH • specific conductance • chlorinated organics		
	Sampling methods and analytical procedures for these parameters shall comply with those specified in 40 CFR Part 136, as amended in 41 Federal Register 52779 on December 1, 1976		
Detection monitoring	Must monitor for specified indicator parameters, waste constituents or reaction products that provide a reliable indication of the presence of hazardous constituents in groundwater	Operation of a detection monitoring program under 40 CFR 264.98–**applicable**	40 CFR 264.98(a) TDEC 1200-1-11-.06(6)(i)
	Must install a groundwater monitoring system at the compliance point as specified under 40 CFR 264.95 that complies with 264.97(a)(2), (b), and (c).		40 CFR 264.98(b) TDEC 1200-1-11-.06(6)(i)(2)
	Must conduct a monitoring program for each specified chemical parameter and hazardous constituent in accordance with 264.97(g)		40 CFR 264.98(c) TDEC 1200-1-11-.06(6)(i)(3)
	A sequence of at least four samples from each well (background and compliance wells) must be collected at specified frequencies		40 CFR 264.98(d) TDEC 1200-1-11-.06(6)(i)(4)
	Must determine the groundwater flow rate and direction in the uppermost aquifer at least annually		40 CFR 264.98(e) TDEC 1200-1-11-.06(6)(i)(5)
	Must determine whether there is statistically significant evidence of contamination of any specified chemical parameter or hazardous constituent at a specified frequency		40 CFR 264.98(f) TDEC 1200-1-11-.06(6)(i)(6)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
	If owner/operator determines that there is statistically significant evidence of contamination at any monitoring well at the compliance point, must follow the provisions of this section		40 CFR 264.98(g) TDEC 1200-1-11-.06(6)(i)(7)
Corrective measures for LLW disposal facility	Must have plans for taking corrective measures if migration of radionuclides would indicate that the performance objectives of Rules of the TDEC 1200-2-11-.16 may not be met	Closure of a LLW landfill–**relevant and appropriate**	TDEC 1200-2-11-.17(4)(b)
Monitoring	After the disposal site is closed, post-operational surveillance of the disposal site shall be maintained by a monitoring system based on the operating history and the closure and stabilization of the disposal site The monitoring system must be capable of providing early warning of releases of radionuclides from the disposal unit before they leave the site boundary	Closure of an LLW landfill–**relevant and appropriate**	TDEC 1200-2-11-.17(4)(d)
Control and stabilization	Control and stabilization features shall be designed to: • provide to the extent reasonably achievable an effective life of 1000 years with a minimum of at least 200 years	Long-term management of uranium, thorium, and their decay products–**TBC**	DOE Order 5400.5 (1V)(6)(d)(1)(a)
	• Limit Rn-222 emanation to the atmosphere from the wastes to less than an annual average release rate of 20 $pCi/m^2/s$ and prevent increase in the annual average Rn-222 concentration at or above any location outside the boundary of the contaminated area by more than 0.5 pCi/L		DOE Order 5400.5(IV)(6)(d)(1)(b)
	Institutional controls		
Waste left in place	Institutional controls are required and shall include, at a minimum, deed restrictions for sale and use of property and securing area to prevent human contact with hazardous substances	Hazardous substances left in place which may pose an unreasonable threat to public health, safety, or the environment–**relevant and appropriate**	TDEC 1200-1-13-.08(10)

Table 2.7. (continued)

Action	Requirements	Prerequisite	Citation
Uranium- and thorium-bearing LLW left in place	Access to a property and use of material should be controlled through appropriate administrative and physical controls, designed to be effective to the extent reasonable for at least 200 years	On-site material contaminated by residual radioactive material (uranium and thorium-**TBC**	DOE Order 5400.5(lV)(6)(d)(1)(e)
	Transportation		
Transportation of LLW off site	LLW waste shall be packaged and transported in accordance with DOE O 1460. 1A and DOE O 460.2	Shipment of LLW off site–**TBC**	DOE M 435.1-1(1)(1)(E)(11)
	To the extent practicable, the volume of waste and number of shipments shall be minimized		DOE M 435. 1-1 (lV)(L)(2)
Transportation of PCB wastes off-site	Must comply with the manifesting provisions at 40 CFR 761.207 through 218	Relinquishment of control over PCB wastes by transporting, or offering for transport–**applicable**	40 CFR 761.207 (a)
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 CFR 262.20-23 for manifesting, Sect. 262.30 for packaging, Sect.262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding and Sect. 262.40, 262.4 1 (a) for record keeping requirements and Sect. 262.12 to obtain EPA ID number	Off site transportation of RCRA hazardous waste–**applicable**	40 CFR 262. 10(h) TDEC 1200-1-11 .03(l)(a)(8)
	Must comply with the requirements of 40 CFR 263.11 -263.31	Transportation of hazardous waste within the United States requiring a manifest–**applicable**	40 CFR 263. 10(a) TDEC 1200- 1-11- .04(1)(a)(1)(6) (iii)
	A transporter who meets all applicable requirements of 49 CFR 171-179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263		
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171-180	Any person who, under contract with an department or agency of the federal government, transports "in commerce", or causes to be transported or shipped, a hazardous material –**applicable**	49 CFR 171.1(c)

Table 2.7. (continued)

ALA RA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = *Code of Federal Regulation*
DOE= U.S. Department of Energy
DOE M = Radioactive Waste Management Manual
DOE ODOE Order 435.1 Radioactive Waste Management
DOT = U.S. Department of Transportation
EDE = effective dose equivalent
EMWMF = Environmental Management Waste Management Facility
EPA = U.S. Environmental Protection Agency
> = greater than
< = less than
$ = greater than or equal to
# = less than or equal to
HMR - Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act of 1975
ID = identification number
LLW = low-level (radioactive) waste
mrem = millirem
mSv = millisievert
ORO = Oak Ridge Operations
ORR = Oak Ridge Reservation
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act of 1976
ROD = record of decision
TBC = to be considered
TDEC = Tennessee Department of Environment and Conservation
TSCA = Toxic Substances Control Act of 1976
WAC = waste acceptance criteria

seq.) Two plant species listed as Tennessee-threatened are present in the vicinity of the site, although impacts to these are not expected. Per the Tennessee Rare Plant Protection and Conservation Act of 1985 (TCA 70-8-309), any rare plants within the area will be protected and preserved. In addition, the Tennessee dace (Phoxinus tennesseensis), listed as a "species in need of management" by the state of Tennessee, has been found throughout Bear Creek. Should any actions associated with the selected remedy impact any state-listed threatened or rare animal species, the provisions found in the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 [TCA 70-8-106(e)and TCA 70-8-104(c)] must be met.

While an archeological survey (Bechtel Jacobs Co. 1998c) did not identify any cultural resources at the site, construction of a new facility could result in the inadvertent discovery of native American remains and objects. Several statutes and regulations protect cultural resources, such as Native American artifacts, that may be discovered. If such a discovery is made at any time during the project, it must be reasonably protected from disturbance and all activity in the discovery area must cease until the site and artifacts are properly evaluated [43 CFR 7.4(a), 43 CFR 7.5(b)(1) and 43 CFR 10.4(c) and (d)].

Action-Specific ARARs. Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste under the selected remedy (55 FR 8741, March 8,1990). No one set of regulations is tailored to the combination of wastes which will be disposed of at the on-site disposal facility. Selection of action-specific ARARs was based on the overriding priority to dispose of wastes in a manner protective of human health and the environment over both the short- and long-term.

Action-specific ARARs for the selected remedy address on-site disposal of low-level waste, RCRA-hazardous waste, mixed waste, and TSCA waste (Table 2.7). The ARARs incorporate the pertinent, substantive federal and state requirements for siting, design, construction, operation, closure and postclosure of a hazardous waste land disposal facility under RCRA, a chemical waste landfill under TSCA, and licensing requirements for land disposal of radioactive waste at a commercial disposal facility under Rules of the TDEC for protection against radiation. Since the on-site disposal facility will meet or exceed requirements for a RCRA-hazardous waste landfill, the alternative also complies with theTSCA recent provisions for disposal of PCB remediation wastes per 40 CFR 761.61 (63 FR 35384 ! 35474, June 29, 1998). The selected remedy will also meet those DOE Order requirements for management of radioactive waste and radiation protection that were identified as TBC. A summary of the ARARs most significant to development and selection of the remedy is provided below.

Transportation requirements for moving wastes from individual response sites to the on-site disposal facility andrequirements for treatment, of these wastes are not ARARs for the selected remedy because these requirements will be met by the individual waste generators prior to

placement in the on-site facility. Some wastes (e.g., wastes resulting from facility operations that exceed WAC developed for this facility) may be managed at the facility pending shipment to a DOE-approved, or as appropriate, EPA-approved off-site facility for treatment or disposal. In the event waste is determined to exceed WAC after receipt at the facility, subsequent management will be in accordance with the WAC attainment plan, a post-ROD primary document. Facility operations could also be shut down temporarily, necessitating waste accumulation. Storage, accumulation, and transportation requirements have been included as ARARs for the on-site disposal facility as appropriate to address these contingencies.

Disposal Siting and Design Requirements. Siting and design requirements for land disposal facilities for RCRA-hazardous waste and low-level radioactive waste stipulate that facilities not be located in a 100-year floodplain, areas subject to seismic activity, geologic processes, or hydrogeology that adversely affect the facility's stability or ability to meet performance standards. If these conditions are present, the site must not preclude design and construction of the facility so that the performance standards will be met. Performance standards for the facility include dose exposure limits for releases of radioactivity to the environment as already described in chemical-specific ARARs [Rules of the TDEC 1200-2-11-.16(2)] and the requirement to achieve long-term stability of the disposal site and eliminate to the extent practicable the need for postclosure care [Rules of the TDEC 1200-2-11-.16(5)]. Long-term management, institutional controls, and residual radioactivity are also addressed by requirements under DOE Order 5400.5(IV)(6)(1)(a), (b), and (e). In addition, the facility site must be capable of being characterized, modeled, analyzed, and monitored [Rules of the TDEC 1200-2-11-.17(1)(b),(j), and(k); 1200-2-11-.17(4)(a)].

Location and design requirements for a chemical-waste landfill under TSCA are very similar to RCRA requirements for a hazardous waste landfill. However, TSCA specifies that if a synthetic liner is used, it must have a minimum thickness of 30 mil [40 CFR 761.75(b)(2)]. In addition, the hydrologic requirements of TSCA specify that the bottom of the liner must be located 50 ft above the historical-high groundwater mark and prohibit any hydrologic connection between the site and any surface water (40 CFR 761.75(b)(3)]. This depth requirement applies to all sites, regardless of underlying geology and soil type.

Construction of the on-site disposal cell is in an area that is between 2! 60 feet above the groundwater table and will not meet the 50 ft to groundwater requirement under TSCA. With the exception of this requirement, implementation of the selected remedy will meet all CERCLA ARARs described. In addition, the risk assessment for this remedy indicates that there will be no risks above acceptable levels to human health or the environment as a result of constructing and operating a disposal facility at this location.

A waiver of the requirement that the bottom liner be located 50 ft above the historical-high groundwater mark is being invoked upon signature of this ROD for the selected remedy, on the basis

that implementation of the more stringent leachate and collection requirements under RCRA result in a facility that meets or exceeds the protectiveness anticipated under TSCA. The provision for a waiver based on equivalent protectiveness under CERCLA is paralleled by provisions under TSCA that allow the EPA-TSCA administrator to waive the 50 ft to groundwater requirement if protectiveness can be demonstrated.

This TSCA requirement for a minimum depth does not provide a performance standard that can be evaluated. For example, gravel and highly fractured rock can have a hydraulic conductivity of as low as 1×10^{-1} cm/second, compared to a conductivity of up to 1×10^{-7} cm/second for clay. For a continuous 50 ft layer, the range of time required for permeation could be anywhere from 4.2 hours (gravel) to 482 years (clay). The engineered cell of the selected remedy will use a multiple liner system that could use flexible membrane liners (FMLs), geosynthetic clay liners (GCLs), and low permeability clay. The range of hydraulic conductivities for these materials range from $< 1 \times 10^{-7}$cm/second for low permeability clay; 5×10^{-9}cm/second for GCLs; and between 1×10^{-11} to 1×10^{-13} cm/second for FMLs depending on the type of material that will be used. In addition, a geologic buffer composed of clay will be used to isolate the disposal cell from the groundwater table. The liner system is designed to meet a performance period of 1000 years consistent with evaluation time frames considered in DOE guidance for composite analysis (DOE 1996m) and in DOE Order 435.1. In addition, peak risks beyond 1000 years were considered for uncertainty/sensitivity analysis to assess confidence in the disposal cell design and performance modeling, or to suggest potential design changes.

Waiver of the 50 ft above groundwater TSCA siting requirement will encourage remediation of ORR sites under CERCLA by providing a safe disposal alternative for TSCA mixed wastes and will reduce overall risks and costs by eliminating the need to transport wastes to an off-site location.

Design requirements to prevent leachate generation and release of hazardous constituents to groundwater stipulate that two or more liners, including a top liner and a bottom liner each with a leachate collection and removal system will be installed [40 CFR 261.301(c) and Rules of the TDEC 1200-1-11-.06(14)]. The bottom liner will include a leak detection system. Facility design must also provide for run-on/runoff control systems and wind dispersion control systems [40 CFR 264.301 (g), (h), and (i) and Rules of the TDEC 1200-1-11-.06(14)(b)]. Response actions for sump leaks must also be in place [40 CFR, 264.304 and Rules of the TDEC 1200-1-11-.06(14)(e)]. Requirements to design the facility so that long-term isolation, compliance with performance objectives, and avoidance of site degradation through erosion are also ARAR [Rules of the TDEC 1200-2-11-.17(2)].

Site Preparation, Construction, and Excavation Activities. These activities trigger various requirements to prevent and minimize emission of radioactivity, fugitive dust, and stormwater runoff [Rules of the TDEC 1200-3-11-.08(3) and 40 CFR 61.92; Rules of the TDEC

1200-3-8-.01; and Rules of the TDEC 1200-4-10-.05(6); Rules of the TDEC 1200-4-10-.04 and 40 CFR 122] as enumerated in Table 2.7 and apply to all phases of selected remedy implementation.

Waste Generation/Management. Requirements for characterization and management of waste will also be triggered in all phases of the selected remedy. Although the responsibility to properly characterize waste sent to the on-site disposal facility rests with the individual projects, waste will also be generated as a result of construction, operation, and closure of the on-site disposal facility. This waste must be characterized and managed as RCRA, TSCA, and radioactive waste as appropriate.

Storage. RCRA-hazardous waste may be accumulated on-site provided that the containers meet substantive requirements of 40 CFR 265.171-173, Subpart I and are properly marked as hazardous waste [40 CFR 262.34 and Rules of the TDEC 1200-1-11-.03(4)]. Containers may be stored on-site provided that container integrity is ensured and precautions to prevent release of the waste are taken per 40 CFR 171, 172, and 173(a) and Rules of the TDEC 1200-1-11-.05(9)]. In particular, the storage area may not allow containers to be in prolonged contact with liquid from precipitation [40 CFR 264.175(c) and Rules of the TDEC 1200-1-11-.06(9)(f)(3)]. PCBs and PCB items must be properly marked and stored in containers per 40 CFR 761.65(c). PCB and PCB radioactive waste may be stored according to the requirements in 40 CFR 761.65(b) for a PCB storage facility, or it does not have to meet those requirements if it is stored in a RCRA compliant storage facility (40 CFR 761-65(b)(2)].

Waste Treatment/Disposal. As previously discussed, CERCLA differentiates between substantive and administrative requirements. Some requirements that would be administrative for most CERCLA response actions have been identified as ARARs for the selected remedy because they are necessary to meeting substantive requirements for an operating disposal facility. Operation of the on-site disposal facility will be in compliance with general facility requirements for security, inspection, training, construction quality assurance, contingency planning, preparedness and prevention, and inventory as identified in Table 2.7.

RCRA-restricted waste may be land disposed only if it meets treatment standards or alternative standards for hazardous waste [40 CFR 268 and Rules of the TDEC 1200-1-11-.10] and requirements for particular waste forms and types [40 CFR 264.312, 264.313, and Rules of the TDEC 1200-1-11-.06(14)]. Hazardous waste may not be disposed of as free liquids and empty containers should be reduced in volume (e.g., shredded, compacted) prior to disposal. LLW bearing uranium and thorium shall be conditioned to minimize the generation and escape of biogenic gases [DOE Order 5400.5(IV)(6)(D)(l)].

Low-level waste must be placed to maintain package integrity and prevent void spaces and a buffer zone of land shall be maintained beneath the disposal unit and between the unit and disposal

boundary [Rules of the TDEC 1200-2-11-.17(3)]. Closure and stabilization measures must be carried out as each disposal unit is filled and covered. A monitoring system to detect releases of radioactivity before they leave the site boundary shall be conducted throughout operations [Rules of the TDEC 1200-2-11-.17(4)].

Bulk PCB remediation waste and other PCB cleanup wastes may be disposed of in a RCRA-compliant land disposal facility or a chemical waste landfill [40 CFR 761.61(a)(5)] or by performance or risk-based disposal options per 40 CFR 761.61 (b)(2) as may PCB bulk product waste [40 CFR 761.62(a)].

Closure and Postclosure Requirements. After a disposal cell is filled to capacity, pursuant to RCRA, it must be covered with a final cover designed and constructed to provide long-term minimization of liquid migration through the capped area; function with minimum maintenance; promote drainage and minimize erosion or abrasion of the cover; and accommodate settling and subsidence so that the cover's integrity is maintained. Additionally, the cap must have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present to keep water and leachate from collecting in the waste. [Rules of the TDEC 1200-1-11.06(14)(a); 40 CFR 310(a)]. Similar requirements are found in Rules of the TDEC 1200-2-11-.17 for closure of a low-level waste facility. TSCA regulations do not specifically address capping individual cells or the chemical waste landfill, however, EPA guidance indicates that closure of a chemical-waste landfill should parallel closure requirements under RCRA (EPA 1990).

Maintenance and monitoring of the waste containment system [40 CFR 264.3 10(b) and Rules of the TDEC 1200-1-11-.06] and operation of a groundwater monitoring system [40 CFR 264.97, Rules of the TDEC 1200-1-11-.06 and 1200-2-11-.17(4)] are required during the postclosure period. Per RCRA, postclosure care must begin after closure and must continue for 30 years. Extended periods for facility monitoring will be addressed in the LUCIP. Additional requirements for detection monitoring are included in 40 CFR 264.98. The CERCLA process provides for a 5-year review process for waste that is left in place as a result of the remedy selected. The EPA regional administrator may shorten or extend the postclosure care period based on consideration of continued protection of human health and the environment. TDEC Radiation Protection Standards also require a postclosure monitoring program capable of providing early warning of radionuclide release before radionuclides leave the facility site boundary [Rules of the TDEC 1200-2-11-.17(4)(d)]. Postclosure care requirements for landfills [Rules of the TDEC 1200-1-11-.06(14); 40 CFR 264.310(b)] also include long-term maintenance of the cover, run-on and run-off diversions systems, etc.

Off-Site Disposal of Wastes. The DOT regulations for hazardous materials include requirements for marking labeling, placarding, and packaging. Rules of the TDEC 1200-1-11-.03 (40 CFR 262) require generators to ensure and document that the hazardous waste they generate is

properly identified and transported to a treatment, storage, and disposal facility. Specific requirements are given for manifesting [Rules of the TDEC 1200-1-11-.03(3); 40 CFR 262.20 ! 23], packaging, labeling, marking, and placarding [Rules of the TDEC 1200-1-11-.03(4); 40 CFR 262.30 ! 33]. In addition, there are record-keeping and reporting requirements [Rules of the TDEC 1200-1-11-.03(5); 40 CFR 262.40 ! 43]. Pretransport requirements reference the DOT regulations under 49 CFR 172, 173, 178, and 179.

CERCLA Sect. 121(d)(3) requires that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be to a facility that is in compliance with RCRA and applicable state laws. EPA has established the procedures and criteria for determining whether facilities are acceptable for the receipt of off-site waste at 40 CFR 300.440.

Any generator who relinquishes control of PCB wastes by transporting them to an off-site disposal facility must comply with the applicable provisions of TSCA (40 CFR 761.207 et seq.). Once wastes generated from a CERCLA response action are transferred off site, all administrative as well as substantive provisions of all applicable requirements must be met.

DOE's policy is to treat, store, and in the case of LLW, dispose of waste at the site where it is generated, if practical, or at another DOE facility if on-site capabilities are not practical and cost effective. The use of non-DOE facilities for storage, treatment, and disposal of LLW may be approved by ensuring, at a minimum, that the facility complies with applicable federal, state, and local requirements and has the necessary permit(s), license(s), and approval(s) to accept the specific waste [DOE M 435.1-1(I)(2)(F)(4)].

COST-EFFECTIVENESS

For the low-end waste volume scenario, the present worth costs for the on- and off-site disposal alternatives are $99.8 million and $133.4 million, respectively. For the high-end scenario, present worth costs for the on- and off-site alternatives are $167.5 million and $450.1 million. The low-end present worth cost differential of $34 million falls within the level of accuracy of the cost estimate and is not very significant. However, the high-end present worth cost differential of $283 million indicates the possibility of significant per-unit and overall disposal cost savings for greater waste volume.

It is very likely that the waste volume ultimately requiring disposal will be significantly above the low-end volume used for the FS. The projected future waste volume presented in the Ten Year Plan, which was used as the basis for the low-end volume, was increased in the documents that consecutively superseded the Ten Year Plan. Based on project-specific waste volume revisions in these documents, the minimum amount of waste requiring disposal is estimated at 280,000 yd^3, a significant increase from the 223,000 yd^3 used for the low-end scenario cost comparison in the FS.

Furthermore, it is likely that there will be projects not included in these documents that will generate waste in the future. To the extent the readily available disposal capacity provided by the on-site disposal facility allows more protective measures to be implemented at individual sites (i.e., those requiring excavation), additional waste requiring disposal may also be generated.

Based on the most reasonable expectations for future ORR CERCLA waste volumes requiring disposal, the selected remedy is the most cost-effective alternative and offers considerable economy of scale savings for future waste disposal when compared to the off-site disposal alternative. Because of state equity issues and the uncertain future availability of commercial facilities, it also provides the assurance of future waste disposal capacity that off-site disposal cannot offer. Any interruption to future shipping schedules from the loss of disposal capacity under a large scale off-site shipping and disposal campaign would result in significant additional costs associated with interim waste storage and procurement of alternate disposal facilities.

USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy represents the maximum extent to which permanent solutions can be used. Construction, operation, closure, and continued monitoring and maintenance of a disposal cell is the most permanent solution practicable for the disposal of CERCLA waste that will be generated from the cleanup of ORR. Of the remediation alternatives considered, it provides the best balance of trade-offs with respect to long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short term-effectiveness; implementability; and cost. Over the long term, this solution is expected to perform effectively and continue to be protective with minimal maintenance. Long term-institutional controls will be continued for an indefinite period to monitor and ensure the effectiveness of the remedy. Because waste generators will be responsible for waste segregation and treatment (if required) before disposal, specifying alternative treatment or resource recovery technologies is beyond the scope of this remedy. These issues will be addressed at the OU-or site-specific level.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

This remedy does not directly meet the statutory preference for treatment as a principal element because it does not establish waste treatment requirements; however, some waste streams will require treatment to meet the disposal facility WAC.

DOCUMENTATION OF SIGNIFICANT CHANGES

DOE, EPA, and TDEC reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, the three parties determined that no significant changes to the selected remedy, as originally identified in the proposed plan, were necessary.

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PART 3. RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Oak Ridge Reservation Environmental Management Site Specific Advisory Board Comments

"The ORREMSSAB continues to support the preferred alternative for construction of a Valley for facility in East Bear Creek Valley for disposal of most of the waste resulting from CERCLA remediation activities on the Oak Ridge Reservation (ORR). The proposed facility should not be considered as a new contamination source but rather as a safer alternative to leaving contaminated materials in their present uncontained locations.

Disposal of waste on site reduces the risk and cost associated with transportation elsewhere. It eliminates the uncertainty associated with the waste disposal policies of other states, and it contributes to a timely and efficient remediation program. Furthermore, it sends the message that Oak Ridge accepts responsibility for waste it can accommodate and wants to minimize the amount and kinds of waste it ships to other facilities.

The proposed facility must safely isolate contaminated material from the environment. It must be designed, constructed, and operated to meet site-specific waste acceptance criteria.

In addition, the public must be assured that closure plans and a long-term maintenance and stewardship program are in place.

The Proposed Plan

Description of the waste acceptance criteria (WAC) and the promise that "the WAC will be finalized in a post-ROD primary document ..." (pp. 13 and 15) do not address the issues raised in two public meetings. The stakeholders expected the proposed plan to have a definitive statement of the WAC or at least a statement of the criteria for their determination. The general reference to the RI/FS and the addendum is not adequate. Furthermore, we expect that the WAC, when agreed to by TDEC, EPA, and DOE, will allow the remediation program to proceed in a reliable and cost-effective manner."

DOE Response: Final WAC will be developed in coordination with EPA and TDEC and will be established in design documents developed after a final ROD is issued. As discussed in the RI/FS and proposed plan completed in support of this project, WAC will be established to ensure that the facility will only accept wastes that it can manage safely. More specifically, WAC will be developed to ensure that no release from the facility will present unacceptable risk to groundwater or surface water resources at the facility and to ensure that other

operational activities present no significant hazards to human health or the environment. The draft WAC and the methodology for its determination and application is included as Appendix B of this ROD.

"The ORREMSSAB understands that the Proposed Plan will be revised to accommodate comments. However, we expect more complete treatment of the following items in the ROD."

DOE Response: The proposed plan, which has been approved by both TDEC and EPA, was issued in final form and thus will not be revised. Comments received by DOE on the proposed plan are included and addressed in the Responsiveness Summary in the ROD.

"The Record of Decision

The following comments for the ROD are based on areas/issues in the Proposed Plan that we believe require additional or modified treatment."

- [SSAB1]"Because the facility will be located in a fairly small drainage basin, the design should accommodate the expected effects of a 1000-year flood (e.g., erosion and material dispersal)."

  DOE Response: DOE has included the commitment to evaluate the effects of a 1000-year flood on the disposal cell design in the "Disposal Cell Design" of the ROD section (pages 2-41 and 2-42). Requirements being placed on the designer will include demonstration that the facility will withstand environmental forces for 1000 years; this includes the 1000-year flood event. This assessment will be a part of the post-ROD "Remedial Design Report."

- [SSAB2]"Please clarify how on-site or off-site disposal options will be evaluated in ... site-specific RODs or other decision documents for all future response actions requiring waste disposal."

  DOE Response: "Scope and Role of Action" (pages 2-10, and 2-11) explains that ORR remedial decisions, including decisions regarding the disposition of remediation wastes, will be made at the site, operable unit, or watershed unit following evaluation of alternatives in the appropriate CERCLA documentation. It also states that this evaluation process will include the public and the decisions will be agreed upon by the regulators. Individual RODs for these areas to be cleaned up will indicate what is to be removed and what fraction of the waste can go into the disposal facility. These RODs will be signed by DOE and the regulators.

- [SSAB3]"The location of the soil borrow pit should be shown on Figure 1 or its equivalent. In addition, please describe or provide specific references for restoration of the borrow area."

  DOE Response: Figure 2.4 on page 2-21 shows the location of the West End Borrow Area. The discussion of the use of the West End Borrow Area as a potential source of cell construction material (page 2-23) includes the statement that the area affected by removal of material for use in constructing the disposal cell will be stabilized, regraded, and revegetated. Specific restoration of the West End Borrow Area will be defined during design and construction when construction needs are more accurately determined. Final Environmental Assessment Y-12 RCRA Closure Initiation Projects (Lee Wan & Associates, Inc. 1988) assesses environmental impacts of developing borrow areas to support closure of several ORR waste disposal areas. It has been approved by DOE-ORO. It contains requirements for restoration of the West End Borrow Area to a natural appearance upon completion of borrow activities.

- [SSAB4]"We believe DOE policy allows off-site shipment of waste only to federal and/or state-licensed facilities. The discussion on page 4 does not include such as policy. Please include it in the ROD."

  DOE Response: The ROD references DOE-approved, or as appropriate, EPA-approved off-site disposal facilities. DOE approval of any off-site disposal would include documentation that facilities are appropriately permitted and/or licensed.

- [SSAB5]"We do not agree that either alternative '... supports sitewide cleanup of the ORR by assuring timely disposal capacity' (p. 4). As previously stated, we believe that only on-site disposal assures timely disposal. Please include the uncertainty associated with off-site disposal in the ROD."

  DOE Response: DOE believes that timely disposal could be assured under both the on-site and off-site disposal alternatives; however, concerns about the continued availability-of off-site disposal facilities for the duration of the waste generation are discussed in "Implementability" in the "Summary of Comparative Analysis of Alternatives" section.

- [SSAB6]"In the discussion of cell design on page 13, the extremely long life of the contaminants and, thus, the long life of the waste cell should be stated explicitly. The ARARs require long-term effectiveness to be addressed, but we would like to see the issue stressed in the ROD. "

DOE Response: DOE recognizes that some contaminants placed in the disposal cell Will be hazardous for many thousands of years. Because of this DOE will assure protection of human health and the environment from these hazards by emphasizing three complimentary activities. First, the facility will be designed to effectively isolate waste from the environment for generations. It will comply with or exceed ARARs, which require stability and assessment of events with long return periods such as earthquakes and floods. Second, DOE realizes that there is a potential for contaminants to be released from the disposal cell while they are still hazardous. To assure protection, DOE is developing limits on the contaminants WAC that restrict wastes to those that will not pose an unacceptable risk to human health and the environment should they ever migrate from the cell. Finally, the selected remedy includes long-term surveillance and maintenance to assist in isolating the waste from the environment. These three points are included in the "Description of the Selected Remedy" (in Part 1), in the "Selected Remedy" (in Part 2), and the importance of a risk/toxicity-based WAC to the protection of human health and the environment is presented in Appendix B.

- [SSAB7]"The ARARs for disposal cell design are listed in Appendix B. Please number the ARARs and provide reference in the text to those that are important for design of this ORR waste facility."

  DOE Response: Text in the "Compliance with ARARs" section identifies and explains major chemical-specific, location-specific, and action-specific ARARs. ARARs affecting design are included as "Disposal Siting and Design Requirements" in the "Action-specific ARARs" section. Also, the post-ROD "Remedial Design Report" will contain a crosswalk of all ARARs, including the design ARARs to specific design components. This document will be reviewed and approved by EPA and TDEC.

- [SSAB8]"As discussed above, even if specific WAC are yet to be developed (p. 15), the criteria upon which they will be based must be clearly stated in the ROD."

  DOE Response: See previous response related to final WAC development.

- [SSAB9]"Please describe how waste will be evaluated relative to the WAC."

  DOE Response: Appendix B of the ROD, "Draft Waste Acceptance Criteria," contains a summary of how risk/toxicity-based WAC are derived and references a "WAC Attainment Plan" currently being developed. Implementation of this plan will ensure only waste that complies with the WAC will be disposed in the cell. As

described in Appendix B of the ROD and *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE/OR/02-1637&D2/A1), the three-step WAC control process for the on-site disposal cell consists of: (1) establishment of risk-based, contaminant-specific levels; (2) sum of fractions applied to assess risk from waste streams with multiple contaminants; and (3) volume-weighted sum of fractions applied to assess risk from entire disposal cell.

- [SSAB10]"The ROD should include plans for keeping long-term records of the origin, composition, location, and date of disposal of waste within the facility."

  DOE Response: ARARS for postclosure care of the facility (pages 2-83 to 2-89) require records be submitted to the local zoning authority that document the type, location, and quantity of wastes in the cell and location and dimensions of the cell. Documentation requirements for this information will be outlined in the "Environmental Compliance Plan" and specifically defined in the "Waste Management Plan," which will be written by the disposal facility operator and will be the basis for compliance with these ARARs. Also, the collection, analysis, and recording of data related to waste origin, composition, date and location of disposal, and associated QA/QC activities are an integral part of the WAC attainment process. Procedures, documentation, and record-keeping requirements will be Included in the "WAC Attainment Plan." Additionally, the LUCIP, currently being developed in conjunction with this ROD, will consider long-term record keeping requirements.

- [SSAB11]"The schedule for closure of the facility when the CERCLA program is complete (p. 16) provides a basis for long-term stewardship planning, but it does not address provisions for a temporary cap and drainage system to control water infiltration in the interim."

  DOE Response: The facility operator will be contractually required to install a temporary (interim) cover to be installed as waste reaches its maximum elevation; a final cover will be installed directly above the interim cover during cell closure (following completion of all disposal activities) (see Fig. 2.6, page 2-43). A drainage system to control water in the interim will consist of contouring inside the disposal cell to segregate and minimize water that contacts the placed waste. This water, along with leachate generated during operations, will be treated, if required. Water failing inside the cell and not contacting waste will be collected in lined basins, tested, and, if appropriate, released to Bear Creek. The long-term stewardship

planning will include collection and treatment of leachate and maintenance of the final cover, which will then include the interim cover.

- [SSAB12]"The discussion of stewardship/institutional controls (p. 15) should provide more detail, particularly regarding how access to the disposal site will be restricted. Continued support of an on-site disposal cell depends on a credible discussion of long-term stewardship in the ROD. We remind DOE that the Stakeholder Report on Stewardship (July 1998) provides a sound approach for design/implementation of a stewardship program. The ROD should incorporate such information, including provision for adequate long-term funding for stewardship/institutional control for the waste disposal facility."

  DOE Response: Comment noted.

Local Oversight Committee Comments

"The Oak Ridge Reservation (ORR) Local Oversight Committee, Inc. (LOC) supports the construction of a disposal facility in Bear Creek Valley designed for waste resulting from CERCLA remediation efforts on the ORR. The LOC has previously endorsed this facility in the form of a resolution (R98117): *A RESOLUTION TO ENDORSE THE CONSTRUCTION OF AN OAK RIDGE RESERVATION LOW-LEVEL/MIXED-WASTE DISPOSAL FACILITY*. This resolution was transmitted by letter to Mr. James Hall on June 29, 1998.

An on-site facility has many benefits: reduced risk, lowered transportation costs, less uncertainty of disposal in other locations, improved efficiency of the remediation program, and demonstrated responsibility by Oak Ridge for a significant portion of its own waste.

The following specific comments are offered by the LOC Citizens' Advisory Panel (CAP). The LOC Board has not had the opportunity to review and approve these, and so they should be considered as submitted by the CAP only."

- [LOC1] "The design should take into consideration the possible effects of a 1000-year flood, due to the small drainage basin."

  DOE Response: DOE has included the commitment to evaluate the effects of a 1000-year flood on the disposal cell design in the "Disposal Cell Design" of the ROD section (pages 2-41 and 2-42). Requirements being placed on the designer will include demonstration that the facility will withstand environmental forces for 1000 years; this includes the 1000-year flood event. This assessment will be a part of the post-ROD. "Remedial Design Report."

- [LOC2] "The soil borrow-pit location and plans for restoration should be described."

  DOE Response: Figure 2.4 on page 2-21 shows the location of the West End Borrow Area. The discussion of the use of the West End Borrow Area as a potential source of cell construction material (page 2-23) includes the statement that the area affected by removal of material for use in constructing the disposal cell will be stabilized, regraded, and revegetated. Specific restoration of the West End Borrow Area will be defined during design and construction when construction needs are more accurately determined. Final Environmental Assessment Y-12 RCRA Closure Initiation Projects (Lee Wan & Associates, Inc. 1988) assesses environmental impacts of developing borrow areas to support closure of several ORR waste disposal areas. It has been approved by DOE-ORO. It contains requirements for restoration of the West End Borrow Area to a natural appearance upon completion of borrow activities.

- [LOC3] "The expected life-cycle of the facility should be clearly stated due to the long life of the contaminants."

  DOE Response: DOE recognizes that some contaminants placed in the disposal cell will be hazardous for many thousands of years. Because of this DOE will assure protection of human health and the environment from these hazards by emphasizing three complimentary activities. First, the facility will be designed to effectively isolate waste from the environment for generations. It will comply with or exceed ARARs which require stability and assessment of events with long return periods such as earthquakes and floods. Second, DOE realizes that there is a potential for contaminants to be released from the disposal cell while they are still hazardous. To assure protection, DOE is developing limits on the contaminants (WAC) that restrict wastes to those that will not pose an unacceptable risk to human health and the environment should they ever migrate from the cell. Finally, the selected remedy includes long-term surveillance and maintenance to assist in isolating waste from the environment. These three points are included in the "Description of the Selected Remedy" (in Part 1), in the "Selected Remedy" (in Part 2), and the importance of a risk/toxicity-based WAC to the protection of human health and the environment is presented in Appendix B.

- [LOC4]"Appendix B lists the ARARs, but the important ones considered for the design are not highlighted."

  DOE Response: Text in the "Compliance with ARARs" section identifies and explains major chemical-specific, location-specific, and action-specific ARARs.

ARARs affecting design are included as "Disposal Siting and Design Requirements" in the "Action-specific ARARS" section. Also, the post-ROD "Remedial Design Report" will contain a crosswalk of all ARARs, including the design ARARs to specific design components. This document will be reviewed and approved by EPA and TDEC.

- [LOC5]"The CAP accepts the DOE's statement that the waste acceptance criteria (WAC) will not be finalized until specified in a post-ROD primary document. Since the WAC are yet to be developed, the steps to accomplish this should be clearly stated in the ROD. There should also be some discussion of the WAC application to incoming waste."

  DOE Response: Appendix B of the ROD, Draft Waste Acceptance Criteria," contains the bases for the development of the WAC and a summary of how risk/toxicity-based WAC are derived. It references a "WAC Attainment Plan" that is currently being developed. Implementation of this plan will ensure only waste that complies with the WAC will be disposed in the cell. As described in Appendix B of the ROD and *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE/OR/02-1637&D2/A1), the three-step WAC control process for the on-site disposal cell consists of: (1) establishment of risk-based, contaminant-specific levels; (2) sum of fractions applied to assess risk from waste streams with multiple contaminants; and (3) volume-weighted sum of fractions applied to assess risk from entire disposal cell.

- [LOC6]"The stewardship discussion should be more precise and requires some detailed comments in the ROD. DOE should develop a stewardship program using the approach specified in the Stakeholder Report on Stewardship (July 1998) as a template. The CAP is particularly concerned about long-term postclosure funding for this waste facility."

  DOE Response: Comment noted.

- [LOC7]"Note that Appendix A contains errors, the location of the receptor, for example."

  DOE Response: The composite analysis (Appendix A of the *Proposed Plan for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of l980 Waste)* was written in 1997 and based on the Bear Creek Valley watershed CERCLA documentation that existed at that time, as well as the RI/FS evaluating on-site disposal. Since the composite analysis was performed, remediation alternatives for the Bear Creek Valley watershed were slightly modified before being approved by the regulators and the receptors used to

develop the risk/toxicity-based WAC for the on-site disposal cell were relocated. The final two paragraphs in Section 1, "Summary and Conclusions," of the composite analysis explain this and state that the conclusions drawn remain valid.

"The LOC is a non-profit regional organization funded by the state of Tennessee and established to provide local government and citizen input into the environmental management and operation of the DOE ORR. The Board of Directors of the LOC is composed of the county executives of Anderson, Knox, Loudon, Meigs, Morgan, Rhea, and Roane counties; the mayor of the city of Oak Ridge; and the chairs of the Roane County Environmental Review Board, the city of Oak Ridge Environmental Quality Review Board, and the CAP. The CAP has up to 20 members with diverse backgrounds who represent the greater ORR region."

City of Oak Ridge

"Enclosed is a copy of Resolution Number 4-42-99 as unanimously adopted by the Oak Ridge City Council during its regular meeting on April 5, 1999. This resolution places the Council on record as conditionally supporting the construction of an on-site disposal facility in East Bear Creek Valley near the Y-12 complex in Oak Ridge for disposal of low-level radioactive and hazardous wastes that will result from future cleanup of the Oak Ridge Reservation.

Please see that the City's position, as described in the attached resolution, is included in all considerations of this matter.

RESOLUTION

WHEREAS, the U.S. Department of Energy (DOE) has conducted a feasibility study to evaluate alternative strategies for disposal of low-level radioactive and hazardous wastes that will result from future cleanup of the Oak Ridge Reservation (ORR) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); and

WHEREAS, the DOE, the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) have issued the *Proposed Plan for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, DOE/0R/01-17161&D3,* to provide an opportunity for public input in the remedy selection; and

WHEREAS, the preferred alternative as described in the proposed plan is the construction of an on-site disposal facility in a brownfield area in East Bear Creek Valley near the Y-12 complex, which is within the corporate limits of the City of Oak Ridge; and

WHEREAS, the DOE proposes to apply strict waste acceptance criteria to ensure eligibility for disposal in the on-site facility for the protection of human health and the environment; and

WHEREAS, it would be better for the City in the long term if no waste remained on the ORR following remediation; however, the City recognizes that it would be cost prohibitive to the United States to eliminate all of the waste and contamination hazards on the ORR, and that some hazards will persist even if all remedial waste were disposed offsite; and

WHEREAS, consolidation of remediation wastes in a well-designed onsite disposal facility would significantly reduce the cost of environmental cleanup and the potential human health and environmental risks, when compared to the uncertainties associated with availability of off-site disposal; and

WHEREAS, the City's Environmental Quality Advisory Board (EQAB) has analyzed the proposed plan and recommended adoption of the proposed plan *provided that* the DOE mitigate some of the possible adverse consequences for the City of Oak Ridge; and"

[COOR1] "WHEREAS, the EQAB recommends that monies saved by disposing of CERCLA waste locally instead of sending it out of state be spent in Oak Ridge on activities such as accelerating cleanup projects, conducting more extensive cleanups, funding long-term stewardship of waste sites, and supporting Oak Ridge's economic development."

DOE Response: Comment noted.

[COOR2] "WHEREAS, the EQAB also recommends that a mechanism be established to assure funding for perpetual care of the facility, such as requiring DOE to pay a fee into a state-managed investment account for every cubic foot of material placed in the cell. Financial assurance should be provided not only for routine maintenance activities, but also to cover the potential costs of contingencies, including the cost of compensation for any parties harmed by unexpected failures and emergency response capabilities of the City."

DOE Response: Comment noted.

[COOR3] "WHEREAS, the EQAB also recommends that funding be provided to compensate Oak Ridge, now and in the future, for economic losses and costs related to the negative public perceptions associated with the presence of the disposal facility and other residual contamination. Compensation is needed both for opportunities lost due to negative public perceptions and for the costs of public education efforts to counter negative perceptions."

DOE Response: Comment noted.

[COOR4] "WHEREAS, the EQAB also recommends that DOE consider using this facility for disposal of modest quantities of newly generated ORR wastes that are similar to the waste generated by CERCLA activities. If some operations wastes can be safely disposed onsite, creation of onsite disposal capacity could assist the United States' missions in Oak Ridge and help assure Oak Ridge's future well-being by holding down the costs of ongoing and future federal R & D and production activities here."

DOE Response: Comment noted.

"WHEREAS, the City understands that the recommended mitigation measures may require congressional authorization and/or promulgation of new regulations, but deems these measures necessary if Oak Ridge is to accept the permanent presence of radioactive and hazardous waste; and

WHEREAS, the City Manager concurs with the recommendations ofEnvironmental Quality Advisory Board.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCILMEN OF THE CITY OF OAK RIDGE, TENNESSEE:

That the recommendations of the Environmental Quality Advisory Board as described herein, and as endorsed by the City Manager, are approved and are to be transmitted to the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Tennessee Department of Environment and Conservation as the official position of City Council; and

BE IT FURTHER RESOLVED that the Governor and Tennessee Congressional Delegation are urged to promote and adopt the legislative and administrative changes required to implement the mitigation measures described herein.

This the 5th day of April 1999."

Tennessee Department of Environment and Conservation, Division of Radiological Health

"Thank you for the opportunity to comment on the Proposed Plan for the Disposal of Oak Ridge Reservation CERCLA Waste. The Tennessee Division of Radiological Health has the following comment."

[TDEC-RAD] "In Appendix B, the ARARs for this proposal, the Tennessee Department of Environment and Conservation Low Level Waste requirements 1200-2-11 are listed as **relevant and appropriate** rather than as **applicable requirements**. EPA defines **"applicable requirements"** as "those cleanup standards, controls, and other substantive, environmental protection requirements,

criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location or other circumstance..." (Sect. 300.400(g)). Based on this, the TDEC Low Level Waste requirements are **applicable requirements** for the radioactive materials involved in this action and should be designated as such in this document. This opinion is buttressed by the EPA/CERCLA actions at other sites, e.g., Maxey Flats in KY."

DOE Response: The Rules of the TDEC 1200-2-11 are applicable by their terms only to commercial low level waste disposal facilities regulated under authority of the NRC. In the state of Tennessee, such regulatory authority is administered by TDEC as an agreement state per authorization by the NRC. NRC regulatory authority does not extend to the DOE on-site disposal facility, as DOE has been delegated authority for control of its nuclear material, per the Atomic Energy Act of 1954. Thus, requirements of the Rules of the TDEC 1200-2-11 are not applicable to the on-site cell. However those requirements were determined to be relevant and appropriate to the on-site disposal cell, consistent with 40 CFR 300.5. Note that by incorporation into the ROD, signed by the EPA, TDEC, and DOE, all ARARs, become legally binding. The remedial action must be undertaken in compliance with these requirements.

Envirocare of Utah, Inc.

"Attached are Comments on the Proposed Plan for Disposal of Oak Ridge Reservation CERCLA Waste. Comments are also included on the Feasibility Study which supports the proposed plan. Thank you for the opportunity of commenting.

Our review indicates that a more thorough cost analysis is needed to fairly consider the on-site versus off-site costs. The information we have provided indicates that off-site can be done at a cost less than on-site. Further, there are significant environmental benefits based on the location of the Envirocare Site. We look forward to working with you to help find the best solution to your waste disposal needs."

"Comments for the Proposed Plan on the Disposal of Oak Ridge Reservation CERCLA Waste"

1. [Envirocarel] "The costs for off site transportation and disposal were evaluated and are shown in Table (1) Off-Site Costs. The onsite costs should be increased to account for the additional capacity needed to properly dispose of debris. Debris will require three to ten times its volume for disposal (See Specific Comment). Table (2) On-Site Costs lists the impacts of debris on disposal costs."

DOE Response: DOE believes that the conclusions from the RI/FS remain valid based on the information presented. That is, the total cost of the on-site waste disposal alternative remains essentially equal to that for the off-site waste disposal alternative for the RI/FS low-end volume scenario, and the total cost of on-site disposal compared to that of off-site disposal remains considerably lower (approximately one-half) at the RI/FS high-end volume. These conclusions are further supported by updated information regarding waste volumes and types.

The cost criterion is only one of nine CERCLA evaluation criteria that must be considered when evaluating remedial actions, per the NCP. Based on the information presented in the RI/FS, the on-site disposal alternative appears to be the best alternative when evaluated under the CERCLA criteria. This evaluation includes the modifying criteria of state acceptance and community acceptance.

2. [Envirocare2] "The determination on cost can best be resolved through both on and off site alternatives in the ROD. After the ROD is approved, a procurement process considering on site and off site alternatives would provide the competition necessary to ensure the best price and alternative to be chosen."

DOE Response: The analysis completed to date indicates that construction of an on-site disposal facility will be more cost-effective than relying on off-site disposal for future CERCLA remediation waste. Thus, this ROD calls for construction of an on-site disposal facility. However, this ROD does not preclude disposal of remediation wastes off-site. Future RODs for sites to be remediated will identify on a case-by-case basis a selected approach managing waste generated pursuant to those RODs. If presented with a lower cost alternative for management of these wastes, DOE retains the option of procuring such services. While analysis conducted in support of this ROD indicates that on-site disposal is potentially much less expensive, please note that cost is not the sole criterion for this decision.

3. [Envirocare3] "Page H-5 of FS-Slight difference in the amount of waste needed for disposal between off site and on site. No reason to expect swell to be different."

DOE Response: Estimates for the amount of contaminated waste on ORR are "in place" volumes and will "swell" when removed from the ground or buildings. Swell factors of 20 percent (see RI/FS, pages H-29 and H-30) were applied during the development of the off-site disposal alternative cost estimate because DOE would be charged for the total volume of waste requiring transportation and disposal.

Waste volumes plus swell (the same swell factors as assumed for off-site disposal) were considered in the on-site disposal alternative. Also, under the on-site disposal alternative, the FS assumed that 5 percent of the total volume of waste removed from the ground or buildings would not meet the WAC for an on-site disposal facility and require off-site disposal. Waste volumes accounting for swell and the amount of waste requiring off-site disposal were used to predict the capacity of a disposal cell. For example, the capacity of a cell to dispose of the 223,000 yd^3 of "in-place" waste was estimated to be 357,000 yd^3 (see Sect. 7.2.2 of the RI/FS). The cost estimate for on-site disposal was based on constructing appropriately sized cells for the low- and high-end waste volumes and estimating the costs. The costs of the on-site alternative were not estimated by multiplying a unit rate by waste volumes.

4. [Envirocare4] "Page H-5 of FS - Estimate assumed that LLW would be placed in intermodal containers before shipment to Envirocare. A less costly alternative would be to consider bulk movement of the material into gondola cars for shipment."

DOE Response: During the FS, several potential off-site transportation scenarios were developed and evaluated. The least expensive scenario was then included in the FS off-site alternative. The shipping approach proposed in this comment was evaluated. It was not the least expensive because all waste would be "double-handled" (that is, loaded into trucks at the sites being remediated, and then transferred to gondola cars at the railhead). The scenario in the comment would have been less expensive if all sites being remediated had adjacent rail access and waste could be loaded directly into gondola cars.

5. [Envirocare5] "Why is the alternative estimated volumes different for the on-site disposal and off-site disposal alternatives? These quantities should be nearly equal (within the 5% factor that is considered excessive for the on-site WAC)."

DOE Response: The same waste volumes were assumed for both on-site and off-site disposal alternatives. However, in the case of on-site disposal, it was assumed that approximately 5 percent of the total volume of remediation waste requiring disposal would not meet the on-site facility WAC and thus would be shipped off site for disposal. Therefore, after removing 5 percent of the volume, the remaining volume (223,000 yd^3) plus swell resulting from removal, daily cover, and other associated codisposed materials (i.e., clean soil berms, etc.) was used to estimate the total volume of the on-site disposal cell required for both low-end and high-end volume scenarios (i.e., 357,000 yd^3 and 1.7 million yd^3, respectively) for conceptual design and costing purposes.

6. [Envirocare6] "A couple of costs/areas that may have been overlooked:

- Local regulatory concerns. "Will an Environmental Assessment be needed?"

  DOE Response: Local regulatory considerations, as well as Federal regulatory considerations, have been included in the analysis of the on-site disposal alternative. Specific portions of the Rules of the TDEC regarding disposal of low-level waste and hazardous waste in the state of Tennessee have been incorporated in the applicable or relevant and appropriate requirements for this CERCLA action. Consistent with DOE policy is to incorporate NEPA values into the CERCLA process to the extent practicable. Thus, no environmental assessment is required.

- "Contingency measures for possible future problems with on-site disposal, such as SW contamination, cell liner rupture, future regulatory changes, etc."

  DOE Response: Contingency measures have been adequately included in the on-site disposal alternative. The cell will be designed to minimize the probability for releases. The disposal facility will contain a leak detection system in the cell and be surrounded with groundwater monitoring wells to continually assess the performance of the facility. Finally, contingencies in the design will be available to mitigate shallow groundwater contamination, should it occur.

- "Costs should be estimated for Leachate collection and treatment at the on-site facilities."

  DOE Response: Requirements of both 40 CFR 761 and 40 CFR 264 (see Table 2.7) mandate the installation of a leachate collection and removal system for a TSCA and RCRA landfill, respectively. Thus, the cost of leachate collection and transportation to a treatment facility has been included in the on-site disposal alternative (see RI/FS, pages H-16 and H-17). Leachate treatment was assumed at DOE's CNF, a facility currently handling similar wastewaters. While the volume of leachate estimated to be collected from the facility will add an incremental cost to DOE's operation of the CNF, its contribution is not expected to increase capacity requirements. Thus, the cost impact to the on-site disposal alternative will be minimal.

- "Contingency Plan for the disposition of material that does not meet Envirocare's WAC, such as higher level nuclides. Additional storage costs? Alternate disposal (NTS) costs?"

DOE Response: Waste that could not be treated to meet a disposal facility WAC would either be transported to another DOE-approved or, as appropriate, EPA approved, off-site facility or placed in interim storage until treatment or disposal capacity becomes available (see page 2-19 of the ROD). Only a very small percentage of the total waste volume expected from remediation of ORR was predicted not to meet the WAC of the on-site disposal facility. Disposal of this waste is not considered a part of this action. The cost for this, however, was included in the cost estimate.

- "What about treatment costs? Would it be cheaper for an off-site facility to treat the waste prior to disposal? This is not an option for the on-site alternative."

  DOE Response: Waste treatment to meet the WAC is assumed to be the responsibility of the generator, not the operator of the on-site disposal facility. Should the generators determine that centralized waste treatment is more cost-effective, an evaluation and decision will be made independently of this action.

7. [Envirocare7] "Assumptions that significantly affect total project costs:

   - Davis-Bacon regulations regarding local prevailing wage rates will be in effect for all construction and operation.

   - Profit, fees, overhead, staff size, and management efforts are based on rates consistent with private industry rather than government management and operations contracting.

   - No contingency costs are added to the on-site disposal alternative cost estimate."

   DOE Response: The on-site alternative was developed per DOE-ORO practices and policy and consistent with the envisioned method of accomplishment. Davis-Bacon Act of 1931 wage rates were assumed to be in effect for construction and operation. Construction of the facility has been identified as a "Privatization Project." As a Privatization Project, profit, fees, overhead, etc. should be consistent with private industry. Competition within the private sector should assure this. No contingency costs are included in the estimate for on-site disposal. This is consistent with remediation alternatives in other FSs for the ORR. DOE does not present contingency cost in FS alternatives.

8. [Envirocare8] "R. Doug McCoy of TDEC (Tennessee Department of Environmental and Conservation): The state will not support delays to currently scheduled FFA (Federal Facility Agreement) milestones for cleanup actions in order to build a disposal cell on the ORR.

Therefore, their assumption that they can store the waste on site until the disposal cell is built is invalid" [Emphasis added.]

DOE Response: Comment noted.

9. [Envirocare9] "Bulk material is less costly than packaged material. Why didn't they look into this option."

DOE Response: See response to Envirocare4 comment.

10. [Envirocare 10] "Current disposal at IWMF (Interim Waste Management Facility) averages about $57 per cubic foot or $1,539 per cubic yard. The proposed CERCLA on-site facility alternative is much cheaper.

The new facility would not operate under DOE Order 5820.2A, and would therefore not need to follow all of the environmentally protective controls in place under this order. Therefore a much lower degree of protection is afforded through this alternative than through disposal at Envirocare's facility, or even a DOE Waste Management Facility." [Emphasis added.]

DOE Response: DOE strongly disagrees with the statement, "Therefore a much lower degree of protection is afforded through this alternative [on-site disposal] than through disposal at Envirocare's facility, or even a DOE Waste Management Facility." DOE policy requires demonstration of compliance and equivalent levels of protection between CERCLA actions resulting in on-site disposal of radioactive waste and DOE Order 5820.2A. To satisfy this policy, DOE prepared Comparative Analysis of Performance Assessment Requirements Under DOE Order 5820.2A and CERCLA Requirements for Disposal of Low-Level Radioactive Waste in East Bear Creek Valley, Oak Ridge, Tennessee. As documented in this analysis, performance requirements placed on the on-site disposal facility meet or exceed the performance requirements in the DOE Order.

11. [Envirocare11] "It is stated in the Proposed Plan that "there will be future disposal costs at individual sites over time that could equal or exceed costs under the two consolidated disposal alternatives. Please clarify this statement."

DOE Response: The statement cited in this comment was made in the context of the no action alternative. The definition of the no-action alternative, which is provided on page 2-19 of this ROD, provides that no sitewide strategy for the disposal of waste from ORR cleanup would be implemented. Therefore, as stated on page 2-35 of this ROD, "For those CERCLA sites that select removal and disposal without the benefit of a coordinated ORR-wide disposal program, transport costs and disposal fees could be higher because each project would have to negotiate separate contracts for these services and there would be no economies of scale."

12. [Envirocare12] "Table 1 - Comparative Analysis Summary states in the Off-site disposal alternative column under the short-term effectiveness evaluation criteria. "If wastes were shipped by truck, risk from vehicular accidents would increase significantly." This statement should not bear any factor on the analysis between on-site and off-site alternatives since the waste shipped to an off-site facility will be done by rail. Rail transportation constitutes a fraction of the risk posed by truck transportation."

DOE Response: It is true that, statistically, rail transport constitutes less risk than truck transport. However, the evaluation of truck transport to an off-site disposal facility is relevant. Envirocare, although identified in the alternative as the "representative" disposal facility, could possibly be replaced with another disposal facility (or facilities) should the alternative be implemented. To fully evaluate off-site disposal, an evaluation of truck transportation was appropriate and required.

13. [Envirocare13] "Does your costs for the onsite disposal alternative include the fee expected to be imposed by the State of Tennessee for disposal of each cubic foot?"

DOE Response: No.

14. [Envirocare14] "How will the cell design handle the mobile isotopes, Technetium 99, identified in the Proposed Plan as having "high leach rates from existing sources and elevated environmental mobility in groundwater and surface water." The Plan also states, "Technetium 99 leaching from the current pond sludges beneath the cap to groundwater intrusion cannot be ruled out." What is the cost of controlling the mobile isotopes and is this costs included in the on-site alternative costs? The cost of managing mobile isotopes such as Technetium 99 at the off-site disposal alternative location is already included in the disposal costs."

DOE Response: DOE recognizes that some contaminants placed in the disposal cell will remain hazardous for many thousands of years. DOE also recognizes that some are very mobile and have the potential to be released rapidly should a release occur (as

evidenced by the composite analysis text describing contaminant fate and transport from existing sources in Bear Creek Valley cited in this comment). Because of this DOE will assure protection of human health and the environment from these hazards by emphasizing three complimentary activities. First, the facility will be designed to effectively isolate waste from the environment for generations. It will meet or exceed ARARs that require stability and assessment of events with long return periods such as earthquakes and floods. Second, DOE realizes that there is a potential for contaminants to be released from the disposal cell while they are still hazardous. To assure protection, DOE is developing limits on the contaminants (WAC) that restrict wastes to those that will not pose an unacceptable risk to human health and the environment should they ever migrate from the cell. Finally, the selected remedy includes long-term surveillance and maintenance to assist in isolating the waste from the environment.

There are no additional costs included in the conceptual design for specifically controlling mobile isotopes. All contaminants that would pose a risk to human health, considering their potential mobility, are being modeled for the development of risk/toxicity-based WAC. Details of the development of the WAC and its importance to the protection of human health and the environment are presented in Appendix B of the ROD.

15. [Envirocare15] "The Proposed Plant [sic] states, "Depth to groundwater in Bear Creek Valley varies spatially and temporally." Please provide the depth to groundwater at East Bear Creek Valley in actual feet. The depth to groundwater at the off-site disposal alternative location varies from 30 feet to 1200 feet."

DOE Response: The most recent field activities included installation of groundwater monitoring wells in and around the conceptual "footprint" of the disposal cell. Depth of groundwater in this area ranges from 5 ft below the surface in the south increasing to 49 ft below the surface in the north.

16. [Envirocare16] "It is stated in the Proposed Plan that "Any contaminants from the proposed on-site disposal facility would be diluted as they move down the creek..." Does this mean it is expected that contamination will be leaking from the site? The off-site disposal alternative location does not have this concern due to its limited annual rainfall (6 inches per year and its and location."

DOE Response: (Envirocare comments 16 through 18 pertain to the *Composite Analysis for a Low-Level Radioactive Waste Disposal Cell in East Bear Creek Valley, Oak Ridge, Tennessee*, which was included as Appendix A of the proposed plan.)

As stated in the "Summary and Conclusions" section of the composite analysis, the purpose of the analysis is to estimate future cumulative radiation doses to hypothetical members of the public from all potential interacting sources of radiation from DOE waste in the ground in Bear Creek Valley, including assumed releases from the disposal facility. These dose estimates are then compared to dose limits established by DOE. The results of this comparison are then used to assist DOE in radioactive waste management decisions for areas already containing buried radiological wastes. To conservatively estimate the dose contribution by the disposal cell, the analysis assumes a conservative leakage rate for the cell based on estimated long-term performance and WAC-limited contaminant concentrations in the waste dispositioned and models the resultant scenario. Dilution of contaminants in the creek was incorporated in the modeling because the public receptor defined in this analysis (based on future land use assumptions) was approximately 2 km downstream from the receptor used to support the WAC development for the on-site disposal facility. Creek flow changes over this distance cause additional natural dilution of any potential contaminants that may enter the creek from the disposal cell. This allowed for a more realistic estimate of cumulative dose to the public receptor and showed that the proposed disposal facility did not significantly contribute to that cumulative dose.

17. [Envirocare17] "It is stated in the Proposed Plan that, "However, because characterization procedures have not yet been specified, it is not possible to quantify uncertainties in release rates from the proposed on-site disposal facility." Will these uncertainties be quantified prior to the Record of Decision (ROD) being signed? Also, are these costs associated with controlling such release rates included in the current on-site disposal alternative costs? If not, would they please be provided."

DOE Response: No, all release rates will not be quantified prior to the record of decision. However, release rates have been estimated for many radioactive constituents in a soil-like waste form through actual site-specific measurements of relevant release parameters, or from references for those parameters. Because conservative approaches, parameters, and value engineering have been used to design the disposal facility, no additional costs are required for controlling any initial uncertainty in constituent release rates.

18. [Envirocarel8] "The Proposed Plan states, "Parameters of the natural features in the migration pathways from the on-site disposal facility will not be as well known as those for the engineered disposal cell features." Please explain the reason for this. Will an Environmental Impact Statement/Study be needed to determine the true risks associated with the migration path for potential contaminants?"

DOE Response: Similar to other disposal facilities, parameters for the migration pathways from EMWMF to Bear Creek are the products of modeling. Design components and the behavior of the engineered RCRA liners and covers have been modeled and physically tested for years to build confidence in the modeling of the engineered features and to develop appropriate QA/QC procedures for their construction. Therefore, there is more confidence in the disposal cell features to effectively protect the public from unacceptable levels of contamination than requiring the natural migration pathway to be an essential component for safe waste isolation. No nonintrusive study of the natural system in East Bear Creek Valley will produce results with a confidence level as high as the parameters being used for the disposal cell. For this reason, the performance of the facility for protection of human health takes no credit for the performance of the natural features in the migration pathway. No Environmental Impact Statement/Study is required after issuance of this ROD. As noted earlier no NEPA document is required to implement this ROD.

19. [Envirocarel9] "Table B.1 Chemical-specific ARARs for on-site disposal under column Control of radiation exposure lists the citations for controlling radiation exposures as DOE Order 5400.5 as "proposed". With these Orders only "proposed" there may be a chance they are not the criteria to be implemented. What criteria will be implemented if the DOE Order 5400.5 is not used?"

DOE Response: As shown on Table 2.7, chemical-specific ARARs have been modified from that presented in the proposed plan. Specifically, DOE Orders 5400.5(I.4) and 5400.4(II.1a) have been replaced with relevant and appropriate NRC requirements in 10 CFR 20.1301(b) and 10 CFR 20.1301(a), respectively.

20. [Envirocare20) "It should be noted that the cost associated with the off-site alternative disposal already include fixed costs for design and construction costs and supporting facilities, operation and management of the disposal cell, environmental monitoring, closure and post-closure monitoring and maintenance."

DOE Response: Comment noted.

21. [Envirocare21] "Please explain why Bechtel Jacobs, Managing and Integration Contractor, overhead costs would not be applicable as costs elements under the on-site disposal alternative. It is our understanding Bechtel Jacobs is managing this project now, what are the costs being incurred today and should be included in the over total project costs. When will Bechtel Jacobs scope for the on-site cell be finished?"

DOE Response: DOE does not present overhead costs for the management and integrating contractor in the remedial alternatives included in the ORR FSs. However, such costs would apply to any selected remedial alternative because the M&I would implement the remedy.

22. [Envirocare22] "Please explain why DOE has elected to not include the cost of transportation of waste to on-site disposal facility but includes this cost in the off-site alternative? There are costs associated with both."

DOE Response: As stated in Chap. 4 of Appendix H, transport to either the on-site disposal facility or the transfer station for off-site shipment was not within the scope of the alternatives and would not represent a discriminating element between the alternatives because of comparable expense. Costs for these activities were assumed to be equal.

23. [Envirocare23] "DOE states "No remediation would be required to construct the on-site facility at an "impacted" site. If required, such activities would be considered a separate project. The implementation of such activities would likely have a significant impact on cost and schedule." Please explain why the cost associated with this activity, clearly part of the overall scope of constructing the on-site disposal cell, is not included in the overall total project cost."

DOE Response: Although located in an "impacted" or "brownfield" area with adjacent areas of contamination, the conceptual facility itself would not require any area within its footprint to be remediated before construction can begin. Therefore, there are no costs for remediation of contaminated areas in the on-site disposal alternative.

24. [Envirocare24] "Are the costs associated with returning containers to the waste generator and transporting the collected leachate included in the on-site disposal alternative?"

DOE Response: Costs for returning containers to the waste generators and transporting collected leachate are included in the on-site disposal alternative.

APPENDIX A

PUBLIC PARTICIPATION

Public Participation

DOE has presented the CERCLA waste disposal project at various public meetings, including semiannual ORR sitewide briefings, and in fact sheets made available to the public. In April 1996, DOE began holding regular public briefings with the SSAB, a citizen's panel advising the DOE EM Program. The ORR End-Use Working Group, a subcommittee of the SSAB, was established in 1996 to provide recommendations to DOE on postremediation ORR land use, cleanup assumptions and goals, and beneficial reuse of portions of ORR. DOE, TDEC, and EPA consider this input for revising the FFA schedules, scheduling and planning future CERCLA watershed evaluations, and implementing remediation.

Input from organizations such as the city of Oak Ridge, Environmental Quality Advisory Board, Local Oversight Committee, SSAB, the Oak Ridge Environmental Peace Alliance (OREPA), and Friends of ORNL, as well as the general public, has been valuable in identifying alternatives and selecting the DOE proposed disposal remedy. Comments received throughout the evaluation process have influenced the approach, content, and conclusions of the CERCLA decision documents. SSAB, OREPA, and Friends of ORNL have each voiced support for construction of the on-site disposal facility.

This appendix contains letters received to date from interested parties regarding construction of an ORR on-site disposal cell.

AK RIDGE RESERVATION

Environmental Management

March 4, 1998

Mr. Rod Nelson
Assistant Manager for Environmental Management
DOE/ORO
P.O. Box 2001
Oak Ridge, TN 37831

Dear Mr. Nelson:

At our March 4, 1998 meeting, the Oak Ridge Reservation Environmental Management Site Specific Advisory Board (ORREMSSAB) reviewed and approved the enclosed "Recommendation to Site a Waste Disposal Facility on the Oak Ridge Reservation."

This recommendation is based upon and consistent with the conclusions reached by the End Use Working Group, an independent group initiated by the ORREMSSAB.

We look forward to receiving your written response to our recommendation. Thank you for your continued support of the ORREMSSAB.

Sincerely,

William M. Pardue

William M. Pardue, Chair
ORREMSSAB

WMP/sb

Enclosure

cc: Ms. Margaret Wilson, DOE/ORO
Mr. John Hankinson, USEPA Region IV
Mr. Earl Lemong, TDEC
Ms. Susan Gawarecki, LOC
M. Heiskell, DOE/ORO
Karol Hamrd, DOE/HQ
ORREMSSAB Members
EUWG Members

P.O. Box 2001 • Mail Stop EW-91 • Oak Ridge, TN 37831 • (423) 241-3665

Recommendation to Site a Waste Disposal Facility on the Oak Ridge Reservation

Remediation of contaminated areas and buildings on the Oak Ridge Reservation (ORR) will generate large volumes of waste materials (up to 1.5 million cubic yards) with varying level and kinds of contamination. The Oak Ridge Reservation Environmental Management Site Specific Advisory Board (ORREMSSAB) believes that the Department of Energy (DOE) must take a balanced approach[1] to the disposal of the contaminated waste materials. A balanced approach requires (1) construction of an onsite waste disposal facility for materials meeting site-specific waste acceptance criteria and (2) disposal off-site for those materials not meeting the waste acceptance criteria.

DOE should consider the following criteria when planning an ORR waste disposal facility:

1. The facility should be located on or adjacent to an area that is contaminated and previously used for long-term waste disposal. After consideration of the Community Guidelines, the End Use Working Group conclusions, and the siting recommendation based on summaries of ecological, hydrogeological, and transportation issues prepared by the ORREMSSAB[2], the Board believes that the East Bear Creek Valley site is the most appropriate location for a waste disposal facility.

2. Facility design must safely isolate contaminated materials from the environment.

3. For materials with very low levels of contamination, options for safely managing these materials without elaborate disposal requirements should be given meaningful consideration.

4. Waste disposal capacity should accommodate both current and future volumes of ORR remediation waste.

[1]A balanced approach recognizes that ORR's environmental problems can not be solved by shipping all of its waste elsewhere. DOE must take into account the concerns of stakeholders at potential receiving facilities and along transportation routes. DOE must also take into account the total costs and risks associated with managing wastes on site vs. off site.

[2]Recommendation to eliminate the White Wing Scrap Yard from consideration as a location for an Environmental Management Waste Management Facility. Approved by the ORREMSSAB on February 5, 1997. Subsequently, DOE deferred any disposal options until the End Use Working Group developed Community Guidelines to aid in cleanup decisions (March 3, 1997 letter to Stakeholders from Rodney R. Nelson. Assistant manager for Environmental Manager for Environmental Management. DOE/ORO.)

6. Perpetual stewardship of the disposal facility and surrounding property must be assured.

7. Focused stakeholder input should be solicited prior to making decisions regarding facility design, waste acceptance criteria and acceptance of waste from outside ORR.

Implementation of this recommendation by the DOE must be consistent with the Community Guidelines and needs for long-term stewardship. This recommendation is based upon and consistent with the conclusions reached by the End Use Working Group for Siting a Waste Disposal Facility on the Oak Ridge Reservation (End Use Working Group recommendation dated September 19, 1997). If the DOE cannot meet this recommendation, exceptions must be discussed in a public forum as part of the decision-making process.

END USE
RKING GROUP

RECOMMENDATION TO SITE A WASTE DISPOSAL FACILITY ON THE OAK RIDGE RESERVATION

Remediation of the Oak Ridge Reservation (ORR) will generate large volumes of material containing varying degrees of contamination. The End Use Working Group believes that DOE should take a balanced* approach to the disposal of contaminated materials from the ORR. A balanced approach will require construction of an on-site waste disposal facility to manage contaminated materials meeting site-specific waste acceptance criteria. Material not meeting waste acceptance criteria for an ORR waste disposal facility should be disposed of off site.

DOE should consider the following criteria when planning an ORR waste disposal facility:

1. The facility should be located on or adjacent to an area that is contaminated and previously used for long-term waste disposal. After consideration of the End Use Working Group's Community Guidelines, the End Use Working Group believes that the East Bear Creek Valley site is the most appropriate location of the three sites proposed by DOE.
2. Facility design must safely isolate contaminated materials from the environment.
3. For materials with very low levels of contamination, options for safely managing these materials without elaborate disposal requirements should be given meaningful consideration.
4. Waste disposal capacity should accommodate both current and future volumes of ORR remediation waste.
5. Consideration should also be given to creating disposal capacity for non-remediation waste. If on-site waste disposal capacity is limited for any reason, the first priority should be given to remediation wastes.
6. Perpetual stewardship of the, disposal facility and surrounding property must be assured.
7. Focused stakeholder input should be solicited prior to making decisions regarding facility design, waste acceptance criteria, and acceptance of waste from outside ORR.

*A balanced approach is one which recognizes that Oak Ridge's environmental problems should not be solved by shipping all of its waste elsewhere. DOE must take into account the concerns of stakeholders at potential receiving facilities and along transportation routes. DOE must also take into account the total costs and risks associated with managing wastes on site *vs*. off site.

We the undersigned members to the Oak Ridge Reservation End Use Working Group, have participated in the development of and endorse the above recommendations.

Wolf Naegele — Jim Fleming — _____

Barbara A. Walton — Jerry B. Phillips — _____

Homer Wacaster — John P. Byers — _____

Roger L. Macklin — James L. Johnson Jr. — _____

Andy Kelsey — Alfred H. Brooks — _____

Robert Bolle — William M. Parks — _____

Mary Bryan — _____ — _____

September 19, 1997

Friends of Oak Ridge National Laboratory
P.O. Box 6641
Oak Ridge, Tennessee 37831-6641

February 9.1998

Ms. Margaret Wilson
Remediation Management Branch Chief and
FFA Project Manager
U. S. Department of Energy
Oak Ridge Operations
P.O. Box 2001
55 Jefferson Circle
Oak Ridge, TN 37830

Dear Ms. Wilson:

The Friends of ORNL officially endorses the *Community Guidelines for End Uses of Contaminated Properties* (Draft 6/9/97) as developed by the End Use Working Group (EUWG). The Friends of ORNL also endorses the EUWG recommendations for future land use of disposal areas on the Oak Ridge Reservation (i.e. *End use Recommendation for Bear Creek Valley*, October 2, 1997 and *Recommendations for the End Use of Contaminated Lands in Bethel Valley Area of the Oak Ridge National Laboratory*, May 29, 1997) and the recommendation to site a waste disposal facility on the Reservation (i.e. *Recommendation to Site a Waste Disposal Facility on the Oak Ridge Reservation*, September 1997).

The Friends of ORNL is an organization of former and present staff members of Oak Ridge National Laboratory and other citizens who are interested in the welfare of the Laboratory and the community. The Friends of ORNL currently has about 200 members, several of whom serve on the End Use Working Group.

When additional EURG land use recommendations are forthcoming or if there are significant revisions to the *Community Guidelines*. we will take these under consideration at the appropriate time.

Sincerely,

William Fulkerson, President

cc: Susan Gawarecki, LOC
Steve Kopp, LOC/CAP
William Pardue, ORREMSSAB
Doug Sarno. Phoenix Environmental
Karen Bowdle, EUWG
Earl Leming, TDEC
Richard Green, USEPA Region IV
Jon Johnston, USEPA Region IV
Camilla Warren, USEPA Region IV

'97 1141

OAK RIDGE ENVIRONMENTAL PEACE ALLIANCE

Nilson

RECEIVED
OFFICE OF AMEM
9/15

Received
Office Of The Manager
9-12-97

September 9, 1997

Mr. Justin Wilson
Deputy to the Governor for Policy
State Capitol
Nashville, TN 37243-0001

Dear Mr. Wilson:

The Oak Ridge Environmental Peace Alliance (OREPA) is a nonprofit organization which advocates for responsible environmental restoration of the Oak Ridge Reservation and to end nuclear weapons production in Oak Ridge. We are also active participants in the End Use Working Group for the Oak Ridge Reservation.

We have read with interest your recent letter to the Department of Energy outlining the state's Guidance Policy on perpetual institutional controls at the Oak Ridge Reservation. We are encouraged to see that the state has taken a stand regarding the cleanup of uranium wastes in Bear Creek Valley. During numerous public meetings, the Department of Energy has made it clear that they prefer to leave the vast majority of these wastes in place. We believe that much more of the wastes can be safely excavated than is currently planned. There are other area on the Reservation, such as Melton Valley, where it may be impossible to excavate wastes without undue risk to workers. This does not appear to be the case for uranium wastes in Bear Creek Valley.

Of concern, however, is what would happen to the millions of pounds of wastes that could potentially be excavated from Bear Creek Valley. OREPA's principled position is that wastes should be disposed as closely as possible to their source; that is, Oak Ridge Reservation wastes should not be dumped in someone else's back yard. We believe that an on-site waste disposal cell may be a critical factor for environmental restoration of the Oak Ridge Reservation.

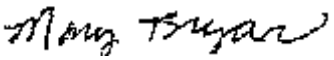
We understand and have been quick to point out the problems associated with waste disposal and the complex hydrogeology and shallow groundwater at the Oak Ridge Reservation. Unfortunately, given today's political and economic realities, the choice may well be between either leaving wastes in place or disposing of them in an on-site disposal cell. The costs to ship wastes to off-site facilities, and the increasing reluctance of state governments to accept out-of-state wastes, tend to make this option infeasible. We feel that disposing wastes in an above-ground, engineered disposal cell with leachate detection and collection systems is superior to leaving wastes in place and in contact with groundwater, even if in situ treatments are applied.

100 Tulsa Road, Suite 4A
Oak Ridge, TN 37830

Aggressive cleanup of the Oak Ridge Reservation (beyond that which is outlined in the Department of Energy's "Accelerating Cleanup: Focus 2006" plan) is key to making an on-site disposal cell a reality. High volumes of cleanup waste are necessary for an on-site disposal cell to be a cost-efficient means of waste disposal. The Focus 2006 Plan currently relies on leaving a great deal of waste in place and depending on institutional controls in perpetuity. This strategy is unacceptable to OREPA and appears to be in violation of the state's Guidance Policy.

We appreciate the state's interest in this issue. If you need further information, please do not hesitate to contact us.

Sincerely,



Mary Bryn
Coordinator

cc: Governor Don Sunquist
James Hall, DOE
Rod Nelson, DOE
John Hankinson, USEPA
Earl Lemming, TDEC

APPENDIX B

DRAFT WASTE ACCEPTANCE CRITERIA

B.1. INTRODUCTION

This appendix summarizes the preliminary WAC for the on-site disposal facility developed in the RI/FS (DOE 1998a) and Addendum (DOE 1998b). WAC define the waste types (regulatory classifications), waste forms (physical parameters), and contaminant concentrations accepted for disposal.

The WAC in this appendix are "draft." Final WAC will be developed during the remedial design phase of the CERCLA process. Final radiological and chemical WAC will be based primarily on long-term risks, toxicities, final cell design, operational requirements, and ARARs. The potential for worker exposure during operation of the facility may dictate additional restrictions on waste acceptance, treatment, packaging, or handling. The development of additional waste acceptance provisions to limit exposure will likely be left to the operating contractor of the facility, and derived using practical information on waste handling techniques and operational controls. Other WAC will be required to limit free liquids, profile the waste relative to acid/base characteristics for placement, and establish constraints on the pyrophoric/combustible/explosive nature of the waste.

Draft WAC contaminant concentrations (analytic WACs) for the on-site disposal cell were developed by back-calculating maximum concentrations for contaminants that would meet a priori risk/toxicity-based criteria under stipulated exposure conditions, for a period of up to 1000 years. Additionally, constituents with peak risks/toxicities occurring after 1000 years were also identified and corresponding WAC concentrations developed as a key component of the uncertainty analysis. For the purpose of WAC development, receptors were assumed to be located where they would be subjected to the maximum potential exposure from estimated future contaminant releases from the on-site cell. Because the risk and toxicity calculations rely on conservative assumptions, the draft WAC concentrations and facility design are likewise conservative.

B.2. REGULATORY AND PHYSICAL WAC

Candidate waste streams for the on-site disposal cell include LLW, hazardous waste as defined by RCRA, PCB-contaminated waste as defined under TSCA, and mixed wastes consisting of combinations of these waste types. Liquid wastes, TRU wastes, spent nuclear fuel, and sanitary

wastes are not considered to be candidate waste streams. All listed wastes must meet RCRA land disposal restrictions (LDRs) per 40 CFR 268. Wastes prohibited from land disposal are not acceptable.

To ensure that waste received at the disposal facility can be properly handled, the physical form of waste will be restricted. Appropriately sized, solidified waste will be accepted. Large debris, containers, and solidified waste may be accepted if special handling arrangements are made. Size limitations for large debris and treatment options to minimize void spaces in the disposal cell and prevent damage to the liner system will be developed during the remedial design phase. Certain waste generators may need to use size reduction equipment such as shredders or grinders to meet these requirements. Void spaces will be minimized within and between containers placed in the cell. Because no free liquids will be allowed, waste will be required to pass the paint filter test. Wastes containing explosive, shock-sensitive, or pyrophoric substances, and infectious wastes will likely be excluded from the on-site disposal facility. These specific WAC requirements (physical WAC) will be developed during the post-ROD remedial design phase.

B.3. CONCENTRATION LIMITS

WAC constituent concentrations represent the maximum allowable concentration of a contaminant for various waste forms (e.g., soil-like, stabilized, solidified, or debris-like), and waste types (e.g., LLW, RCRA, TSCA). Risk/toxicity-based WAC are determined such that target risk and toxicity levels at specific receptor points, and stated time frames are not exceeded. Analytical fate and transport models are used for predicting the contaminant concentrations (WACs) corresponding to those risk/toxicity levels at the receptor locations. Appendix E of the RI/FS (DOE 1998a) and the RI/FS Addendum (DOE 1998b) provide details of the WAC modeling process.

The design features of the cell and institutional controls will preclude intrusion directly into the wastes or into the restricted facility area. The only potential direct exposure pathway linking the waste to receptors is migration of contaminants through mostly shallow groundwater discharging to surface water in Bear Creek or one of its tributaries adjacent to the disposal cell (NT-5). In the RI/FS Addendum (DOE 1998b), the future receptor was a residential farmer located between the disposal facility and Bear Creek (in the direction of general groundwater flow from the facility to Bear Creek), This hypothetical receptor was assumed to use water drawn from a well constructed at that location for domestic purposes. Bear Creek surface water obtained from a location downstream of the intersection of the nearest tributary (NT-5) and Bear Creek was used for agricultural requirements, including irrigation of crops and livestock watering. It is anticipated that

ultimate ORR land-use decisions, however, will result in the nearest potential receptor being located far downstream of the receptor point used to develop the analytic WAC. Modeling addressed the water pathway through the disposal cell cover, waste, underlying vadose zone, and into the groundwater, and then into a groundwater well and surface water used by the receptor.

PATHRAE was used as the full pathway analytical model to evaluate the use of Bear Creek surface water for agricultural purposes. In addition to data on waste volume and characteristics, PATHRAE relied on input from other models, information on contaminant release mechanisms, and additional material and geohydrologic parameters. The Hydrologic Evaluation of Landfill Performance (HELP) model was used to estimate the rate of infiltration into and through the cell to groundwater. Contaminant release mechanisms and predicted migration rates determine the concentration of contaminants in water passing through the cell and entering the groundwater regime. The rate and path of groundwater flow were estimated by a pair of standard, site-specifically calibrated groundwater models, MODFLOW and MODPATH. In conjunction with flow data for Bear Creek and its tributaries, these groundwater flow data enabled PATHRAE to be used to estimate future contaminant concentrations in Bear Creek. PATHRAE also evaluated the uptake of contaminants through the food chain to the future residential farmer and calculated the associated risks and toxicities anticipated from using Bear Creek for agricultural purposes.

To determine the risk/toxicity contribution for domestic use of groundwater, the solute transport code MT3D was coupled with MODFLOW. Using the modeled contaminant seepage concentrations and rates developed to assess impacts on Bear Creek, as previously described, the MT3D/MODFLOW combined model generated three-dimensional contaminant distributions for the groundwater regime between the disposal facility and Bear Creek. A representative well was located in this solute flow field, and simulations were made without and with continuous pumping of the well at 0.17 gal/minute. This pumping rate was equivalent to the well being pumped twice daily for 1 hour at 2 gal/minute, which is a plausible domestic well utilization. The concentrations withdrawn from the well under this well pumping scenario were used to obtain risk and toxicity estimates from domestic well usage; these estimates were also combined with corresponding impacts from using Bear Creek for agricultural purposes. The detailed modeling approach is more fully described in Appendix E of the RI/FS (DOE 1998a) and its addendum (DOE 1998b).

A 1000-year compliance period was used for the on-site disposal facility, consistent with regulatory time frames considered in the DOE composite analysis guidance (DOE 1996f), DOE Order 5820.2A and draft DOE Order 435.1. Target risks selected for the calculation of WAC were an ILCR of 1×10^{-5} and a noncarcinogenic (systemic) risk HI < 1. These limits are consistent with the EPA target risk range for public exposures from remediated sites and are more restrictive than

the 25 mrem/year dose requirement stipulated in DOE Order 5820.2A (DOE 1998e). In addition, peak risks beyond 1000 years were calculated for uncertainty/sensitivity analyses to evaluate the long-term characteristics of the disposal cell design and performance. Modeling concentrations and estimating risks/toxicities beyond the design life of a disposal facility are inherently uncertain, and the results are generally less reliable than those for time frames within the design life of a facility (facility designed to environmentally isolate waste for at least 1000 years). For time periods > 1000 years after cell closure, complementary risk and toxicity criteria were adopted. For carcinogenic risks, the upper end of the EPA target risk range, 1×10^{-4}, was chosen. For systemic effects, the upper end of the acceptable range of HI values, 3, was used to calculate remedial goal options (EPA 1995). The draft WAC incorporates the additional WAC concentrations developed from the RI/FS uncertainty/sensitivity analyses. Table B.1 presents the risk-based WAC concentrations calculated for soil-like materials. WAC for waste forms other than soil-like materials have not been fully developed.

For preliminary screening purposes, the soil-like WAC was used as a surrogate WAC for all waste forms. Although this approach is adequate for a preliminary evaluation, it is also conservative because stabilized, solidified, and debris-like materials are expected to have lower leaching rates than soil-like materials and consequently higher WAC concentration limits than those for soil-like materials. Therefore, improved models for estimating release rates from treated wastes and debris waste forms will be needed to estimate appropriate concentration limits for those waste forms. WAC concentrations or methods for determining contaminant release rates for the nonsoil waste forms along with methods for calculating the WAC for these waste forms will be included in the WAC attainment plan developed in the post-ROD period.

Peak toxicities or risks for various contaminants were calculated assuming that the concentration is 1 mg/kg hazardous materials or 1 Ci/m^3 radioactive materials, respectively, and that the entire disposal cell volume is occupied by that contaminant in a single waste disposal form. These results were used to back-calculate the contaminant concentration that would result in attaining the target and complementary risk and toxicity levels at the selected receptor location. This calculated contaminant concentration is the analytical WAC for that constituent in that waste form.

The underlying assumptions used to derive the individual concentrations must be considered when applying the WAC. As noted above, each constituent was modeled assuming a uniform concentration distributed in a single waste form throughout the entire waste cell volume. The most important parameter is the overall average concentration of contaminant in the waste cell.

However, in reality, the cell would be filled with a mixture of different waste streams/forms, each containing many contaminants. A methodology is required to ensure that the aggregate impacts from a mixture of contaminants does not exceed the target risk/toxic criteria. To account for this condition, WAC for each waste stream will be applied using a sum-of- fractions procedure. This method consists of first dividing the concentration of each contaminant in a waste stream by its corresponding WAC, and then summing these fractions. If the fractional sum is < 1, the waste stream can be accepted without further consideration of the contaminant concentrations. This procedure ensures that the overall risk presented by the mix of contaminants will not exceed the target and complementary risk and toxicity levels, when the entire waste stream (or form) is assumed to occupy the entire disposal cell. Because CERCLA considers noncarcinogenic toxicities and carcinogenic risks separately, the sum-of-fractions limitation applies separately for WAC based on carcinogenic risks and noncarcinogenic toxicities. The sum of fractions, based on carcinogenic and systemic WAC, must be independently < 1.

For example, for a soil-like waste stream containing 1 mg/kg of carbazole (individual carcinogenic WAC of 1.1E+05 mg/kg), 50 mg/kg of carbon tetrachloride (individual noncarcinogenic WAC of 66 mg/kg, and an individual carcinogenic WAC of 56 mg/kg), and 100 mg/kg of phenol (individual noncarcinogenic WAC of 3200 mg/kg) would be considered acceptable for disposal without further concentration considerations because both the carcinogenic and noncarcinogenic sum-of-fractions conditions would be met as follows:

1. carcinogenic sum of fractions = (1/1.1E+05) + (50/56) < 1 and
2. noncarcinogenic sum of fractions = (50/66) + (100/3200) < 1.

However, because of the second underlying assumption, requiring the carcinogenic and noncarcinogenic sum of fractions to be less than or equal to 1 as absolute screening limits to be applied to individual waste streams would cause the projected risk/toxicity for all the waste placed in the disposal cell to be considerably less than the adopted criteria. This is because many waste streams are likely to have individual sum of fractions less than 1, and each waste stream will produce contributions to the risk/toxicity criteria in proportion to their respective volume. For example, consider two waste lots of the same waste type (soil, debris, etc.) and of equal volume. If one lot has a sum of fractions of 0.9 and the other has a sum of fractions of 1.1, both can be placed in the disposal cell and the net sum of fractions for the combined lots would be 1. Therefore, for this example, the risk criteria would not be exceeded, and more waste could be placed in the disposal facility than if only the waste lot with a sum of fractions less than 1 was allowed.

To maximize the volume of waste that can be placed safely in the disposal facility (comply with the risk/toxicity-based criteria), a volume-weighted sum-of-fractions (VWSF) approach will be used to determine the acceptability of individual waste streams. The VWSF is the sum of all sums of fractions for each waste lot placed or likely to be placed in the disposal facility, with each individual waste lot's sum of fractions multiplied by the volume of the waste lot's volume and divided by the total volume to be placed. To meet the risk/toxicity-based criteria for safe disposal, the VWSF must not exceed 1. An example of the implementation of the VWSF waste screening process to the preliminary CERCLA generated waste inventory is given in the RI/FS Addendum (DOE 1998b). Procedures for implementing the VWSF process during disposal operations will also be detailed in a post-ROD developed WAC attainment plan.

Uncertainties

The design and construction of the disposal cell will control its hydrological performance within acceptable limits. Uncertainties in the transport of leached contaminants in groundwater to surface water will have a minimal effect on the draft WAC concentrations because more than 90 percent of the estimated travel time for contaminants from the source to potential receptors occurs within the facility's engineered features and the thin vadose zone between the facility's prepared geological buffer and the groundwater. Therefore, the major WAC uncertainties are functionally linked to the contaminant release rates from the waste forms and leachate concentrations resulting from leached contaminants mixing with infiltrated water passing through and around the water forms.

K_d Values

Where available, K_d factors (soil-to-liquid partitioning coefficients) used to model contaminant leaching for ORR soils in previous studies in the West Bear Creek Valley area were used to predict leach rates from the soil waste form [including radiological K_d factors used by the Low-Level Waste Disposal Development and Demonstration Program Class L-II Tumulus Facility (ORNL 1996)]. However, many hazardous constituents modeled have not been considered by previous characterization efforts at the West Bear Creek Valley site or for potential soil waste. For those constituents, default values obtained from various literature sources were used. In general, variations in the K_d values for the soil-like waste form alter the predicted leaching characteristics of the waste and the calculated WAC concentrations. Though the values used are sufficiently representative for this draft WAC analysis, waste-specific and site-specific K_d factors for radiological and hazardous constituents developed from actual waste analysis and field data would

be preferable in establishing the final facility WAC. Alternatively, the WAC attainment plan allows for a process of calculating revised waste stream-specific WAC based on measured K_d.

Incomplete Waste Characterization Information

There are many waste streams in the future CERCLA inventory for which no characterization data exist, and numerous others for which the available data are sparse. Additional characterization will be required for these waste streams before disposal. It is possible that there will be contaminants present in these waste streams for which WAC constituent concentration limits have not been developed. Procedures to develop supplementary WAC for such contaminants will be prescribed as part of the final WAC implementation guidelines (i.e., WAC attainment plan).

Waste Forms Other Than Soil-Like Materials

The modeling performed in the RI/FS (DOE 1998a) for waste forms other than soil-like materials involved release mechanisms for which adequate modeling algorithms are not readily available in literature sources. As a result, release rates estimated for these waste forms (stabilized materials, solidified materials, and debris-like materials) are speculative. In order to set appropriate concentration limits for these waste forms, additional post-ROD evaluation will be needed. Such an evaluation would have to consider the treatment methodologies likely to be used and their effect on the release rates of various contaminants. Different concentration limits would be modeled or release rates measured for various treatment methodologies (e.g., grout stabilization, grout or cement solidification, vitrification, resin solidification, etc.) to account for the relative effectiveness of the various technologies. An effective alternative to setting definitive concentration limits is to impose limits based on measured leachate concentrations or release rates similar to the procedure used in RCRA Toxicity Characteristic Leaching Procedure (TCLP) tests. Such an approach would have an advantage over definitive concentration limits because it would directly measure the specific parameter of interest. This approach would also allow flexibility in the choice of future treatment options, as new proposed technologies could be proven as acceptable based on measured results. These WAC will be developed in the post-ROD WAC attainment plan.

B.4. SUMMARY AND CONCLUSIONS

The goal of the FS analysis was not to set a definitive WAC for an operational facility but to determine whether the concept of an on-site disposal cell is a viable alternative based on its projected ability to safely and economically contain a significant percentage of waste generated from

future CERCLA remedial actions. The analyses performed were tailored to the FS-level evaluation, and several assumptions and uncertainties were accepted in lieu of definitive data. The impact of these assumptions and uncertainties was assessed and deemed acceptable within the context of the FS objectives. Final WAC and procedures for attainment (the WAC attainment plan) will be developed as part of the remedial design process based on final design, long-term risks, ARARs, and expected operational activities. Regulatory agencies will review and approve this documentation.

Table B.1. Risk-based WAC constituent concentration limits for soil-like materials in the on-site disposal facility, ROD for disposal of ORR CERCLA waste, Oak Ridge, Tennessee

Constituent	Carcinogenic risk limit	Systemic effects limit
Radionuclides (pCi/g)		
^{241}AM	2.0×10^{21}	NA
^{3}H(tritium)	150,000	NA
^{14}C	5.0	NA
^{99}Tc	43	NA
^{233}U	1,700	4.5×10^{7}
^{234}U	1,700	2.8×10^{7}
^{235}U	1,500	9,500
^{236}U	1,700	280,000
^{238}U	1,200	1,500
^{129}I	13	NA
^{237}Np	320	NA
^{239}Pu	720	NA
^{240}Pu	5,800	NA
Hazardous contaminants (mg/kg)		
Acenophthene	NA	3.9×10^{5}
Acetone	200	NA
Antimony	NA	160
Barium	NA	1.5×10^{5}
Benzene	200	NA
Carbazole	1.1×10^{5}	NA
Carbon tetrachloride	56	66
Chloroform	40	100
Chromium	NA	1.4×10^{5}
Di-n-butylphthalate	NA	190
Dieldern	7.1	60
Isophorone	6,100	15,000
Lead	NA	1,500

Table B.1. (continued)

Constituent	Carcinogenic risk limit	Systemic effects limit
N-nitroso-di-n-propylamine	0.019	NA
Naphthalene	NA	9,900
Phenol	NA	3,200
Selenium	NA	1,600
Strontium	NA	3.0×10^5
Tetrachloroethene	440	900
Tin	NA	2,200
Toluene	NA	4.9×10^4
Trichloroethene	780	NA
Vanadium	NA	25,000

Am = americium
C = carbon
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
g = gram
^{3}h = tritium
kg = kilogram
mg = milligram
NA = not applicable
Np = neptunium
ORR = Oak Ridge Reservation
pCi = picocurie
Pu = plutonium
ROD = record of decision
Tc = technetium
U = uranium
WAC = waste acceptance criteria