EA-1117; Environmental Assessment and FONSI Management of Spent Nuclear Fuel on the Oak Ridge Reservation Oak Ridge, Tennessee, February 1996

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Acronyms and Abbreviations

ac
: acres

ALARA
: as low as reasonably achievable

Bldg.
: Building

Bq
: becquerel

BMAP
: Biological Monitoring and Abatement Program

BSR
Bulk Shielding Reactor
CERCLA
Comprehensive Environmental Response, Compensation, and Liability Act
CFR
Code of Federal Regulations
CH
contact-handled
CH
contact-handled
Ci
Curie
cm
centimeter
DOE
U.S. Department of Energy
dpm
disintegrations per minute
EA
environmental assessment
EDE
effective dose equivalent
EIS
environmental impact statement
EPCRA
Emergency Planning and Community Right-to-Know Act
FONSI
finding of no significant impact
ft
foot (feet)
ft2
square foot/feet
ft3
cubic foot/feet
g
gram
HEPA
high-efficiency particulate air (filter)
ha
hectare
HFIR
High Flux Isotope Reactor
h
hour
HRLEL
High Radiation-Level Examination Laboratory
in
inch
INEL
Idaho National Engineering Laboratory
ISCST
Industrial Source Complex Short-term (model, EPA)
kg
kilogram

km
  kilometer
km2
  square kilometer
L
  liter
lb
  pound
LCF
  latent cancer fatality
LLLW
  liquid low-level waste
LLW
  low-level waste
m
  meter
m2
  square meter
m3
  cubic meter
mgy
  milligray
mph
  miles per hour
mrad
  millirad
mrem
  millirem
MSRE
  Molten Salt Reactor Experiment
mSv
  millisievert
MT
  metric ton
MTHM
  metric tons of heavy metal
MVST-CIP
  Melton Valley Storage Tank-Capacity Increase Project
MW
  megawatt
NAAQS`
  National Ambient Air Quality Standards
NEPA
  National Environmental Policy Act of 1969
NPDES
  National Pollutant Discharge Elimination System
ORNL
  Oak Ridge National Laboratory
ORR
  Oak Ridge Reservation
ORRR
  Oak Ridge Research Reactor
OSHA
  Occupational Safety and Health Administration

p
: pico

P&E
: Plant & Equipment Division

PEIS
: programmatic environmental impact statement

PM
: particulate matter

ppm
: parts per million

REDC
: Radiochemical Engineering Development Center

RM
: remote-handled

ROD
: Record of Decision

SDP
: Site Development Plan

sec
: second

SHPO
: state historic preservation officer

SLLW
: solid low-level waste

SNF
: spent nuclear fuel

SRS
: Savannah River Site

$^{90}SrTiO_3$
: strontium 90 titanate

Sv
: sievert

SWSA
: solid waste storage area

TRU
: transuranic

TSR
: Tower Shielding Reactor

yd
: yard

yr
: year

Fm
: micrometer

Summary

On June 1, 1995, the U.S. Department of Energy (DOE) issued a Record of Decision (ROD)* [60 *Federal Register* 28680] based on the analyses presented in a programmatic environmental impact statement (PEIS) (DOE 1995a) for the Department-wide management* of spent nuclear fuel* (SNF)(1). In the ROD, DOE selected regionalized storage* of SNF by fuel type as the preferred alternative. Implementation of the preferred alternative would require that aluminum-clad SNF from the DOE complex be transported to storage at the DOE Savannah River Site in South Carolina and non-aluminum-clad SNF, except for production reactor* fuel from Hanford, be transported to storage at

the DOE Idaho National Engineering Laboratory, pending ultimate disposition*.

The proposed action evaluated in this environmental assessment (EA) is the management of SNF on the DOE Oak Ridge Reservation (ORR) to implement the preferred alternative of regional storage. To implement the ROD, ORR SNF would be retrieved from storage; transferred by truck to a hot-cell facility, if segregation by fuel type and/or repackaging is required; loaded into containers/transport casks that meet Federal regulatory requirements; and shipped via truck to off-site storage at either the Savannah River Site or the Idaho National Engineering Laboratory. Transport from Oak Ridge to off-site storage and impacts at off-site storage locations were evaluated in the PEIS and would not be part of the proposed action addressed in this EA. The proposed action would also include construction and operation of a dry cask SNF storage facility on the ORR to help ensure continuation of reactor operations. Construction and operation of the dry cask storage facility would only occur if there was interruption of off-site shipments of HFIR SNF, resulting in inadequate SNF storage.

A no-action alternative was also evaluated. No action would not include construction or operation of the dry cask storage facility or the shipment of SNF from the ORR. This would result in the eventual shutdown of the High Flux Isotope Reactor when SNF wet storage space is exhausted.

Impacts analyses resulted in the following findings:

Air--There would be no atmospheric emissions during handling and on-site transportation. Fugitive dust from construction would be short-term, localized at construction site, and sporadic. Off-site ambient concentrations of criteria pollutants would not be affected and National Ambient Air Quality Standards would not be violated.

Water--No emissions or effluents would occur during handling, packaging, and on-site transport. Erosion and sedimentation to surface waters during construction would be controlled by best management practices.

Geology and Soils--No prime farmland would be impacted, and erosion would be controlled with best management practices.

Ecology--For construction of a dry cask storage* facility, up to 1.2 ha (3 ac) of land would be cleared. This would result in loss of less than 0.05% of the pine forest on the ORR. No federally listed, threatened, or endangered species of plants or animals or designated critical habitats are known to occur on or near the site. Best management practices during construction would protect against impacts due to erosion. Construction of the dry cask storage facility would contribute to cumulative impacts on ORR vegetation, wildlife, and wildlife habitat. Less than 1% of forested areas in Melton Valley would be cleared for construction of all planned facilities.

Floodplain/Wetlands--There would be no construction activities within either a floodplain or wetland for either the preferred or alternative site. A small, man-made wetland near the preferred site will be marked with flags prior to construction to prevent potential disturbance.

Radiological Impact: Operation--Operation of the dry cask storage Facility would result in worker doses* less than DOE=s annual limit of 50 mSv (5 rem) and dose rates less than as-low-as-reasonably-achievable levels of 0.025 mSv/h (2.5 mrem/h). Impacts to the public would be negligible.

Radiological Impact: Transportation--On-site transportation of SNF associated with segregating, repackaging, and storage activities would result in potential radiological impacts to the worker handling SNF and to the public* that are less than those predicted in the PEIS: 1.36 H 10-4 (0.000136) occupational fatal cancers and 4.28 H 10-6 (0.00000428) public* fatal cancers. To put these values in perspective, the DOE occupational limit for radiological exposures would result in a cancer fatality risk* of 2 H 10-3 (0.002), and background annual exposure would be associated with a cancer fatality risk of approximately 2 H 10-4 (0.0002).

Radiological Impact--Accidents--Accidents* involving handling the SNF would result in a probabilistic cancer fatality risk to the maximally exposed individual (public) and to the worker of 9.6 H 10-7 and 1.9 H 10-7 (0.00000096 and 0.00000019), respectively. This compares to a 2 H 10-4 (0.0002) fatality risk resulting from background radiation exposure. Therefore, the cancer risk from accidents is extremely small.

Socioeconomics--The small workforce necessary for construction would be drawn from the ORR labor pool. There would be no influx of workers associated with any of the proposed projects.

Historic Preservation--Although there is one historic structure in Melton Valley, it would not be affected by the proposed action.

Environmental Justice--Because the proposed action would have no adverse impacts, no minority or economically disadvantaged populations would be disproportionately affected.

1. INTRODUCTION

1.1 Purpose of and Need for Action

On June 1, 1995, the U.S. Department of Energy (DOE) issued a Record of Decision (ROD*) [60 *Federal Register* 28680] based on the analyses presented in a programmatic environmental impact statement (PEIS) (DOE 1995a) for the Department-wide management* of spent nuclear fuel* (SNF*) (2). In the ROD, DOE selected regionalized storage* of SNF by fuel type as the preferred alternative. Implementation of the preferred alternative would require that aluminum-clad SNF from the DOE complex be transported to storage at the DOE Savannah River Site (SRS) in South Carolina and non-aluminum-clad SNF, except for production reactor* fuel from Hanford, be transported to storage at the DOE Idaho National Engineering Laboratory (INEL), pending ultimate disposition*.

The proposed action evaluated in this environmental assessment (EA) is the management* of SNF on the DOE Oak Ridge Reservation (ORR) to implement the preferred alternative of regional storage. To implement the ROD, ORR SNF would be retrieved from storage; transferred by truck to a hot-cell facility, if segregation* by fuel type and/or repackaging is required; loaded into container/transportation casks that meet Federal regulatory requirements; and shipped via truck to off-site storage at either the SRS or the INEL. Transport from Oak Ridge (Figure 1.1) to off-site storage and impacts at off-site storage locations were evaluated in the PEIS and are not part of the proposed action addressed in this EA. The proposed action would also include construction and operation of a dry cask SNF storage facility on the ORR to help ensure continuation of reactor operations. Construction and operation of the dry cask storage facility would only occur if there was interruption of off-site shipments of HFIR SNF, resulting in inadequate SNF storage.

Action is needed to enable DOE to continue operation of the High Flux Isotope* Reactor (HFIR) facility that generates SNF. The HFIR and related facilities produce radioisotopes* for industrial and medical applications. Shipment of the current inventory of ORR SNF would make storage space available for future SNF generated by HFIR. Re-racking of SNF storage positions in the HFIR is necessary in order to store additional HFIR SNF. Even with this re-racking, storage space will be filled by 2001 if HFIR SNF is not shipped. The dry cask storage facility would allow continued HFIR to continue to operate after 2001, even if SNF shipments are discontinued. This would ensure that the supply of important isotopes for industry and nuclear medicine would not be interrupted. If the HFIR continues operating through the year 2035, the predicted SNF production would be approximately an additional 480 fuel assemblies.

Figure 1.1. General Location of the Oak Ridge Reservation and Main Facilities in Oak Ridge, TN

1.2 Background

Spent nuclear fuel is that which has been used in a nuclear reactor and removed from the core when its uranium content has been depleted. For the purpose of this EA, SNF also includes reactor fuel assemblies, uranium/neptunium target materials, blanket subassemblies, pieces of fuel, and debris. SNF is stored dry or wet. In dry storage, fuel is not immersed in liquid for the purpose of cooling and/or shielding from radiation*. In wet storage, SNF is placed in a pool of water.

Facilities that have either generated or stored SNF on the ORR are described below (see also DOE 1995a: PEIS,

Appendix F - ORR, pp. 3.2-8 through 3.2-16). A summary of SNF storage at these locations on the ORR is provided in Table 1.1, and the locations are presented in Figure 1.2.

1.2.1 SNF Storage Facilities Within the Scope of this EA

(1) High Flux Isotope Reactor (Building 7900)--The 85-megawatt (MW) HFIR is an operating beryllium-reflected, light-water-cooled and moderated, flux-trap-type reactor. It is the primary or sole source of several important isotopes, and is the only facility on the ORR currently generating SNF. The reactor uses aluminum-clad fuel plates containing highly enriched uranium*-235. Since 1985, HFIR spent fuel has been placed in wet storage* at HFIR. As of September 1, 1995, 65 fuel assemblies are stored in the stainless steel-lined HFIR pool. Current HFIR operation yields approximately one additional fuel assembly per month. After the pool is reracked (in progress), remaining storage space for SNF would accommodate about 75 additional months (about 6 years) of HFIR operation.

(2) Tower Shielding Reactor (TSR, Building 7700)--The 1-MW Tower Shielding Reactor is a light-water-moderated research reactor* that was shut down in 1992. The reactor was placed in standby in September 1992 pending DOE direction to prepare the facility for shutdown. The existing spent fuel assembly remains in the reactor. There are no current plans for resuming operations.

Table 1.1. Spent Nuclear Fuel Stored on the Oak Ridge Reservation, Oak Ridge, TN and Within the Scope of this EA

SNF Storage Facilities Facility Name	Facility Description	SNF Stored at Facility	No. of items	Units	Mass (MT)[b]	Volume (m^3)	Heavy Metal Mass (MTHM)[b]
High Flux Isotope Reactor (HFIR; 7900)	Operating research reactor; wet storage	HFIR fuel[c]	65[d]	assemblies	8.674	7.38	0.626
Tower Shielding Reactor (TSR; 7700)	Reactor shut down in 1992; wet storage	TSR fuel[b]	1	assembly	0.182	0.1	0.009
Bulk Shielding Reactor (BSR; 3010)	Reactor shut down in 1991; wet storage	BSR & ORRR fuel[b]	73	elements	0.2367	0.39	0.059
High-Rad Level Examination Laboratory (HRLEL, 3525)	Hot cell facility*; dry storage*	Misc. fuel samples	1	unit	0.001	0.1	0.0001
Radiological Engineering Development Center (REDC, 7920)	Hot cell facility; dry storage	Dresden-1 fuel s Mark-42	2 18	cans cans	0.0057 0.99	0.1 0.0053	0.004 0.001
Solid Waste* Area 5 North: -- Facility	Dry storage facility	Misc. fuel	9	cans	0.175	1.2	0.0019

7823A							
-- Facility 7827	Dry storage facility	Al-, stainless steel-, & zircalloy-clad Peach Bottom fuels[e]	67	cans	2.009	3.68	0.156
-- Facility 7829	Dry storage facility	Peach Bottom[d] fuels	14	cans	0.552	1.15	0.0161
TOTAL	~	~	~	~	11.926	14.08	0.872

*See Glossary (Appendix A)

[a.] Sources: DOE 1995, Appendix F; Klein 1995

[b.] MT=Metric Tons;MTHM=Metric Tons of Heavy Metal

[c.] Aluminum-clad fuel

[d.] As of September 1, 1995

[e.] Peach Bottom Nuclear Plant fuels are from research and development.

BSR Bulk Shielding Reactor PTRL-DRWG-2-200901

HRLEL High Radiation-Level Examination Lab

HFIR High Flux Isotope Reactor

REDC Radiochemical Engineering Development Center

TSR Tower Shielding Reactor

SWSA 5 Solid Waste Storage Area 5

Figure 1.2. Oak Ridge Reservation Spent Nuclear Fuel Storage Sites Addressed in this Environmental Assessment.

(3) Bulk Shielding Reactor (BSR, Building 3010)--The 2-MW Bulk Shielding Reactor is an open-pool, light-water-moderated and -reflected training and research reactor. This reactor was built in 1951 and shut down in 1991; there are no plans for resumption of operations at this time. There are 41 elements from the BSR and 32 elements from the Oak Ridge Research Reactor (ORRR) in wet storage in the BSR pool, which has an epoxy/fiberglass liner.

(**4) High Radiation*-Level Examination Laboratory (HRLEL, Building 3525)**--This two-story brick structure was built in 1963 and contains hot cells*. The facility mission has been disassembly and examination of irradiated fuel and components. Building 3525 hot cells contain research reactor fuel in the form of fuel samples and targets*. These facilities are designed to handle, examine, and provide interim storage of SNF. All operations are designed to be performed in a dry environment.

(5) Radiochemical Engineering Development Center (REDC, Building 7920)--This building is a multipurpose hot cell facility with equipment, shielding, and containment provisions to safely process and store significant quantities of targets from the HFIR. Building 7920 contains research reactor fuel in the form of fuel samples in dry storage*.

(6-8) Solid Waste* Storage Area 5 (SWSA 5, Dry Storage Facilities 7823A, 7827, and 7829)--The storage configurations for these shielded, retrievable storage facilities are dry storage positioned below grade in SWSA 5 North. They vary from 20 to 76 cm (8 to 30 in.) in diameter and from 3 to 4.6 m (10 to 15 ft) in depth. The stainless-steel storage tubes were placed on a concrete pad and held in place by concrete slabs and are surrounded by soil or concrete. Spent fuel and other materials were placed in the storage positions beginning in 1972.

1.2.2 SNF Storage Facilities Beyond the Scope of this EA

A summary of SNF stored on the ORR, but not within the scope of this EA is presented in Table 1.2.

(1) Molten Salt Reactor Experiment (MSRE, Building 7503)--The MSRE operated from June 1965 to December 1969. The purpose of the reactor was to test the practicality of a molten-salt reactor concept for central power station applications. Following reactor shutdown, the fuel and flush salts were drained to critically safe storage tanks and isolated. The SNF inventory at the MSRE consists of approximately 4650 kg (about 9500 lb) of fuel salt mixture in dry storage. The uranium salt is predominantly uranium-233 [31 kg (68 lb)] with lesser amounts of uranium-234, uranium-235, uranium-238, and plutonium-239. The MSRE is part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA*) site and is awaiting decommissioning* and decontamination*. Future actions at the MSRE, including management of the MSRE SNF, will be determined through the CERCLA process.

(2) SWSA 6 - KEMA Suspension Test Reactor Fuel--The KEMA Suspension Test Reactor (located in the Netherlands) was an experimental fluidized bed test reactor. One can of SNF was placed in SWSA 6 for storage. As with the MSRE, future actions at the KEMA SWSA 6 site will be determined through the CERCLA process. SNF stored at this site is, therefore, not within the scope of this EA.

(3) High-Level Radiochemical Laboratory (Building 4501)--Constructed in 1951, this facility contains centrally located hot cells supported by various laboratories capable of handling radioactive materials. It no longer contains SNF, and the facility is, therefore, not in the scope of the EA.

(4) Oak Ridge Research Reactor (ORRR, Building 3042)--The ORRR was shut down permanently in 1987 and has been defueled. Most of the fuel was transported to the SRS, but some of the fuel was transferred to the BSR pool (see Item 3, Section 1.2.1). No SNF is currently stored at the ORRR, and the facility is therefore not in the scope of this EA.

Table 1.2. Spent Nuclear Fuel on the Oak Ridge Reservation, Oak Ridge, TN

Facilities Beyond the Scope of this EA (8)

SNF Storage Facilities Facility Name	Facility Description	SNF Stored at Facility	No. of items	Units	Mass (MT)[9]	Volume (m^3)	Heavy Metal Mass (MTHM)[b]
Molten Salt Reactor Experiment[c] (MSRE; 7503)[c]	Reactor closed in 1969; dry storage*	MSRE fuel	1	core*	8.940	1.81	0.038
Solid Waste Storage Area 6 --KEMA Suspension Test Reactor 5	Disposal facility	KEMA Suspension Test Reactor fuel	1	pipe	0.132	0.01	0.023
Bldg. 4501--High-Level	Hot cell	None (misc. fuels canned	0	pin	0	0	0.00

Radiochemical Laboratory	facility*; dry storage	and moved to dry storage in Facility 7827)					
Oak Ridge Research Reactor (ORRR; 3042)	Reactor shut down in 1987 and defueled	None (moved to SRS or BSR pool)	0	~	0	0	0.00

*See Glossary (Appendix A)

[a.] Sources: DOE 1995, Appendix F; Klein 1995

[b.] MT=Metric Tons of Heavy Metal.

[c.] COvered in CERCLA actions

1.3 Scope of Environmental Assessment

This EA evaluates the environmental impacts on the ORR of implementing DOE=s ROD on the SNF Management PEIS. The EA also evaluates the no action alternative. Implementation of the ROD would require the following actions:

- Preparation of SNF on the ORR for transportation to the SRS and INEL-- This would include retrieval* of the fuel, movement to a handling facility, sorting, characterizing, possible repackaging, and placement into an off-site shipping cask. These procedures would differ at each storage facility. Potential impacts may affect worker health and safety, public health, and transportation. No ecological impacts are anticipated because existing facilities would be used.
- Shipment of SNF to SRS and INEL--Potential impacts of shipment of these fuels to SRS and INEL are reported in the PEIS (DOE 1995a, Appendix I, p. I-105); therefore, off-site shipment need not be discussed in this EA.
- Construction and operation of a dry cask storage facility--The storage facility would be designed to store SNF generated from the HFIR in the future (at a rate of approximately one fuel assembly per month for 40 years). This new facility would only be constructed if SNF could not be shipped to the SRS or INEL and storage space was predicted to be filled less than a year after the dry cask storage facility would be ready for operation. Construction could affect terrestrial ecology, air quality, surface water runoff, cultural resources, and socioeconomics.
- Operation of the dry cask storage facility--Worker health and safety, public health, and on-site transportation could be affected.
- Safety documentation and criticality safety limits exist for each of the facilities where SNF is stored or managed. Impacts from credible accidents will be evaluated in this EA.

This EA will result in either a finding of no significant impact (FONSI), or the preparation of an environmental impact statement (EIS) if the potential for significant impacts is indicated.

2. ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 No Action

If no action is taken, current SNF management practices on the ORR would continue. No SNF would be shipped from the ORR to off-site storage, and the dry storage facility would not be built. Lack of SNF storage space would require shutdown of the HFIR by 2001. Shutdown of the HFIR would eliminate:

- the national capacity to provide transuranic isotopes,
- the only western-world source of some medical isotopes, and

the nationally and internationally important capability for research and development in the structure of materials and radiation effects on materials (DOE 1995a, Appendix F, p. 3.3-2).

No action would also result in continued on-site storage of SNF and maintenance of storage facilities to meet health and safety requirements. Current impacts from these facilities are part of the description of the baseline environment (Chapter 3).

2.2 Proposed Action (Preferred Alternative)

The proposed action is the management of SNF on the DOE ORR to implement the preferred alternative of regional storage. To implement the ROD, ORR SNF would be retrieved from storage; transferred by truck to a hot-cell facility, if segregation by fuel type and/or repackaging is required; loaded into transport casks/containers that meet regulatory requirements; and shipped via truck to off-site storage at either the SRS or the INEL. The proposed action would also include construction and operation of a dry cask SNF storage facility on the ORR to help ensure continued HFIR reactor operations. Construction and operation of the dry cask storage facility would only occur if there was interruption of off-site shipments of HFIR SNF, resulting in inadequate SNF storage. Transport from Oak Ridge to off-site storage and impacts at off-site storage locations were evaluated in the PEIS and, therefore, are not addressed in this EA.

2.2.1 Dry Cask Storage Facility Construction

A dry cask storage facility is proposed to house SNF currently stored in eight locations on the ORR (Table 1.1). This is consistent with the national SNF program, which encourages dry cask storage for new interim SNF storage facilities (DOE 1994a). The storage facility would also be designed to store SNF generated from the HFIR in the future (at a rate of approximately one fuel assembly per month for 40 years). This new facility would only be constructed if SNF could not be shipped to the SRS or INEL and existing on-site storage space would not be adequate to allow continued operation of the HFIR. The construction schedule of the storage facility would ensure that the facility would be available for operation less than a year before the existing storage space for HFIR SNF was filled. The facility would be designed for 40 years of operation and to meet DOE and/or the Nuclear Regulatory Commission (NRC) regulations. If necessary, the proposed facility could also store other materials classified as SNF from the ORR (e.g., KEMA and MSRE fuels), which are currently not part of this proposed action (Section 4.5.10).

Dry storage systems are mature technologies that are being applied at U. S. commercial and foreign nuclear electric generating systems (DOE 1995a). In a dry storage system, cooling of SNF is accomplished by heat transfer to the inner wall of the storage system, with eventual heat rejection through vents to the air surrounding the storage system. A modular dry cask system is preferred at Oak Ridge. A modular system would easily accommodate the relatively small quantities of existing SNF at the ORR (Appendix B). Incremental additions can be readily made as needed to accommodate future SNF being generated by the HFIR. A number of large storage casks are available in the DOE system and in commercial applications. The concrete and steel casks are top- or end-loading (DOE 1995a).

One preferred and one alternate location for the dry cask storage facility are shown in Figure 2.1. A site selection committee chose these two sites out of seven alternative sites on the ORR, based on health and safety, functional, environmental, and programmatic criteria (Appendix B). Either site would consist of a maximum of 1.2 ha (3 ac) and would be cleared and graded for construction.

The facility would be a reinforced concrete pad within a double security fence. A gravel area would be provided for cask loading and unloading. A concrete pad of about 20 m H 50 m (70 ft H 160 ft) would serve as a storage area for concrete cylinders approximately 7 m (25 ft) tall with about a 3 m (10 ft) diameter. A hollow center in the cylinder would house the SNF. The SNF would be packaged in different ways and could include stackable baskets, borated aluminum pipes, canisters, or other storage devices and configurations (Lockheed Martin 1995a). Design specifications of the dry cask storage facility ensure that the area is 1.8 m (6 ft) above the seasonal high level of the groundwater table and the 100-year floodplain*.

The facility would be constructed in a modular fashion; storage space would be added as needed. Construction would be completed before the reracked HFIR pool is full. If the maximum facility size were constructed at one time, construction would occur during about a two-year period. Approximately 10 construction workers would be needed for construction activities.

Figure 2.1. Proposed Locations for the Dry Cask Storage Facility: SWSA 5 and West of HFIR

2.2.2 SNF Management Operations

Operational activities associated with the proposed action would include:

- segregation of SNF by fuel type and repackaging, if necessary,
- on-site transportation,
- storage in the dry cask storage facility, and
- loading and transloading* for off-site shipment.

Each of these activities are described in this section.

2.2.2.1 Segregation and Repackaging

Before off-site transport, some SNF would need to be repackaged to meet the acceptance criteria of the receiving site. Repackaging involves unpacking the SNF, segregating it by fuel type, and re-packaging it for shipment. Aluminum-clad fuel, excluding that from the BSR and HFIR, would be placed into aluminum cans to meet SRS SNF acceptance criteria. Non-aluminum-clad SNF would be placed in stainless steel cans to meet INEL acceptance criteria. Most SNF has been previously characterized. If required, additional characterization would involve visual examination, verification that the package contents meet the acceptance criteria, and possibly chemical analysis of samples at an on-site laboratory.

Segregation and repackaging, if needed, could take place at six locations (see Table 2.1). These locations contain hot cells that are used for this type of operation, particularly if the fuel is not intact. It is expected that most repackaging would be conducted in the hot cells in Building 3525.

2.2.2.2 On-Site Transport

The movement of SNF on the ORR would depend on the type of SNF, its storage location, and preparation required for each shipment. For example, some SNF may need to be transported to a repackaging facility prior to storage or off-site shipment. Also, some SNF

Table 2.1. Summary of Handling Activities for Spent Nuclear Fuel on the Oak Ridge Reservation.

Facility Name	No. Of Items of SNF	Units	Possible Repackaging Locations	Possible Transloading Locations	Maximum No. of Shipments	Maximum Distance per Shipment km (mi)	Total Distance km (mi)
HFIR (7900)	65	elements	Not required	HFIR pool	545[a]	3.8 (2.4)	2071 (1287)
TSR (7700)	1	assembly	TSR, Bldg. 7920, HFIR, Bldg. 3047	TSR, Bldg. 7920, HFIR, Bldg. 3047	23	20.6 (12.8)	474 (294)

BSR (3010)	73	elements	Not required	HFIR, Bldg. 3047, ORRR (Bldg. 3042)	73	7.0 (4.3)	511 (318)
HRLEL (3525)	1	unit	Bldg. 3525, Bldg. 3019	SWSA 5, Bldg. 3047, Bldg.7920, Bldg.3042	1	6.9 (4.3)	6.9 (4.3)
REDC (7920)	20	cans	Bldg. 3525, Bldg. 3019	SWSA 5, Bldg. 3047, Bldg.7920, Bldg.3042	20	9.4 (5.8)	188 (117)
SWSA 5 North: -- Facility 7823A	9	cans	Bldg. 3525, Bldg. 3019	SWSA 5, Bldg. 3047, Bldg.7920, Bldg.3042	90	8.4 (5.2)	756 (470)
-- Facility 7827	67	cans					
-- Facility 7829	14	cans					
						TOTAL	4007 (2490)
Source: DOE 1995a, Appendix F; Klein 1995; Socolof et al. 1995.							

a. 545 shipments=65 currently stored fuel elements +480 fuel elements generated at 1/month for the next 40 yearsmight need to be placed in interim storage at the proposed dry cask storage facility prior to off-site shipment. On-site transportation casks are made of various steel alloys.

Once off-site transport is imminent, the SNF would be placed into an off-site shipping cask. For example, SNF in SWSA 5 could be transloaded at SWSA 5, Building 3047, or Building 7920. TSR fuel could be transloaded at TSR, HFIR Building 7290, or Building 3047. All the location options are presented in Table 2.1, which lists the expected locations for repacking and transloading SNF, the maximum possible on-site shipment distance for each SNF storage facility, and number of anticipated shipments. On-site transport would involve a crew of about 5 workers.

Different on-site routes would be used to transport SNF from each storage location. The upper-bound cases of SNF on-site transport would consider the maximum number of trips along the longest distances between repackaging, storage, and transloading locations. For example, from Table 2.1, the bounding case for SWSA 5 fuel (in Facilities 7823A, 7827, and 7829) would be transporting SNF 1.9 km (1.2 mi) to Building 3525 for repackaging; 3.0 km (1.9 mi) to the dry cask storage facility for interim storage; and then 3.5 km (2.1 mi) to Building 3047 for transloading to an off-site shipping cask for shipment off-site (e.g., SRS). The total distance equals 8.4 km (5.2 mi) per shipment. The number of on-site shipments is also presented in Table 2.1, which can be used to calculate a total distance for SNF from each current storage location.

2.2.2.3 Dry Cask Storage Facility Operation

The dry cask storage facility would house storage casks and would not require constant attendance by operating personnel. The facility would only be occupied during transfers of SNF to the facility. Radiation exposure of operations personnel in the storage area must comply with 10 CFR 20 ("Standards for Protection Against Radiation") and 40 CFR 191 ("Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level, and Transuranic Radiation Wastes"). To meet the DOE Order 5480.11 as-low-as-reasonably achievable (ALARA)* goals, the maximum dose rate to operations personnel from the highest-activity SNF cannot exceed 2.5

mrem/h. A radiological alarm system would be provided in accessible work areas and a criticality monitoring system would be provided.

3. EXISTING ENVIRONMENT

3.1 Natural Features

This section briefly describes the natural features of the ORR. It then provides a description of the natural features of Melton Valley. Finally, it provides details on the proposed and alternative sites for the dry cask storage facility.

3.1.1 Oak Ridge Reservation

The DOE-owned ORR is located in Oak Ridge, Tennessee, approximately 25 miles west of Knoxville. The ORR consists of 14,245 ha (35,200 ac) in a rural area bounded by the Clinch River on its eastern, southern, and western borders (Figure 1.1). It is topographically characterized by valleys and ridges.

Abundant precipitation is the driving mechanism of the hydrologic system. The surface water hydrology* on the ORR is characterized by a small network of streams that are tributaries to the Clinch River. The Clinch River is the primary source of water for the ORR and the City of Oak Ridge. The water intake is upstream of the ORR.

Groundwater in the area supplies water to rural residents, industries, and public water utilities as well as sustaining base flow in streams and rivers. The properties of groundwater on the ORR are highly dependent on the geology of the area. The geologic units through and upon which the groundwater passes affect its flow and quality (Chance 1991).

There are wetland areas within ORR consisting mostly of small, swampy areas generally less than 9 m (30 ft) wide located within and around major drainage basins

(Chance 1991). Wetlands are found in stream drainages and along Melton Hill and Watts Bar Reservoir (Cunningham and Pounds 1991).

The dominant plant association on ORR is oak-hickory forest that is most widely distributed on ridges and dry slopes (Kitchings and Mann 1976). Southern yellow pines are also common, especially in areas that were cleared and farmed before 1942. The most common understory trees throughout ORR are red maple, blackgum, and sourwood. ORR provides habitat for a large number of animal species, including about 60 reptilian and amphibian species, more than 152 species of birds (including 32 species of waterfowl, wading birds, and shorebirds), and about 40 mammalian species. Habitats supporting the greatest number of species are those dominated by hardwood forests and wetlands.

Suitable habitat for the federally listed threatened bald eagle exists on Melton Hill Lake, which borders the ORR on the south, and eagles have recently been observed there. Also, a federally listed, endangered gray bat was recently found dead at the Y-12 plant. No other federally listed threatened or endangered plant or animal species are known to occur on the ORR except for threatened peregrine falcons which are uncommon visitors.

Of the animals listed by the State of Tennessee as endangered or threatened (Hatcher 1994a), only the threatened osprey is known to occur regularly on the ORR. Other state endangered or threatened species of wildlife may occasionally visit the ORR, but suitable breeding habitat is not present (Kroodsma 1987). A number of other animals listed by the state as being in need of management are found on the ORR. These species are listed in Appendix C.

A number of plant species that are found on the ORR are candidates for federal listing or are listed by the State of Tennessee as endangered, threatened, or of special concern. These species are listed in Appendix C.

A minimum of ten extensive archaeological reconnaissance surveys have been conducted on the ORR with many documented by DOE (DOE 1983). Various archaeological sites exist on the ORR, including Freels Cabin, an historic site, and the Jones House site. Freels Cabin is listed in the *National Register of Historic Places* pursuant to 36 CFR

60.4(d) and the Jones House is considered eligible for inclusion in the list.

3.1.2 Melton Valley

Melton Valley (Figure 2.1) is the area within the ORR where the dry cask storage facility is proposed to be located. Several designated waste management* areas, including solid waste storage areas are located there. The following sections describe natural features of Melton Valley.

3.1.2.1 Soils

The only prime agricultural soil in the vicinity of Melton Valley is Pope soil. This bottomland soil type occurs in areas less than 30 m (100 ft) wide adjacent to some stream drainages. Because of the small size of these areas, they would not be valuable for agricultural use.

3.1.2.2 Groundwater Hydrology

Groundwater movement in the Melton Valley Conasauga Group of rocks has been extensively investigated (McCold et al. 1992; Rothschild et al. 1984). The current understanding of Melton Valley is that this area is a groundwater discharge area; recharge of the groundwater in the Conasauga Group occurs at Haw Ridge (Figure 2.1). The primary direction of groundwater movement in the Conasauga is parallel to the strike (N55EE). This observation suggests that the greatest permeability in unweathered bedrock is associated with partings between beds and perhaps with residue of more soluble units.

3.1.2.3 Surface Water

The majority of Melton Valley is drained in a southwesterly direction by the White Oak Creek watershed which covers 16.4 km2 (6.37 mi2) (Figure 3.1). Melton Branch, the primary tributary of White Oak Creek, joins the main stem at White Oak Creek Mile 1.55 and has a drainage area of 3.83 km2 (1.48 mi2) above the confluence. Surface runoff in Melton Valley discharges directly into Melton Branch via several small tributaries. Rapid runoff is promoted by the clayey, poorly drained, relatively impervious soils characteristic of East Tennessee. Approximately 30% (up to 85% on steep slopes) of the incident rain falling on unpaved, grassy surfaces flows overland into Melton Branch and associated tributaries (van der Leeden et al. 1991).

Liquid releases from the Oak Ridge National Laboratory (ORNL) enter the White Oak Creek watershed. Water quality, including radiological and non-radiological constituents, of White Oak Creek and Melton Branch is monitored just upstream of their confluence at locations designated as NPDES permitted discharge points. White Oak Creek was dammed to form White Oak Lake (Figure 3.1). White Oak Lake serves as a settling basin for radionuclides* and chemical pollutants that have been discharged in the White Oak Creek watershed through the years. The White Oak Creek Embayment sediment control structure prevents further sediment transport out of White Oak Creek.

Melton Branch and White Oak Creek do not serve as municipal or industrial water supplies. They are not suitable for contact recreation, and fishing is prohibited. The entire White Oak Creek watershed, including Melton Branch, is located within the confines of ORR. Access to this DOE-fenced area is restricted and not open to the public.

3.1.2.4 Aquatic Ecology

Except during the summer, there is sufficient flow in Melton Branch to allow the establishment of a relatively diverse benthic macroinvertebrate community and a small fish community (Ryon 1988; Smith 1988a, 1992). The most recent fish surveys in lower Melton Branch [0.6 km (0.4 miles) above its confluence with White Oak Creek] contained creek chubs, blacknose dace, and redbreast sunfish (Loar et al. 1991). The densities and standing crops of fish in lower Melton Branch are comparable with values from other small headwater streams in the area. Samples in uppermost Melton Branch [Melton Branch km 1.4 and 2.1 (miles 0.86 and 1.30)] found only creek chubs and blacknose dace. A weir on Melton Branch upstream of km 2.1 (mile 1.3) serves as a barrier to movement of fish further upstream. Most of the benthic macroinvertebrate taxa sampled in Melton Branch are typical of either moderately distributed or relatively undisturbed streams on ORR (Smith 1988a, 1988b, Smith and Ryon 1989). There are no federally listed or proposed endangered or threatened aquatic species on the ORR. However, the Tennessee dace, a fish listed by the State as being in need of management, is found on the ORR.

Figure 3.1. White Oak Creek Watershed

3.1.2.5 Terrestrial Ecology/Land Use

Melton Valley contains a variety of ecosystems from those that are greatly disturbed to some that are relatively undisturbed. Where the valley has been heavily disturbed, the current vegetation cover is primarily grass and weeds. Vegetation of the rest of the valley is typical of forests found throughout ORR (Cunningham et al. 1988). Relatively undisturbed second-growth forests of mixed oak-hickory occur on the ridges and dry slopes, while pine and pine-hardwood on the lower slopes and valleys are typical of abandoned, eroded farmland on the ORR.

Wildlife in Melton Valley is also typical of ORR (Kroodsma 1985). Wildlife representative of that which occurs in the valley includes the rat snake, black racer, red-eyed vireo, scarlet tanager, red-tailed and red-shouldered hawks, yellow-billed cuckoo, coyote, deer mouse, gray squirrel, flying squirrel, and white-tailed deer.

No federally listed or proposed endangered or threatened plant or animal species or designated or proposed critical habitats* are known to regularly occur in Melton Valley, but the threatened bald eagle and the threatened peregrine falcon are uncommon visitors to the vicinity (Appendix C).

While some state listed endangered or threatened species of wildlife (Hatcher 1994a) may occasionally visit the vicinity, no suitable breeding habitat is present, and no such animal species are known to regularly occur there (Kroodsma 1987). Of species listed by the state as in need of management (Hatcher 1994b), the southeastern shrew, the Cooper's hawk, the sharp-shinned hawk, and the yellow-bellied sapsucker are known to be present in Melton Valley. Other animal species listed by the state as in need of management that may be found in wetlands in Melton Valley are the northern harrier, the little blue heron, the great egret, and the snowy egret (Mitchell 1995).

Some plants listed by the state as threatened or endangered are known to occur in Melton Valley. Pink lady's slipper, a species endangered in Tennessee due to commercial exploitation, and ginseng, a species listed by the state as threatened, grow in the valley. A small population of the state-listed threatened Canada lily grows in one wetland area about 200 meters (656 ft) from the preferred site. River bulrush and lesser lady's tresses, species listed by the state as of special concern, have also been reported from Melton Valley (Socolof 1995).

A wetlands survey has been done for most of Melton Valley. Forested, scrub-shrub, and emergent wetlands in seep and spring areas in the Melton Branch, White Oak Creek tributary bottom lands. Wetlands range in size from approximately 0.0031 ha (0.0077 ac) to almost 10 ha (27.4 ac).

3.1.2.6 Historic and Archaeological Resources

There is one known historical site in Melton Valley, the Jones House (DuVall and Associates 1992) (Figure 3.1).

3.1.3 Dry Cask Facility Sites

The two proposed sites, a preferred site and an alternate site (Figure 2.1), are described below.

3.1.3.1 Preferred Site

The preferred site (HFIR west site) is located to the southwest of the HFIR(Figure 2.1). Much of the northern half of the site has been cleared and is used as a 45-50 m (148-164 ft) wide utility line corridor which has been reseeded with grasses (Rosensteel 1995). The remainder of the site is a second-growth forest dominated by Virginia pine and is typical in vegetation and wildlife of abandoned farmland on ORR.

The site is bounded on the south by a light-use, graveled dead-end road. On the upslope side of the road are two ponded seeps that are classified as wetlands (Rosensteel 1995). The total area of these two ponded seeps is approximately 0.02 hectares (<0.05 ac). Water insects, tadpoles, and frogs were observed in and around the ponds. The primary ecological function of these particular ponds is probably as habitat for aquatic and semi-aquatic species.

Twenty-one soil borings were drilled on and near the site in 1991 as part of a geotechnical study for a proposed HFIR maintenance facility (ERCE 1991). This exploratory program revealed that subsurface* materials at the site consist of a thin veneer of topsoil, underlain by fill, residual soil/saprolite, and shale bedrock. No analysis was performed for radioactive contamination*. Depths to groundwater ranged from 3.9 to 7.0 m (12.7 to 22.9 ft) below ground surface. No historical or archaeological sites were identified on the preferred site.

3.1.3.2 Alternative Site

The alternative location (SWSA 5 site) is southeast of SWSA 5 (Figure 2.1). The site is dominated by Virginia pine, tulip poplar, sweetgum, oak saplings, flowering dogwood, Japanese honeysuckle, and microstegium. A survey of the site for wetlands found no springs, seeps, streams, or wetlands (Rosensteel 1995).

Although no geological or groundwater investigations have been performed on this site, conditions are expected to be similar to undisturbed areas in the southeastern portion of SWSA 5 (BNI 1944). Based on SWSA 5 investigations, soils at the alternative location should be similar to those at the preferred location.

Based on water level measurements in wells in the southeastern portion of SWSA 5, groundwater at the alternative location should be encountered from 1 to 6 m (3 to 20 ft) below ground surface. Groundwater depths should be greater in the topographically higher portions of the site and during the dry part of the year (i.e., from April through November).

No historical or archaeological sites were identified on the alternative site (DuVall and Associates 1992).

3.2 Background Radiation Dose

3.2.1 Public Radiation Dose

The average annual radiological effective dose equivalent (EDE)* to an individual residing in the United States is approximately 3.6 mSv/yr (360 mrem/yr) (NCRP 1987). External radiation exposure rates from background sources have been measured in Tennessee. The measured rates are equivalent to an average EDE of 0.42 mSv/yr (42 mrem/yr), ranging between 0.19 and 0.72 mSv/yr (19 and 72 mrem/yr) (Myrick et al. 1981). A typical annual EDE to the maximally exposed individual due to external radiation from ORR is about 0.01 mSv (1 mrem), which is about 2.4% of the natural external radiation background EDE to an average Tennessee resident. Airborne emission from ORR are expected to contribute to internal (e.g., inhalation) and external off-site radiation exposures. Table 3.1 shows the 1993 EDEs from ORR and ORNL airborne emissions to the hypothetically maximally exposed individual and the collective population within 80 km (50 miles). The collective population EDE from ORR airborne emissions, of about 0.26 person-Sv (26 person-rem), represents approximately 0.01% of the 2.6 H 103 person-Sv (2.6 H 105 person-rem) the surrounding population would receive from all sources of natural radiation (i.e., radon and other natural sources) (Kornegay et al. 1994b).

Table 3.1 also shows the EDE from all exposure pathways from gaseous and liquid releases to the maximally exposed individual. DOE Order 5400.5, "Radiation Protection of the Public and the Environment," limits the EDE that an off-site individual may receive from all exposure pathways and all radionuclides released from ORR during 1 year to no more than 1.0 mSv (100 mrem). The 1993 exposures are 3% of this DOE Order limit.

3.2.2 Occupational Radiation Dose

The annual average EDE to radiation workers* in the United States (e.g., medicine, industry, nuclear fuel* cycle, government) is approximately 2.2 mSv/yr (220 mrem/yr) (NCRP 1987). In 1989, a total of 925 workers at low-level waste* disposal facilities were monitored, 119 of whom had measurable exposures. The average dose to those with measurable exposures was 3 mSv (300 mrem). The individual exposures ranged from nonmeasurable to approximately 0.02 Sv (2 rem) (NRC 1992).

At ORNL the average dose to 57 waste operations radiation workers in 1991 was 0.40-mSv (40 mrem). The maximum dose equivalent received by an individual worker was 1.40 mSv (140 mrem) and the minimum was 0 mSv (0 mrem) (Setaro 1992).

DOE Order 5480.11, "Radiation Protection for Occupational Workers," establishes radiation protection standards and program requirements for DOE and DOE contractor operations with respect to the protection of workers from ionizing radiation. DOE's limiting value for a worker's radiation dose is 50 mSv/yr (5 rem/yr) (annual EDE) from both internal and external sources received in any year for the whole body. The Energy Systems Radiation Control Manual (DOE/EH-0256T) sets an Energy Systems administrative control level of 15 mSv (1.5 rem) per year for all activities. Exceeding this control level requires approval of the Laboratory Director and Energy Systems President. DOE also has a policy that requires exposures to be ALARA. ORNL's 1995 ALARA control level goal is to keep individual occupational exposures below 6.5 mSv/yr (0.65 rem/yr). Permission from an ORNL division director is required if exposure is to exceed 6.5 mSv/yr (0.65 rem/yr). The ORNL ALARA Steering Committee may approve individual exposures to exceed 6.5 mSv/yr (0.65 rem/yr) without exceeding the Energy Systems administrative control level of 15 mSv/yr (1.5 rem/yr).

Table 3.1 Annual Radiation Effective Dose Equivalents (EDEs) from ORR and ORNL

Population Within 80 km (50 mi)[b][person-Sv/yr (person-rem/yr)]

Annual EDE		
Maximally Exposed Individual [mSv/yr (mrem/yr)]		Population Within 80 km (50 mi)[b] [person-Sv/yr (person-rem/yr)]
All exposure pathways (internal, external) from airborne emissions		
ORR	0.014 (1.4)	0.26 (26)
ORNL	0.001 (0.1)	0.06 (6)
All exposure pathways (internal, external) from all releases (gaseous, liquid)		
ORR	0.03 (3.0)	not available

a. Source: Kornegay et al. 1994b.
b. Approximately 880,000 persons.

4. ENVIRONMENTAL IMPACTS

4.1 Construction of Dry Cask Storage Facility

4.1.1 Preferred Site

4.1.1.1 Air Quality

Disturbance of 3 acres would generate fugitive dust and gaseous exhaust. Emissions would be short-term, localized at the site, and sporadic. Therefore, ambient air quality away from the construction zone would not be affected.

4.1.1.2 Water Resources

Based on limited groundwater studies, the depth to the water table in the area of the preferred site ranges from approximately 3.7 to 7.0 m (13 to 23 ft) below ground surface (ECRE 1991). Therefore, cut and fill operations and groundwater suppression measures would not be necessary to ensure that the storage facility remains 1.8 m (6 ft) above the water table (design criteria).

There are no surface waters located on the preferred site. However, construction activities could result in soil erosion and subsequent sedimentation in Melton Branch or its tributaries, which are approximately 30.4 m (100 ft) from the site. Site clearing and grading would be done to minimize alteration of the existing surface water drainage pattern of the site. Also, use of sediment containment structures (such as silt fences) would minimize impacts to water quality and aquatic biota in Melton Branch.

4.1.1.3 Ecological Resources

For the dry cask storage facility, up to 1.2 ha (3 ac) of pine forest and/or low growing herbaceous plants in the power line corridor would be cleared. The total forest that would be cleared for this project is a very small fraction of the roughly 2300 ha (5600 ac) of pine forest on ORR. Even if the clearing were all taken from the pine forest, the cleared area would only be 0.05% of the pine forest on ORR. Thus, only a small amount of natural vegetation on this site would be lost with a correspondingly small amount of wildlife populations also lost. Areas disturbed during construction but not needed for the facility would be revegetated after construction is completed with native species following Executive Order 11987, "Exotic Organisms" and DOE 5400.1/AI-1 which restrict the introduction of exotic species into natural ecosystems on federally owned land.

No federally listed, threatened, or endangered species of plants or animals or designated critical habitats are known to occur on or near the site. Also, no species listed by the state as threatened, endangered, or in need of management are known to regularly occur on the site. Therefore, none would be affected by construction.

To prevent wetlands disturbance, the facility would be sited north of the existing transmission line, and the boundaries of the small, man-made wetlands south of the transmission line would be marked with flags before construction. Because the proposed project would not involve construction activity within a wetland, consultation with the U.S. Corps of Engineers regarding a Section 404 permit is not necessary.

4.1.1.4 Health and Safety

All routine construction activities would be conducted in accordance with ORNL, Energy Systems, and DOE policy regarding protection of personnel and the environment. All activities would also be conducted in accordance with ALARA objectives. ORNL Health Physics and Industrial Hygiene personnel would monitor the site for potential soil contamination during excavation. Potential impacts from accidents are discussed in Section 4.3.1.

4.1.2 Alternative Site

4.1.2.1 Air Quality

Disturbance of 3 acres would generate fugitive dust and gaseous exhaust. Emissions would be short-term, localized at the construction site, and sporadic. Therefore, ambient air quality away from the construction zone would not be affected.

4.1.2.2 Water Resources

Based on data from groundwater level measurements in SWSA 5, which is directly to the west of the alternative site, the depth to the water table in the area of the alternative site should range from approximately 1 to 6 m (3 to 20 ft) below ground surface. Therefore, cut and fill operations and/or the installation of groundwater control measures would be required to ensure that the storage facility remains 1.8 m (6 ft) above the water table (design criteria). There are no surface waters located at the alternative site. However, construction activities could result in soil erosion and sedimentation of White Oak Creek and Melton Branch. These streams are approximately 30.4 m (100 ft) and 61.0 m (200 ft), respectively, from the site. Site clearing and grading, along with sediment containment structures, would be used to minimize impacts to water quality and aquatic resources.

4.1.2.3 Ecological Resources

If the dry cask storage facility were built at this site, up to 1.2 ha (3 ac) of second-growth forest would be cleared. This site has more second-growth forest, than the preferred site. There are no wetlands or threatened or endangered species or species in need of special management on or near this site.

Strontium 90 titanate (90SrTiO3) soil contamination was found in one sample plot taken on the site (see Appendix D.1). Based on the conservative cumulative impact assessment (Sects. 4.5.6 and 4.5.8), the potential exposure from soil contamination found at this location is below concern to humans and thus the risk to biota are assumed to be negligible. It is estimated that conditions that would result in a mSv/yr (100 mrem/yr) human environmental exposure would lead to dose rates to plants and animals of less than 1 mGy/day (100 mrad/day) (IAEA 1992). Irradiation of even the most sensitive species at chronic dose rates of 1 mGy/day (100 mrad/day) or less, or 10 mGy/day (1000 mrad/day) or less would not affect terrestrial animal or plant populations, respectively.

4.1.2.4 Health and Safety

Health and safety impacts are minimal and would be the same as those described for the preferred site in Section 4.1.1.4.

4.2 Handling and On-Site Transportation of SNF

4.2.1 Air Quality

There will be no atmospheric emissions during handling and transport of SNF on the ORR. No emissions from the operations of the facility are expected. Therefore, there should be no impacts to air quality.

4.2.2 Water Resources

When construction of the dry cask storage facility is complete, a concrete pad would hold the concrete storage casks with a gravel area next to it for parking trucks during loading and unloading operations. The concrete pad would be sloped to collect water from the dry cask storage facility. The State of Tennessee (State) has not yet determined whether an NPDES permit would be required.

The concrete pad could increase the flow and quantity of storm water runoff because there would be less natural ground surface for infiltration and retention. A natural vegetation buffer of 30 m (98 ft) between the concrete pad and Melton Branch paved would be adequate to decrease runoff and sedimentation. This change would probably not affect the hydrology of the small wetlands south of the preferred site because they are likely the result of the road south of them which blocks downslope drainage (Rosensteel 1995).

4.2.3 Ecological Resources

Except for truck noise, operation of the dry cask storage facility would not impact vegetation, wildlife, or rare plants or animals. Noise from trucks carrying SNF to the site and equipment at the site might disturb wildlife. However, this impact would be minimal since the noise on the site would be infrequent.

4.2.4 Health and Safety

Operations would include handling, characterization, repackaging, and storing SNF. The primary health hazard during operations would be the presence of radioactive material. In general, the potential human exposure pathways for radiation exposure include external radiation, inhalation of airborne radionuclides, ingestion or direct contact with waterborne radionuclides, and ingestion of radionuclides in the food chain. Incident-free handling would be expected to result in low dose rates of external radiation exposure. At all times SNF would be contained in shielded containers to minimize personal external exposure. During transport, the SNF would be contained in shielded shipping casks; during storage, in shielded concrete storage casks; and during characterization and repackaging activities, in shielded hot cells designed for remote manipulation of radioactive material.

Impacts on human health from operations are bounded by the PEIS analysis (DOE 1995a, Volume 1, Appendix F-ORR) and, therefore, are not detailed here. The PEIS-estimated exposures to the average SNF storage facility worker of approximately 0.40 mSv/yr (40 mrem/yr). The analysis is bounding* because the PEIS assesses a large centralized facility for storage of all DOE SNF throughout the United States. This estimated exposure rate is the same as the average dose to ORNL waste operations workers described in Section 3.2.2.

To ensure safe working conditions, all workers would be monitored to achieve, if possible, the ALARA goal of 6.5 mSv/yr (0.65 rem/yr), and the Energy Systems= administrative control level of 15 mSv/yr (1.5 rem/yr). This would ensure that exposures would not exceed DOE's annual limit of 50 mSv (5 rem). Furthermore, as stated in Section 2.2.2.3, radiation exposure of operations personnel in the dry cask storage area must comply with other radiation protection regulations. A radiological alarm system and criticality monitoring system would provide protection against radiological exposure and preclude a criticality event. This system would be designed to operate during a power failure.

The off-site population dose within an 80-km (50-mile) radius of ORR from SNF operations was estimated at 0.052 person-Sv/yr (5.2 person-rem/yr) in the PEIS. This bounding exposure level is 20% of the current dose from airborne emissions from the ORR of 0.26 person-Sv/yr (26 person-rem/yr) (Section 3.2.1).

The PEIS analysis also estimated exposures and cancer fatalities to workers and the public from incident-free transportation. This PEIS analysis is bounding because it assumed greater on-site distances [4680 km (2909 mi)] are traveled than would be for the proposed action [4007 km (2490 mi)]. The estimated on-site transportation distance and estimated number of shipments associated with each SNF facility is given in Table 4.1.

The distance traveled is conservative because it represents the maximum on-site transportation distance required for each SNF facility. The total on-site transportation distance for all shipments is the summation of the product of distances and number of trips for each SNF facility. Therefore, impacts from currently proposed SNF activities on ORR would be less than those calculated in the PEIS: 1.36H 10-4 (0.000136) occupational fatal cancers and 4.28 H 10-6 (0.00000428) public fatal cancers (Table 4.2). To put these values in perspective, the DOE occupational limit of 50 mSv/yr (5 rem/yr) would be associated with acancer fatality risk of 2 H 10-3 (0.002), and the background individual annual exposure of 3.6 mSv/yr (360 mrem/yr) to the general public would be associated with a cancer fatality risk of approximately 2 H 10-4 (0.0002).

Table 4.1. On-Site Transportation Distance Estimations

Name of Facility	Distance Traveled per Shipment km (miles)	Number of Shipments	Total Distance km (miles)

HFIR (7900)	3.8 (2.3)	545	2071 (1287)
TSR (7700)	20.6 (12.8)	23	474 (294)
BSR (3010)	7.0 (4.3)	78	511 (318)
HRLEL (3525)	6.9 (4.3)	1	7 (4)
REDC (7920)	9.4 (5.8)	20	188 (117)
SWSA 5 N	8.4 (5.2)	90	756 (470)
	Totals	749	4007 (2490)
	PEIS Estimated Values	480	4680 (2909)

BSR = Bulk Shielding Reactor
HRLEL = High Radiation-Level Examination Laboratory
HFIR = High Flux Isotope Reactor
PEIS = Programmatic Environmental Impact Statement (DOE 1995a)
REDC = Radiochemical Engineering Development Center
SWSA 5 N = Solid Waste Storage Area 5 North
TSR = Tower Shielding Reactor

Table 4.2. Estimated Dose

~	**Unit Cancer Risk (Person-rem[b]/km)**	**Dose (Person-rem[b])**	**LCF/Person-rem[b]**	**LCF**
On-site				
Occupational	7.16 H10-5 (0.0000716)	2.85 H 10-1 (0.285)	4 H 10-4 (0.0004)	1.15 H10-4 (0.000115)
Public	1.83 H 10-6 (0.00000183)	7.3 H10-3 (0.0073)	5 H 10-4 (0.0005)	3.67 H10-6 (0.00000367)
PEIS[c] Estimate				
Occupational	7.16 H10-5 (0.0000716)	3.35 H10-1 (0.335)	4 H 10-4 (0.0004)	1.34 H10-4 (0.000134)
Public	1.83 H 10-6 (0.00000183)	8.6 H 10-1 (0.86)	5 H- 10-4 (0.0005)	4.28 H 10-6 (0.00000428)

a. Calculated using methodology in PEIS, which assumes linear extrapolation. NAS (1990) cautions against using this methodology when dose is less than 0.1.0E-2 rem
b. 1 rem = 10 mSv
c. PEIS = Programmatic ENvironmental Impact Statement (DOE 1995a)

4.3 Accidents

4.3.1 Construction

Construction of the dry cask storage facility would not present any unique occupational hazards. Standard industrial accidents would be minimized through the implementation of safety codes and standards [e.g., Occupational Safety and Health Administration (OSHA) standards)]. Workers would comply with the DOE Order 5480.9, "Construction Safety and Health Program," and applicable OSHA provisions. Further, to avoid exposure to liquid hazards (e.g., hydraulic fluid, lubricating oil, fuels, and ethylene glycol if construction equipment overturned), workers would be trained in implementing spill prevention, control containment, and cleanup measures.

Impacts to groundwater and/or surface water from accidental spills of hazardous construction liquids would be minimized by using rapid spill emergency response actions as described in the ORNL Spill Prevention, Control, Countermeasures, and Contingency Plan (September 1985). Thus, potential impacts on aquatic resources from runoff, sediment transport, leaks, or spills from the facility would be minimal. Any soil contaminated by a spill of hazardous liquid would be collected and disposed of at appropriate ORNL waste disposal facilities. Under the Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III, industrial facilities are required to report releases of Areportable quantities@ of hazardous substances [CERCLA- and Emergency Planning and Community Right-to-Know Act (EPCRA)-listed] to state and local emergency response personnel. DOE, LMES, and City of Oak Ridge would mobilize an emergency preparedness plan if a release of hazardous materials (to any environmental medium--air, surface water, groundwater, soils) occurs.

4.3.2 Handling and On-Site Transportation of SNF

The PEIS analyzed several accident scenarios. The accident scenario that would result in the greatest probable risk (risk times probability) to the maximally exposed off-site individual is a fuel assembly breach. This could occur from objects falling on the assembly, cutting into the assembly, or dropping the assembly. This type of accident is expected to occur less frequently than 1.6 H 10-1 (0.16) per year (DOE 1995a, Volume 1, Appendix F-ORR, p. 3.5-63). The dose and associated cancer fatality risk to the highly conservative maximally exposed off-site individual for this type of accident would be 1.2 H 10-4 Sv (1.2 x 10-2 rem) and 6 H 10-6 (0.000006) cancer fatality risk, respectively. The associated probablistic cancer fatality risk from a fuel assembly breach is 9.6 H 10-7 (0.00000096) (i.e., less than a one in a million chance of cancer fatality due to the accident) (DOE 1995a, Volume 1, Appendix F-ORR, p. 3.5-57 and -59).

The accident scenario that would result in the greatest probable risk to workers is a dropped fuel cask. This scenario involves dropping and overturning a fuel cask in an existing storage pool (e.g., the HFIR pool). The probability of this accident is estimated to be less than 1 H 10-4 per year (DOE 1995a, Volume 1, Appendix F-ORR, p. 3.5-63). The dose and associated cancer fatality risk to a worker for a dropped fuel cask was found to be 0.047 Sv (4.7 rem) and 1.9 H 10-3 (0.0019) cancer fatality risk, respectively. The associated probablistic cancer fatality risk from a dropped fuel cask is 1.9 H 10-7 (0.00000019) (i.e., about a two in ten million chance of dying of cancer due to the accident) (DOE 1995a, Volume 1, Appendix F-ORR, p. 3.5-57 and -59).

To put these values in perspective, the background individual annual exposure of 3.6 mSv/yr (360 mrem/yr) to the general public would be associated with a cancer facility risk of approximately 2 H 10-4 (0.0002).

4.4 Socioeconomics and Environmental Justice

The small workforce necessary for construction would be drawn from the ORR labor pool. All other activities would be done by the existing ORNL workforce. There would be no influx of workers associated with the proposed action.

Executive Order 12898 requires federal agencies to achieve environmental justice Ato the greatest extent practicable@ by identifying and addressing Adisproportionately high and adverse human health or environmental effects of its . . . activities on minority populations and low-income populations . . .@ No minority or economically disadvantaged populations would be disproportionately affected since the proposed action would have no adverse impacts.

4.5 Cumulative Impacts

DOE has proposed or approved the construction and operation of other waste management activities in Melton Valley through 1995 (Figure 4.1). National Environmental Policy Act (NEPA) documentation has been completed or is being prepared for each of these proposed actions. The cumulative impacts from the implementation of these actions in Melton Valley are assessed in this section. The following is a listing and short description of these proposed projects, including the proposed action assessed in this document. Project 1 is undergoing environmental review. FONSIs were issued for Projects 2, 3, 5, and 6. A categorical exclusion was issued for Project 4.

(1) **Class III/IV solid low-level waste (SLLW) storage facilities** (Sites 1 and 2 on Figure 4.1)--The proposed facilities consist of one above-grade and four below-grade SLLW storage facilities to be constructed and operated in SWSA 7. Construction of these facilities would result in clearing approximately 5.3 ha (13 ac) [1.6 ha (4 ac) for the above-grade facility and 3.6 ha (9 ac) for the four below-grade facilities]. Construction and operation of the below-grade facilities would occur as necessary over approximately 10 years.

(2) **Contact-handled (CH) and remote-handled (RH) transuranic (TRU) waste storage buildings** (Sites 3, 4, and 7 on Figure 4.1)--Two CH TRU waste storage facilities and one RH TRU waste staging/storage facility have been approved for construction and operation in SWSA 7. These metal buildings will store CH TRU and mixed CH TRU waste. Approximately 1.2 ha (3 ac) will be cleared and leveled for this project. The RH TRU waste storage facility will consist of one reinforced concrete bunker to store casks of RH TRU and RH TRU mixed waste* generated at ORNL. The building will be in Melton Valley, and approximately 0.4 ha (1 ac) will be cleared. The TRU facilities will be permitted under the Resource Conservation and Recovery Act (RCRA)*. An approved EA (DOE 1995b) resulted in a FONSI.

(3) **Nuclear Fuel Services CH TRU storage building** (Site 5 on Figure 4.1) A metal building has been constructed to store mixed waste transported from the Nuclear Fuel Services facility in Erwin, Tennessee. This facility is located in the northwest corner of SWSA 7. Less than 1.2 ha (3 ac) was cleared. The approved EA for this project (DOE 1992) resulted in a FONSI.

(4) **Melton Valley liquid low-level waste (LLLW) collection and transfer system upgrade** (site 6 on Figure 4.1) This project, approved under a NEPA categorical exclusion, is designed to upgrade existing underground LLLW transport lines from the Radiochemical Engineering Center in Melton Valley to existing waste lines in the main ORNL complex located in Bethel Valley. The project also includes the construction of a monitoring and control station for collection of LLLW from Melton Valley facilities and the addition of an ion exchange system in the HFIR building for treatment of HFIR waste. Dewatered and dried spent ion exchange resins (Class II SLLW) would be stored as part of the Class III/IV above-grade inventory. Approximately 1.6 ha (4 ac) of land will be disturbed by construction associated with the upgrade.

Figure 4.1. Site Locations for Oak Ridge National Laboratory=s Proposed Waste Management Projects for Melton Valley through 1995. (Some locations are preliminary sites for proposed facilities)

(5) **Melton Valley Storage Tank-Capacity Increase Project (MVST-CIP)** (Site 8 on Figure 4.1) This project includes construction and operation of eight LLLW storage tanks. These tanks are needed to increase the capacity of ORNL's existing LLLW storage tanks. Approximately 2 ha (5 ac) will be cleared. The final EA for this project (DOE 1995c) resulted in a FONSI.

(6) **Mixed waste storage facilities** (Site 9 on Figure 4.1) These facilities are proposed to expand the storage capacity of hazardous mixed waste storage facilities located just to the east of SWSA 7. Approximately 0.1 ha (0.25 acre) of land will be affected by construction of proposed buildings. The final EA for this project (DOE 1994b) resulted in a FONSI.

Approximately 13.0 ha (32.1 ac) of land would be cleared for all these approved or proposed projects addressed in this cumulative impact assessment. Operation of these facilities would result in the continued transport and storage of low-level and TRU wastes and spent nuclear fuel at ORNL. Releases of hazardous material or radioactive isotopes from storage facilities would not be expected under normal operation. The cumulative impacts of these reasonably foreseeable actions are discussed in the following paragraphs.

4.5.1 Groundwater Hydrology

Construction and operation of the actions in Melton Valley are not expected to result in cumulative impacts to groundwater hydrology and quality. Implementation of groundwater suppression techniques at individual sites could have minimal localized effects on the groundwater table. Lowering of the groundwater table by approximately 0.3 m (1 ft) could occur over small areas. Materials used to backfill pipeline trenches could be more permeable than native soils, creating preferred pathways for groundwater movement. Containment features incorporated into the design of the facilities would minimize the potential for movement of contaminants from these facilities into groundwater. During construction, accidental releases of construction liquids could occur. However, rapid spill emergency response would minimize impacts to groundwater.

Under the Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III, industrial facilities are required to report releases of Areportable quantities@ of hazardous substances [CERCLA- and Emergency Planning and Community Right-to-Know Act (EPCRA)-listed] to state and local emergency response personnel. DOE, LMES, and City of Oak Ridge would mobilize an emergency preparedness plan if a release of hazardous materials (to any environmental media--air, surface water, groundwater, soils) occurs.

4.5.2 Surface Water Hydrology

Construction of the proposed SNF dry cask storage area and other Melton Valley actions included in this cumulative assessment would result in clearing and grading of approximately 13.0 ha (32.1 ac), which may result in sediment mobilization and transport into nearby surface waters. The potential for eroded material to reach streams and adversely impact water quality increases as more area in the watershed is disturbed. Impacts to surface water are expected to be minimal because (1) most of the proposed facilities are not adjacent to surface waters; (2) many of the streams in the construction areas are intermittent during part of the year; (3) only a portion of the total area would be under construction at any one time; and (4) best management practices (i.e., hay bales and silt fences) would be implemented to reduce impacts.

Operation of numerous production and storage facilities in Melton Valley increases the potential for accidental releases of contaminants to the environment and potential transport of these contaminants into the aquatic environment. However, cleanup of any spills of hazardous materials following the ORNL Spill Prevention, Control, Countermeasures, and Contingency Plan (September 1985) would minimize the potential for impacts to surface waters. Releases of Areportable quantities@ of hazardous substances (CERCLA- and EPCRA-listed) would be required to the State (see Section 4.5.1).

Clearing vegetation and replacing it with buildings and/or concrete pads could cause faster and greater runoff of storm water because there would be less natural vegetation and ground surface to allow absorption and longer retention. Natural buffers of more than 30 m (98 ft) between the areas developed and streams such as Melton Branch should be adequate to allow runoff to be slowed and absorbed before reaching the creeks. Retention ponds could be used to collect runoff and reduce impacts on surface water quality and hydrology if projects are located closer to streams than 30 m (98 ft).

Finally, the ORNL Biological Monitoring and Abatement Program (BMAP), which has reported improvement in water quality in Melton Valley in the last few years, will continue to monitor water quality and aquatic biota there. Thus, any deterioration of water quality would be quickly detected allowing measures to be implemented to correct the problem as necessary.

4.5.3 Wetlands

Construction has the potential to result in sediment transport and deposition in wetlands. Sediment deposition occurs in wetland areas under natural conditions; however, excessive sediment deposition can have an adverse impact on wetland ecology. In general, without the use of sediment control measures, the effects of construction at several sites or larger areas would be additive. Although there is potential for sediment transport to wetlands from some of the projects proposed for Melton Valley, especially to small headwater wetlands close to construction areas, use of best management practices during construction and operation, such as silt fences, seeding, and water velocity reduction, would minimize sediment transport.

Clearing vegetation and replacing it with buildings and/or concrete pads could cause faster and greater runoff of storm water because there would be less natural vegetation and ground surface to allow absorption and longer retention. Such changes in hydrology might impact headwater wetlands and their plants. If runoff velocity proves to be a problem, use of settling ponds could retard runoff and minimize such impacts.

Wetland surveys have been conducted for each proposed site. All wetlands that occur near any of the proposed sites would be flagged before construction to ensure their protection from impacts due to construction of individual projects. Further, a 15-m (65-ft) buffer around wetlands should adequately reduce potential wetland impacts. These protective measures would also prevent significant cumulative effects. Thus, with careful planning and follow through, the proposed facilities in Melton Valley would not be expected to have separate or cumulative adverse effects on wetlands.

4.5.4 Aquatic Ecology

The effects of sedimentation in small streams are generally additive and result in habitat degradation or loss and ultimately in changes in community composition of the aquatic environment (see Section 4.1.1). Disturbance of only a small portion of the overall area at any one time by construction activities, in addition to the use of best management practices, such as those mentioned in Section 4.5.3, during construction and operation at all sites would minimize impacts to surface water quality and, consequently, to aquatic biota. As more land in the watershed is disturbed, the potential for eroded material to reach the stream, to accumulate, and to have an adverse impact on aquatic biota increases.

BMAP surveys have shown an increase in fish and macroinvertebrate populations in Melton Branch in the last few years in response to remedial actions at ORNL. Adequate planning and control measures should ensure that this trend continues and is not reversed by increased sedimentation and habitat alteration. Since BMAP will continue to monitor water quality in Melton Branch, any deterioration of water quality should be detected allowing measures to be implemented to correct the problem as necessary.

4.5.5 Terrestrial Ecology

Cumulative impacts on local and regional terrestrial ecosystems include the loss of natural vegetation and reductions in wildlife populations due to habitat loss and forest fragmentation. Construction and operation of each facility in Melton Valley would result in a loss of some native forest habitat and associated wildlife. These effects are generally additive.

Forest fragmentation affects some wildlife species (e.g., the ovenbird, yellow-billed cuckoo, wood warblers, red-shouldered hawk) which require large areas of undisturbed forest. To protect forest species that generally do not reproduce in nonwooded habitats, forested areas at least 100 ha (247 ac) or larger are needed (Askins 1995, Robinson et al. 1995). Even species preferring edge (e.g., indigo bunting), nest more successfully in less fragmented landscapes.

Some species that require large forested areas, especially neotropical migratory songbirds, could be adversely affected by increase predation and parasitism from species that live in openings and edges and hunt in surrounding forest. Parasites such as cowbirds, for example, are active within 100 m (328 to 656 ft) of forest edge and can severely affect reproductive success of songbirds in fragmented forests (Askins 1995, Robinson et al. 1995). Extensive forests not only protect forest species, but provide a source of recolonization of more fragmented forests that are too small to be self-sustaining. [Songbird declines also could lead to leaf-feeding insects outbreaks (Askins 1995, Robinson et al. 1995)].

In general, as forest cover is removed from more areas within Melton Valley, smaller populations of species that require large forested areas could occupy the remaining forest. Other species that use openings and edges of forests and already occupy abundant habitat associated with existing disturbed sites would become even more abundant.

Many species requiring extensive forest might be impacted by forest fragmentation in Melton Valley. One such species, which is known to occur there and for which data are available, is the red-shouldered hawk. The optimal habitat for a pair of red-shouldered hawks is approximately 500 ha (1,200 ac) of primarily forest land, with less than 15% of the total area in clearings smaller than about 4 ha (10 ac). These birds reuse the same area for many years, preferably the same tree, and often the same nest. The hawk often nests near roads and probably would not be affected by nearby traffic. There has been an active nest located in an oak tree in one of the bottomlands in the eastern part of Melton Valley. A buffer zone of about 200-m (650-ft) radius including the nest site and surrounding riparian habitat would probably ensure successful nesting and rearing of young.

Site clearing would create some opportunity for erosion. These areas would need to be planted with native species of vegetation to stabilize soil and minimize erosion, as outlined in Executive Order 11987, "Exotic Organisms," and DOE 5400.1/AI-1, which restrict the introduction of exotic species into natural ecosystems on federally owned land.

The proposed actions in Melton Valley are not expected to have separate or cumulative adverse effects on rare plants. The state-listed endangered lilies growing on SWSA 7 at the eastern end of Melton Valley could be indirectly affected if there were changes in hydrology. However, the wetland and floodplain areas where they are growing would be protected from disturbance, runoff, and siltation. State-listed wildlife populations known to use forest ecosystems such as those affected by these projects are assumed to be affected by additive fragmentation and effects of loss of habitat.

The overall impact on the wildlife habitats of ORR and the surrounding region of the projects proposed for Melton Valley would be relatively small since the entire acreage of the proposed sites is approximately 13 ha (32 ac). About 85% of the land is forested on the approximately 809 ha (2000 ac) of Melton Valley between Highway 95 and the eastern boundary of SWSA 7. Construction for these proposed actions would, therefore, result in less than an additional 1% of cleared forest in this part of Melton Valley.

However, forests of the ORR are representative of ecosystems that are increasingly threatened by human development (Noss et al. 1995). ORR is a uniquely large and continuously forested area compared with the surrounding landscape (Mann et al. in press). The Nature Conservancy has identified the eastern end of Melton Valley as one of three landscape complexes on the ORR of ecological importance because of concentrations of rare species, rare ecological communities, and large blocks of high-quality native vegetation (Nature Conservancy 1995). Minimizing clearing of forest during construction would help reduce fragmentation.

Construction of the proposed facilities in Melton Valley considered in this evaluation would make a minor additional contribution to the cumulative impacts on ORR vegetation and wildlife due to all recent, current, and proposed actions on ORR. However, these projects in Melton Valley add to progressive fragmentation of forest on ORR which could have a disproportionately negative effect on interior forest populations and migratory bird species in the region.

DOE's recent (e.g., last ten years), currently proposed, and possible future actions, including property sales and numerous construction projects in various areas on ORR, have usually had or would have minor individual impacts because most of the actions affect only a relatively small area. However, some projects, not specifically included in this analysis, would impact large areas [e.g., Parcel A which was recently sold to the city of Oak Ridge, the proposed lease of 405 ha (1,000 ac) east of K-25 to the East Tennessee Economic Council, the proposed Spallation Neutron Source which might take an area of up to 3.2 km x 0.8 km (2 mi x 0.5 mi)]. In total, therefore, the actions in Melton Valley, in addition to all the other on-going and potential actions on the ORR, could have considerable cumulative impact on ORR vegetation and wildlife.

4.5.6 Air Quality

Temporary and localized increases in atmospheric concentrations of carbon monoxide, nitrogen dioxide, volatile organic compounds, and particulate matter would result from exhaust emissions of heavy construction vehicles, diesel generators, and other construction equipment. Because of the small scale of the proposed activities, these emissions would not add appreciably to existing levels of pollutants and would have negligible impacts on ambient air quality.

Fugitive dust would result from excavation and earthwork during construction activities. The impact of constructing any one building would be negligible. However, more than one site may be disturbed at any one time. Therefore, the cumulative impacts of simultaneous construction of several sites were modeled (see Appendix D.2) using the EPA-recommended Industrial Source Complex Short-Term (ISCST) air dispersion model (EPA 1992). All sites were assumed to be under construction at the same time [a total of approximately 14 ha (34 ac) of disturbed area]. The modeling results indicate that PM-10 would increase by 20 F/m3. Exceedance of the National Ambient Air Quality Standards (Appendix D.2) would not be expected to occur as a result of the proposed activities, even if they were occurring simultaneously (see Appendix D.2) .

Doses resulting from the possible excavation of 90SrTiO3 contaminated soils (Appendix B.1) have been calculated Assuming (1) the concentration of 90SrTiO3 in the soil at the site of the construction activities is 0.037 Bq/g (1 pCi/g) (a reasonable upper-bound estimate of the radioactivity* at SWSA 5), and (2) the construction activities would increase the annual average atmospheric concentration of soil particles by 20 Fg/m3 (the conservative estimate given above), then the radioactivity of the air would nominally increase by 7.4 H 10!7 Bq/m3 (2 H 10!5 pCi/m3). For comparison, the activity of radon in outdoor air is about 100 pCi/m3 (NCRP 1984), or more than 106 times the estimated increase from 90SrTiO3 if the proposed activities were all taking place simultaneously. That is, the 90SrTiO3 would be expected to increase the natural background radioactivity of the air by less than 0.0001%. It should be noted that this is a very conservative estimate, based on the assumptions that all waste management sites would be disturbed simultaneously, that the radioactivity of the suspended soil is the same as that at SWSA 5 (where it is about an order of magnitude higher than typical concentrations in the area), and that no measures would be used to suppress fugitive dust.

4.5.7 Historic and Archaeological Resources

The only currently known historical sites in Melton Valley is the Jones house site (DuVall and Associates 1992). None of the proposed sites is on this historical site, and therefore, no impacts are expected on archaeological or historical resources in Melton Valley. For all proposed projects, National Historic Preservation Act Section 106 consultation with the State Historic Preservation Officer (SHPO) would be carried out. For the proposed actions that have received consultation from the SHPO, no objections or recommendations were given regarding construction of the proposed projects. Proposed projects awaiting correspondence with the SHPO would follow the SHPO's recommendations to ensure that proper measures are undertaken to protect archeological resources during construction and operation of the proposed facilities.

4.5.8 Health and Safety

The construction and operation of the proposed or planned actions in Melton Valley could result in additional injuries, illnesses, or radiation exposures. Injuries from construction and operation equipment are considered to be standard industrial accidents. Workers would comply with OSHA regulations (29 CFR 1926) and ORNL safety provisions to mitigate the incidence of equipment-related injuries or illnesses.

Construction of each of these projects might involve excavation of soils contaminated with 90SrTiO3. Radioactivity from 90SrTiO3 is from beta particles. Radiation exposure could therefore result in external exposures to the skin and internal exposures from inhalation of contaminated, airborne soil particles. Strontium-90 is known to absorb readily into the bloodstream and deposit in the bone. However, 90SrTiO3 is an insoluble compound and would tend to remain in the respiratory tract if inhaled.

To bound exposures, the same conservative assumptions in the air quality section (Section 4.5.6) are used here. Assuming all the soil is contaminated, external exposures to the skin from the 90SrTiO3 would result in an annual EDE of approximately 8.7 H 10!6 mSv (8.7 H 10!4 mrem). This is 0.0002% of the average individual background level. Exposure from inhalation of airborne particulates is based on the conservative air concentration of 7.4 H 10!7 Bq (2 H 10!5 pCi/m3), presented in the air quality assessment (Section 4.5.6). The associated annual EDE from inhalation would be approximately 2 H 10-5 mSv (2 H 10-3 mrem). This is about 0.0006% of the average annual individual background level of 3.6 mSv (360 mrem). Therefore, using conservative assumptions, such as (1) all soils are contaminated above the average levels found in SWSA 7, and (2) all excavation is conducted simultaneously for all activities in Melton Valley, the impacts on an individual's radiation exposure are negligible. This assessment bounds impacts for any individual excavation activity included in this cumulative impact assessment.

Cumulatively, operational activities in Melton Valley (Figure 4.1) would represent an increase in the radioactive waste* management activities at ORNL.(17) However, waste operators* at ORNL would continue to rotate between jobs, comply with DOE Order 5480.11, and meet ALARA goals. Precise changes in exposures due to operations of all the actions are difficult to estimate. The annual dose to waste operations radiation workers would be expected to vary little from the 1991 average measurable exposure of 0.40 mSv/yr (40 mrem/yr) (see Section 3.2.2). This is well below the DOE limit of 50 mSv/yr (5 rem/yr), the ORNL ALARA goal of 6.5 mSv/yr (0.65 rem/yr), and the Energy Systems administrative control level of 15 mSv/yr (1.5 rem/yr). Therefore, there would be no significantly increased radiological risk to workers, and the addition to cumulative impacts on worker health and safety during incident-free operation of this action would be negligible.

Some of the proposed facilities would handle mixed waste, thereby potentially exposing workers to hazardous materials. These facilities would handle only small amounts of hazardous material (e.g., 25 mg/L of cadmium) that would be mixed with a larger inventory of radioactive waste [e.g., in a 208-L (55-gal) drum]. The hazardous waste* component of individual operations at the proposed facilities would not pose a threat because the quantities would be sufficiently small. Measures taken to control radiological hazards would also generally protect workers from the hazardous constituents in the mixed waste, except for highly volatile chemicals.

Public risk from radiological or hazardous materials would also be negligible because the waste would be well contained and the overall radiological doses to off-site individuals would increase only slightly (probably not measurable). DOE Order 5400.5, "Radiation Protection of the Public and the Environment," limits the EDE that an off-site individual may receive from all exposure pathways and all radionuclides released from ORR during 1 year to no more than 1.0 mSv (100 mrem). In 1993, the maximum predicted EDE from exposure through all pathways was 0.03 mSv (3 mrem), 3% of the DOE Order 5400.5 limit (Kornegay et al. 1994a). Any small increase due to cumulative impacts from the waste storage activities assessed in this section would not be expected to change current experience measurably, which is well below the DOE limit. The cumulative impact on health and safety of the waste operation facilities would be negligible.

The proposed facilities would represent an increase in radioactive waste inventory in the immediate area and would thereby increase the health hazard to the workers and members of the public who may travel near to the area. However, the hazard is passive and only becomes a problem (risk) when the radioactive material becomes mobilized during an incident. Operation of numerous storage facilities in an area increases the potential for accidental releases of contaminants to that immediate area but does not change materially the overall potential for accidents per storage facility. Individual incidents do not change in probability; however, with more facilities, there is a greater likelihood for an effect at the region of greater facility density. Even with all the proposed facilities, impacts on the public health are expected to be small.

4.5.9 Transportation

Completed EAs have reported that the potential transportation impacts from both incident-free and accident conditions have been negligible for all proposed Melton Valley facilities.

Operating these proposed facilities in Melton Valley would not greatly alter the transportation risks posed by a particular facility but would increase the overall health hazard potential to the workers and the public in the immediate area as a result of the increased cumulative quantities of radioactive waste or material being shipped. Even after a postulated accident, the effects would be localized and the actions of emergency response teams would prevent any large population exposures. Increased traffic flow would increase the risk of a vehicular accident, but this fact was considered in this and previous assessments by using conservative traffic volumes and accident rates.

5. REGULATORY COMPLIANCE AND AGENCY CONSULTATION

The following additional federal statutes and regulations are applicable to the proposed action: the Clean Air Act and its amendments; RCRA, as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984 which includes requirements for a waste minimization* program (ORNL 1994); the Clean Water Act (CWA) and its amendments; the Toxic Substances Control Act (TSCA); the Endangered Species Act of 1973; Section 106 of the Historic Preservation Act; OSHA (29 CFR 1910, Subpart G, *Occupational Health and Environmental Controls*, 29 CFR 1910, Subpart I, *Personal Protective Equipment*, 29 CFR 1910, Subpart J, *General Environmental Controls*, 29 CFR 1926, *Safety and Health Standards for Construction*); and 10 CFR 1022, DOE review requirements for floodplains and wetlands. The proposed action would also comply with Tennessee state laws, including the Tennessee Water Quality Control Act (TCA 69-3-108) the Tennessee Burial Law (TCA 39-17-311, TCA 39-17-312), and Tennessee Hazardous Waste Reduction Act of 1990.

Consultation letters are found in Appendix E. Consultation with the United States Fish and Wildlife Service has been completed, as required by the Endangered Species Act of 1973. Appendix C summarizes the status of endangered species, as they apply to the ORR. Consultation with the U.S. Natural Resource Conservation Service has been completed and is being undertaken with the State Historic Preservation Officer.

6. REFERENCES

Askins, R A. 1995. AHostile Landscapes and the Decline of Migratory Songbirds.@ *Science*, V267, pp. 1956-7.

BNI (Bechtel National, Inc.) 1994, *Draft Remedial Investigation Report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Appendix B: Technical Findings and Conclusions*, DOE/OR/01-1326&D0/V3, Oak Ridge, TN, December.

Chance, W. W. June 1991. *Oak Ridge Reservation Site Development and Facilities Utilization Plan, 1990 Update*, Oak Ridge National Laboratory, Oak Ridge, TN.

Cunningham, M. and L. Pounds. 1991. *Resource Management Plan for the Oak Ridge Reservation, Vol. 28: Wetlands on the Oak Ridge Reservation*, ORNL/NERP-5, Oak Ridge National Laboratory, Oak Ridge, TN.

Cunningham, M., Pounds, L., and Parr, P. 1988. *Vegetation of Four Sites on the Oak Ridge Reservation Proposed for Low-level Waste Disposal*, report to P.D. Parr, Environmental Sciences Division, National Environmental Research Park, Oak Ridge National Laboratory, Oak Ridge, TN.

DOE (U.S. Department of Energy) 1994a. *DOE-owned Spent Nuclear Fuel Strategic Plan,* U.S. Department of Energy, M94-GI-0535, December.

DOE (U.S. Department of Energy) 1994b. *Construction of Mixed Waste Storage RCRA Facilities, Buildings 7668 and 7669*, DOE/EA-0820, Washington, DC., April.

DOE (U.S. Department of Energy) 1995a. *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Program Final Environmental Impact Statement* (PEIS), Volume 1, Appendix A-L, April 1995.

DOE (U.S. Department of Energy) 1995b. *Construction and Operation of Transuranic and Transuranic Mixed Waste Retrievable Storage Facilities at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/EA-0349, Oak Ridge Operations Office, Oak Ridge, TN, January.

DOE (U.S. Department of Energy) 1995c. *Melton Valley Storage TankCCapacity Increase Project Environmental Assessment*, DOE/EA-X10-354, Oak Ridge Operations Office, Oak Ridge, TN, April.

DOE (U.S. Department of Energy) 1992. *Environmental Assessment - Receipt and Storage at Oak Ridge National Laboratory, Oak Ridge, Tennessee of Transuranic Waste and Mixed Oxide Waste from Nuclear Fuel Services, Inc.*, prepared by Oak Ridge National Laboratory, Oak Ridge, TN, October.

DOE (U.S. Department of Energy) 1983. Resource Management Plan for the Oak Ridge Reservation: Appendix B: Archaeological Considerations. In DuVall and Associates. *An Archaeological Reconnaissance of the Solid Waste Storage Area (SWSA-7) at the Oak Ridge National Laboratory, Oak Ridge Reservation, Tennessee 1992*, prepared for Martin Marietta Energy Systems, Inc., Oak Ridge, TN.

DuVall & Associates 1992. *An Archaeological Reconnaissance of the Solid Waste Storage Area (SWSA-7) at the Oak Ridge National Laboratory, Oak Ridge Reservation, Tennessee 1992*, prepared for Martin Marietta Energy Systems, Inc., Oak Ridge, TN, May.

ERCE 1991. *Geotechnical Study HFIR Maintenance Facility at ORNL (X-10)* Oak Ridge, Tennessee MMES Subcontract 88B 99977V Requisition Number C05. Martin Marietta Energy Systems. Knoxville, TN, June 20.

EPA (U.S. Environmental Protection Agency) 1992. *User's Guide for the Industrial Source Complex (ISC2) Dispersion Models*, EPA-450/4-92-008a (Vol. 1). Office of Air Quality Planning and Standards, Research Triangle Park, NC.

IAEA (International Atomic Energy Agency) 1992. *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards,* Technical Reports Series No. 332, Vienna, Austria.

Hatcher, R. M. 1994a. Tennessee Wildlife Resources Commission Proclamation: Endangered or Threatened Species, Proc. 94-17.

Hatcher, R. M. 1994b. Tennessee Wildlife Resources Commission Proclamation: Wildlife in Need of Management, Proc. 94-16.

Kitchings, J. T. and L. K. Mann 1976. *A Description of the Terrestrial Ecology of the Oak Ridge Environmental Research Park*, ORNL/TM-5073, ORNL, Oak Ridge, TN.

Klein, J. A. 1995. Martin Marietta Energy Systems Internal Correspondence, to D. W. Turner, March 14, 1995 re: Oak Ridge Spent Nuclear Fuel Inventories.

. Kornegay, F. et al. 1994a. *Environmental Monitoring and Surveillance on the Oak Ridge Reservation: 1993 Data.* ES/ESH-48, Martin Marietta Energy Systems, Inc., Oak Ridge, TN, December.

Kornegay, F. et al. 1994b. *Oak Ridge Reservation Environmental Surveillance Report for 1993*, ES/ESH-47, Martin Marietta Energy Systems, Inc., Oak Ridge, TN, November.

Kroodsma, R. 1985. *Ecological Characterization of Terrestrial Biota of the Proposed Solid Waste Storage Area* (SWSA) 7, report to L. K. Mann, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.

Kroodsma, R. 1987. *Resource Management Plan for the Oak Ridge Reservation, vol. 24: Threatened and Endangered Animal Species.* ORNL/ESH-1/V24, Oak Ridge National Laboratory, Oak Ridge, TN.

Loar, J. M. et al. 1991. *Fifth Annual Report on the ORNL Biological Monitoring and Abatement Program, Draft Report*, ORNL/TM-12143, Oak Ridge National Laboratory, Oak Ridge, TN

Lockhheed Martin Energy Systems, Inc., 1995a. *Oak Ridge Dry Cask Storage Project Feasibility Study.* August 31, 1995.

Lockheed Martin Energy Systems, Inc., 1995b. *Spent Nuclear Fuel Dry Cask Storage Facility.* ES/EN/SFP-42, August.

McCold, L. N. et al. 1992. *Phase 1 Environmental Report for the Advanced Neutron Source at Oak Ridge National Laboratory*, ORNL/TM-12069, Oak Ridge National Laboratory, Oak Ridge, TN, February.

Mitchell, J. M. 1995. JAYCOR, Oak Ridge, TN, personal communication to M. S. Salk, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, July 20 and July 24.

Myrick et al. 1981. *State Background Radiation Levels of Measurements Taken During 1975-1979*. Union Carbide Corporation, Oak Ridge National Laboratory, Oak Ridge, TN.

NAS (National Academy of Sciences) 1990. *Health Effects of Exposure to Low Levels of Ionizing Radiation*, BEIR V Report, National Academy Press, Washington, DC.

NCRP (National Council on Radiation Protection and Measurements) 1987. *Ionizing Radiation Exposure of the Population of the United States*, NCRP Report No. 93, Bethesda, Md., September.

Nature Conservancy 1995. Oak Ridge Reservation, Biodiversity, and the Common Ground Process: Preliminary Biodiversity Report on the Oak Ridge Reservation, communication to Patricia D. Parr, Environmental Sciences Division, from the Nature Conservancy, April 3.

Noss, R. F. et al. 1995. *Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation*, Biological Report 28, USDI/NBS, Washington, DC.

NRC (U.S. Nuclear Regulatory Commission) 1992. *Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 1989*, *Twenty Second Annual Report*, NUREG-0713 Vol. 11, Office of Nuclear Regulatory Research, Washington, DC.

ORNL, 1994. *U.S. Department of Energy Pollution Prevention Program Plan*, ORNL/TM-11853/R5, Oak Ridge National Laboratory, Oak Ridge, TN, May.

Robinson, S. K. et al. 1995. ARegional Forest Fragmentation and the Nesting Success of Migratory Birds.@ Science V267, pp. 1987-90.

Rosensteel, B. May 9, 1995. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, letter to J. Dickerman, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN.

Rothschild, E. R. et al. December 1984. *Geohydrologic Characterization of Proposed Solid Waste Storage Area (SWSA) 7*, ORNL/TM-9314, Oak Ridge National Laboratory, Oak Ridge, TN.

Ryon, M. G. 1988. "Fishes," pp. 203B232 in J. M. Loar (ed.), *Second Annual Report on the ORNL Biological Monitoring and Abatement Program*, ORNL/TM-10804, Oak Ridge National Laboratory, Oak Ridge, TN.

Setaro, J. A. 1992. Office of Radiation Protection, Oak Ridge National Laboratory, Oak Ridge, TN, personal communication to M. L. Socolof, Energy Division, ORNL, November 10.

Smith, J. G. 1988a. "Benthic Macroinvertebrates," pp. 164B202 in J. M. Loar ed., *Second Annual Report on the ORNL Biological Monitoring and Abatement Program*, ORNL/TM-10804, Ridge National Laboratory, Oak Ridge, TN.

Smith, J. G. 1988b. "Benthic macroinvertebrates," pp. 109-155. In G. R. Southworth ed., *Ecological Evaluation of Bear Creek 1984-1087, Draft Report*, Martin Marietta Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, TN.

Smith, J. G. 1992. "Benthic Macroinvertebrates," pp. 109B155 in G. R. Southworth ed., *Ecological Effects of Contaminants and Remedial Actions in Bear Creek*, ORNL/TM-11977, Oak Ridge National Laboratory, Oak Ridge, TN.

Smith, J. G. and M. G. Ryon 1989. Environmental Sciences Division, Oak Ridge National Laboratory Oak Ridge, TN, letter to J. M. Loar, Environmental Sciences Division, Oak Ridge National Laboratory, July 21.

Socolof, M.L. et al. 1995. *Environmental Data and Analyses for the Proposed Management of Spent Nuclear Fuel on* *the ORR*. ORNL/TM-13065.

van der Leeden, F. et al. 1991. *The Water Encyclopedia*, Geraghty & Miller Ground-Water Series, Lewis Publications, Chelsea, MI.

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Finding of No Significant Impact
Management of Spent Nuclear Fuel on the Oak Ridge Reservation
Oak Ridge, Tennessee

AGENCY: U.S. DEPARTMENT OF ENERGY

ACTION: FINDING OF NO SIGNIFICANT IMPACT

SUMMARY: The U.S. Department of Energy (DOE) has completed an environmental assessment (DOE/EA-1117) of the proposed management of spent nuclear fuel (SNF) on the DOE Oak Ridge Reservation (ORR). On June 1, 1995, the DOE issued a Record of Decision (ROD) [60 *Federal Register* 28680] based on the analyses presented in a programmatic environmental impact statement (PEIS) for the Department-wide management of SNF. To implement the ROD, ORR SNF would be retrieved from storage; transferred by truck to a hot-cell facility, if segregation by fuel type and/or repackaging is required; loaded into containers/transport casks that meet regulatory requirements; and shipped via truck to off-site storage at either the Savannah River Site or the Idaho National Engineering Laboratory. The proposed action may also include construction and maintenance of a SNF dry cask storage facility on the ORR to enable reactor operations to continue in the event of an interruption of offsite SNF shipments. Based on the results of the analysis reported in the EA, DOE has determined that the proposed action is not a major Federal action that would significantly affect the quality of the human environment within the context of the National Environmental Policy Act of 1969 (NEPA). Therefore, preparation of an environmental impact statement (EIS) is not necessary, and DOE is issuing this Finding of No Significant Impact (FONSI).

PUBLIC AVAILABILITY OF EA AND FONSI: The EA and FONSI may be reviewed at and copies of the documents obtained from:

U.S. Department of Energy
Public Reading Room
55 Jefferson Circle
Oak Ridge, Tennessee 37830
Phone: (423) 241-4780.

INFORMATION ON THE NEPA PROCESS: For further information on the NEPA process, contact:

Patricia W. Phillips
NEPA Compliance Officer
U.S. Department of Energy
P. O. Box 2001
Oak Ridge, Tennessee 37831
Phone: (423) 576-4200.

BACKGROUND: On June 1, 1995, the U.S. Department of Energy (DOE) issued a Record of Decision (ROD) [60 *Federal Register* 28680] based on the analyses presented in a programmatic environmental impact statement (PEIS) for the Department-wide management of spent nuclear fuel (SNF). In the ROD, DOE selected "regionalized storage of SNF by fuel type" as the preferred alternative. Implementation of the preferred alternative would require that aluminum-clad SNF from the DOE complex be transported for storage at the DOE Savannah River Site in South Carolina and non-aluminum-clad SNF, except for production reactor fuel from Hanford, be transported for storage at the DOE Idaho National Engineering Laboratory, pending final disposition.

The proposed action is the management of SNF on the DOE Oak Ridge Reservation (ORR) to implement the preferred alternative of regional storage. To implement the ROD, ORR SNF would be retrieved from storage; transferred by truck to a hot-cell facility, if segregation by fuel type and/or repackaging is required; loaded into containers/transport casks that meet regulatory requirements; and shipped via truck to off-site storage at either the Savannah River Site or the Idaho National Engineering Laboratory. Transport from Oak Ridge to off-site storage and impacts at off-site storage locations were evaluated in the PEIS; thus, they are not part of the proposed action addressed in this EA. The proposed action may also include construction and operation of a dry cask SNF storage facility on the ORR to enable reactor operations to continue in the event of an interruption of off-site SNF shipment.

ALTERNATIVES: A no-action alternative was evaluated. If no action is taken, neither construction of a dry cask storage facility nor shipment of SNF from the ORR would occur. SNF would remain in present storage locations on the ORR. Because of limited storage space, operations on the ORR that generate SNF would have to cease, including operation of the High Flux Isotope Reactor, which produces radioisotopes for medical applications.

ENVIRONMENTAL IMPACTS: Impact analyses resulted in the following findings:

- Up to 3 acres of land would be cleared at the site of the dry cask storage facility. This loss of less than 0.05% of the pine forest on the ORR would reduce a minimal amount of wildlife habitat, but would contribute to cumulative impacts resulting from forest loss as other projects on the ORR remove similar habitat. The relative loss of habitat from the proposed action is quite small.
- No federal- and state- listed, threatened, or endangered species of plants or animals, and critical habitat would be affected by land disturbance, construction, and transport operations.
- Exposure to radioactivity during on-site transportation of SNF associated with segregating, repackaging, and storage activities would result in 1.36 × 10-4 (0.000136) fatal cancers in workers and 4.28 × 10-6 (0.00000428) fatal cancers in the general public. These risks are less than one-tenth of the DOE annual limit for occupational radiological exposure, which would result in a risk of 2 × 10-3 (0.002) fatal cancers, and the cancer fatality risk associated with annual exposure to background radiation, which is approximately 2 × 10-4 (0.0002).
- Stored SNF at the dry cask storage facility would result in annual worker radiological doses less than DOE's limit of 5 rem and as-low-as-reasonably-achievable level of 0.025 Mev/h (2.5 mrem/h). Public doses would be negligible.
- Accidents involving handling the SNF would result in a cancer fatality risk to the maximally exposed individual

(public) and to the worker of 9.6 × 10-7 and 1.9 × 10-7 (0.00000096 and 0.00000019), respectively. This risk is quite small in comparison with general population cancer risk of 2 × 10-4 (0.0002) fatalities from exposure to background radiation.

- Clean Air Act-regulated pollutant emissions generated during handling and onsite transport would include small quantities of fugitive dust, sulfur dioxide, nitrogen oxides, unburned hydrocarbons, and carbon monoxide from vehicle exhaust emissions, and from earth disturbance during construction of a dry cask storage facility as well as truck traffic. These emissions would temporarily increase onsite pollutant concentrations, but this effect would be temporary, and offsite pollutant concentrations would not be affected because of dispersal in the atmosphere as distance increases from the source.
- Because there would be no effluents discharged during the proposed action, there would be no direct impacts to water resources. Indirect effects of erosion and sedimentation to streams during earth disturbance for construction of a dry cask storage facility would be minimized by the implementation of Best Management Practices, such as the use of straw barriers and silt fences.
- There are no archaeological and historic sites, prime farmlands, wetlands, or floodplains at or near the proposed site for the dry cask facility. Handling and transport of SNF on the ORR would not affect any of these resources.
- The current pool of ORR workers would provide labor for the proposed action. Therefore, the local employment and economy would not be affected.
- The nearest minority and economically disadvantaged population is located in the city of Oak Ridge, approximately 8 miles from ORNL facilities. Because impacts of the proposed action would be concentrated at ORNL facilities and no offsite impacts are expected, there would be no environmental justice issues associated with the proposed action.

DETERMINATION: Based on the findings of the environmental assessment and Finding of No Significant Impact, DOE has determined that the proposed management of spent nuclear fuel on the Oak Ridge Reservation does not constitute a major Federal action that would significantly affect the quality of the human environment within the context of the National Environmental Policy Act. Therefore, preparation of an environmental impact statement is not required.

Issued at Oak Ridge, Tennessee, this day of 1996.

James C. Hall
Manager
U.S. Department of Energy
Oak Ridge Operations Office
Oak Ridge, Tennessee

Appendix A:
Glossary

100-year flood--A flood event of such magnitude it occurs, on average, every 100 years (equates to a 1 percent probability of occurring in any given year).

accident--An unplanned sequence of events that results in undesirable consequences.

as low as reasonably achievable (ALARA)--A process by which a graded approach is applied to maintaining dose levels to workers and the public, and releases of radioactive materials to the environment as low as reasonably achievable.

background radiation--Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and global fallout as it exists in the environment from the testing of nuclear explosive devices.

bounding analysis--An evaluation which determines the limits of anticipated impact.

by-product--a) Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident, during the process of producing or utilizing special nuclear material, and b) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material [Atomic Energy Act 11(e)]. By-product material is exempt from regulation under the Resource Conservation and Recovery Act.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)--A Federal law (also known as ASuperfund@) that provides a comprehensive framework to deal with past or abandoned hazardous materials. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment that could endanger public health, welfare, or the environment, as well as the cleanup of inactive hazardous waste disposal sites. CERCLA has jurisdiction over any release or threatened release of any Ahazardous substance@ to the environment. Under CERCLA, the definition of Ahazardous@ is much broader than under the Resource Conservation and Recovery Act, and the hazardous substance need not be a waste. If a site meets the CERCLA requirements for designation, it is ranked along with other ASuperfund@ sites and listed on the National Priorities List. This ranking and listing is the U.S. Environmental Protection Agency=s way of determining which sites have the highest priority for cleanup.

contamination--The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel.

core--The central portion of a nuclear reactor containing the fuel elements, moderator, neutron poisons, and support structure.

curie (Ci)--The basic unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion disintegrations per second, which is approximately the rate of decay of 1 gram of radium. A curie is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second.

decommissioning--The process of removing a facility from operation, followed by decontamination, entombment, dismantlement, or conversion to another use.

decontamination--The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive contamination from facilities, soil, or equipment by washing, chemical action, mechanical cleaning, or other techniques.

dose (or radiation dose)--A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent.

dry storage--Storage of spent nuclear fuel in environments where the fuel is not immersed in liquid for the purposes of cooling and/or shielding.

effective dose equivalent (EDE)--The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. It includes the dose from radiation sources internal and/or external to the body and is expressed in units of rem. The International Commission on Radiation Protection defines this as the effective dose.

enriched uranium--Uranium that has greater amounts of the fissionable isotope uranium-235 than occurs naturally. Naturally occurring uranium is 0.72 percent uranium-235.

hazardous waste--Under the Resource Conservation and Recovery Act, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may (a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Source, special nuclear material, and by-product* material, as defined by the Atomic Energy Act, are specifically excluded from the definition of solid waste.

hot cell/hot cell facility--A heavily shielded enclosure for handling and processing (by remote means or automatically), or storing highly radioactive materials.

hydrology--The study of water, including groundwater, surface water, and rainfall.

isotope--One of two or more atoms with the same number of protons, but different numbers of neutrons, in their nuclei. Thus, carbon-12, carbon-13, and carbon-14 are isotopes of the element carbon, the numbers denoting the approximate atomic weights. Isotopes have very nearly the same chemical properties, but often different physical properties (for example, carbon-12 and -13 are stable; carbon-14 is radioactive).

low-level waste--Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nanocuries per gram of waste.

management (of spent nuclear fuel)--Emplacing, operating, and administering facilities, transportation systems, and procedures to assure safe and environmentally responsible handling and storage of spent nuclear fuel pending (and in anticipation of) a decision on ultimate disposition.

mixed waste--Waste that contains both hazardous waste under the Resource Conservation and Recovery Act and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954.

normal operation--All normal conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

nuclear fuel--Materials that are fissionable and can be used in nuclear reactors to make energy.

operator--The organization that operates a facility.

production reactor--A nuclear reactor that is used to irradiate target material to produce special nuclear material or by-product material.

proposed critical habitat--Critical habitat as defined in Section 3(5)(A) of the Endangered Species Act (Pub. l. 93-205, as amended) that has been proposed, but that has not been finalized. When the proposal is finalized, the habitat is termed Adesignated@ critical habitat.

public--Anyone outside the DOE site boundary at the time of an accident or during normal operation. With respect to accidents analyzed in this EA, anyone outside the DOE site boundary at the time of an accident.

radiation (ionizing radiation)--Alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as it is used here, does not include nonionizing radiation such as radio- or microwaves, or visible, infrared, or ultraviolet light.

radiation worker--A worker who is occupationally exposed to ionizing radiation and receives specialized training and radiation monitoring devices to work in such circumstances.

radioactive waste--Waste that is managed for its radioactive content.

radioactivity--The property or characteristic of material to spontaneously Adisintegrate@ with the emission of energy in the form of radiation. The unit of radioactivity is the curie* (or becquerel).

radioisotope--An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. Approximately 5,000 natural and artificial radioisotopes have been identified.

radiological survey--The evaluation of the radiation hazard accompanying the production, use, or existence of radioactive materials under a specific set of conditions. Such evaluation customarily includes a physical survey of the disposition of materials and equipment, measurements or estimates of the levels of radiation that may be involved, and a sufficient knowledge of processes affecting these materials to predict hazards resulting from unexpected or possible changes in materials or equipment.

radionuclide--See radioisotope.

Record of Decision (ROD)--A public document that records the final decision(s) concerning a proposed action. The Record of Decision is based in whole or in part on information and technical analysis generated either during the Comprehensive Environmental Response, Compensation, and Liability (CERCLA) process or the National Environmental Policy Act (NEPA) process, both of which take into consideration public comments and community concerns.

research reactor--A nuclear reactor used for research and development.

Resource Conservation and Recovery Act (RCRA)--A Federal law addressing the management of waste. Subtitle C of the law addresses hazardous waste under which a waste must either be Alisted@ on one of the U.S. Environmental Protection Agency=s (EPA=s) hazardous waste lists or meet one of EPA=s four hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity, as measured using the toxicity characterization leaching procedure (TCLP). Cradle-to-grave management of wastes classified as RCRA hazardous wastes must meet stringent guidelines for environmental protection as required by the law. These guidelines include regulation of transport, treatment, storage, and disposal of RCRA-defined hazardous waste. Subtitle D of the law addresses the management of nonhazardous, nonradioactive, solid waste such as municipal wastes.

retrieval--The process of recovering wastes that have been stored or disposed of on-site so they may be appropriately characterized, treated, and disposed of.

risk--Quantitative expression of possible loss that considers both the probability that a hazard causes harm and the consequences of that event.

segregation--The process of separating (or keeping separate) individual waste type and/or forms in order to facilitate their cost-effective treatment and storage or disposal.

solid waste--Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges, which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended [Public Law 94-580, 1004(27) (Resource Conservation and Recovery Act)].

special nuclear material--a) Plutonium, or uranium enriched in the isotope 233 or in the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission, pursuant to the provisions of the Atomic Energy Act of 1954, Section 51, determines to be special nuclear material; or b) any material artificially enriched by any of the foregoing, but does not include source material. Special nuclear material is exempt from regulation under the Resource Conservation and Recovery Act (RCRA).

spent nuclear fuel (SNF)--Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated. For the purposes of this EA, spent nuclear fuel also includes uranium/neptunium target materials, blanket subassemblies, pieces of fuel, and debris.

storage--The collection and containment of waste or spent nuclear fuel in such a manner as not to constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting treatment or disposal capacity (that is, not short-term accumulation).

subsurface--The area below the land surface.

target--A tube, rod, or other form containing material that, on being irradiated in a nuclear reactor, would produce a designed end product (that is, uranium-238 produces plutonium-239 and neptunium-237 produces plutonium-238).

transloading--Transfer of SNF from an on-site transportation container to an off-site transportation cask.

ultimate disposition--The final step in which a material is either processed for some use or disposed of.

vulnerabilities--Conditions or weaknesses that may lead to radiation exposure to the public, unnecessary or increased exposure to the workers, or release of radioactive materials to the environment. For example, some DOE facilities have had leakage from spent fuel storage pools, excessive corrosion of fuel causing increased radiation levels in the pool, or degradation of handling systems. Vulnerabilities are also caused by loss of institutional controls, such as cessation of facility funding or reductions in facility maintenance and control.

waste management--The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transport, and disposal of waste, as well as associated surveillance and maintenance activities.

waste minimization--The minimization or elimination of :

(1) the production of waste at the sources;

(2) the mixing of radioactive and nonradioactive hazardous waste; and

(3) exposures of personnel and the general public to hazardous materials.

wet storage--Storage of spent nuclear fuel in a pool of water, generally for the purposes of cooling and/or shielding.

Appendix B:
Site Selection Criteria for Dry Cask Storage Facility

B.1 Evaluation Results of Potential Sites for the Dry Cask Storage Facility

Seven potential sites were evaluated (Lockheed Martin 1995). One site, SWSA 7, was eliminated because of conflict with the proposed Class III/IV belowground storage facility planned. The other six sites (Figure B-1) were evaluated as follows:

(1)SWSA 5

Opportunities

- elevated plateau site
- good access via gravel non-public road

Constraints

- adjacent to life sciences area and Melton Branch
- not directly accessible from HFIR
- possible conflict with ORNL Site Development Plan (SDP)

(2)HFIR West

Opportunities

- level topography
- excellent access to HFIR
- area accessible via non-public road
- site characterization completed for previous project (HFIR Maintenance Facility)

Constraints

- close to HFIR parking log
- conflicts with SDP
- close to Melton Branch and a blue line stream
- may require relocation of trailers (7964 E&F) in SW portion of HFIR area
- contains unsurveyed wetlands

(3)Melton Branch

Opportunities

- C level-to-rolling topography
- area accessible via gravel, non-public road

Figure B-1. Candidate Sites Evaluated for the Dry Cask Storage Facility Location

Constraints

- requires crossing of Melton Branch
- located near Melton Branch
- adjacent to low/wet area in gravel road

(4) HFIR East

Opportunities

- excellent access to HFIR
- good expansion capability
- requires only minor road construction
- located within limits of proposed SWSA 7

Constraints

- some site grading will be required
- possible conflict with existing patrol road
- proposed road will cross blue line stream

(5) SWSA 8

Opportunities

- relatively level topography
- located within limits of proposed SWSA 8
- fronts on Melton Branch Circle (gravel road)
- adjacent site has previous site characterization
- location well suited for vendor operation due to outside accessibility

Constraints

- requires crossing of Melton Branch

- located adjacent to Melton Branch
- Melton Branch Circle may require upgrading for truck traffic
- farthest candidate site from HFIR
- located inside ANS exclusion area boundary

(6)Melton Branch West

Opportunities

- frontage along paved road that may be improved under another project
- relatively good access to HFIR

Constraints

- steep topography
- adjacent to Melton Branch and wetlands
- trucks required to cross Melton Branch

The sites were then ranked, and the one with the highest scores was determined to be the preferred site; the one with the next highest score was determined to be the alternate site (Figure B-2).

Figure B-2. Site Evaluation Form for Candidate Sites Evaluated for the Dry Cask Storage Facility.

(Source: Lockheed Martin 1995b)

Appendix C:
Status of Protected Species on The Oak Ridge Reservation

Table C.1. Status of Protected Species on the Oak Ridge Reservation[a]

Species		Legal status[b] Federal	State
Plants			
Aureolaria patula	spreading false foxglove	C2	E
Cimicifuga rubifolia	Appalachian bugbane	C2	T
Delphinium exaltatum	tall larkspur	C2	E
Juglans cinerea	butternut	C2	~
Cypripedium acaule	pink lady-slipper	~	E
Liparis loeselii	fen orchid	~	E
Diervilla lonicera	northern bush-honeysuckle	~	T
Fothergilla major	mountain witch-alder	~	T
Hydrastis canadensis	goldenseal	~	T
Lilium canadense	Canada lily	~	T
Panax quinquifolius	ginseng	~	T

Platanthera flava var hebiola	tuberculed rein-orchid	~	T
Platanthera peramoena	purple fringeless orchid	~	T
Elodea nuttallii	Nuttall's waterweed	~	S
Saxifraga careyana	Carey's saxifrage	~	S
Spiranthes ovalis	lesser lady's tresses	~	S
Carex gravida	heavy sedge	~	S
Draba ramosissima	branching whitlow grass	~	S
Juncus brachycephalus	small-headed sedge	~	S
Spiranthes lucide	shining ladies= tresses	~	T
Carex oxylepis var. pubescens	hairy sharp-scaled sedge	~	S
Rhynchospora colorata	white-topped sedge	~	S
Ruellia purshiana	Pursh=s wild petunia	~	S
Fish	~	~	~
Polyodon spathula	paddlefish	C2	~
Phoxinus tennesseensis	Tennessee dace	~	NM
Amphibians and Reptiles	~	~	~
Aneides aeneus	green salamander	C2	~
Cryptobranchus alleganiensis	hellbender	C2	NM
Hemidactylium scutatum	four-toed salamander	~	NM
Birds	~	~	~
Haliaeetus leucocephalus(20)	bald eagle	T	T
Falco peregrinusc	peregrine falcon	T	E
Aimophila aestivalis(21)	Bachman's sparrow	C2	E
Ammodramus henslowii c	Henslow's sparrow	C2	~
Chlindonias nigerc	black tern	C2	~
Dendroica cerulead	cerulean warbler	C2	~
Thyromanes bewickii	Bewick's wren	C2	T
Pandion haliaetus	osprey	~	T
Ammodramus savannarumd	grasshopper sparrow	~	NM
Accipiter striatusd	sharp-shinned hawk	~	NM
Accipiter cooperiid	Cooper's hawk	~	NM
Circus cyaneusc	northern harrier	~	NM

Anhinga anhingac	anhinga	~	NM
Casmerodius albac	great egret	~	NM
Contopus borealisc	olive-sided flycatcher	~	NM
Grus canadensisc	sandhill crane	~	NM
Phalacrocorax auritusc	double-crested cormorant	~	NM
Sphyrapicus variusc	yellow-bellied sapsucker	~	NM
Tyto alba	common barn owl	~	NM
Egretta caeruleād	little blue heron	~	NM
Lanius ludovicianus	loggerhead shrike	~	NM
Mammals	~	~	~
Myotis grisescens	gray bat	E	E
Sorex longirostris	southeastern shrew	~	NM

a. From Parr and Evans (1992), Cunningham et al. (1993), Kroodsma (1987), Pounds ert al.(1994), and ongoing environmental restoration field surveys.
b. E=endangered, T=threatened, C1, C2=candidate, NM=in need of management, S=special concern in Tennessee.
c. Uncommon visitor or migrant. Does not currently nest on the Oak Ridge Reservation.
d. Present in summer

C.2 REFERENCES

Cunningham, M. et al. 1993. *Resource Management Plan for the Oak Ridge Reservation Vol. 29: Rare Plants on the Oak Ridge Reservation*, ORNL/NERP-7, Oak Ridge National Laboratory, Oak Ridge, Tenn.

King, A. L., D. J. Awl, and C. A. Gabrielsen. 1994. Environmentally Sensitive Areas Surveys Program Threatened and Endangered Species Survey Progress Report, ORNL/ES/ER/TM-130, Oak Ridge National Laboratory, Oak Ridge, Tenn.

Kroodsma, R. L. 1987. *Resource Management Plan for the Oak Ridge Reservation, Vol. 24: Threatened and Endangered Animal Species*. ORNL/ESH-1/V24, Oak Ridge National Laboratory, Oak Ridge, Tenn.

Parr, P. D. and J. W. Evans 1992. *Resources Management Plan for the Oak Ridge Reservation, Vol. 27*: *Wildlife Management Plan.* ORNL/NERP-6, Oak Ridge National Laboratory, Oak Ridge, Tenn.

Pounds, L. R., P. D. Parr, and M. G. Ryon. 1993. *Resource Management Plan for the Oak Ridge Reservation, Vol. 30: Oak Ridge National Environmental Research Park Natural Areas and Reference AreasCOak Ridge Reservation Environmentally Sensitive Sites Containing Special Plants, Animals, and Communities*. ORNL/NERP-8, Oak Ridge National Laboratory, Oak Ridge, Tenn.

Appendix D: Technical Support Data

D.1 Radiological Background Data

Beginning in 1994, a radiological survey* was conducted at SWSA 7 (Figure 4.1) to determine if the land was radiologically contaminated and if so, to what degree. Random sampling was conducted in areas proposed for construction for solid low-level waste storage facilities. Forty-two 3-m H 3-m (10-ft H 10-ft) plots were sampled for gamma and beta radiation. The results of the survey determined that there were no areas of gamma radiation above background. Beta particles were found in all but four of the plots. The particles were found to be 90SrTiO3, an insoluble form of 90Sr. Fifteen-cm (6-in.) depth profiles were conducted at four sampling plots. Contamination was found below the surface but began to taper off before 15 cm (6 in.). The number of particles per plot and disintegrations per minute (dpm) of beta radioactivity were recorded. The minimum, maximum, mean, and median number of contaminated particles per plot and activities per particle are presented in Table 3.1.

A sample was also taken near SWSA 5, where 90SrTiO3 was historically taken for disposal. (see Figure 2.1, SWSA5 Site). Strontium titanate was found in higher concentrations at that one plot than in SWSA 7. In a 0.3-m H 1.5-m (1-ft H 5-ft) plot, approximately 25 particles were found at the surface, and a total of 85 particles were found in the same area to a depth of 15 cm (6 in.). The mean activity was 1098 dpm per particle. Although there is no statistical support for making conclusions based on one plot, this information gives an indication that the SWSA 5 area may have more contamination than SWSA 7. Furthermore, it is logical to assume that the contamination would be greater in SWSA 5 since the material was disposed of in that area.

Table D.1 Strontium Titanate Soil Contamination in Solid Waste Storage Area 7

No. of contaminated particles per plot (surface only)	Activity per particle (per plot)	
	disintegrations per minute (dpm)	Bq (Ci)[a]
min 0 max 56 mean 12 median 6	261 9582 1192 1091	4.4 (1.2 H 10-10) 160 (4.3 H 10-9) 20 (5.4 H 10-10) 18 (4.9 H 10-10)

[a]One dpm = 0.0167 Bq; 1 Bq = 2.7 x 10-11 Ci.

Under the provisions of ORNL/M-116/R1, *Health, Safety and Environmental Protection Procedure for Excavating Operations*, the contaminated soils are listed as Category 2 soils. This category allows the excavated soil to be used as backfill, provided the area is not intended for continuous human occupation, but requires that the contaminated backfill be covered with 0.3 m (1 ft) of clean, uncontaminated soil.

D.2 Air Quality

An average emission factor for total suspended particulate matter of 1.02 g/ha/s (1.2 tons/acre/month) (EPA 1985) was used, and 30% of that amount was assumed to be respirable particulate matter (EPA 1988a). Respirable particulate matter is defined as particles of 10 Fm or less in diameter and is therefore abbreviated PM-10. Particles that small can move easily into the lower respiratory tract. National Ambient Air Quality Standards (NAAQS) exist for annual and 24-h averages of PM-10 concentration.

The wind was assumed to be blowing toward the nearest residential area [Shoreline Estates, about 3 km (2 mi) southeast of the proposed above- and below-grade storage areas] at a speed of 1 m/s (2.2 mph). Flat terrain was assumed for this fugitive dust analysis. These assumptions are all conservative. That is, they lead to overestimates of the ambient air concentrations of PM-10.

Two approaches were taken to estimate the maximum 24-h average concentrations of PM-10 resulting from the proposed activities. In the first approach, stable meteorological conditions were assumed. These conditions only occur at night, so the simulated concentrations were multiplied by 0.4 as per EPA (1988b) to arrive at an estimate of the maximum 24-h average to compare with the corresponding NAAQS. In the second approach, neutral stability (which can persist for 24 h) was assumed and the resulting simulated concentrations were taken as the estimate of the maximum 24-h average. The highest of these figures (obtained by the first approach) was multiplied by 0.25 as per EPA (1988b) to arrive at a conservative estimate of annual average concentration of PM-10 that would result from all proposed activities occurring simultaneously. These figures were added to the background concentration, from monitoring data for Loudon County, Tennessee. Emissions from the stack at the ORNL steam plant, a local source that is not accounted for in the Loudon County survey, were also included in the modeling.

The annual average concentration of PM-10 was simulated to increase by 20 Fg/m3. When added to the background value of 31 Fg/m3, the result exceeds the NAAQS for annual average PM-10 concentration (50 Fg/m3) by 1 Fg/m3. The maximum increase in PM-10 for a 24-h period was simulated as 80 Fg/m3. When added to the background value of 61 Fg/m3, the result is still less than the corresponding NAAQS for PM-10 averaged over a 24-h period (150 Fg/m3).

Because of the conservative nature of the modeling, the simulated PM-10 concentrations probably represent an unrealistic situation. Exceedance of the NAAQS would not be expected as a result of the proposed activities, even if they were all occurring simultaneously. However, it is generally recommended that the disturbed areas be sprinkled with water, or other dust suppression measures be implemented, on particularly dusty days to mitigate possible nuisance or health hazards to workers resulting from inhalation of particulate matter.

D.3 REFERENCES

EPA (U.S. Environmental Protection Agency) 1985. *Compilation of Air Pollutant Emission Factors, Vol. I: Stationary Point and Area Sources*, 4th ed. EPA Publication AP-42, Research Triangle Park, NC.

EPA (U.S. Environmental Protection Agency) 1988a. *Gap Filling for PM-10 Emission Factors for Selected Open Area Dust Sources*, EPA-450/4-88-003, Research Triangle Park, NC.

EPA (U.S. Environmental Protection Agency) 1988b. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, EPA-450/4-88-010. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

Appendix E:
Consultation Letters

Letters

Response to Comments From Earl C. Leming
Tennessee Department of Environment and Conservation, DOE Oversight Division
December 21, 1995

Number	Comment	Response
General Comments		
G1.	The alternatives considered in the subject EA, including the construction and operation of a Dry Cask Storage Facility, should identify and consider the impact of all waste streams generated as a result of the spent nuclear fuel management program. In addition, waste minimization	The proposed action is to implement regional storage of SNF. Wastes generated from this action would be minimized by implementation of the ORNL Pollution Prevention Program as mandated by DOE Order 5400.1. Waste minimization is a significant effort in the Oak Ridge operations. Extensive effort is devoted to minimization of waste in the repackaging of SNF.

	possibilities should be explored and identified.	
G2.	A cost evaluation of each alternative, including estimated costs for construction and operation of a Dry Cask Storage Facility, should be a part of the subject EA.	Cost evaluation is an ongoing programmatic action. However, cost evaluation is not required for environmental decision making and will not be evaluated in this EA.

Specific Comments		
S1.	Page x, line 17 This line reads Ait would be affected by the proposed action.@ It should read Ait would not be affected by the proposed action.@	This change has been incorporated into the text on Page xi.
S2.	Page 1, Section 1.1 Purpose and Need for Action & 4 Please provide additional detailed information to justify the need for construction of a dry cask SNF storage facility. In addition to other details, explain how long the facility may be needed to enable continued operation of the High Flux Isotope Reactor (HFIR), and why the current eight SNF storage areas at ORNL are not sufficient to implement the Record of Decision for SNF.	The EA has been revised to clarify that the construction of the Dry Cask Storage Facility is a contingency to ensure adequate on-site storage capacity for SNF should off-site shipments be blocked in the future. These changes were made in the Summary (Page ix); Section 1.1 (Pages 1 and 3); and Section 2.2 (Page 11). The dry cask storage facility will not be needed if shipments of HFIR SNF are not interrupted. HFIR SNF can only be stored on site in the HFIR pool.
S3.	Page 1, lines 28 - 30 It should be clearly stated that reracking of the High Flux Isotope Reactor (HFIR) pool must be completed in order to allow continued reaction operation until the year 2001 if no spent nuclear fuel (SNF) is moved from the pool.	Section 1.1 (Page 1) has been revised to emphasize the importance of reracking .
S4.	Page 1, line 30 The year-by-year costs of HFIR reracking should be included in the EA to ensure budget requirements for that activity are not overlooked.	This is a programmatic cost for the HFIR Program that is continuing to evolve and is therefore not appropriate for inclusion in the EA.
S5.	Page 4, Table 1.1 and Page 7, Table 1.2 Reference a. ASources: DOE 1995, Appendix F@ contains outdated SNF inventory figures; therefore, that reference should be deleted.	This reference is part of the source information and needs to stay referenced in the EA.
S6.	Page 8, Section 1.2.2 Numbers 3 & 4 Provide information on why buildings 4501 High-Level Radiochemical Laboratory, and 3042 the Oak Ridge Research Reactor were excluded as SNF storage facilities beyond the scope of this document.	Section 1.2.2 (Page 7) has been revised to emphasize that SNF no longer exists in these buildings.
S7.	Page 9, Paragraph under third bullet	Section 1.3 (Page 9) has been revised to define Atimely

	Please define Atimely fashion@ in regard to when the dry cask storage facility would be constructed if SNF could be shipped to SRS or INEL.	fashion.@
S8.	Page 10, Section 2.2 AProposed Action (Preferred Alternative)@ Line 28 Insert AHFIR@ before reactor operations. Also, a statement should be added that clearly explains that a dry cask storage facility will not be constructed unless absolutely needed for continued operation of the HFIR reactor.	The text in Section 2.2 (Pages 11 and 12) has been revised and a statement added concerning the dry cask storage facility.
S9.	Page 10, Section 2.2.1 ADry Cask Storage Facility Construction@ Reference the codes and standards to which the SNF Dry Cask Storage Facility would be constructed.	Applicable codes and standards for the design of the Dry Cask Storage Facility would be addressed at the time of facility design.
S10.	Page 11, Line 4 Insert AHFIR@ before SNF and delete Aor INEL.@	This would be incorrect since SNF from facilities other than HFIR have contributed to the SNF inventory in Oak Ridge. Both SRS and INEL are potential sites for ORNL SNF shipments; therefore, the reference to INEL should not be deleted.
S11.	Page 11, Line 33 This line read AYbefore the reracked pool is full.@ It should read AYbefore the reracked HFIR pool is full.	The text has been revised (Page 14).
S12.	Page 20, Section 3.1.2.5 Terrestrial Ecology/Land Use, Paragraph 3 Please clarify the phrase Aproposed critical habitat.@	The term Aproposed critical habitat@* has been defined in the Glossary (Page A-3).
S13.	Page 42, Section 4.5.7 Historical and Archeological Resources Please clarify if archeological and historical surveys have been completed in Melton Valley. Also, provide correspondence from State Historical Preservation Officer stating a position for the proposed project.	The text has been revised on Page 46. Archaelogical surveys have been completed for the site and the consultation letter from SHPO has been included in Appendix E.

(1)Technical terms indicated by an asterisk (*) are defined in the Glossary (Appendix A), and acronyms are defined in a list at the beginning of this EA.

(2)Technical terms indicated by an asterisk (*) are defined in the glossary, and acronyms (Appendix A) are defined in a list at the beginning of this EA.

(3)Radioactive waste management is assumed to include the management of SNF.

(4). Sources: DOE 1995, Appendix F; Klein 1995.

(5). MT = Metric Tons; MTHM = Metric Tons of Heavy Metal.

(6). Aluminum-clad fuel.

(7). As of September 1, 1995.

(8). Peach Bottom Nuclear Plant fuels are from research and development.

(9) DOE 1995, Appendix F; Klein 1995.

(10)ric Tons; MTHM = Metric Tons of Heavy Metal.

(11)in CERCLA actions.

(12)ments = 65 currently stored fuel elements + 480 fuel elements generated at 1/month for the next 40 years.

(13) Kornegay et al. 1994b.

(14)ately 880,000 persons.

(15)ed using methodology in PEIS, which assumes linear extrapolation. NAS (1990) cautions against using this methodology when dose is less than 0.1.0E-2 rem.

(16)0 mSv

(17)grammatic Environmental Impact Statement (DOE 1995a)

(18)r and Evans (1992), Cunningham et al. (1993), Kroodsma (1987), Pounds et al. (1993), King et al. (1994), and ongoing environmental restoration field surveys.

(19)ngered, T = threatened, C1, C2 = candidate, NM = in need of management, S = special concern in Tennessee.

(20) visitor or migrant. Does not currently nest on the Oak Ridge Reservation.

(21)in summer.