DOE/EA-1451

Environmental Assessment for the Leasing of Facilities and Equipment to USEC Inc.

United States Department of Energy

October 2002

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ACM	asbestos containing materials
AEA	*Atomic Energy Act*
AFV	alternative fuel vehicles
ALARA	as low as reasonably achievable
AMSL	above mean sea level
ASER	Annual Site Environmental Report
BA	Biological Assessment
BLM	Bureau of Land Management
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFR	*Code of Federal Regulations*
CRADA	Cooperative Research and Development Agreement
CROET	Community Reuse Organization of East Tennessee
CTC	Centrifuge Technology Center
CWA	*Clean Water Act*
CX	Categorical Exclusion
D&D	decontamination and decommissioning
DAW	Dry Active Waste
DOE	Department of Energy
DOT	Department of Transportation
EA	environmental assessment
EDE	effective dose equivalent
EPA	Environmental Protection Agency
ESA	*Endangered Species Act*
ES&H	environment, safety and health
ETAC	Enrichment Technology Applications Center
ETTP	East Tennessee Technology Park (formerly the K-25 Site)
FFA	Federal Facility Agreement
FFCA	*Federal Facility Compliance Act*
FONSI	finding of no significant impact
FY	fiscal year
HEU	highly enriched uranium
IMTL	Inorganic Membrane Technology Laboratory
LCF	potential latent cancer fatalities
LDR	land disposal restrictions
LEU	low enrichment uranium
LLW	low level waste
MEI	maximally exposed individual
MRDF	Machine Recycle Development Facility
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards

NAC	noise abatement criteria
NEPA	*National Environmental Policy Act*
NERP	National Environmental Research Park
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	*National Historic Preservation Act*
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OMI	Operations Management International, Inc.
ORGDP	Oak Ridge Gaseous Diffusion Plant
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PMF	probable maximum flood
PPE	Personal Protective Equipment
R&D	research and development
RBCS	rotor balance check stands
RCRA	*Resource Conservation and Recovery Act*
REL	recommended exposure limit
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
ROI	region of influence
S&D	storage and disposition
SDWA	*Safe Drinking Water Act*
SHPO	State Historic Preservation Officer
STP	Sewage Treatment Plant
TDEC	Tennessee Department of Environment and Conservation
TSCA	*Toxic Substances Control Act*
TSD	Treatment, Storage, and/or Disposal
TVA	Tennessee Valley Authority
TWA	time weighted average
USACE	United States Army Corps of Engineers
USEC	USEC Inc.
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
UT	University of Tennessee
VOC	volatile organic compound
VRM	Visual Resources Management
Y-12	Oak Ridge Y-12 National Security Complex

CHEMICALS AND UNITS OF MEASURE

AHF	anhydrous hydrogen fluoride
BTEX	benzene, toluene, ethylbenzene, and xylenes
Bq	Becquerel
C	Celsius
Ci	curie
CCl_4	carbon tetrachloride
cm	centimeters
CFC	chlorofluorocarbons
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
DCE	1, 2-dichloroethylene
F	Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
g	grams
G	acceleration due to gravity
gal	gallons
GPD	gallons per day
gpm	gallons per minute
GPY	gallons per year
ha	hectares
hr	hour
hrs	hours
in	inches
kg	kilograms
km	kilometers
km^2	square kilometers
KOH	potassium hydroxide
kV	kilovolts
kVA	kilovolt-ampere
kW	kilowatts
kWh	kilowatt hours
L	liters
lbs	pounds
Li	lithium
LiD	lithium deuteride
LiH	lithium hydride
LiO	lithium oxide
m	meters
m^2	square meters

m^3	cubic meters
m/s	meters per second
Mbps	million bits per second
Mbtu	million British thermal unit
mCi	millicuries (one-thousandth of a curie)
mCi/mL	millicuries per milliliter
mg	milligram (one-thousandth of a gram)
mg/L	milligrams per liter
MGD	million gallons per day
MGY	million gallons per year
mi	miles
mi^2	square miles
MLD	million liters per day
MLY	million liters per year
mph	miles per hour
mrem	millirem (one-thousandth of a rem)
Mscf	million standard cubic feet
MVA	megavolt-ampere
MW	megawatt
MWe	megawatt electric
MWh	megawatt hour
MWt	megawatt thermal
NaK	sodium potassium
NaOCl	sodium hypochlorite
NaOH	sodium hydroxide
nCi	nanocurie (one-billionth of a curie)
nCi/g	nanocuries per gram
NMP	n-methyl pyrrolidone
NO_2	nitrogen dioxide
NOX	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
PVC	polyvinyl chloride
pCi	picocurie (one-trillionth of a curie)
pCi/L	picocuries per liter
PM_{10}	particulate matter (less than 10 microns in diameter)
ppb	parts per billion
ppm	parts per million
psig	pounds per square gage
Ra	radium
rem	roentgen equivalent man
s	seconds
scf	standard cubic feet
scfd	standard cubic feet per day

scfm	standard cubic feet per minute
SO_2	sulfur dioxide
SR	State Route
Sv	Sievert
t	metric tons
TATB	triaminotrinitrobenzene
TC	technetium
TCA	1, 1, 1-trichloroethane
TCE	trichloroethylene
Th	thorium
TNT	trinitrotoluene
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
yd^3	cubic yards
yr	year
µCi	microcurie (one-millionth of a curie)
µCi/g	microcuries per gram
µg	microgram (one-millionth of a gram)
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m3	micrograms per cubic meter
µ	micron or micrometer (one-millionth of a meter)

CONVERSION CHART

To Convert Into Metric			To Convert Into English		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inch	2.54	centimeter	centimeter	0.3937	inch
feet	30.48	centimeter	centimeter	0.0328	feet
feet	0.3048	meter	meter	3.281	feet
yard	0.9144	meter	meter	1.0936	yard
mile	1.60934	kilometer	kilometer	0.62414	mile (Statute)
Area					
square inch	6.4516	square centimeter	square centimeter	0.155	square inch
square feet	0.092903	square meter	square meter	10.7639	square feet
square yard	0.8361	square meter	square meter	1.196	square yard
acre	0.40469	hectare	hectare	2.471	acre
square mile	2.58999	square kilometer	square kilometer	0.3861	square mile
Volume					
fluid ounce	29.574	milliliter	milliliter	0.0338	fluid ounce
gallon	3.7854	liter	liter	0.26417	gallon
cubic feet	0.028317	cubic meter	cubic meter	35.315	cubic feet
cubic yard	0.76455	cubic meter	cubic meter	1.308	cubic yard
Weight					
ounce	28.3495	gram	gram	0.03527	ounce
pound	0.45360	kilogram	kilogram	2.2046	pound
short ton	0.90718	metric ton	metric ton	1.1023	short ton
Force					
dyne	0.00001	newton	newton	100,000	dyne
Radiation					
rem	0.01	Sievert	Sievert	100	rem
rad	0.01	Gray	Gray	100	rad
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor	
exa-	E	1 000 000 000 000 000 000 =	10^{18}
peta-	P	1 000 000 000 000 000 =	10^{15}
tera-	T	1 000 000 000 000 =	10^{12}
giga-	G	1 000 000 000 =	10^{9}
mega-	M	1 000 000 =	10^{6}
kilo-	k	1 000 =	10^{3}
hecto-	h	l00 =	10^{2}
deka-	da	l0 =	10^{1}
deci-	d	0.1 =	10^{-1}
centi-	c	0.01 =	10^{-2}
milli-	m	0.001 =	10^{-3}
micro-		0.000 001 =	10^{-6}
nano-	n	0.000 000 001 =	10^{-9}
pico-	p	0.000 000 000 001 =	10^{-12}
femto-	f	0.000 000 000 000 001 =	10^{-15}
atto-	a	0.000 000 000 000 000 001 =	10^{-18}

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND/OVERVIEW

The U.S. Department of Energy (DOE) Oak Ridge Operations Office (DOE-ORO) has prepared this Environmental Assessment (EA) for the lease of facilities and equipment to USEC Inc. (USEC), which would be used in its Gas Centrifuge Research and Development (R&D) Project at the East Tennessee Technology Park (ETTP) [hereinafter referred to as the USEC EA]. The USEC EA analyzes the potential environmental impacts of DOE leasing facility K-101 and portions of K-1600, K-1220 and K-1037 at the ETTP to USEC for a minimum 3-year period, with additional option periods consistent with the Oak Ridge Accelerated Clean-up Plan (ACP) Agreement. In July 2002, USEC notified DOE that it intends to use certain leased equipment at an off-site facility at the Centrifuge Technology Center (CTC) on the Boeing Property. The purpose of the USEC Gas Centrifuge R&D Project is to develop an economically attractive gas centrifuge machine and process using DOE's centrifuge technology. This EA is prepared in accordance with the *National Environmental Policy Act* (NEPA) of 1969, P.L. 91-190, 42 U.S. C. §4321 et seq.

1.2 DESCRIPTION OF EXISTING FACILITY AND EQUIPMENT

The USEC Gas Centrifuge R&D Project would utilize a large majority of Building K-1600 and additional leased space in Buildings K-1037, K-1220, and the K-101 at the ETTP Site under a Cooperative Research and Development Agreement (CRADA) between University of Tennessee (UT)-Battelle and USEC. Building K-1600, or the Technology Test Facility, is a unique facility previously designed and used for similar centrifuge activities in the early 1980s. It was used in the development of improved centrifuge models through high-speed testing under typical and atypical operating conditions. Building K-1600 was also used to perform simulated earthquake testing on operating centrifuges. Currently, only portions of Building K-1600 are being used for maintenance, storage, or administrative offices. Although a limited amount of smaller support and electronic equipment was removed from Building K-1600, the facility is basically still equipped with the required utility, support, testing and operational systems needed for the USEC Gas Centrifuge R&D Project.

Building K-1220, or the Centrifuge Plant Demonstration Facility, was previously used to test operations on equipment designs used in the Gas Centrifuge Enrichment Plant (GCEP), including a demonstration cascade and supporting process, and the Machine Recycle Development Facility (MRDF). Current Building K-1220 uses are office space for the Enrichment Technology Applications Center (ETAC) and the physics laboratory, which is used by various research programs for the DOE, Air Force, Navy, National Aeronautics and Space Administration (NASA), and the Tennessee Valley Authority (TVA). A portion of Building K-1220 is leased to the Community Reuse Organization of East Tennessee (CROET).

Building K-1037 was previously used for barrier manufacturing, and later used for advanced isotopic separation process evaluation and design. Current Building K-1037 uses are R&D, manufacturing, office spaces for administrative purposes, maintenance shops, and storage for a number of different users. Building K-1037 houses the Inorganic Membrane Technology Laboratory (IMTL) and a portion of the building has been leased to the CROET and subleased to Pall Industrial Membranes, LLC, for the manufacturing of inorganic membranes. Approximately 70 percent of Building K-1037 is not being used at this time.

Building K-101, or the Prototype Component Evaluation Laboratory, was previously used to assemble and evaluate advanced gas centrifuge components in less than full-sized units and in the development and testing of advanced diagnostic instrumentation systems. Currently, Building K-101 is not being used.

In addition to conducting all manufacturing and testing operations in the K-1600 Facility, a private industrial facility has been leased at the Boeing Property on Boeing Road in the City of Oak Ridge that is suitable for fabricating, assembling, and testing centrifuge components. This CTC Facility was previously used to support a DOE funded project that was part of the Gas Centrifuge Development Program. The primary use of the facility during this project was for mechanical testing of centrifuge components. Following this project, Boeing revised the use of the building for industrial, office space, and storage. The industrial activities focused mainly on assembly of commercial aircraft parts. Since 1989, the building has been used for interim storage of office materials (Polestar 2002).

In addition, centrifuge equipment would be leased to USEC for the purpose of fabricating, assembling, and testing centrifuge components. This equipment would be used at both the DOE-owned facilities and the offsite facility at the CTC.

1.3 PURPOSE AND NEED

Nuclear power generates about 20 percent of America's electricity. Development and demonstration of the Gas Centrifuge, a US-origin advanced enrichment technology, is key to supporting DOE's national energy security goals by providing a reliable and secure domestic source of enriched uranium. The primary purpose of this action is to allow USEC access to facilities and equipment in order to conduct centrifuge activities described in this section. DOE action is necessary because equipment and facilities to be leased are specific to the kind of research to be conducted. Future USEC enrichment activities at the Portsmouth and/or Paducah Uranium Enrichment Plants would depend on the successful demonstration of this Gas Centrifuge technology.

The Gas Centrifuge is an enrichment process that increases the concentration of Uranium-235 (^{235}U), the isotope desired for the production of nuclear energy. The Gas Centrifuge process has three inherent characteristics that make it particularly attractive: (1) it is a proven technology; (2) it has low operating cost; and (3) it is amenable to modular architecture. The low energy requirements of Gas Centrifuge technology, approximately 5 percent of that required by a comparably-sized Gaseous Diffusion Plant (GDP), provide for considerable lower operating costs. With a modest development effort, there is a high potential for further improvements in the operating cost of centrifuge machines through optimization of machine performance and reliability and reduction in materials and manufacturing costs. The modularity of Gas Centrifuge technology allows for a flexible deployment of enrichment capacity, enabling responsiveness to market demand.

As other phases of the project progress, new and existing centrifuge components would be shipped to the site of the Lead Cascade Facility. The likely location of the Lead Cascade is either the Portsmouth Gaseous Diffusion Plant (PORTS) in Ohio or the Paducah Gaseous Diffusion Plant (PGDP) in Kentucky. The Lead Cascade Project is the second phase in the USEC Centrifuge Program to incrementally build a commercially viable gas centrifuge plant.

CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action is to lease the subject facilities at ETTP and equipment to USEC in order to develop an economically attractive gas centrifuge machine and process using DOE's centrifuge technology along with recent advances in materials, electronics, and manufacturing processes. The essential R&D objectives are to:

- Demonstrate machine performance by confirming an economically attractive separative performance in a development test stand

- Verify performance of a prototype plant machine by demonstrating that the derived machine design provides a low cost, as well as a reliable and stable machine that meets the operating requirements for a production plant

- Verify that the design and manufacturing processes to be used in the production plant result in a reliable machine and separation process

- Provide follow-up support to the USEC Lead Cascade Project

The proposed leased space in Building K-1600 and/or the leased CTC Facility would be used for modification, refurbishment, startup and operation of the Centrifuge Test Facility including design, engineering, fabrication, development, and demonstration of the performance capabilities of centrifuge components and machines. The proposed lease space in Buildings K-1037, K-1220, and K-101 also would be used for disassembly, evaluation, and storage or refurbishment of centrifuge components and equipment. In addition, Building K-1037 may also be used for component manufacturing. Portions of Buildings K-1037 and K-101 also would be used for office space.

As an option to conducting all manufacturing and testing operations in the K-1600 Facility, in 2002 USEC leased the CTC Facility at Boeing Road, a private industrial facility that is suitable for fabricating, assembling, and testing centrifuge components.

The CTC Facility is located approximately 19 kilometers (km) (12 miles [mi]) from ETTP. Centrifuge components would be produced in this facility and would be transported over the open highway between the CTC and the K-1600 facilities at ETTP. No radiological testing would be performed at the CTC. The CTC Facility was previously used to support a DOE-funded project that was part of the Gas Centrifuge Program. The primary use of the facility during this project was for mechanical testing of centrifuge components. Following this project, Boeing revised the use of the building for industrial, office space, and storage. The industrial activities focused mainly on assembly of commercial aircraft parts. Since 1989, the building has been used for interim storage of office materials (Polestar 2002).

As the project progresses, centrifuge components would also be shipped to the site of the Lead Cascade Facility. The likely location of the Lead Cascade Facility is either PORTS in Ohio or PGDP in Kentucky. The Lead Cascade Project is the second phase in the USEC Centrifuge Program to incrementally build a commercially viable gas centrifuge plant.

The Proposed Action, scope and range of alternatives for the Proposed Action that are analyzed in this EA, may change as DOE receives public input during public workshops, public meetings and document preparation.

2.2 ALTERNATIVES

The Proposed Action and the No Action alternatives are the only alternatives that have been analyzed.

2.2.1 Alternatives Considered But Eliminated

DOE determined that the following alternatives were not reasonable and were eliminated from further analysis as described under each bullet.

- Lease of DOE facilities at PORTS, Y-12 National Security Complex, or a greenfield site at ETTP

For PORTS, the Y-12 Site, and an ETTP greenfield alternative, there are no other existing centrifuge demonstration and test facilities available or suitable for this project at these locations. Placing the

project at one of these alternative locations would mean recreating the necessary infrastructure and facilities from conception through design, construction, and eventual operation readiness. This would result in a much larger overall cost for the project for new facilities and infrastructure when compared to utilizing existing facilities and infrastructures. An even more important impact would be the delay until new facilities would be available for use by the project. The time delay could be as long as 2 to 4 years. In addition, moving the existing demonstration and test equipment currently within Building K-1600 to another facility would add more cost and time to the project.

For the above alternatives, the impact to the environment from the extensive construction activities would be much greater than the minimal construction activities involved in the use of the proposed facilities.

While some facilities at ETTP, specifically the K-1200 Facility, were previously used for centrifuge manufacturing and testing, they are already committed to the reindustrialiation effort.

- Sale of proposed facilities and equipment to USEC

Transferring title to the facilities or portions of the facilities was dismissed by DOE since portions of the facilities would still remain with DOE as part of the Reindustrialization Program and the remaining portions are not currently considered a candidate for disposal.

- Lease of ETTP facilities to the Community Reuse Organization of East Tennessee, with subsequent sublease of facilities to USEC

Leasing facilities to USEC through CROET would require that USEC comply with state of Tennessee or Nuclear Regulatory Commission (NRC) requirements for its use of DUF_6 in its research and development activities. DOE has determined that, because of its interest in developing uranium enrichment technologies in order to assure a viable domestic supply of enrichment services, and its interest in retaining rights to use inventions and use technical data generated by USEC, DOE can regulate the activities under its *Atomic Energy Act* of 1954, as amended, authority.

2.2.2 Preferred Alternative

The Preferred Alternative is the Proposed Action which is to lease the subject facilities and centrifuge equipment for use at ETTP and the CTC to USEC in order to develop an economically attractive gas centrifuge machine and process using DOE's centrifuge technology. USEC would lease the ETTP facility K-101 and portions of K-1600, K-1220 and K-1037 for a period of approximately 3 years, with options to extend the lease period if the option period does not aversely impact the decomtamination and decomissioning (D&D) of the ETTP site.

DOE determined that the Preferred Alternative was reasonable for the following reasons:

- The K-1220 and K-1600 facilities were originally developed with the intent of centrifuge testing. A large percentage of the infrastructure is already in place, saving considerable time and costs.

- There are no other existing facilities in the United States for testing centrifuge equipment.

- The project is expected to be of relatively short duration which does not justify constructing a new facility.

- Constructing a new facility would have much greater environmental impacts than using an existing facility, such as loss of vegetation, wildlife and aquatic habitation sites, and open space and construction impacts such as generation of dust or contaminated runoff.

Building K-1220

The Middle Bay and the adjacent bay, containing the former recycle/assembly area, are planned to be used for storage, evaluation, and possible refurbishment of testing/fabrication equipment and centrifuge components that may be contaminated. The plan for the cascade area is to remove some machines from the area and move them to the middle bay for disassembly, diagnostics and cleaning. Subsequently, the machines or components could be moved to Building K-1600 or the CTC Facility for checkout or R&D purposes.

Building K-1037

The first and second floor office areas on the east end of the building are planned as offices for the project. A portion of the high bay area on the first floor on the east end is planned for manufacturing, testing, and storage of equipment and centrifuge components which would be uncontaminated. USEC may install a building addition for component manufacturing and testing purposes. These pieces of equipment may be cleaned and refurbished and then would eventually be moved to Building K-1600. In addition, component manufacturing may be conducted in a portion of the building. If the ACP is on schedule, then a decision would be required on whether to delay closure until completion of the Centrifuge Project or to relocate the USEC Building K-1037 centrifuge activities. Details of the Environmental Restoration Program strategy are available in the ACP, the *Oak Ridge Performance Management Plan* (ORO 2002).

Building K-101

Building K-101 is being considered for contaminated storage on the first floor and the second floor for use as office space.

Building K-1600

Building K-1600 would be used for the Project's manufacturing, assembly, test, and operations facility. Building K-1600 was previously designed and used for similar activities in the early 1980s. Although a limited amount of smaller support equipment was removed from the facility, it is basically still equipped with the required utility, support, and operational systems needed for the project. (Facility modifications and conversions would include changes to the area surrounding the building, minor alterations to the building structure, relocation or installation of fixtures, stands, instrumentation and data systems, and the cleaning or replacement of certain piping, valves, or pumping systems). Some minor office modifications may be required. In addition, USEC may construct one or two small building additions. This decision would be based on the use of the CTC Facility and K-1037 lease term. Building K-1600 is not radiologically contaminated except in limited areas such as the withdrawal housing, sample areas and the internal surfaces of some equipment.

The R&D project can be divided into three phases:

- The Modification Phase
- The Manufacturing Phase
- The Test Operations Phase

Modification Phase. During the modification phase, new equipment would be installed, existing equipment would be upgraded or cleaned, refurbished or undergo maintenance servicing. The removal, refurbishment, and reinstallation of approximately 1,000 control and isolation valves from the process systems would be done during this phase. Support equipment would undergo maintenance servicing and checkout, (i.e., lubrication and oil changes in the cranes and pumps).

The centrifuge machine casing assembly that would be utilized for operation and performance testing would consist of a fixed, built-in casing with internal and external components included. The current fixed casings would be modified to match the dimensional requirements for the Project's machine.

Activities planned for this phase would include normal construction such as material handling and movement, welding, cutting, painting, lubricating, drilling, and grinding. There would only be minor exterior modifications, with the exception of concrete pads for a refrigeration unit, a small cooling tower, and an emergency generator, and building envelope modifications.

Manufacturing Phase. The manufacturing/assembly phase would consist of the manufacture of centrifuge components, assembly, and testing of sub-assemblies and assemblies. The manufacturing of the centrifuge rotor includes a filament winding process. This process requires the combination of resins (polyesters, amines, polyamides, epoxies, etc.), curing agents or hardeners (amides, aromatic amines, dicyanamide, etc.), and filaments. Final curing of the resulting parts would occur either in an in-place or remote curing oven or hood. Some of the smaller parts or sub-assemblies would undergo mechanical testing which would include, in some cases, a planned failure test. A fully assembled centrifuge may also fail during an operational test.

Prior to final assembly or even sub-assembly, a final cleaning of all parts would be performed. Solvents would be used to clean the produced parts and manufacturing equipment.

Test Operations Phase. The centrifuge operations require the use of temperature control during some phases of operation. A small cooling tower would be installed adjacent to Building K-1600 to assist in maintaining the desired water temperature. Standard commercial corrosion inhibitors would be used in the cooling water. A small amount of makeup water would be required and the blow-down from the tower would be batch treated on the ETTP Site. An auxiliary refrigeration system would be installed on a small pad outside of the building to achieve the desired water temperatures. A regulatory-acceptable refrigerant bath would be used in the withdrawal system.

Certain component cleaning processes would be performed in hoods or clean rooms. A quantity of operational and maintenance chemicals, supplies, and materials required to maintain project continuity would be stored within K-1600 in appropriate storage containers, cabinets, or areas. Appropriate chemical inventory lists would be maintained and Material Safety Data Sheet (MSDS) access would be provided.

CTC Facility

As an option to conducting all manufacturing and testing operations in the K-1600 Facility, USEC has leased the CTC Facility, a private industrial facility that is suitable for fabricating, assembling, and non-radiological testing centrifuge components. The building was constructed in 1983 and was intended to be used to support a DOE project that was part of the Gas Centrifuge Program. The primary use of this facility was for mechanical testing of centrifuge components. After the termination of DOE's centrifuge programs, Boeing revised the building to light industrial, office space, and storage. Facility modifications and conversions would include some modification to the area surrounding the building and the installation of equipment to the interior. A fabrication machine would be installed along the south wall and would require some concrete removal. Two separate component test machines, 4 to 5 hoods, and curing ovens would also be installed. Office modifications would also be required.

2.2.3 No Action Alternative

The Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500-1508) and the DOE NEPA Regulations (10 CFR Part 1021) require the analysis of a No Action Alternative. Under the No Action Alternative, DOE would not be leasing Buildings K-1600, K-1220, K-1037, and

K-101 at ETTP for an approximate 3-year period with options for additional period for the purpose of conducting an R&D project under a CRADA between USEC and the UT-Battelle. The USEC Gas Centrifuge R&D Project would not develop an economically attractive gas centrifuge machine and process using DOE's centrifuge technology. No activities related to the USEC Gas Centrifuge R&D Project would occur at the ETTP Site. Under the No Action Alternative, the proposed leased space in Buildings K-1037 and K-1220 would remain in the DOE Reindustrialization Program for future lease. Buildings K-101 and K-1600 would become part of the DOE D&D Program for ultimate disposition. The No Action Alternative does not satisfy the purpose and need.

If no action is taken and the proposed lease space and equipment remains in the DOE Environmental Management Program, underutilized land and facilities at ETTP would not be leased by DOE for commercial or business uses. Ongoing and planned environmental restoration; waste management; occupational training and development; and technology demonstration, development and transfer activities would continue at ETTP until projects are completed or transferred to another site and until milestones in the Federal Facility Agreement (FFA) are met (i.e., the site meets regulatory standards). The following sections describe environmental restoration and waste and materials management activities at ETTP, which would continue if no action is taken and adequate funding is available (ORO 2002).

2.2.3.1 *Environmental Restoration at ETTP*

On November 21, 1989, the Oak Ridge Reservation (ORR) was placed on the National Priorities List (53 *Federal Register* 48184). On December 1991, DOE, EPA Region IV, and the Tennessee Department of Environment and Conservation (TDEC) signed an FFA that defined an approach to and responsibilities for environmental remediation of the ORR in accordance with *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and the *Resource Conservation and Recovery Act* (RCRA). The goal of the FFA, which became effective in February 1992, is to ensure that releases of hazardous substances to the environment from past waste management and operations on the ORR are adequately investigated. The FFA also requires that appropriate action be taken to protect human health and the environment. In its ACP, DOE outlined a schedule to accomplish remediation; the strategy for restoration is contained in the *Oak Ridge Performance Management Plan*.

With the former gaseous diffusion facilities in a safe shutdown condition, DOE began full-scale D&D of some structures at the ETTP Site, such as the demolition of cooling towers and a large powerhouse structure. Contamination in soils, groundwater, surface waters, and inactive waste disposal areas is also being addressed. Unless there is an immediate threat to the environment, safety, and/or health, contaminants are managed in place; those that present a greater risk to the public are the first to undergo remedial actions. While CERCLA response actions are specific to contaminated areas at ETTP, D&D and surveillance and maintenance are site-wide activities.

Buildings K-1220, K-1600 and K-10 are scheduled for DOE D&D in 2006 as part of the ETTP ACP. Building K-1037 is scheduled to be made available to CROET in FY2005. If the building is deeded to CROET, USEC would lease the building from CROET. However, if the title to the building is not transferred to CROET, USEC would be required to vacate the building in accordance with the D&D schedule. The D&D of Building K-1037 would alter USEC's use of facilities at ETTP and would be addressed at a later date. If CROET decides to obtain ownership of the facility, USEC could negotiate a lease with CROET. If CROET decides to decline ownership of the facility, deactivation of the facility would be scheduled in the first quarter of fiscal year (FY) 2006.

The DOE centrifuge equipment proposed to be utilized by USEC is currently located in structures at ETTP. If not utilized by USEC in the centrifuge program, equipment proposed for leasing would be included in the D&D program.

2.2.3.2 *Waste and Materials Management at ETTP*

ORR waste management (generation, handling, treatment, storage, disposal and transportation) is discussed in detail in the ACP. For the most part, treatment and storage facilities at ETTP handle wastes generated by ORR operations and CERCLA wastes from environmental restoration actions. Wastes regulated under the *Toxic Substance Control Act* (TSCA) are incinerated in the TSCA Incinerator at ETTP, ORR low-level and mixed low-level wastes are stored at ETTP pending disposition, and wastewater is treated at the ETTP Central Neutralization Facility (CNF). With regulatory approval, stored and newly generated wastes are packaged and loaded for transport to off-site treatment and/or disposal facilities. Mixed low-level waste stored at ETTP is managed in accordance with the terms and conditions of a TDEC Commissioner's Order issued in October 1995, which approved the use of specific technologies and schedules proposed by DOE for the treatment of all mixed low-level and transuranic waste. As planned by DOE, management of ORR mixed

wastes may include any or all the following: (1) treatment in existing facilities, (2) private-sector treatment, (3) disposal in lieu of treatment for wastes with treatment variances, (4) limited development of new on-site facilities, and (5) treatment at other DOE facilities, if required.

ETTP facilities are scheduled for D&D through FY2006, and specific out-year actions are specified in the ACP. Beginning in 1998, newly generated, non-CERCLA wastes were limited to solid, sanitary, and industrial wastes from support activities, solid residuals and wastewater effluent from operation of the TSCA Incinerator, groundwater collection, and utilities operations. A 5-year inventory workoff for stored non-CERCLA wastes is needed to facilitate D&D. All stored low-level waste (LLW) and mixed LLW must be removed from Buildings K-29, K-31, and K-33.

Other materials managed at ETTP include: scrap metals, enriched and natural uranium, lithium, sodium, chemicals, Nuclear Materials Management Safeguards System-tracked materials, and lead (ORO 1997).

2.2.3.3 *Workforce and Schedule*

About 3,000 employees (DOE and contractor) are physically located at the ETTP site. This workforce would decline as remedial actions are completed. A small workforce (probably less than 50 employees) would remain after FFA requirements are met to maintain institutional controls required by CERCLA.

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 CLIMATE, AIR QUALITY AND NOISE FOR ETTP AND THE CTC FACILITY

3.1.1 Climate

The climate for the City of Oak Ridge, Tennessee, is characterized by warm, humid summers and cool, wet winters. Extremes in temperature, annual precipitation, and winds are uncommon. The Oak Ridge climate is moderated by the influence of the Cumberland Mountains to the west and the Great Smoky Mountains to the east. During winter, the Cumberland Mountains have a moderating influence on the local climate by retarding the flow of cold air from the north and west. During summer, the Great Smoky Mountains divert the hot winds emanating from the Atlantic coast.

The mean annual temperature in Oak Ridge between 1963 and 1993 was 14.2 °C (58 °F). The coldest month is usually January, with temperatures averaging 2.8 °C (37 °F) and lows occasionally reaching -17.8 °C (0 °F). The warmest month is usually July, with temperatures averaging 24.4 °C (76°F) and highs occasionally reaching 37.8 °C (100 °F). Temperatures of 37.8 °C (100 °F) or higher have occurred during less than half of the years of the time recorded, and temperatures of -17.8 °C (0 °F) or below are rare. Daily temperature fluctuations are typically -5.6 °C (22 °F) (ORNL 1999).

Average precipitation in the Oak Ridge area varies from place to place by as much as 30 percent depending on the location relative to the local terrain. The 40-year annual average precipitation is 137 cm (53.8 in), including about 26 cm (10.4 in) of snowfall. Precipitation in the region is greater in the winter and spring months (January through April) and least during the fall months (September through November), when high-pressure systems are more frequent.

The Oak Ridge area has relatively light winds compared to other parts of the United States. The Cumberland Mountains and the Plateau to the northwest and west, and the local valley-and-ridge topography divert severe storms and minimize air movement and local wind impact. Ridge-top and valley sites in the Oak Ridge area (excluding the Cumberland Plateau) experience wind speeds less than 5 m/sec (11.2 mph) over 90 percent of the time, and many valley-bottom sites experience winds less than 2 m/sec (4.5 mph) over 70 percent of the time. Prevailing wind directions in the Oak Ridge

area are primarily oriented to the direction of the local ridge and valley terrain. Prevailing winds are either up-valley (northeasterly) day-time winds, or down-valley (southwesterly) night-time winds (DOE 2000b).

3.1.2 Air Quality

ETTP

The DOE facilities at Oak Ridge have permits for radiological and non-radiological air emissions. Radioactive emissions are registered by the U.S. Environmental Protection Agency (EPA) under National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations (40 *Code of Federal Regulations* [CFR] 61, Subpart H). This emission standard limits emissions of radionuclides to the ambient air from DOE facilities not to exceed amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/year. Nonradiological emissions are regulated under the rules of the TDEC Division of Air Pollution Control.

CTC Facility

Since there is no currently available ambient air quality data specific to the Boeing Property or the CTC Facility, the ambient air quality data for the nearby ETTP is the most representative of the air quality at the site area.

3.1.2.1 *Non-radiological Air Quality*

As directed by the *Clean Air Act* (CAA) of 1970 (42 U.S.C. §7401), the EPA has set the National Ambient Air Quality Standards (NAAQS) for several criteria pollutants to protect human health and welfare (40 CFR 50). These pollutants include particulate matter less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3).

Non-radiological air quality is defined by the concentration of various pollutants in the atmosphere expressed in units of parts per million (ppm) or in micrograms per cubic meter. The standards and limits set by Federal and state regulations are provided in concentrations averaged over incremental time limits (e.g., 30 minutes, 1 hour, 3 hours). The averaging times shown in the tables in this section correspond to the regulatory averaging times for the individual pollutants.

TDEC implements and enforces the NAAQS and regulations on additional pollutants. In addition to the NAAQS, the TDEC has set standards for gaseous fluorides expressed as hydrogen fluoride (HF). Table 3.1–1 presents the NAAQS and Tennessee ambient air quality standards (AAQS). The EPA approved more restrictive ambient standards for ground-level ozone and particulate matter that became effective on September 16, 1997 (62 FR 38855). However, on May 14, 1999, in response to challenges filed by industry and others, a three-judge panel of the U.S. Court of Appeals for the District of Columbia Circuit issued a split opinion (2 to 1) on these new clean air standards. The Court vacated the new particulate standard and directed EPA to develop a new standard, meanwhile reverting back to the previous PM_{10} standard. The revised ozone standard was not nullified; however, the judges ruled that the standard "cannot be enforced" (EPA 1999). On October 29, 1999, the full U.S. Court of Appeals for the District of Columbia supported the lower court's decision with a split ruling. The Justice Department, on behalf of EPA, took the case to the U.S. Supreme Court and the EPA standards were upheld.

TABLE 3.1–1.—*National Ambient Air Quality Standards and Tennessee Ambient Air Standards*

		NAAQS Standard		Tennessee Standard	
Pollutant	**Averaging Time**	$\mu g/m^3$	ppm	$\mu g/m^3$	ppm (if not indicated)
Ozone (O_3)	1-hr	235	0.12	235	0.12
Carbon monoxide (CO)	8-hr	10,000	9	10,000	9
	1-hr	40,000	35	40,000	35
Nitrogen dioxide (NO_2)	Annual	100	0.053	100	0.053
Sulfur dioxide (SO_2)	Annual	80	0.03	80	0.03
	24-hr	365	0.14	365	0.14
	3-hr	1,300	0.5	1,300	0.5
	30-minute	--	--	1,021	0.4
Particulate matter (PM_{10})	Annual	50	--	50	--
	24-hr	150	--	150	--
Lead	Calendar Quarter	1.5	--	1.5	--
Gaseous fluorides (as HF)	30-day	--	--	1.2	1.5 ppb
	7-day	--	--	1.6	2.0 ppb
	24-hr	--	--	2.9	3.5 ppb
	12-hr	--	--	3.7	4.5 ppb

Source: TDEC 1997.

An area is designated by the EPA as being in attainment for a pollutant if ambient concentrations of that pollutant are below the NAAQS, or in nonattainment if violations of the NAAQS occur. In areas where insufficient data are available to determine attainment status, designations are listed as unclassified. Unclassified areas are treated as attainment areas for regulatory purposes.

ETTP

Existing air quality at ORR is in attainment with NAAQS for all criteria pollutants (i.e., sulfur dioxide, nitrogen dioxide, particulate matter, carbon monoxide, lead, and ozone). It should be noted that EPA has a 1-hour standard for ground-level ozone that is currently enforced (DOE 2000c).

The ETTP operated eight major air emission sources subject to Tennessee Title V Major Source Operating Permit program rules. TDEC air permits for non-radiological sources do not require stack sampling or monitoring. The monitoring of key processes and air pollution control device parameters is done to ensure compliance with all permitted emission limits. Table 3.1–2 shows the allowable emission of criteria pollutants from the ETTP operations for a recent five year period. Table 3.1–3 shows actual 1999 emissions from the ETTP. For 1999, Table 3.1–4 presents the actual versus allowable emissions from the TSCA Incinerator at the ETTP. The actual emissions from the incinerator are much less than the allowable emissions (ASER 2000).

CTC Facility

Air quality data was generated from the ambient air and/or perimeter air monitoring stations located around ETTP. Both radiological and non-radiological air emissions from certain buildings and specific plant sites at ETTP were also monitored. In 2000, the air emissions for all permitted air emission sources at the three facilities on the ORR were lower than the TDEC limits. The TDEC did not find any violations of air quality regulations at any facility during inspections of permitted emission sources. The radiological and non-radiological ambient air monitoring programs for the facilities and for the ORR show that plant emissions do not affect local air quality (ASER 2000). The CTC Facility is currently inactive and has no air emissions (USEC 2002a).

TABLE 3.1–2.—*Allowable Emissions of Criteria Pollutants from the ETTP, 1995-1999*

Pollutants	Allowable emissions (tons/year) 1995	1996	1997	1998	1999[1]
Particulate Matter	296	247	194	192	13
Volatile Organic Compound (VOC)	167	150	120	122	14
Sulfur dioxide	428	428	428	427	39
Nitrogen oxides	224	224	224	185	20
Carbon monoxide	157	157	157	147	20
Hazardous Air Pollutants	24	24	24	24	21
Miscellaneous	125	0	0	0	0
Total	1421	1230	1147	1097	127

Source: ASER 2000.

[1] Note: Steam plant pollutants were removed from 1999 allowable emissions.

TABLE 3.1–3.—*Actual Emissions of Criteria Pollutants from Permitted ETTP Sources, 1999*

Pollutant	Actual Emissions (lbs/year)	Actual Emissions(tons/year)
Particulate Matter	16.6	0.008
VOC	665.3	0.3
Sulfur dioxide	17.9	0.009
Nitrogen oxides	21,919	11.0
Carbon monoxide	5,480	2.7

Source: ASER 2000.

TABLE 3.1–4.—*Actual vs. Allowable Air Emissions from the TSCA Incinerator at the ETTP, 1999*

Pollutant	Actual Emissions (tons/year)	Allowable Emissions (tons/year)
Lead	0.008	0.575
Beryllium	0.000004	0.00037
Mercury	0.005	0.088
Hydrogen Fluoride	0.003	2.98
Hydrogen Chloride	0.007	16.12
Sulfur dioxide	0.009	38.5
Particulate	0.008	13.1

Source: ASER 2000.

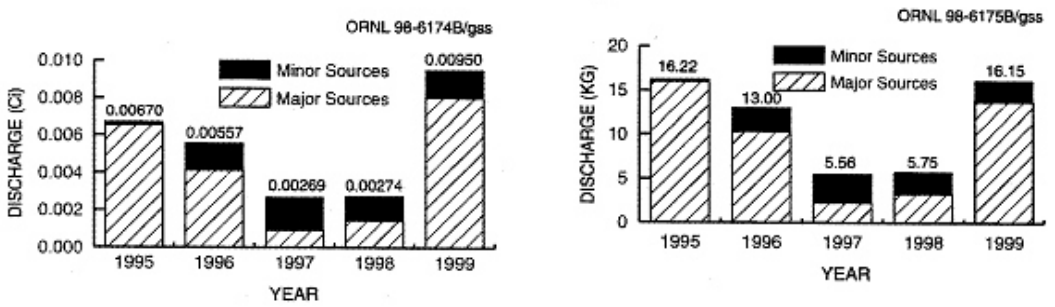
The information on the ETTP ambient air monitoring program and the ambient air concentrations are presented in ORR's 1999 *Annual Site Environmental Report* (ASER 2000).

3.1.2.2 Radiological Air Quality

NESHAP regulations for radionuclides require continuous emission sampling for major sources.

ETTP

In 1999, there were two major sources of emissions operating in the ETTP. In addition, there were 11 point and 2 grouped minor sources that operated in 1999 at the ETTP. Emissions from the various minor sources located at ETTP were estimated by EPA-approved methods. The ETTP 1999 radionuclide emissions from major and minor emission sources are presented in the *Annual Site Environmental Report*, 1999 (ASER 2000). Figure 3.1–1 shows the comparison of the total discharges of uranium in 1999 with those of previous years. The increase in uranium emissions in 1999 was due to increased uranium contained in feed to TSCA Incinerator (ASER 2000).



Source: ASER 2000.

FIGURE 3.1–1.—*Total Uranium Discharged from ETTP to the Atmosphere, 1995-1999.*

Atmospheric emissions of radionuclides from DOE facilities are limited by EPA regulations found under NESHAP, 40 CFR Part 61, Subpart H. The EPA effective dose equivalent (EDE) limit of 10 mrem per year to members of the public from the atmospheric pathway is also incorporated in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." To demonstrate compliance with the NESHAP regulations, DOE annually calculates Maximally Exposed Individual (MEI) and collective doses and a percentage of dose contribution from each radionuclide emitted using the CAP88 computer code. For 1999, all ORR facilities were in compliance with the Radiological NESHAP dose limit. Results of ETTP compliance modeling are discussed below. Details on the annual compliance modeling are also reported in ORR's 1999 ASER (ASER 2000).

The annual EDE to the MEI for 1999 from the ETTP Plant was 0.35 mrem. The MEI was located at a construction site about 2.5 km (1.4 mi) northeast of Building K-1435, the TSCA Incinerator stack. About 50 percent of this dose is from ingestion and inhalation of tritium, 36 percent is from uranium isotopes, about 12 percent is from thorium radioisotopes, and about 2.8 percent is from plutonium isotopes. The contribution of the ETTP Plant emissions to the 50-year committed collective EDE to the population residing within 80 km (50 mi) of the ORR was calculated to be about 7.2 person-rem, which is approximately 38 percent of the committed collective EDE for the ORR (40 CFR 61).

CTC Facility

The CTC Facility is currently inactive and has no radiological or non-radiological air emissions, and has not generated radiological emissions in the past (USEC 2002a). Since there is no currently available radiological air quality specific to the Boeing Property or the CTC Facility, the ambient

air quality data for the nearby ETTP is the most representative of the air quality at the site area. There is no radiological activity proposed at the CTC Facility (USEC 2002a).

3.1.3 Noise

Noise sources near ORR and the Boeing Property (USEC 2002a) can be categorized into two major groups: transportation and stationary sources. Transportation sources are associated with moving vehicles that generally result in fluctuating noise levels above ambient noise levels for a short period of time. Transportation sources include aircraft, motor vehicles, and rail operations. Stationary noise sources are those that do not move or that move relatively short distances. Stationary noise sources near ORR include ventilation systems, air compressors, generators, power transformers, and construction equipment. Various standards that regulate the noise levels are:

The National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for occupational noise exposure is 85 dBA as an 8-hour Time-Weighted Average (TWA) (NIOSH 1998). Exposures at or above these levels are considered hazardous.

The *Noise Control Act* of 1972 (23 CFR 722) regulates maximum per truck noise levels of 80-83 dBA depending on the truck type measured 15 m (50 ft) from the traffic centerline.

The *Federal-Aid Highway Act* of 1970 has set the noise abatement criteria (NAC) by land use type and human activities (23 CFR 722). The following NAC are the unacceptable levels which are used to determine impacts.

1. NAC for the outdoors range from 57 dBA to 75 dBA
2. NAC for parks (most similar to National Environmental Research Park [NERP]) is 67 dBA
3. NAC for developed areas is 72 dBA

The State of Tennessee has not established specific community noise standards applicable to the ORR. The City of Oak Ridge has specific acceptable sound levels at property lines. Maximum allowable noise limits for the City of Oak Ridge are presented in Table 3.1–5 (DOE 1996b).

TABLE 3.1–5.—*City of Oak Ridge Maximum Allowable Noise Limits Applicable to the Oak Ridge Reservation*

Adjacent Use	Measurement location	Maximum Sound Level (dBA)
All residential districts	Common lot line	50
Neighborhood business district	Common lot line	55
General business district	Common lot line	60
Industrial district	Common lot line	65
Major street	Street lot line	75
Secondary residential street	Street lot line	60

Source: DOE 1996b.

ETTP

During peak hours, the ETTP Facility traffic is a major contributor to traffic noise levels in the area. The background noise levels at the ETTP are not available. However, the representative noise levels along State Highway 95 and the Oak Ridge National Laboratory (ORNL) boundary were measured to be approximately 60 dBA (DOE 2000a).

CTC Facility

Noise levels at the CTC site are not available. However, noise data from ETTP were considered to be representative of the noise levels at the CTC (USEC 2002a). Typical noise levels from familiar noise sources are provided in Figure 3.1–2.

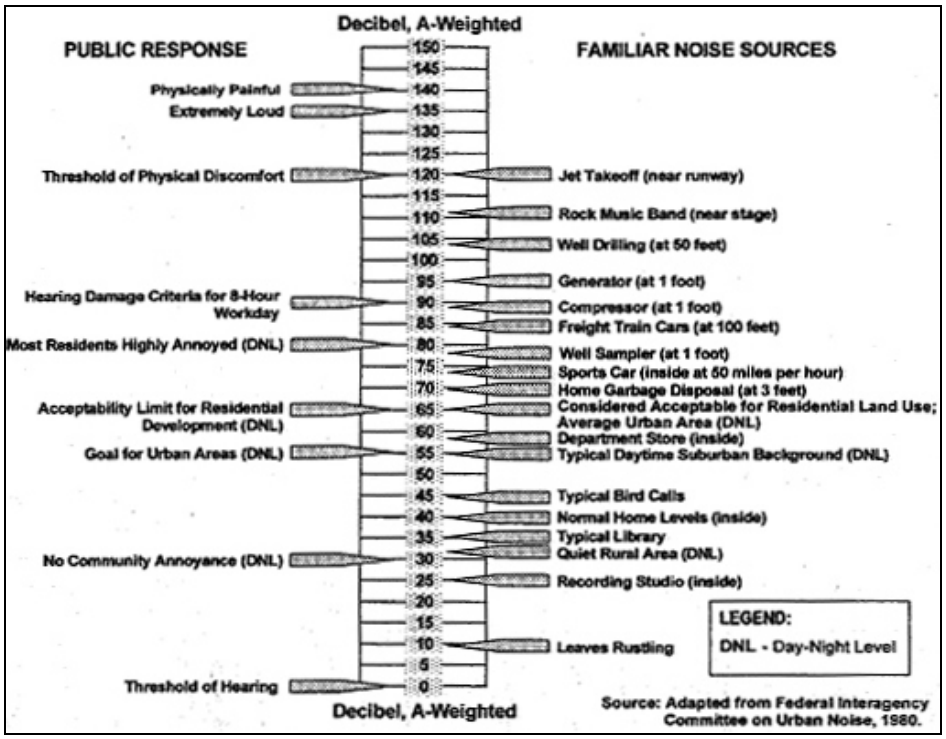


FIGURE 3.1–2.—*Typical Noise Levels from Familiar Noise Sources and Public Responses.*

3.2 PROCESS, MATERIALS AND WASTE MANAGEMENT

The 293 ha (725 acres) of land that defines the ETTP, in which the DOE facilities in the scope of this EA reside, consists mostly of existing buildings and previously disturbed areas (LMES 1999). The CTC Facility is located on the Boeing Property on approximately 3.6 ha (9 acres) of land that consists of an existing building and previously disturbed land (USEC 2002a).

ETTP

The scope of the activity defined by this EA includes the modification or use of four buildings at the ETTP and their subsequent use for several processes involved in the manufacture and testing of centrifuges. These four buildings are K-1600, K-1220, K-1037, and K-101.

Based on facility review (and reference USEC 2000c), the present usage of these buildings is as follows:

- K-1600 is presently being used as an office complex and document storage area, and one part is being used as a shop and storage area for electricians.

- K-1220 areas are being used as offices and one area is being used as a physics laboratory. A portion of the building is leased to the CROET.

- K-101 has no activities except for building review.

- K-1037 is presently used for R&D, manufacturing, offices and storage. K-1037 houses the IMTL, and a portion is leased to Pall Industrial Membranes, LLC, for manufacturing inorganic membranes.

With the exception of the electrical shop, the materials used in these facilities are those common to offices. Wastes generated by these facilities include sanitary trash (paper, etc.) and domestic wastewater. The sanitary trash is picked up by Weskem and disposed at a DOE sanitary landfill.

The domestic wastewater generated by these facilities is treated locally at the ETTP Sewage Treatment Plant (STP), which is currently operating within its National Pollutant Discharge Elimination System (NPDES) permit. The STP is scheduled for D&D in 2006. If CROET and the City of Oak Ridge have problems developing a new plant, the ACP could be delayed or modified. The last permit exceedance was in 1994. The operating capacity of the ETTP STP is about 2,300 m^3/d (600,000 gpd) with a current load of about half that capacity. This plant discharges directly to Poplar Creek (ORO 1997). The process materials used by and wastes generated by the electricians' storage and shop in Building K-1600 are minimal. The process materials used by and wastes generated by the physics laboratory in Building K-1220 are minimal.

CTC Facility

The balance of the scope of this EA includes the modification and use of one building at the Boeing Property. Based on facility review, the CTC Facility is vacant and is not in use. No waste is currently generated at the facility. A minimal amount of wastewater is generated at the facility created by the infrequent use of restroom facilities. Wastewater is treated at the City of Oak Ridge Waste Treatment Facility (USEC 2002a). Only a minimal amount of waste will be generated during the construction phase. This will consist primarily of excess dirt and concrete from the construction of a new security fence surrounding the building; concrete pads, and foundation, and piping relocation or installation inside and outside of the building and asphalt from exterior excavation.

There would be some building materials converted to waste during interior modifications. There would be some materials such as wipes (non-hazardous), wood for forming, and paper generated during the construction phase. Most, if not all, of this waste would go to the sanitary/industrial landfill used by the City of Oak Ridge (USEC 2002b).

3.3 GEOLOGY AND SOILS

ORR lies in the Valley and Ridge Physiographic Province of eastern Tennessee. The topography consists of alternating valleys and ridges that have a northeast-southwest trend, with most of the ORR facilities occupying the valleys. Major valleys within the ORR include East Fork Valley, Bear Creek Valley, Bethel Valley, and Melton Valley. Major ridges within the ORR include Blackoak Ridge, East Fork Ridge, Pine Ridge, Chestnut Ridge, McKinney Ridge, and Copper Ridge (LMER 1999). In general, the ridges consist of resistant siltstone, sandstone, and dolomite units, and the valleys, which resulted from stream erosion, consist of the less resistant shales and shale-rich carbonates (DOE 1991).

The topography within the ORR and the City of Oak Ridge (USEC 2002a) ranges from a low of 229 m (750 ft) above mean sea level (amsl) along the Clinch River to a high of 384 m (1,260 ft) amsl along Pine Ridge. Within the ORR, the topographic relief between the valley floors and ridge crests is generally about 91 to 107 m (300 to 350 ft) (LMER 1999).

3.3.1 Geology

General Geology. Several geologic formations are present in the ORR and the City of Oak Ridge areas (USEC 2002a). The Rome Formation, which forms the Pine Ridge, consists of massive to thinly bedded sandstones interbedded with minor amounts of thinly bedded, silty mudstones, shales, and dolomites. In the ORR area, the stratigraphic thickness of the Rome Formation is uncertain because of the displacement caused by the White Oak Mountain Thrust Fault. The Conasauga Group, which underlies Bear Creek Valley and Melton Valley, consists primarily of calcareous shales, siltstone, and limestone. The Knox Group can be divided into five formations of dolomite and limestone. The Chickamauga Limestone, underlying Bethel Valley, East Fork Valley, and a narrow belt northwest of Pine Ridge, consists of limestone, shaly limestone, calcareous siltstone, and shale. All of these formations have been identified at the ORR. The Knox Group, which underlies

Chestnut Ridge, Melton Hill and Copper Ridge, is estimated to be approximately 730 m (2,400 ft) thick. The Knox Group weathers to a thick, orange-red, clay residuum that consists of abundant chert and contains karst features (DOE 1991).

Karst features are dissolutional features occurring in carbonate bedrock. Karst features represent a spectrum ranging from minor solutional enlargement of fractures to conduit flowpaths to caves large enough for a person to walk into. Numerous surface indications of karst development have been identified at the ORR (Figure 3.3–1). Surface evidence of karst development includes sinking streams (swallets) and overflowing swallets, karst springs and overflowing springs, accessible caves, and numerous sinkholes of varying size.

In general, karst appears most developed in association with the Knox Group carbonate bedrock which underlies Copper Ridge, Chestnut Ridge, McKinney Ridge at ETTP, and Black Oak Ridge (LMER 1999). The highest density of sinkholes occurs in the Knox Group, and drilling data suggests the largest solution cavities are associated with these formations, ranging up to 7 m (22 ft) in height at ETTP. In contrast with the Knox Group, karst is less developed in the Chickamauga Group carbonates that underlie much of ETTP facilities. Cavities have been encountered in nearly 40 percent of all subsurface penetrations in carbonates at ETTP, although 60 percent of these are described as mud-filled. Sinkholes within the Chickamauga bedrock underlying ETTP are typically small and sparse (ORO 1997).

ETTP Geology

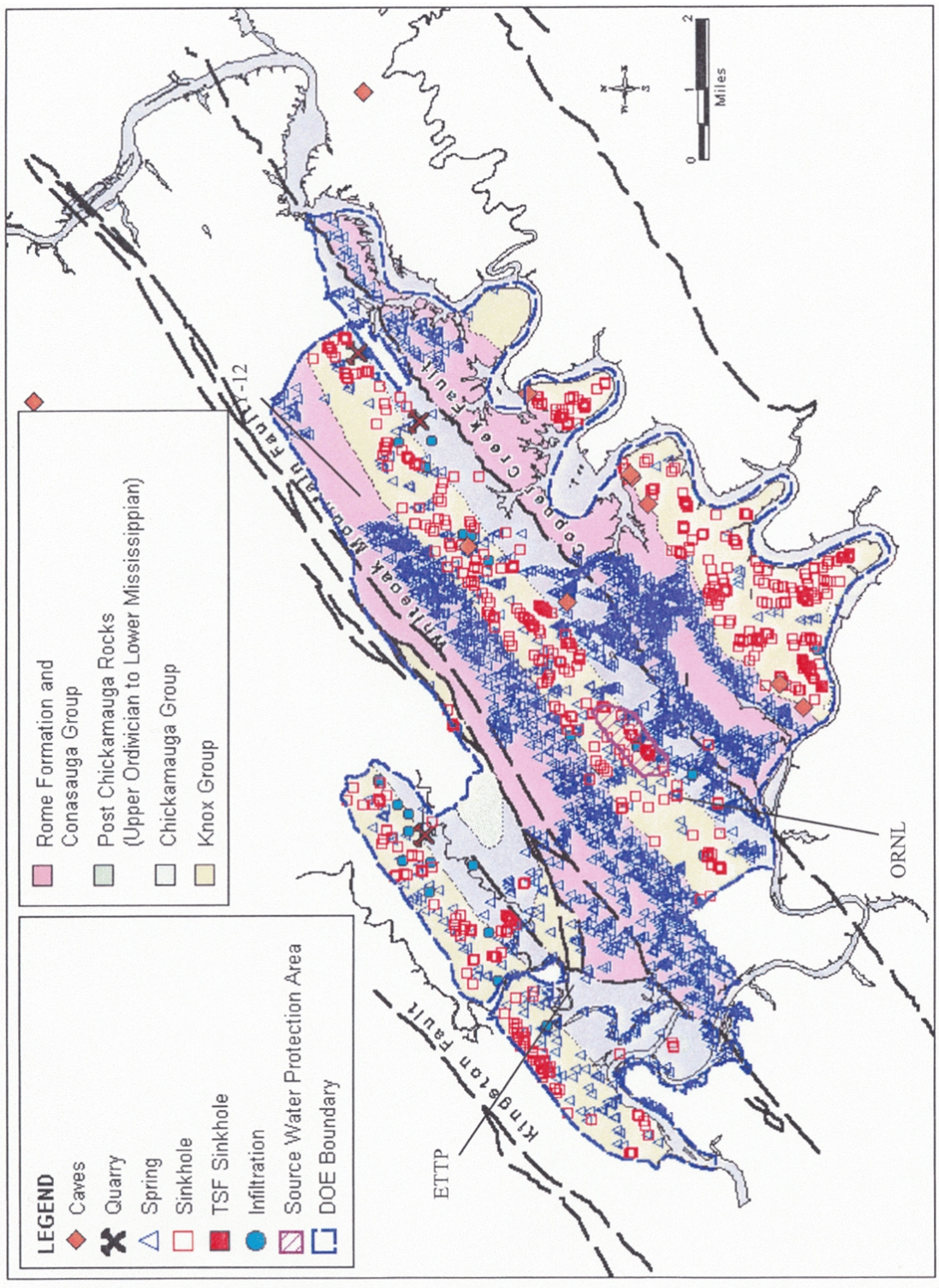
The ETTP is underlain by the carbonate and clastic bedrock. The carbonate bedrock can be found in the Chickamauga and Knox bedrock, and the clastic bedrock lies within the Rome Formation. The Chickamauga Group underlies the Main Plant area and the Knox Group underlies the Black Oak Ridge (ORO 1997).

The structural geology of the ETTP site includes map scale folds and faults as well as outcrop scale fractures, folds, and faults. The principal faults in the area include the White Oak Mountain Fault, located on the south side of the ETTP, which places the Rome Formation clastic rocks and underlying Pine Ridge over the Chickamauga carbonates (ORO 1997).

CTC Geology

Since there is currently no available data on the geology specific to the CTC Facility, the soil data from the ETTP site is most representative of the geology at the site area (USEC 2002a). The CTC is underlain by bedrock of the Rome Formation. The Rome Formation is a sequence of interbedded sandstone, siltstone, and shale of variegated olive, maroon, and brown colors that conformably underlies the Conasauga Group. Erosion resistant buff-colored sandstone of the upper Rome Formation forms Pine Ridge. The lower part of the formation has been truncated by faulting, and the total thickness of the unit is unknown. The CTC is also bounded by the same ridges and has the same fault lines and general rock formation as ETTP (USEC 2002b).

Seismology. The Oak Ridge area lies at the boundary between seismic Zones 1 and 2 of the Uniform Building Code, indicating that minor to moderate damage could typically be expected from an earthquake. Since the New Madrid earthquakes of 1811 to 1812, at least 26 other earthquakes with a modified Mercalli intensity, herein referred to as intensity, of III to VI have been felt in the Oak Ridge area, with the majority of these having occurred in the Valley and Ridge Province. The Charleston, South Carolina, earthquake of 1886 had an intensity of VI at Oak Ridge and an earthquake centered in Giles County, Virginia, in 1886 produced an intensity of IV to V at Oak Ridge. One of the closest seismic events to ORR occurred in 1930; its epicenter was 8 km (5 mi) from ORR (DOE 1996a). This earthquake had an estimated intensity of VII at the epicenter and an approximate intensity of V to VI in the Oak Ridge area. Recorded ground acceleration at ORR was less than 0.01 gravity. A maximum horizontal ground surface acceleration of 0.19 gravity at ORR is estimated to result from an earthquake that could occur once every 2,000 years.



Source: LMER 1999.

Note: TSF=Tower Shielding Facility.

FIGURE 3.3–1.—*Geology and Karst Features on the Oak Ridge Reservation and CTC Facility.*

The magnitude of the largest recorded earthquake in eastern Tennessee registered 4.6 on the Richter scale. This earthquake occurred in 1973 in Maryville, Tennessee, 34 km (21 mi) southeast of the ORR, and had an estimated intensity of V to VI in the Oak Ridge area (DOE 1996a). In 1987, an earthquake occurred approximately 48 km (30 mi) from the ORR with an intensity of VI. In addition, since 1995, two earthquakes with an intensity of III and two earthquakes with an intensity of V occurred within 160 km (100 mi) from the ORR (NEIC 1999).

3.3.2 Soils

ORR typically lies on well to moderately well-drained soils underlain by shale, siltstone, silty limestone, and sandstone. Developed portions of ORR within the valley are designated as urban land. Soil erosion from past land uses has ranged from slight to severe. Erosion potential is very high in those areas that have been eroded in the past with slopes greater than 25 percent. Erosion potential is lowest in the nearly flat-lying permeable soils that have a loamy texture. Additionally, wind erosion is slight, shrink-swell potential is low to moderate, and the soils are acceptable for standard construction techniques (DOE 1996a).

ETTP

Prime farmland is land with the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and available for these uses. Most of the land on ETTP has been in forest, but current land use does not affect the designation except that water, urban land, or other built-up land areas are excluded. However, because the pines have been removed from much of the area, the land could be made available for agricultural crop production again. Prime farmland is protected by the *Farmland Protection Policy Act* (FPPA) which seeks “to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmlands to nonagricultural uses" ([7 USC 4201[b]). Some of the soils on ETTP are prime farmland; however, because these soils are present on land that is within the City of Oak Ridge, this designation is waived and other uses are permitted (ORO 1996).

CTC Facility

The CTC land and Boeing Property is made up of sandy loam, very channery-sandy loam, and weathered bedrock. Based on Soil Conservation Services STATSGO data, silt loam, shaly-silt loam, gravelly-silt loam, unweathered bedrock, and stratified soil types may also appear within the general area of the CTC Facility (Arcadis 2002). The soil data from the ETTP site is also representative of the geology at the site area (USEC 2002a).

3.4 ECOLOGICAL RESOURCES

3.4.1 Terrestrial

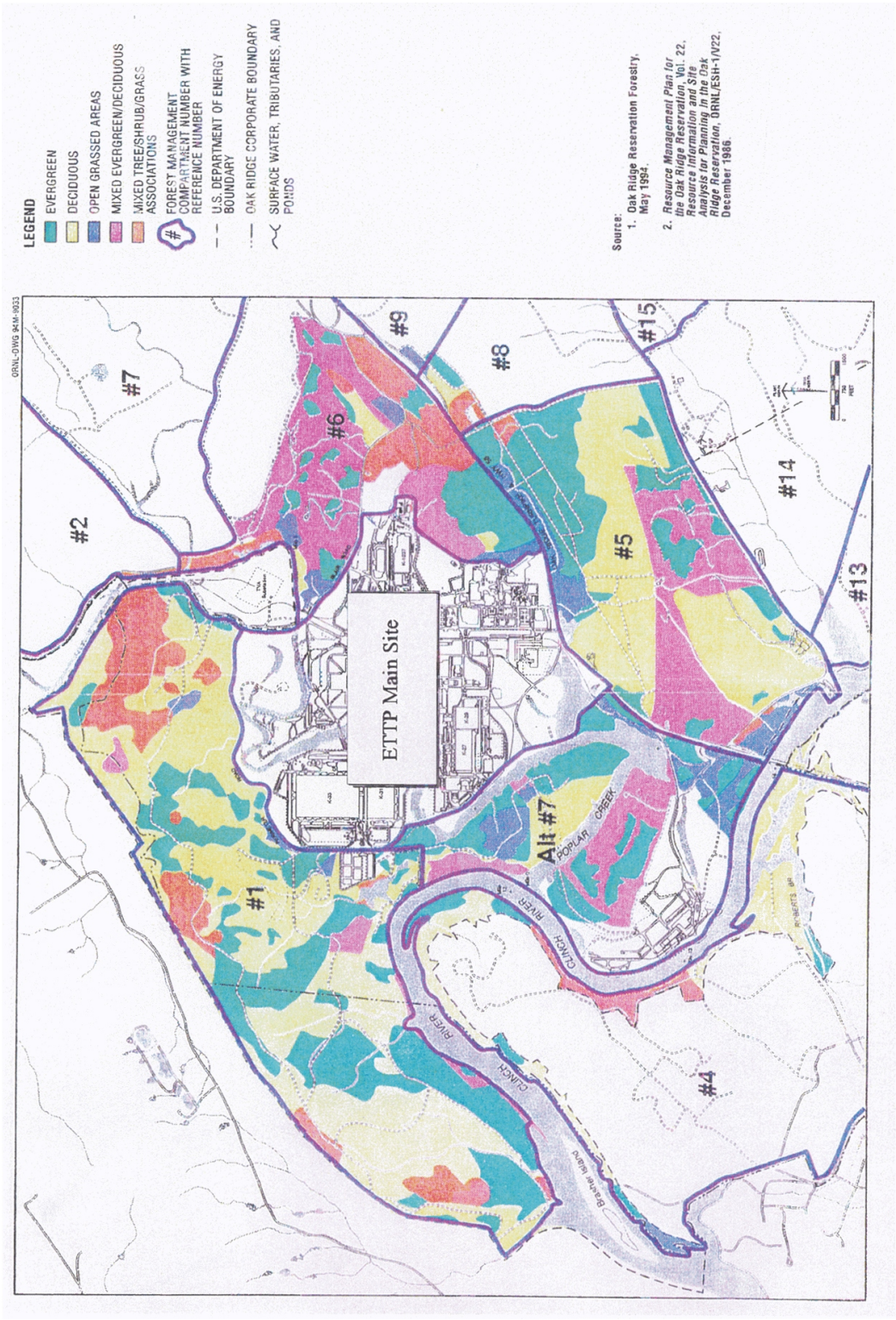
3.4.1.1 *Vegetation*

The ORR consists of diverse habitats and supports a rich variety of flora, with vegetation characteristic of that found in the intermountain regions of central and southern Appalachia. Rare, threatened, and endangered species are discussed in Section 3.4.5 of this EA.

ETTP

Figure 3.4-1 shows where the types of plant communities, natural and planted, are located on the ETTP Area of Responsibility (ORO 1997). Buildings K-1220, K-1037, K-1600 and K-101 at the ETTP are the focus areas for the Proposed Action. Vegetation around the buildings within the fenced area on the ETTP proper is a mixture of mowed grasses with a few shrubs and trees. Small areas have mixed tree/shrub/grass associations or mixed evergreen-deciduous vegetation. Many of the shrubs and trees have been planted as landscaping (ORO 1997).

Because of the presence of the industrialized ETTP Site, much of the vegetation in the ETTP Area of Responsibility not covered by this EA is fragmented compared with areas elsewhere on the ORR. The most widespread vegetation type on the ETTP Area of Responsibility is hardwood forest (587 ha [1,451 acres] or 60 percent of the total forested area of the ETTP Area of Responsibility). Almost all of the hardwoods are naturally occurring, with only about 1 percent having been planted. The



Source: ORO 1997.

FIGURE 3.4–1.—*Vegetation on the ETTP Area of Responsibility.*

second most common vegetation type in the ETTP Area of Responsibility is native and non-native coniferous forest (392 ha [969 acres]). Approximately 66 percent of the total area of conifer stands are pines planted in formerly open fields (ORO 1997).

CTC Facility

The CTC Facility, Building 90-12, is a large single floor building surrounded by paved parking on three sides. The remaining area consists of a small portion of mowed grass area and small sections of small-growth hardwoods and pines. Various types of typical native grasses and weeds border the trees and grasses (USEC 2002a).

3.4.1.2 *Wildlife*

The diverse vegetational communities of the ORR create a number of favorable habitats for a wide variety of animal species typical of eastern Tennessee. Most of the birds and mammals found on the ORR can tolerate and adapt to a variety of habitats and, therefore, may be found in places other than those which are considered typical for a particular species (ORO 1997). Rare, threatened, and endangered species are discussed in Section 3.4.5 of this EA.

ETTP

Since the ETTP proper is primarily planted in non-native grasses, it has very little habitat available for native animals except along Poplar Creek. The majority of the animal species found within the ETTP's boundaries are species that adapt well to disturbance and the presence of humans, including small rodents, birds such as starlings and pigeons, reptiles, and waterfowl, especially Canada geese. Larger animals and many smaller native animals are not found because of a lack of suitable habitat (ORO 1997).

The ETTP Area of Responsibility includes some areas that have suitable habitat for native animals. Species found in those areas would be similar to those found elsewhere on the ORR in areas of similar habitat (ORO 1997).

CTC Facility

The 3.6 ha (9 acres) of the CTC site is made up of primarily planted non-native grasses, small growth hardwood, and pines, and have very little habitat available for native animals. Small mammals such as squirrels, rodents, ground hogs, rabbits, and birds have been observed entering and leaving the CTC Facility's fenced enclosure (USEC 2002a).

Breeding Birds. One route for the national breeding bird survey follows Poplar Creek through the middle of ETTP, while another one is in the Dyllis Orchard area at the east end of ETTP Area of Responsibility. Birds were identified during a 1995 survey along those routes and also at other places near ETTP. Many different species of birds are found there because of the varied habitats in the ETTP Area of Responsibility (ORO 1997). The immediate area surrounding the CTC Facility has limited area and unfavorable conditions for breeding birds (USEC 2002a).

Game Species. Most of the land in the ETTP Area of Responsibility surrounding ETTP is part of a wildlife management area and is open annually to white-tailed deer and wild turkey hunting on specified dates. Although only the hunting of deer and turkey is presently allowed, some other game species known or likely to be present (e.g., Canada geese, gray squirrels, cottontail rabbits, raccoons, beavers, minks, muskrats, wood ducks, woodcocks, quail, common snipes) could also be harvested if permitted (ORO 1997). Game species have not been observed in the immediate area surrounding the CTC Facility. Small mammals such as squirrels, rabbits, racoons, and ground hogs have been observed entering and leaving the CTC Facility area, but no hunting is allowed on the site. Hunting will not be allowed at the facility (USEC 2002a).

3.4.2 Aquatic

Aquatic habitats on the ORR include undisturbed small streams, liquid-waste disposal ponds, and the Clinch River that contain fish and invertebrate populations (ORO 1997). Rare, threatened, and endangered species are discussed in Section 3.4.5 of this EA.

ETTP

Poplar Creek flows through the center of ETTP and into the Clinch River. The water level of Poplar Creek is dependent upon the level of Watts Bar Lake (e.g., the Clinch River). A biological monitoring program designed to document the effects on the stream biota of the operation of major new pollution-abatement facilities on ETTP has been developed (ORO 1997).

Aquatic habitat on or near the ETTP Area of Responsibility consists of streams, ponds and the Clinch River, which forms its southeast boundary. Five major biotic communities occur in waters adjacent to ETTP: phytoplankton, periphyton, zooplankton, benthic macroinvertebrates, and fish (ORO 1997).

CTC Facility

There are three ponds on the Boeing Property (Arcadis 2002). One is located on the southwestern portion of the property near the exit ramp for Route 62. The other two ponds on the property are man-made features, originally constructed when the property was a farm. These surface-water features act as stormwater retention basins and are both located on the eastern portion of the property. The larger of the ponds in bounded by a man-made levee on the eastern edge and has flood-control overflow measures to ensure the integrity of the levee. In addition, there are two stormwater runoff retention basins on the property, located to the north of the CTC Facility and east of the guard house (Arcadis 2002). No waterbodies or wetlands are located within the 3.6 ha (9 acre) leased property (USEC 2002a).

3.4.3 Wetlands

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to, and that under normal circumstances do, support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, and similar areas and perform a variety of important functions in ecosystems (ORO 1997).

ETTP

A few small wetland areas have been identified on ETTP associated with Mitchell Branch, Poplar Creek, the K-770 Scrap Yard, and the K-1007-P1 pond. These wetlands total about 3.5 ha (8.6 acres). The wetlands along Poplar Creek are the most natural and least disturbed of those on ETTP and are strongly influenced by fluctuations in Watts Bar Lake. The Mitchell Branch wetlands occur in a narrow strip along the bank and are all in highly disturbed areas. The K-1007-P1 pond-related wetland developed due to construction of the pond and compaction of soil there. One wetland, a man-made pond on the northern end of the site, is found in the K-770 Scrap Yard area. Also, a highly degraded stream flows through the eastern half of that area. Although the narrow fringe along that stream could possibly be classified as wetland, aquatic and/or wetland functions are probably occurring at a minimal level, if at all. Thus, that area has not been mapped as a wetland (ORO 1997).

Surveys in selected areas of the ETTP Area of Responsibility identified 38 other wetland areas, ranging in size from 0.13 to 4.24 ha (0.32 to 10.5 acres) and totaling about 32.6 ha (80.6 acres) (Rosensteel and Awl 1995). These wetlands occur in association with springs and seeps along stream bottomlands, in areas of seasonally high groundwater tables and surface water levels on the alluvial islands and floodplains of Poplar Creek and the Clinch River, in association with a beaver dam, and in and adjacent to areas of human impact (including utility line rights-of-way and channelized streams). Some of the wetland areas outside ETTP are designated as National Environmental Research Park (NERP) Natural Areas or Reference Areas and support several species of rare or threatened plants and animals (see Section 3.4.5). Other wetlands may occur in the sections of the ETTP Area of Responsibility that have not been completely surveyed (ORO 1997).

CTC Facility

There are no designated wetlands within the boundaries of the CTC Facility (USEC 2002a).

3.4.4 Environmentally Sensitive Areas

ETTP

The Lower Poplar Creek Rookery is an environmentally sensitive area within the ETTP. It is just over 2.6 ha (almost 6.5 acres) in size and is located on the north bank of Poplar Creek in the middle of the main plant site. It contains a great blue heron rookery with heron nests in a forested wetland. The Nature Conservancy has given this area a biological significance ranking of high significance (ORO 1997).

Three other environmentally sensitive areas are found near the boundaries of the parcels outside the security fence: the Duct Island Road Bluffs, the ETTP Beaver Pond Complex, and the Upper Mitchell Branch aquatic reference area. The Duct Island Road Bluffs cover almost 5 ha (just over 12 acres). This area is ranked as having very high biological significance because of the known populations of two rare plant species, spreading false foxglove and branching whitlow-grass and also the diverse community types found there. The ETTP Beaver Pond Complex is just under 7 ha (almost 17 acres) in size and provides habitat for wetland wildlife (e.g., herons, muskrats, mink, beaver, raccoons). The Upper Mitchell Branch Site is an aquatic reference area containing about 9 ha (almost 22.5 acres) of land and is the ETTP wetland mitigation area. It is ranked as having high biological significance (ORO 1997).

CTC Facility

There are no environmentally sensitive areas within the boundaries of the CTC Facility (USEC 2002a).

3.4.5 Threatened, Endangered, and Special Concern Species

The area of the ETTP site is an industrial site that does not provide suitable habitat for sensitive species. Species of concern known to be present on the ORR are given in Table 3.4–1. The U.S. Fish and Wildlife Service (USFWS) was consulted in order to comply with Section 7 of the *Endangered Species Act* (ESA); the point-of-contact for USFWS is listed in Chapter 8 (List of Agencies and Persons Contacted). The USFWS determined that the gray bat (*Myotis grisescens*),

Indiana bat (*Myotis sodalis*), and the pink mucket (*Lampsilis abruta*) have the potential to occur within project impact areas. The USFWS has recommended that a biological assessment (BA) be submitted to determine if the proposed project may affect the species. After review of the BA, the USFWS has concluded, in a letter dated October 16, 2002, that the proposed action is not likely to adversely affect the above mentioned species. Copies of consultation letters and the BA submitted to the USFWS are included in Appendix B. Discussions with the Tennessee Wildlife Resources Agency (TWRA) and the TDEC were held to provide information on the evaluation of threatened, endangered, and special concern species (USEC 2002c). The TWRA stated that discussions with the TDEC would identify any concerns with the CTC Facility. Species of concern in the Clinton quadrangle in the vicinity of the CTC Facility are listed in Table 3.4-2.

ETTP

Sixteen plant species that are considered rare, threatened, or endangered have been identified on or near the ETTP Area of Responsibility. None of these species are known to occur in the area of the proposed action in this EA. However, two rare species, spreading false foxglove, a Federal species of concern and a state-threatened species, and branching whitlow-grass, a state special concern species, occur along the Clinch River near the ETTP Area of Responsibility (ORO 1997).

Eighteen wildlife species that are considered rare, threatened, or endangered have been found on or near the ETTP Area of Responsibility. At least two pairs of osprey, a state threatened species, occur on the ETTP Area of Responsibility. Some habitat suitable for bald eagles is found on Melton Hill Reservoir and the Clinch River. Although no bald eagles are currently known to nest on the ORR, they continue to winter there, and unverified summer occurrences have also been reported. Because of the proximity of developed areas, most of the ETTP Area of Responsibility is unsuitable habitat for bald eagles, although there has been one unverified eagle sighting near the ETTP (ORO 1997).

CTC Facility

Consultations were held with the TWRA and the TDEC to determine the existence of threatened, endangered, and special concern species. Based on these consultations, it is reasonable to predict that suitable habitat for any endangered species would not be affected, and therefore, there would be no

reasonable expectation of any adverse impact to any rare endangered species (USEC 2002c). There are no known endangered species within the boundaries of the CTC Facility (USEC 2002a).

TABLE 3.4–1.—*Animal Species of Concern Reported from the Oak Ridge Reservation in the 1999 Annual Site Environmental Report.*

Species		Legal Designation
Amphibians and Reptiles		
Hemidactylium scutatum	Four-toed salamander	State in need of management
Birds		
Haliaeetus leucocephalus[1]	Bald eagle	Federally and State threatened
Falco peregrinus[2]	Peregrine falcon	State endangered
Dendroica cerulea	Cerulean warbler	State in need of management
Pandion haliaetus	Osprey	State threatened
Accipiter striatus	Sharp-shinned hawk	State in need of management
Circus cyaneus	Northern harrier	State in need of management
Anhinga anhinga	Anhinga	State in need of management
Casmerodius alba	Great egret	State in need of management
Egretta thula	Snowy egret	State in need of management
Contopus borealis	Olive-sided flycatcher	State in need of management
Grus canadensis	Sandhill crane	State in need of management
Lanius ludovicianus	Loggerhead shrike	State in need of management
Phalacrocorax auritus	Double-crested cormorant	State in need of management
Sphyrapicus varius	Yellow-bellied sapsucker	State in need of management
Egretta caerulea	Little blue heron	State in need of management
Mammals		
Myotis grisescens	Gray bat	Federally and State endangered
Sorex longirostris	Southeastern Shrew	State in need of management

[1] The bald eagle was proposed for federal delisting on July 6, 1999.

[2] The peregrine falcon was federally delisted on August 25, 1999.

TABLE 3.4-2.—*Animal Species of Concern Reported within the vicinity of the CTC Facility*

Species		Legal Designation
Fish		
Noturus flavipinnis	Yellowfin madtom	Federally and state threatened
Amphibians		
Cryptobranchus alleganiensis	Hellbender	Federal candidate
Mollusc		State in need of management
Dromus dromas	Dromedary pearlymussel	Federally and state threatened
Fusconaia edgariana	Shiny pigtoe	Federally and state threatened
Hemistena lata	Cracking pearlymussel	Federally and state threatened
Plethobasus cicatricosus	White wartyback	Federally and state threatened
Plethobasus cooperianus	Orangefoot pimpleback	Federally and state threatened
Other Types of Invertebrates		
Mammals		
Myotis grisescens	Gray bat	Federally and state endangered

Source: USEC 2002c.

3.5 CULTURAL RESOURCES

ETTP

The K-25 Site was established as part of the Manhattan Project to develop and produce highly enriched uranium nuclear material for the atomic bomb used in World War II. The Manhattan Project was the first industrial process for separating the ^{235}U isotope by the gaseous diffusion method and precipitated extraordinary innovations in science, engineering, and building construction needed to build and operate these industrial facilities. In 1994, a cultural resources survey of the former K-25 Site identified it as a "Main Plant Historic District" with 120 "contributing" buildings eligible for inclusion on the *National Register of Historic Places* (NRHP). A listing of these buildings, some no longer existing, is included in the K-25 Cultural Resources Survey (ORO 1997).

Three of the buildings that would be affected by the proposed project are within the K-25 Main Plant Historic District (K-1600, K-1037, and K-101). Buildings K-1037 and K-101 are contributing

properties to the Historic District. Building K-1220 is located outside the Main Plant Historic District, and is not a contributing property nor individually eligible for inclusion in the NRHP.

CTC Facility

Boeing-Oak Ridge purchased the Boeing Property in the late 1970s as a single tract of land, consisting of approximately 85 ha (210 acres). Previously, a portion of the land was utilized as a farm, presumably for agricultural purposes. The main building was completed in three phases between 1979 and 1990. The CTC Facility was added as an adjacent building in 1983 as office and administrative space (Arcadis 2002).

The CTC Facility was used to support a DOE-funded project that was part of the USEC Gas Centrifuge R&D Program. The primary use of the facility during this project was for mechanical testing of centrifuge components. Following this project, Boeing revised the use of the building for industrial, office space and storage. The industrial activities focused mainly on assembly of commercial aircraft parts. Since 1989, the building has been used for interim storage of office materials (Polestar 2002). The CTC Facility is not considered to be eligible for inclusion in the NRHP (USEC 2002a).

3.6 WATER RESOURCES

3.6.1 Surface Hydrology

The major surface waterbody in the immediate vicinity of the ORR is the Clinch River, which borders the site to the south and west. There are four major subdrainage basins on the ORR that flow into the Clinch River and are affected by site operations: Poplar Creek, East Fork Poplar Creek, Bear Creek, and White Oak Creek. Drainage from ETTP drains predominantly into Poplar Creek and Mitchell Branch, which have a total drainage of approximately 352 km^2 (136 mi^2). Drainage from Y-12 enters both Bear Creek and East Fork Poplar Creek, and ORNL drains into the White Oak Creek Drainage Basin. Several smaller drainage basins, including Ish Creek, Grassy Creek, Bearden Creek, McCoy Branch, Kerr Hollow Branch, and Raccoon Creek, drain directly into the Clinch River. Each drainage basin takes the name of the major stream flowing through the area. Within

each basin are a number of small tributaries. The natural surface waterbodies in the vicinity of ORR are shown in Figure 3.6–1. No major surface water bodies were identified in the immediate vicinity of the Boeing Property. However, three man-made ponds were identified on the property.

ETTP

The ETTP is directly adjacent to the Clinch River along the northwest boundary of the ORR. Poplar Creek enters the north side of ETTP downstream from the confluence of the east and west forks of Poplar Creek. Poplar Creek meanders sharply along the southwest side of the ETTP (ORO 1997).

The Clinch River adjacent to the ETTP is approximately 150 m (500 ft) wide and ranges from about 7 to 10 m (25 to 30 ft) deep along the main channel. The Clinch River occupies the lowest topographic position in the valley, and therefore, serves as the discharge boundary for groundwater flow from ETTP. The ETTP potable water supply is currently obtained from the Clinch River. The water intake is located upstream from the ETTP Site (ORO 1997).

The Clinch River and Poplar Creek fluctuate up to 1.5 m (5 ft) on diurnal, weekly, and seasonal cycles due to a system of dams operated by TVA (ORO 1997). Melton Hill Dam controls the flow of the Clinch River along the northeast and southeast sides of the ORR. Watts Bar Dam, located on the Tennessee River downstream at the lower end of the Clinch River, controls the flow of the Clinch River along the southwest side of the ORR.

TVA has conducted floodplain studies along the Clinch River and Poplar Creek. The studies indicated that most of ETTP is above the probable maximum flood (PMF). The K-25 power plant, which is no longer present, and the ETTP water filtration plant are the only facilities at risk during major floods. Flooding would most likely occur from backwater from the Clinch River and the Watts Bar Reservoir.

Surface Water Quality for ETTP. The streams and creeks of Tennessee are classified by the TDEC and defined in the State of Tennessee Water Quality Standards. Classifications are based on water quality, designated uses, and resident aquatic biota. The Clinch River is the only surface waterbody on the ORR classified for domestic water supply. Most of the streams at the ORR are classified for fish and aquatic life, livestock watering, wildlife, and recreation. White Oak Creek and

Melton Branch are the only streams not classified for irrigation. Portions of Poplar Creek and Melton Branch are not classified for recreation.

CTC Facility

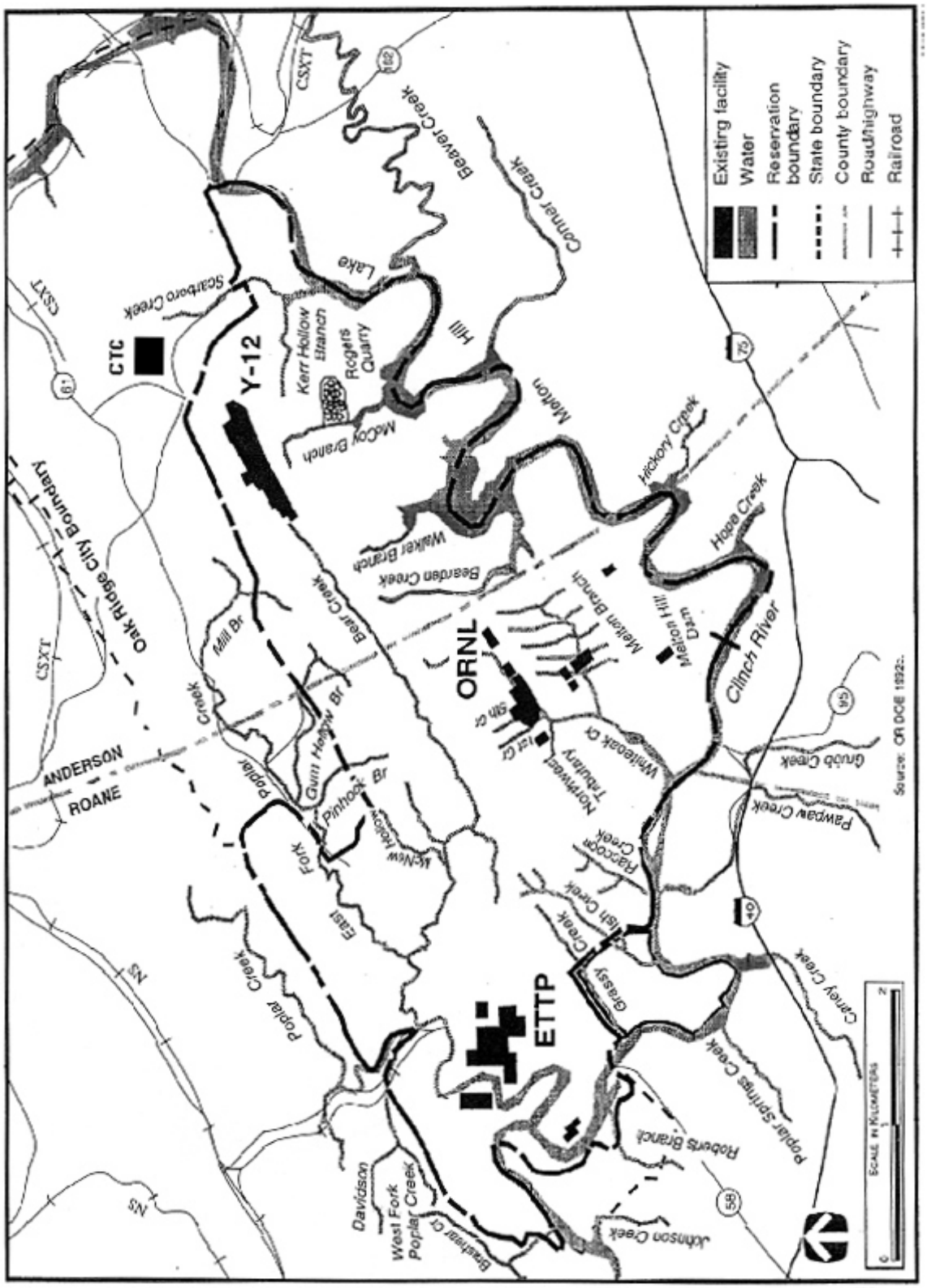
No designated waterbodies were identified on the Boeing Property (USEC 2002b). However, three man-made ponds outside of the leased area, were observed to hold water, even in dry seasons (Arcadis 2002). There are no streams within the boundaries of the 3.6 ha (9 acres) of the CTC Facility (USEC 2002a). Surficial drainage on the western portion of the property is expected to be northwest. Surficial drainage on the eastern portion of the property is expected to be to the east-northeast (Arcadis 2002).

3.6.2 Groundwater

The ORR is located in an area of sedimentary rocks of widely varying hydrological characteristics. Two geologic units on the ORR, the Knox Group and the Maynardville Limestone of the Conasauga Group, both consisting of dolomite and limestone, constitute the Knox Aquifer. Active groundwater flow in the Knox Aquifer can occur at depths of 91 to 122 m (300 to 400 ft). The Knox Aquifer is the primary source of groundwater to many streams, and most large springs on the ORR receive discharge from the Knox Aquifer.

The remaining geologic units on the ORR, including the Rome Formation, the Conasauga Group, and the Chickamauga Group, are aquitards which consist mainly of siltstone, shale, sandstone, and interbedded limestone and dolostone of low to very low permeability. Nearly all groundwater flow in the aquitards occurs through fractures similar to the flow mechanism dominant in aquifers. In areas underlain by aquitards, the combination of topographic relief and a decrease in bedrock fracture density with depth, restrict groundwater flow to shallow depths of the saturated zone and groundwater discharges primarily to nearby surface waters within the ORR (DOE 1999b).

Aquifers at the ORR include a surficial soil and regolith unit and bedrock aquifers. The surficial aquifer consists of man-made fill, alluvium, and weathered bedrock. Bedrock aquifers occur in carbonates and low-yield sandstones, siltstones, and shales.



Source: ORO 1997.

FIGURE 3.6-1.—*Surface Water Features on the Oak Ridge Reservation.*

There are no aquifers or wellheads present on the 3.6 ha (9 acre) parcel of land to be leased to USEC (USEC 2002b).

ETTP

At ETTP, groundwater occurs in unconsolidated overburden and underlying bedrock as a single, unconfined water table aquifer. The water table occurs in the overburden overlying bedrock with the saturated overburden ranging up to 21 m (70 ft). In general, the water table is encountered within several feet of the surface adjacent to any major water features (ORO 1997). The water table mimics the surface topography, therefore, the groundwater flows from higher elevations of the site to Poplar Creek and the Clinch River. Groundwater flows in bedrock are controlled by hydraulic gradients, fracture networks, and karst solution features. The local groundwater flow direction at the ETTP site is variably and generally towards Poplar Creek in the main plant area of ETTP (ORO 1997).

Karst features are presently underlying the ETTP site, however, conduit-dominated flow has only been confirmed at portions of the site underlain by the Knox Group along Black Oak Ridge (ORO 1997).

Groundwater Quality for ETTP. Groundwater samples are collected semiannually or annually from a representative number of monitoring wells throughout the ORR. Groundwater samples collected from the monitoring wells are analyzed for a standard suite of parameters and constituents, including trace metals, volatile organic compounds (VOCs), radionuclides, inorganics, and field parameters. Background groundwater quality at the ORR is generally good in the near surface aquifer zones and poor in the bedrock aquifer at depths greater than 300 m (984 ft) due to high total dissolved solids.

CTC Facility

There are no aquifers or wellheads present on the proposed parcel of land (USEC 2002b). The direction of shallow groundwater flow at the site is to the northwest on the western portion of the property and to the east-northeast on the eastern portion of the property (Arcadis 2002). No specific groundwater wells are located within the boundaries of the CTC Facility (USEC 2002a).

Groundwater Quality for the CTC Facility. Surface water runoff at the CTC Facility is visually monitored quarterly. No specific groundwater wells are located within the boundaries of the CTC Facility (USEC 2002a).

3.7 LAND USE AND VISUAL RESOURCES

3.7.1 Land Use

ETTP

The ETTP Site, located in the northwest quadrant of the ORR, is adjacent to the Clinch River in Roane County and is approximately 21 km (13 mi) west of the downtown Oak Ridge, Tennessee. Figure 3.7–1 shows the location of the ORR and the surrounding area. Over the past few years, DOE developed a strategy for future uses of the ORR (including the ETTP) through several initiatives that involved community leaders, citizens, civic organizations, government agencies, and other stakeholders. Taken into consideration were pre-existing agreements among DOE, EPA, and the TDEC, especially those established by Record of Decisions (RODs) under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). Through these processes, the future land use recommended for the previously industrialized areas of ETTP was "industrial" (ORO 1997).

CTC Facility

The Boeing - Oak Ridge facility is located on the southern edge of the City of Oak Ridge. Figure 3.7–1 shows the location of the Boeing Property and surrounding area. The site is located in an area of predominantly residential and commercial properties.

3.7.1.1 *Historical Land Use*

ETTP

Construction of the Oak Ridge Gaseous Diffusion Plant (ORGDP) at the K-25 Site (now the ETTP) began in 1942 when gaseous diffusion technology was developed during World War II as part of the

Manhattan Project to enrich uranium for use in a nuclear weapon. The ORGDP had five primary process buildings (K-25, K-27, K-29, K-31, and K-33) where uranium enrichment took place. The massive K-25 Building, for which the site was later named, was one of the world's largest industrial buildings at the time. In 1964, military production of highly enriched uranium (HEU) at ORGDP was discontinued, and this function was transferred to another Federal gaseous diffusion plant at Portsmouth, Ohio. At this time, the K-25 and K-27 process buildings were shut down (ORO 1997).

For the next 20 years, the primary mission of ORGDP was the production of low-enrichment uranium (LEU) for fabrication into fuel elements for commercial and research nuclear reactors. Secondary missions in the mid-1980s included research on new technologies for uranium, such as gas centrifuge and laser isotope separation. In 1985, because of a decline in the demand for enriched uranium, DOE placed ORGDP in stand-by mode. The decision to permanently shut down diffusion operations was announced in late 1987, and the name of the facility was changed to the K-25 Site. The site was renamed the ETTP in 1997 (ORO 1997).

CTC Facility

The Boeing Property is comprised of a 37,959 m^2 (408,585 ft^2) main production building (Building 90-01), an approximate 15,000 ft^2 Hazardous Materials Storage Building (Building 90-22), and approximate 51,000 ft^2 Technology Center (Building 90-12), a guard house (Building 90-19), a recreational pavilion and ball field, a wood shop (Building 90-01), a welding shop (Building 90-047), and a wastewater treatment plant (Building 90-06) on 85 ha (210 acres). The main production building is divided into machine shop space, sheet metal production areas, raw materials storage, shipping offices, product storage, office space, chemical processing, assembly, quality control office space/laboratory, and a cafeteria. The name of the Oak Ridge Boeing Property has changed several times since 1981 and is currently named Boeing Defense and Space Group - Oak Ridge, Inc.

The Boeing Property manufactured uranium enrichment centrifuges for the DOE from 1980 to 1985. From 1985 until 1996, the Boeing Property fabricated parts for aircraft, and from 1996 to 1998 the facility performed maintenance on and upgraded non-nuclear Conventional Air-Launched Cruise Missiles for the U.S. Department of Defense.

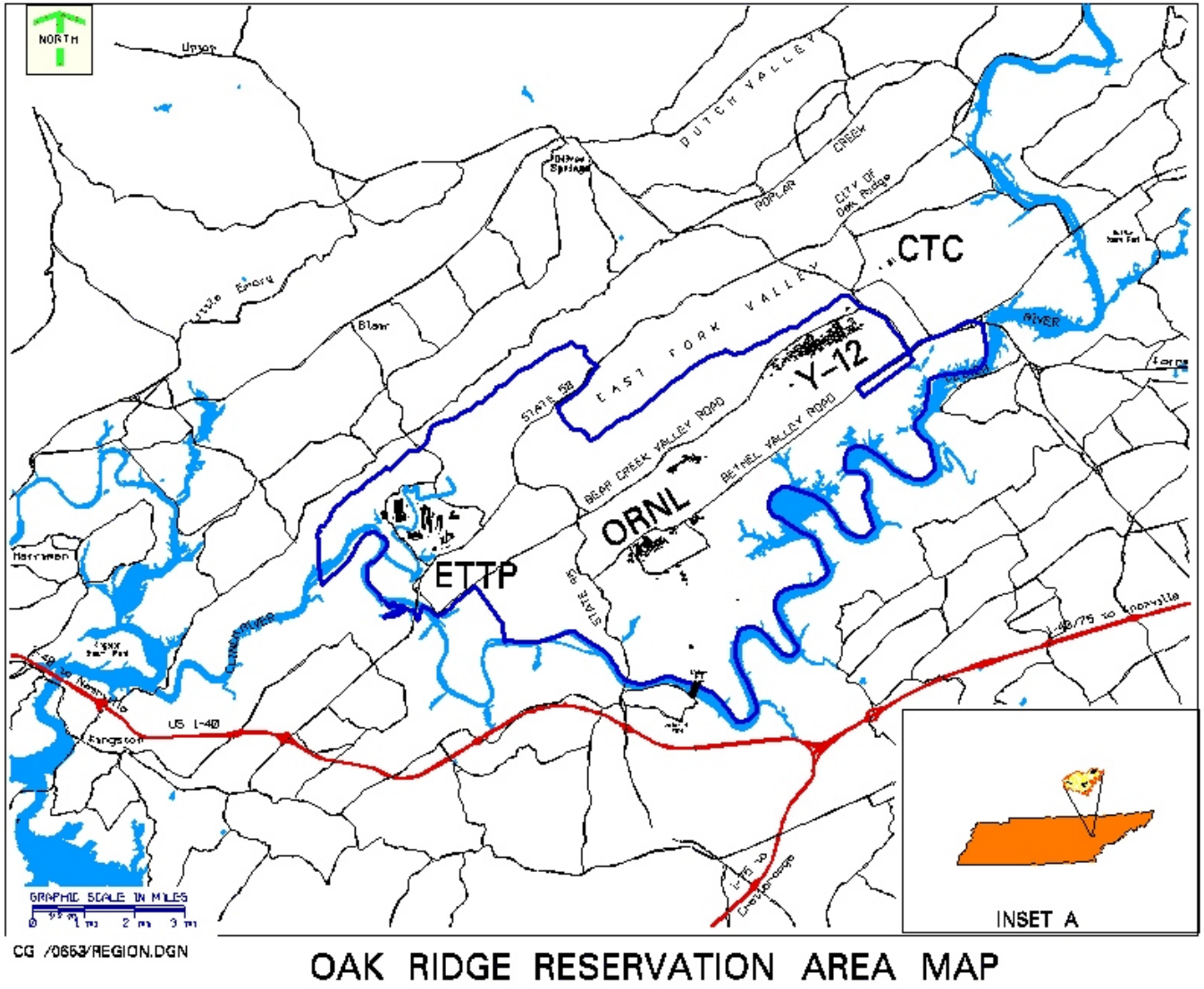


FIGURE 3.7–1.—***Location of Oak Ridge Reservation, Principle Facilities, Boeing Property and Surrounding Area.***

The CTC Facility (Building 90-12) was constructed in 1983 and used to support a DOE-funded project that was part of the USEC Gas Centrifuge R&D Program and was originally used for office and administration space. This space was also used for product assembly prior to the completion of the third phase of construction in the main building on the Boeing Property. During the USEC Gas Centrifuge R&D Program the primary use of the facility was for mechanical testing of centrifuge components. Following this project, Boeing revised the use of the building in light of industrial, office space and storage. The industrial activities focused mainly on assembly of commercial aircraft parts. Since 1989, the building has been used for interim storage of office materials (USEC 2002a). No hazardous materials are now, or have historically been, stored in this building.

3.7.1.2 *Current Land Use*

ETTP

The mission at ETTP is to reindustrialize and reuse site assets through leasing of underutilized facilities and incorporation of commercial industrial organizations as partners in the ongoing environmental restoration, D&D, water treatment and disposal, and diffusion technology development activities (LMES 1999). The ETTP main site encompasses 293 ha (725 acres) and is enclosed within a security fence. However, the ETTP geographic Area of Responsibility consists of approximately 2,405 ha (5,942 acres), including Parcels ED-1, ED-2, and ED-3 outside the fencing. Land use within the security fencing is typically mixed industrial, with much of the area undergoing environmental restoration. ETTP residents include DOE prime contractors, M&I operations, M&I subcontractors, CROET leasees, and subleasees (LMES 1999).

Most of the land outside of the security fencing has been maintained as natural areas (open space and forest management land). Many of these areas are protected and managed as sensitive cultural and natural resources. Some areas are designated as being available for "alternative uses" in connection with reindustrialization (LMES 1999). Other uses include:

- Parcel ED-1 (a lease to CROET, effective April 28, 1998)
- Parcel ED-2 (a lease to CROET, effective September 15, 1997)
- Parcel ED-3 (EA is on hold)

CTC Facility

The Boeing Property encompasses 85 ha (210 acres). The CTC Facility is located to the west of the main facility on 3.6 ha (9 acres) of land. The building currently has no occupants and no activities are currently taking place in the building. The building is surrounded by paved parking areas on three sides of the building. A majority of the area, approximately 2.8 ha (7 acres) consists of native trees, grasses, and weeds. There is also a small section of maintained non-native grass (USEC 2002a).

3.7.1.3 *Centrifuge Project Affected Facilities and Equipment*

DOE has prepared a draft lease which would allow usage of centrifuge equipment and a large majority of Building K-1600 and additional leased space in Buildings K-1037, K-1220, and K-101 for at least 3 years, with additional option periods consistent with the ACP. The previous and current uses for these four buildings are discussed below (USEC 2000d). As an alternative to conducting all manufacturing and testing operations in the K-1600 Facility, USEC has leased the CTC Facility, Building 90-12 on the Boeing Property and centrifuge equipment for fabrication, assembling, and testing centrifuge components.

Use of Buildings K-1600 and K-101 beyond January 2006 would delay or require modification of the ACP because they are scheduled for D&D in 2006 under the ACP. Building K-1220 is scheduled for inclusion in the ACP at the ETTP site. However, K-1220 utilization as a short-term storage facility for DOE equipment to be leased to the Centrifuge Project would not be for the life of the project and K-1220 would be available to DOE for disposition as envisioned by the ACP. Building K-1037 is scheduled to be made available to CROET in FY2005. If CROET decides to obtain ownership of the facility, USEC may negotiate a lease with CROET. If CROET decides to decline ownership of the facility, deactivation of the facility would be scheduled in the first quarter of FY2006. If the ACP is on schedule, then a decision would be required on whether to delay closure until completion of the centrifuge project or to relocate the USEC K-1037 centrifuge activities. Details of the environmental restoration program strategy are available in the ACP, the *Oak Ridge Performance Management Plan for the Environmental Restoration Program* (ORO 2002).

In addition to the facilities listed above, DOE has agreed to lease certain centrifuge equipment needed by USEC to conduct the demonstration project. The DOE centrifuge equipment required by USEC to implement the project would be enumerated in a classified attachment to the lease agreement.

Building K-1600

This building was used for the development of improved centrifuge models through high-speed testing under typical and atypical operating conditions. The facility was also used to perform simulated earthquake testing on operating centrifuges. Approximately 50 percent of this building is currently being used as follows: (1) maintenance glove shop, (2) electrical shop and storage, (3) record storage area, and (4) administrative offices. Building K-1600 is not radiologically contaminated except in limited areas such as withdrawal housing, sampling areas, and the internal surfaces of some equipment.

Building K-1220

This building was previously used for test operations on equipment designs used in the Gas Centrifuge Enrichment Plant, including a P1 cascade and supporting processes, and Machine Recycle Development Facility (MRDF) and therefore contamination exists within equipment and on localized surfaces. Currently, a portion of the building is being leased by CROET.

Building K-1037

Currently, this building is being used by a number of different users for administrative purposes. This office space comprises approximately 10 percent of the total building space of which 25 percent USEC is currently using. Building K-1037 houses the IMTL and a portion of the building is leased to CROET and subleased to Pall Industrial Membranes, LLC, for the manufacturing of inorganic membranes. The remaining 70 percent is not being used at this time. There is no radiological contamination in the leased portions of this facility.

Building K-101

This building was used for the assembly and evaluation of advanced gas centrifuge components in less than full-sized units. The development and testing of advanced diagnostic instrumentation systems was also performed at this facility. There is surface contamination on the first floor of the building. Currently, this building is not being used.

CTC Facility

The CTC Facility was constructed in 1983 and used to support a DOE-funded project that was part of the USEC Gas Centrifuge R&D Program. The primary use of the facility during this project was for mechanical testing of centrifuge components. Currently the building is not being used. There is no radiological contamination in the CTC Facility.

3.7.2 Visual Resources

ETTP

The ORR landscape is characterized by a series of ridges and valleys that trend in a northeast-to-southwest direction. Vegetation around ETTP is dominated by deciduous and evergreen forests. As a result, the viewshed, which is the extent of the area that may be viewed from ETTP, consists mostly of forested and rural land. The Oak Ridge Turnpike is the only one public freeway that can be seen from the main gate of ETTP. Viewpoints affected by the facilities at ETTP are also limited by the surrounding ridges and dense vegetation. Facilities at ETTP range from two to five stories in height. Buildings K-101, K-1037, K-1220, and K-1600 also range from two to five stories. These facilities are located within the security fencing and can only be partially seen from the main road.

For the purposes of rating the scenic quality of ETTP and surrounding areas, the Bureau of Land Management's (BLM) Visual Resource Management (VRM) Classification System was introduced in this analysis. Although this classification system is designed for undeveloped and open land owned by BLM, this is the only system of its kind available for the analysis of visual resource management and planning activities. Currently, there is no BLM classification for the ETTP. However, the development within the security fence line, which includes the four buildings, would

be consistent with VRM Class IV which would be used to describe a highly developed area (see Glossary for definition of VRM classes).

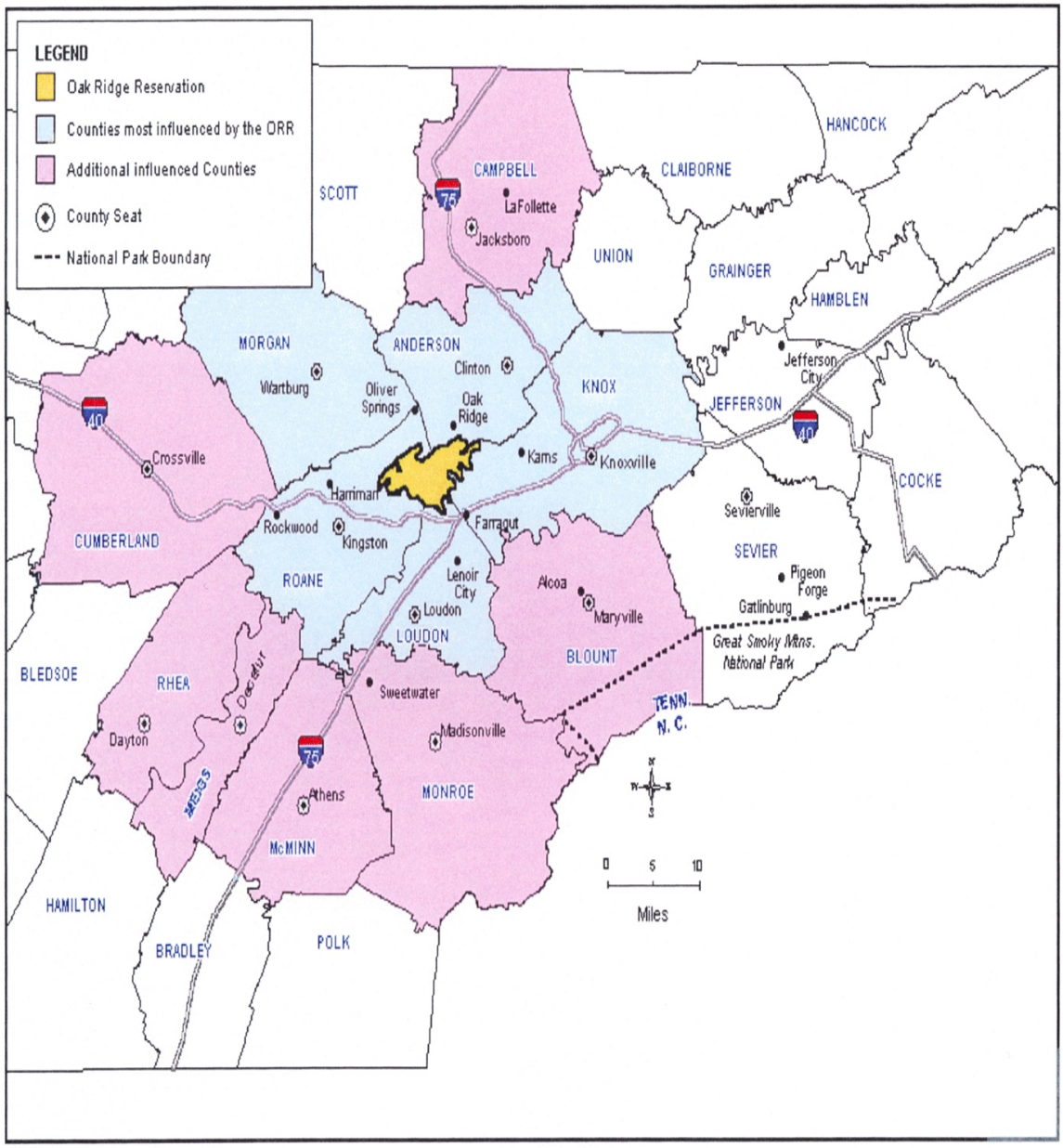
Most of ETTP's remaining Area of Responsibility outside the fence line has been maintained as natural areas and therefore, covered with second growth forest. These areas would be consistent with VRM Classes II and III left to its natural state with little to moderate changes.

CTC Facility

The terrain is slightly rolling to flat. Of the 3.6 ha (9 acres) being leased, the main portion used will only be approximately 0.8 ha (2 acres). The area contains the CTC Facility and parking lots. This land is flat and has a small amount of grassed area (USEC 2002b). The CTC Facility is surrounded by property owned and controlled for industrial use. The facility cannot be seen from public roads (USEC 2002a).

3.8 SOCIOECONOMICS

This section describes current socioeconomic conditions within a region of influence (ROI) where more than 90 percent of the ORR workforce resides. The ROI is a four-county area in Tennessee comprised of Anderson, Knox, Loudon, and Roane Counties. Figure 3.8–1 shows the surrounding counties influenced by the ORR. In 1997, almost 40 percent of the ORR workforce resided in Knox County, 29 percent in Anderson County, 16 percent in Roane County, and 6 percent in Loudon County. The remaining 9 percent of the workforce resided in other counties across Tennessee, none of which were home to more than 3 percent of the workforce (DOE 1999a). The general population distribution surrounding the CTC Facility would be the same as that shown for ETTP ROI (USEC 2002b).



Source: LMER 1999.

FIGURE 3.8–1.—*Location of Oak Ridge Reservation and Surrounding Counties.*

3.8.1 Employment and Income

The ORR and Boeing Property ROI has historically been dependent on manufacturing and government employment. More recent trends show growth in the service and wholesale and retail trade sectors and a decline in manufacturing and government employment. Table 3.8–1 presents current and historical employment for the major sectors of the ROI economy.

TABLE 3.8–1.—*Employment by Sector (Percent)*

Sector	1980	1990	1998
Services	19.1	27.5[a]	30.2[a]
Wholesale and Retail	21.1	25.3[a]	24.7[a]
Government (including Federal, State, local, and military)	20.3	15.6	13.7
Manufacturing	21.9	15.9	13.0
Farm	2.0	1.6	1.2
Construction	4.9	5.4	6.1
Finance, Insurance, and Real Estate	6.0	5.2	6.5
Transportation and Public Utilities	3.7	4.0	4.5
Agricultural Service, Forestry, and Other	0.3	0.6	0.9
Mining	0.7	0.4	0.2

[a] Percentage only includes Knox and Loudon Counties. Data for Roane and Anderson Counties not available.
Source: BLS 1999.

The ROI labor force grew by almost 15 percent in the first half of this decade from 243,209 in 1990 to 279,275 in 1995. There was an increase in the labor force between 1995 and 2001 when it totaled 285,920. ROI employment grew from 231,822 in 1990 to 268,748 in 1995 and continued to grow and totaled 277,197 in 2001 (BLS 1999, BLS 2002).

The ROI unemployment rate was 2.9 percent in 2001, as shown in Table 3.8–2. Unemployment rates within the ROI ranged from a low of 2.5 percent in Knox County to a high of 4.5 percent in Roane County. The unemployment rate in Tennessee was 4.5 percent in 2001 (BLS 2001).

Per capita income in the ROI was $25,639 in 2000, a 46 percent increase from the 1990 level of $17,407. Per capita income in 2000 in the ROI ranged from a low of $22,000 in Roane County to a high of $28,281 in Knox County. The per capita income in Tennessee was $22,699 in 1997 (BEA 2002).

TABLE 3.8–2.—*Region of Influence Unemployment Rates (Percent)*

County	1993	1994	1995	1996	1997	1998	1999	2000	2001
Anderson	4.9	3.9	3.9	4.8	5.6	3.7	3.6	3.6	4.0
Knox	3.9	3.3	3.4	3.4	3.6	3.1	2.6	2.3	2.5
Loudon	4.6	3.9	4.0	3.9	4.6	3.2	3.0	2.8	3.5
Roane	5.7	4.4	5.8	5.3	7.3	5.0	4.6	4.3	4.5
ROI Total	4.3	3.6	3.6	3.6	4.3	3.4	2.9	2.6	2.9
Tennessee	5.7	4.8	5.2	5.2	5.4	4.2	4.0	3.9	4.5

Source: BLS 1999, BLS 2002.

3.8.2 Population and Housing

Between 1990 and 2000, population growth in the ROI was slower than population growth in Tennessee as a whole. The ROI population increased at an average annual rate of 1.3 percent while the state population increased 1.7 percent annually. Between 2000 and 2001, ROI population growth increased 1.1 percent annually while the state population increased 0.9 percent annually. Loudon County experienced the fastest rate of population growth, averaging 3 percent between 2000 and 2001, while the Anderson and Roane Counties population has increased an average of 0.2 percent between 2000 and 2001 (Census 2000). Population in all counties in the ROI is projected to continue to grow at a somewhat slower rate between 2000 and 2020, as shown in Table 3.8–3.

TABLE 3.8–3.—*Historic and Projected Population in the Region of Influence*

County	1960	1970	1980	1990	2000	2010	2020
Anderson	60,032	60,300	67,346	68,250	71,330	72,502	79,275
Knox	250,523	276,293	319,694	335,749	382,032	374,616	432,866
Loudon	23,757	24,266	28,553	31,255	39,086	39,761	50,238
Roane	39,133	38,881	48,425	47,227	51,910	50,829	58,113
ROI	373,445	399,740	464,018	482,481	544,358	537,708	620,492
Tennessee	3,567,089	3,923,687	4,591,120	4,877,203	5,689,283	5,533,762	6,593,194

Source: BLS 1999, Census 1995, Census 1999, Census 2000.

Knox County is the largest county in the ROI with a 2000 population of 382,032. Knox County includes the city of Knoxville, the largest city in the ROI. Loudon County is the smallest county

in the ROI with a total population of 39,086. The City of Oak Ridge and the ORR are located in both Anderson and Roane Counties with 2000 populations of 71,330 and 51,910, respectively (Census 2000).

There were a total of 244,536 housing units in the ROI in 2000. A summary of ROI housing characteristics is shown in Table 3.8–4. Approximately 70 percent of these units were single family homes, 17 percent were multifamily units, and 13 percent were mobile homes. Approximately 8 percent of the housing units were vacant, although some vacant units were used for seasonal, recreational, or other occasional purposes. Rental vacancy rates ranged from 9 percent in Loudon County to 13.1 percent in Roan County, while homeowner vacancy rates ranged from 1.7 percent in Roane County to 2.5 percent in Knox County.

Owner-occupied housing units accounted for 74 percent of the total housing units while renter-occupied units accounted for approximately 26 percent (Census 2000).

In 2000, the median value of owner-occupied housing units ranged from $85,500 in Roane County to $97,300 in Knox County, while the median contract rent ranged from $450 in Anderson County to $493 in Knox County.

TABLE 3.8–4.—*Region of Influence Housing Characteristics (1990)*

County	Total Number of Housing Units	Number of Owner-Occupied Units	Owner-Occupied Vacancy Rates (percent)	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates (percent)	Median Monthly Contract Rent
Anderson	32,451	21,592	1.9	87,500	8,188	12.8	$450
Knox	171,439	105,569	2.5	$98,500	52,310	10.0	$493
Loudon	17,277	12,612	1.9	$97,300	3,332	9.0	$462
Roane	23,369	16,453	1.7	$85,500	4,747	13.1	$398
ROI	244,536	156,226	NA	NA	68,577	NA	NA

Note: NA - Not applicable.
Source: Census 2000.

3.8.3 Community Services

Community services in the ROI include public schools, law enforcement, and medical services. There are 8 public school districts with a total of 144 schools that provide educational services for the approximately 78,000 students in the ROI. Higher education opportunities in the ROI include the University of Tennessee as well as several private colleges and two community colleges (HPI 1999a).

Law enforcement is provided by 20 municipal, county, and local police departments that employ over 1,500 officers and civilians (HPI 1999b).

There are 13 hospitals in the ROI with a total of 2,833 beds. These hospitals operate at an average of 67 percent occupancy (AHA 1995). There are 1,525 doctors in the ROI with the majority (1,279) in Knox County (AMA 1996).

3.9 INFRASTRUCTURE

This section describes the utilities and building space currently used at the ETTP site and for the four buildings (K-1600, K-1220, K-1037, and K-101) which will be used for the centrifuge project and information on the utilities used at the CTC Facility. Utilities include air, electricity, natural gas, fuel oil, steam, and water (potable and treated). Water usage is difficult to calculate for each individual building as there are no meters to provide these data. Therefore, estimates were made to the extent practical. Initially USEC will use the existing infrastructure arrangements to obtain utilities. Utilities will be rerouted as necessary. Currently utilities are operated by OMI for CROET at ETTP.

3.9.1 ETTP Site

General Utilities. Initially USEC will use the existing infrastructure arrangements to obtain utilities. Utilities will be rerouted as necessary to avoid conflict with the ACP D&D. USEC will install individual metering for Buildings K-1600 and K-101. The existing DOE contractor through a fee for service arrangement will supply utilities for Buildings K-1220 and K-1037. USEC's lease

will require that USEC obtain their own utilities when DOE contractors can no longer supply the services.

Electricity. Electricity for all of ORR is provided by the TVA. Power is brought onsite via transmission lines currently owned by DOE. The total electricity consumption for ETTP is approximately 80,723 MWh (Bechtel Jacobs 2000).

Natural Gas/Fuel Oil/Steam. Two facilities at ETTP are the sole users of natural gas and fuel oil on the site: the steam plant and TSCA Incinerator. The steam plant uses approximately 3,390,180 therms while the TSCA Incinerator uses approximately 1,413,360 therms. Fuel oil (#2) is used as a back-up source for the steam plant, usually during the cold winter months when the demand of natural gas is high and exceeds current supply. During FY 1999, approximately 484,500 L (128,000 gal) of the fuel oil was used at the steam plant (Bechtel Jacobs 2000).

Water Resources. The potable water supply for ETTP is currently obtained from the Clinch River, with the water intake located upstream of the ETTP facility. The ETTP Site is currently producing 3,387,933 L/day (895,000 gal/day) (OMI 2000). The treatment of domestic wastewater is performed locally at the ETTP STP, which is currently operating within its NPDES permit (ORO 1997). The last permit exceedance was in 1994 (ORO 1997). The operating capacity of the ETTP STP is approximately 2,271,200 L/day (600,000 gal/day). Over the last year, 1,020,824 L/day (269,674 gal/year) of the water produced each month was treated as sewage at the plant. This plant discharges directly to Poplar Creek (OMI 2000).

3.9.2 CTC Facility

Electricity. Electricity of the City of Oak Ridge is provided by TVA. Power is brought onsite via transmission lines currently owned by the City of Oak Ridge. The total electrical consumption of the facility is currently estimated at 17,000 KWh per year (USEC 2002a).

Natural Gas/Fuel Oil/Steam. The current natural gas usage is approximately 50 standard cubic feet per hour (scf/hr) (USEC 2002b). The facility has a natural gas supply for supplying part of the heating requirements during the cold-weather months. The projected estimated natural gas usage is approximately 4,000 scf/hr (USEC 2002b).

Water Resources. The current potable water usage is 70 gallons/day. The potable water supply is currently produced by the City of Oak Ridge Water Treatment Plant, which is supplied by the Clinch River. The City of Oak Ridge distributes the water to the facility. The treatment of domestic wastewater is performed by the City of Oak Ridge Wastewater Treatment Facility (USEC 2002a). The projected water usage is 3,000 gallons/day

3.9.3 Project-Specific Facilities

ETTP

Building K-1600. This building encompasses approximately 3,530 m^2 (38,000 ft^2) of space. Utility capabilities during full operation include fire water, sanitary water, process water, safety water, plant

and emergency air, plant steam, emergency diesel generator, and normal electrical services. Current utility uses include (USEC 2000d):

- Electricity - 1.6 M kWh/yr
- Potable Water - 2,650 L/day (700 gal/day)
- Sewage - 2,650 L/day (700 gal/day)
- Air - 10 cfm

Building K-1220. This building encompasses approximately 7,293m^2 (78,500 ft^2) of space. Currently, a portion of the building is being leased by CROET. Centrifuge equipment left behind from the centrifuge operations in the 1980s remain in the Cascade Area. Specific utility uses are currently not metered (USEC 2000d):

Building K-101. This building encompasses approximately 559 m^2 (6,013 ft^2) of space. Currently the building is vacant and utility usage is limited to 17,000 kWh/yr of electricity (USEC 2000d).

Building K-1037. This building encompasses approximately 30,957 m^2 (333,215 ft^2). ITML occupies approximately 4,090 m^2 (44,000 ft^2) of space, or about 13 percent of the total space in the building. Specific utility uses include (USEC 2000d):

- Electricity - 4.8 M kWh/yr
- Potable Water - 2,839 L/day (750 gal/day)
- Sewage - negligible

CTC Facility

This facility encompasses approximately 4,738 m^2 (51,000 ft^2). Utility capacities during the full operation include fire water, sanitary water, bottled nitrogen, compressed air, natural gas, and normal electrical services. Current estimates of utility uses include (USEC 2002a, 2002b):

- Electricity - 17,000 KWh/YR
- Potable Water - 265 L/day (70 gal/day)
- Sewage - 265 L/day (70 gal/day)
- Natural Gas - 50 scf/hr (estimated)

3.10 ENVIRONMENTAL DESIGN

The elements of Environmental Design require that releases/emissions/wastes be compliant with present ES&H standards and that to the extent practical they be minimized by volume, mass and toxicity. The present design of these facilities was defined by the physical, ES&H requirements of the time during which these were built and operational (approximately the early to mid 1980s for the CTC Facility, K-1600 and K-1220 and the 1950s for K-1037 and K-101). In addition, some building modifications would be made to the proposed USEC space due to security requirements. Some construction debris would be handled as classified at the ETTP site. During the processes of building, equipment, and infrastructure modification, manufacturing, and test operations, for the scope of this EA, the design for these elements must be reviewed for compliance to present ES&H standards and for minimization of the quantity and toxicity of the materials used and wastes generated.

3.11 HUMAN HEALTH

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 one year to no more than 100 mrem. DOE regulations (10 CFR 835 *Occupational Radiation Protection)* establish 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 administrative control value for a worker's radiation dose is 5,000 mrem/yr from combined internal and external sources received in any year for the whole body.

ETTP

The *K-25 Site Radiation Control Program* sets an annual facility administrative control level of 1,500 mrem/yr for all activities. Approval of the ETTP Site Manager must be obtained to exceed this control level. Members of the public may be potentially exposed to low concentrations of radionuclides or chemicals resulting from past operational releases, ongoing remedial actions, facility D&D activities, and current operational activities. An annual environmental monitoring program on the ORR and ongoing environmental surveillance activities at ETTP are in place to ensure that the quantities of materials released to the environment are as low as reasonably achievable (ALARA) and to ensure protection of the public and the environment.

CTC Facility

No hazardous materials are now, or have historically been stored in this building (Arcadis 2002) and there have been no radiological activities at the CTC Facility. There would be no radiological materials located at the CTC Facility, therefore release evaluations are not applicable (USEC 2002b). No chemical release scenarios are projected that would affect the exterior of the CTC Facility (USEC 2002b).

3.11.1 Radiological Exposure to the Public

ETTP

Release of radionuclides to the environment from the ETTP site may occur via airborne and waterborne emissions (liquid discharge). Once released into the environment, these radionuclides are available for exposure to the public via several routes: inhalation, drinking water ingestion, direct radiation, and consumption of contaminated food products.

Monitoring of the release of airborne radionuclides from 15 emission points, each of which includes one or more individual sources, at ETTP was modeled during 1999 and reported in the ORR's 2000 ASER. The MEI for ETTP was located at a construction site about 2,210 m (7,250 ft) northeast of K-1435, the TSCA Incinerator. Building K-1600 facility is located approximately 1,280 m (4,200 ft) west of the TSCA Incinerator. The EDE received by the MEI was calculated to be about 0.35 mrem. About 50 percent of this dose is from ingestion and inhalation of tritium, 36 percent is from uranium radioisotopes, about 12 percent is from thorium radioisotopes, and about 2.8 percent is from plutonium radioisotopes. The contribution of the ETTP emissions to the collective EDE to the population residing within 80 km (50 mi) of the ORR was calculated to be about 7.2 person-rem which is approximately 38 percent of the collective EDE for the ORR. This corresponds to a potential LCF of $3.6\text{-}10^{-3}$.

Waterborne radionuclides discharged to surface waters enter the Tennessee River system by way of the Clinch River and various feeder streams. Discharges from the ETTP enter the Clinch River either directly or via Poplar Creek. Surface water monitoring programs and periodic fish sampling in both the Clinch River and Poplar Creek evaluate the potential radiological impacts of these discharges to persons who drink water, eat fish, and use the river system for recreational purposes (swimming, boating, shoreline use). The ETTP (Gallaher) water plant draws water from the Clinch River. Exposures from fish eaten from the Poplar Creek range between 0.08 and 1 mrem. Exposures from fish eaten from the Clinch River range between 2 and 3 mrem. It is to be noted that the higher radionuclides concentrations in Clinch River fish are most likely the result of the combined effects of radionuclides discharge from the ORNL, Y-12, and the ETTP. Fishing advisories are in effect for both Poplar Creek and the Clinch River.

Access by the public to the majority of the ETTP and access to radiological areas is strictly controlled. However, two fenced UF_6 cylinder storage yards (K-1066-J and K-1066-E) are located along the near bank of Poplar Creek and one is adjacent to an official use only parking lot (K-1066-K). In addition, there is a publicly accessible road that runs alongside the Clinch River in the vicinity of the K-770 Scrap Yard that was a known storage area for radionuclides contaminated scrap metal. As such, each of these areas is monitored for direct radiation. The vicinity of the K-770 Scrap Yard was determined to be equivalent to the background level of 0.005 mrem/hour (as established at the ambient air monitoring station north of ETTP). Therefore, no contribution to the EDE is expected from the K-770 Scrap Yard. For the remaining monitored areas two exposure scenarios were evaluated and the results are reported in Table 3.11–1.

TABLE 3.11–1.—*Summary of Direct Radiation Exposure Scenarios, Sampling Locations, and Results*

Scenario	Exposure duration	Sampling Location	EDE (mrem)
Fisherman	250 hours/year	Poplar Creek near K-1066-J Cylinder Yard	0.25
		Poplar creek near K-1066-E Cylinder Yard	2.0
Individual on Parking Lot	125 hours/year	Edge closest to K-1066-K Cylinder Yard	1.1

Adapted from ASER 1999.

CTC Facility

There are no chemical release scenarios projected that would affect any receptors exterior to the CTC Facility. Chemical releases would only occur internally and would result in impacts to on-site workers consistent with general industry activities (i.e. skin or eye irritation, rash, etc.) (USEC 2002b).

3.11.2 Radiological Exposure to Workers

ETTP

The primary source of radiation exposure for the radiological worker at ETTP is uranium, which emits mostly alpha particles. Alpha particles do not penetrate clothing or skin; therefore, internal

exposure (e.g., ingestion and inhalation) is the primary exposure route of concern. Potential exposures to the ETTP workers are more likely to occur from activities such as decontamination, metal recycling, and uranium deposit removal.

Data collected in the 3rd quarter of 1995 and the 2nd quarter of 1996 indicate that the average external whole body dose to the 1,408 radiological workers at ETTP (including DOE contractors and subcontractors) for a year was less than 1 mrem (ORO 1997). This dose is a small fraction (2 percent) of the natural external background dose of 42 mrem/yr measured in Tennessee. Internal dosimetry results indicate that the average dose to all radiological workers at the ETTP is less than 10 mrem. The total internal and external average dose of all radiological workers is therefore about 11 mrem, only 0.2 percent of the DOE annual administrative control limit. Maximum individual annual doses are generally below about 100 mrem (ORO1997).

To evaluate the ingestion pathway, surface water and plant discharges are routinely sampled for waterborne radionuclides. Table 3.11–2 provides a summary of the individual and collective doses as calculated for the ETTP worker population based on monitoring data.

TABLE 3.11–2.—*Summary of the Individual and Collective Doses to the ETTP Worker Population Resulting from Exposure to Waterborne Radionuclides*

Sampling Type/Location	Individual EDE (mrem)[a]	Collective EDE (person-rem)[b]	Potential Latent Cancer Fatalities
ETTP (Gallaher) Plant	0.6	0.6	2.4×10^{-4}
Clinch River	0.9	1.0	4.0×10^{-4}
Discharge data	0.09	0.09	3.6×10^{-5}

[a] Assumes a worker drinks 370 L of water or about half their annual intake of water.

[b] Based on a worker population of 2000.

Adapted from ASER 2000.

CTC Facility

There are no chemical release scenarios projected that would affect any receptors exterior to the CTC Facility. Chemical releases would only occur internally and would result in impacts to on-site

workers consistent with general industry activities (i.e. skin or eye irritation, rash, etc.) (USEC 2002b).

3.11.3 Chemical Exposure to the Public

ETTP

Remedial investigations/feasibility (RI/FS) studies have been performed for many of the existing treatment, storage, or disposal areas at the ETTP. Information regarding the potential for chemical exposures to the public has been extracted from the *Final Environmental Assessment Lease of Land and Facilities within the East Tennessee Technology Park, Oak Ridge, Tennessee* (ORO 1997) which summarizes the results of the Clinch River RI/FS. This investigation analyzed two primary exposure pathways (drinking water and fish ingestion) and the associated human health risks from chemicals found in the environs of the ORR. Additionally, particular emphasis was placed on the section of Poplar Creek that flows through the ETTP Site.

The results of the Clinch River RI/FS indicated that for all reaches/subreaches of the Clinch River that were analyzed, no carcinogenic chemicals of concern were identified for the drinking water pathway. Several noncarcinogenic chemicals were identified as being a concern (antimony, manganese, and nitrate) when cumulative effects were evaluated; however, none of these chemicals pose a cancer risk. Within Poplar Creek, arsenic, antimony, manganese, nitrate, and polychlorinated bipheyl (PCB)-1254 are considered to be chemicals of concern for surface water.

The results of the fish ingestion scenario indicated that nine contaminants detected produced cancer risks of greater than $1x10^{-6}$. The primary contaminant in all species of fish analyzed was PCB-1260. The pesticides aldrin, chlordane, and 4,4'-DDT along with 4,4'-DDE, a degradation product of 4,4'-DDT are not unique to the ORR but are ubiquitous contaminants in eastern Tennessee streams and reservoirs. The remaining carcinogenic contaminants of concern for fish include two inorganics (arsenic and beryllium) and two radionuclides (cesium-137 and strontium-90). Noncarcinogenic chemicals of concern that indicated a potential existing health concern to a hypothetical MEI included two inorganic contaminants (mercury and selenium), two pesticides (chlordane and 4,4'-DDT) and PCB-1254.

The TSCA Incinerator is a potential source of air emissions from ETTP. Emissions from the incinerator are controlled by extensive off-gas treatment. Emissions from the incinerator are significantly less than the permitted allowable emissions. Estimates of cancer risk from all airborne emissions are much less than the $1x10^{-6}$ EPA target.

CTC Facility

There are no chemical release scenarios projected that would affect any receptor exterior to the CTC Facility. Chemical releases would only occur internally and would result in impacts to on-site workers consistent with general industry activities (i.e. skin or eye irritation, rash, etc.) (USEC 2002b). There have been no historical chemical releases which would have resulted in impacts to the public (USEC 2002a).

3.11.4 Chemical Exposure to Workers

Typical industrial health and safety hazards associated with current plant activities include chemical, electrical, confined space, mechanical, and construction-related hazards.

ETTP

Oversight for control of occupational chemical exposures at ETTP fall under the responsibility of the ES&H organization who must ensure compliance with the provisions of DOE Order 440.1, *Worker Protection Management for DOE Contract Employees.* This Order includes a requirement that contractors comply with Federal Occupational Safety and Health Administration (OSHA) regulations.

Potential chemical hazards could include, for example, exposures to asbestos, lead, PCBs, and *Resource Conservation and Recovery Act* (RCRA) hazardous materials. Conceivably, there are other sources from the various past activities at ETTP. Recent complaints of health effects in workers that have sparked public interest at ETTP have led to the suggestion of possible cyanide exposures. NIOSH conducted an investigation of this possibility and found no occupational source of hydrogen cyanide at the site. The NIOSH results corroborated with the ETTP Industrial Hygiene testing which also found no occupational source of hydrogen cyanide. Therefore, the source of these complaints

of health effects experienced by the workers is unknown, and investigations into the reasons underlying the health complaints are continuing.

CTC Facility

Typical general industrial chemicals will be utilized at the CTC Facility. Oversight of activities performed at the CTC Facility are the responsibility of OSHA. Some minimal quantities of RCRA hazardous waste were generated during the building's past use. No waste or hazardous material currently exist at the site. There are no chemical release scenarios projected that would affect any one exterior to the CTC Facility. Chemical releases would only occur internally and would result in impacts to on-site workers consistent with general industry activities (i.e. skin or eye irritation, rash, etc.) (USEC 2002b). There have been no historical chemical releases which would have resulted in impacts to the public (USEC 2002a).

3.11.5 Accidents

ETTP

Accident scenarios analyzed at ETTP have been associated with the 7,100 cylinders primarily containing depleted UF_6 stored at the site, operation of the TSCA Incinerator, and storage of certain uranium materials (ORO 1997). Potential accidents related to the ETTP cylinder yards were evaluated based upon hazards that included UF_6 (radioactive and chemical toxicity) and its hydrolysis products, and HF (chemical toxicity). The analysis indicated the uranium intake to be 10 mg uranium and the HF exposure to be 2.3 mg/m^3 HF at the site boundary, both below the guideline threshold values and both posing no severe health risk.

The accident analysis of the TSCA Incinerator concluded that the incinerator facility poses no undue threat to workers or public safety and health. This conclusion was based upon three hypothetical accidents associated with worker exposures to high concentrations of PCBs. However, no situation was identified that could not be controlled adequately by facility features or by implementation of existing safety and health policies and procedures.

CTC Facility

No specific accident analysis has been performed nor planned for the CTC Facility since the projected accident scenarios are consistent with standard general industrial work (USEC 2002b). The CTC Facility is currently not in use. No accident scenarios have been evaluated for this facility (USEC 2002a).

3.12 ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," signed by President Clinton in February 1994, requires each Federal agency to formulate a strategy for addressing environmental issues in human health- and environment- related programs, policies, planning and public participation processes, enforcement, and rulemakings. The White House memorandum accompanying the Executive Order directs Federal agencies to "analyze the environmental effects . . . of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA."

Any disproportionately high and adverse human health effects on minority populations or low-income populations that could result from ETTP alternatives being considered are assessed for an 80-km (50-mi) radius around the site, the area for which health effects are assessed. Any health effects resulting from discharge to water pathways would also be assessed for this area. Minority and low-income populations in this area are shown in Figures 3.12–1 and 3.12–2, respectively. Figure 3.12–3 shows the census tracts surrounding the ORR. Minority populations for these tracts are shown in Table 3.12–1, and low-income populations are shown in Table 3.12–2. Source: Census 1992.

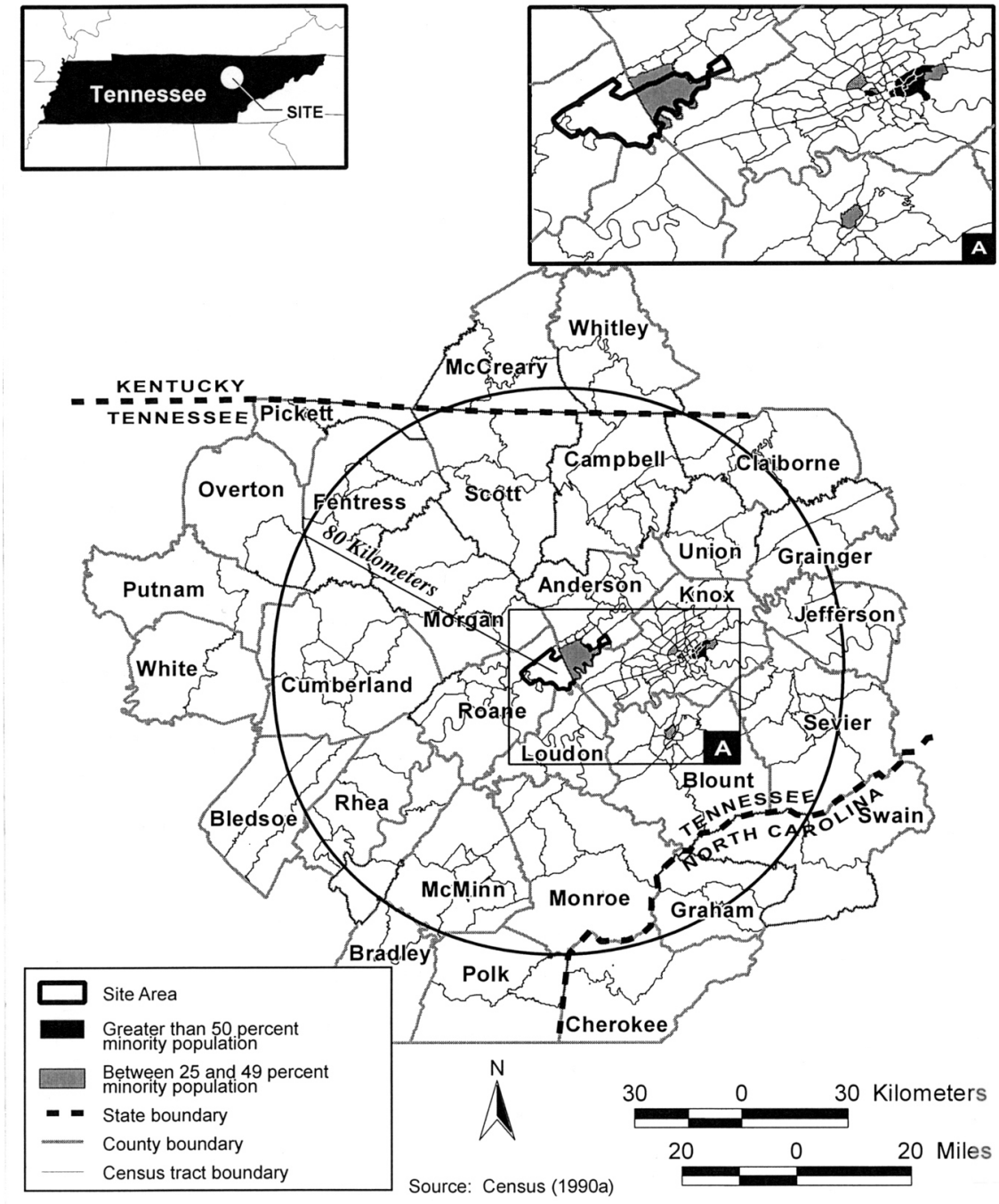
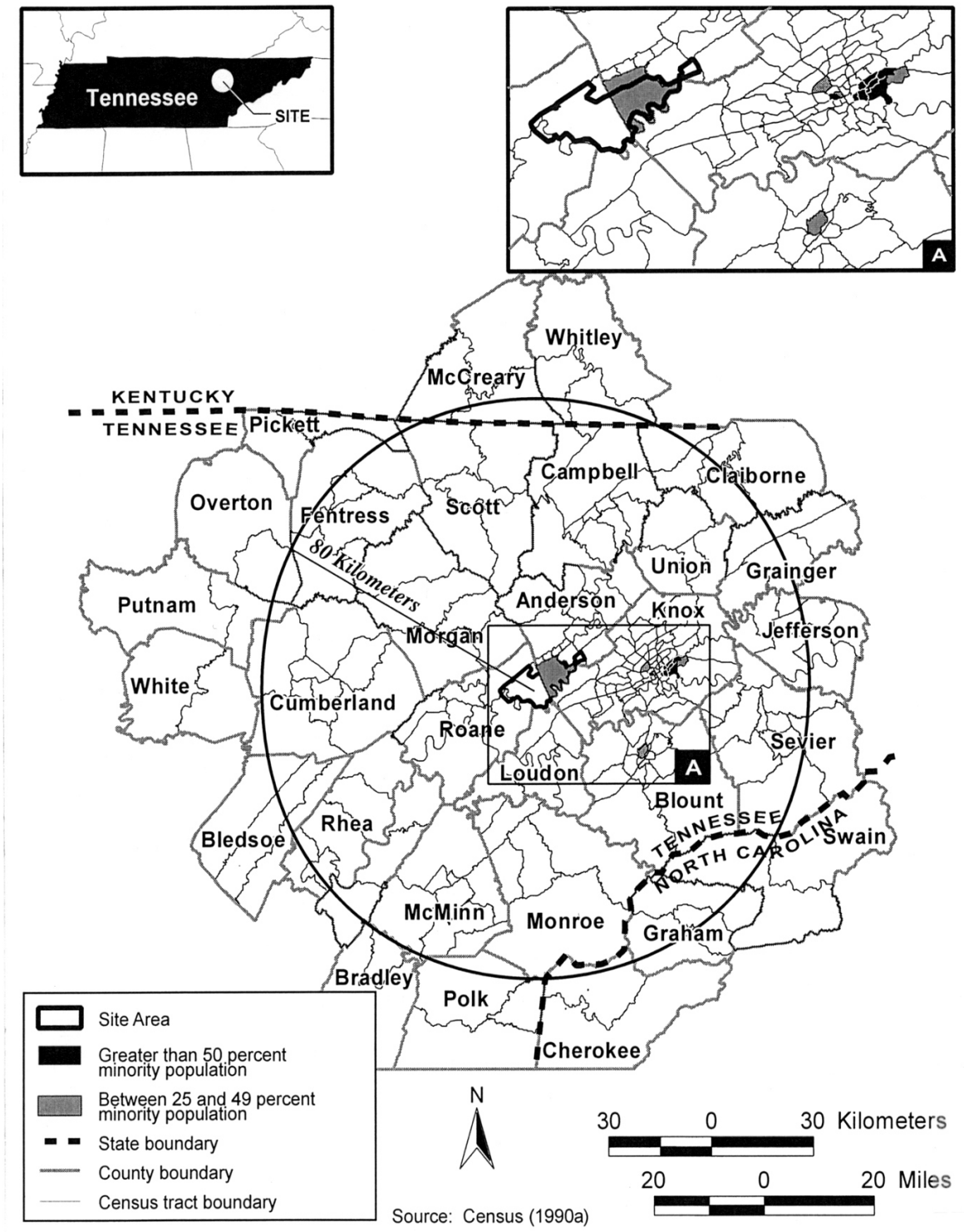


FIGURE 3.12–1.— ***Minority Population in the Region of Influence.***



Source: Census 1992.

FIGURE 3.12–2.—*Low-Income Population in the Region of Influence.*

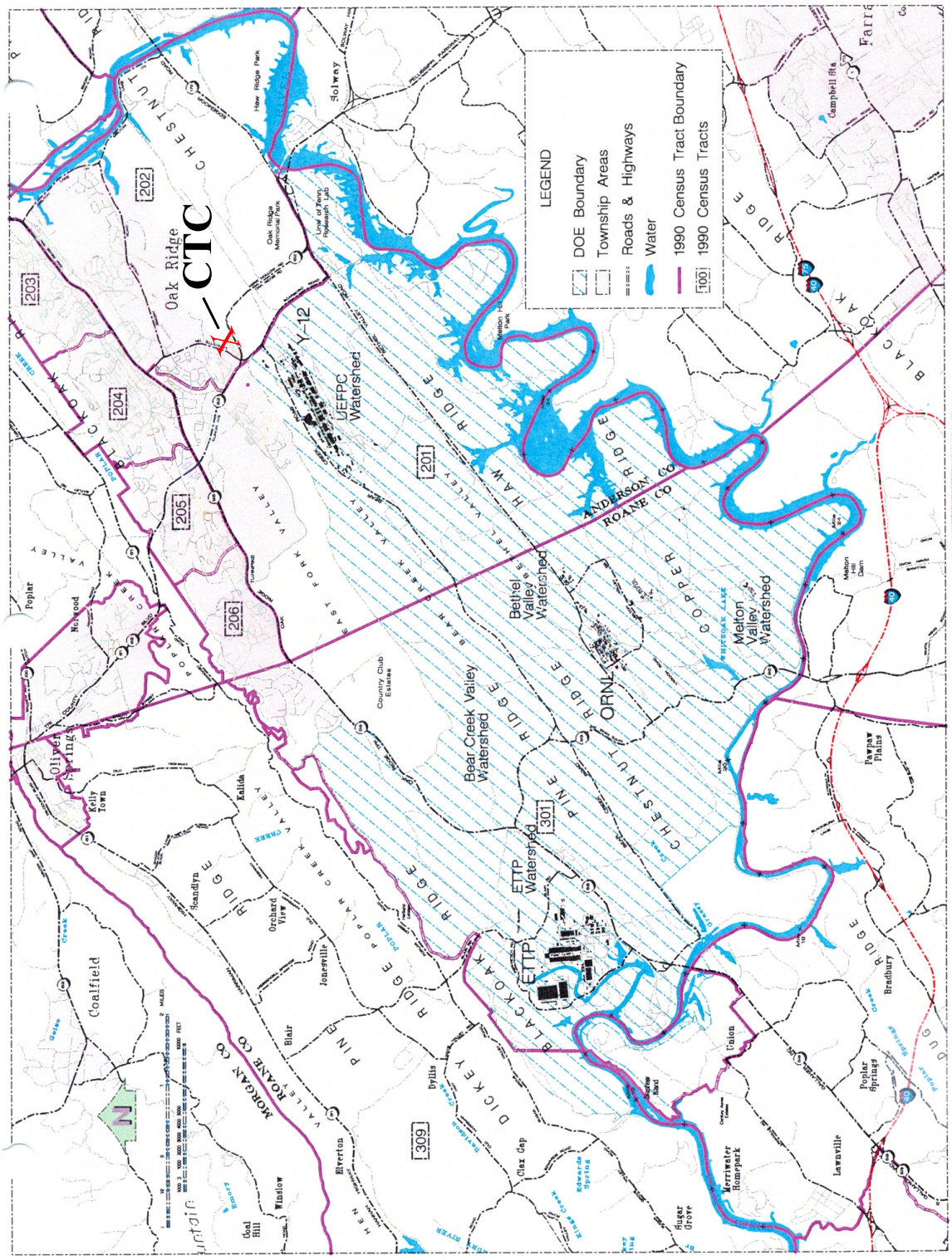


FIGURE 3.12–3.—***City of Oak Ridge Census Tracts.***

TABLE 3.12–1.—*Population Distribution by Race in Oak Ridge Census Tracts*

Tract	Total Population	White		Black		Other non-white		Hispanic[a]	
		Total	%	Total	%	Total	%	Total	%
201	2,767	1,620	58.5	951	34.4	196	7.1	19	0.7
202	6,260	5,820	93.0	228	3.6	212	3.4	124	2.0
203	4,395	4,107	93.4	232	5.3	56	1.3	39	0.9
204	4,544	4,231	93.1	251	5.5	62	1.4	93	2.0
205	3,932	3,625	92.2	257	6.5	50	1.3	26	0.7
206	2,735	2,478	90.6	158	5.8	99	3.6	72	2.6
301	2,567	2,438	95.0	71	2.8	58	2.3	64	2.5
Total	27,200	24,319	89.4	2,148	7.9	733	2.7	437	1.6

[a]Hispanic origin may be any race and is included in other totals.
Source: Census 1992.

TABLE 3.12–2.—*Oak Ridge Families Living Below Poverty Level, by Census Tract (1989)*

Census Tract	Number of Families Below Poverty Level	Percentage of Total Families in Census tract Below Poverty Level
201	142	20.9
202	68	3.8
203	59	4.4
204	95	7.0
205	195	17.6
206	0	0
301	9	1.1

Source: Census 1990.

Socioeconomic impacts associated with environmental justice concerns are assessed for the four-county ROI described in Section 3.8, Socioeconomics.

Approximately 880,000 people live within a 80-km (50-mi) radius of the ORR. Minorities compose of 6.1 percent of this population. In 1990, minorities composed of 24.1 percent of the population nationally and 17 percent of the population in Tennessee. There are no federally recognized Native American groups within 80 km (50 mi) of the ETTP. The percentage of persons below the poverty level is 16.2 percent, which is slightly higher than the 1990 national average of 13.1 percent but much lower than the statewide figure of 30 percent (Census 1990).

The Scarboro community is a primarily minority community located approximately 1 km (0.5 mi) north of Y-12. This community has been included in a number of epidemiological health studies conducted by an independent group overseen by the Tennessee Department of Health. Mercury health studies have shown that estimates for mercury intake for Scarboro residents exceeded standards for inhalation of mercury during the years of peak mercury release in the late 1950s. Impacts of uranium releases to the air on the community between 1944 and 1995 were analyzed to determine if cancer risks from uranium releases are elevated for this community. The analysis reported cancer screening indexes that were slightly lower than the investigators decision guide for carcinogens, but with a great deal of uncertainty.

The Health Studies Report of PCB releases from the ORR prior to the early 1970s concluded that some fishermen at the Clinch River and Watts Bar Reservoir have eaten enough fish from these sources to affect their health, including excess cancers, but estimates of how many have been affected are not possible at this time. Further studies were recommended, including studies of fish and turtle consumption, PCB blood levels in people consuming fish, PCB levels in core samples from the Clinch River and the Watts Bar Reservoir, PCB levels in the soils near East Fork Poplar Creek, and PCB levels in cattle grazing near the creek. There are no populations in the area completely dependent on consumption of these fish from the Clinch River and the Watts Bar Reservoir for subsistence.

3.13 TRANSPORTATION

ETTP

Major transportation routes to the ORR are via two interstate highways, I-40 and I-75, and U.S. highways 11, 25W, and 70. State highways that service the area include 58, 61, 62, 95, and 162 (Pellissippi Parkway). These highways lead to Bear Creek Road and Bethel Valley Road. Existing traffic on various roads in the ORR are given below.

As the project progresses, centrifuge components would also be shipped to the site of the centrifuge lead cascade plant at either the PORTS or the PGDP. The distance between Portsmouth, Ohio, and

Oak Ridge, Tennessee, is approximately 345 miles (555 km) and the distance between Paducah, Kentucky, and Oak Ridge, Tennessee, is approximately 315 miles (506 km). The major travel routes to these two areas are I-40 and I-24 from Oak Ridge, Tennessee, to Paducah, Kentucky, and I-75 and I-64 from Oak Ridge, Tennessee, to Portsmouth, Ohio (USEC 2002d).

CTC Facility

Major transportation routes to the CTC Facility are via two interstate highways, I-40 and I-75, and U.S. highways 11, 25W, 61, 62, 95, and 70. State highways that service the area include 58 and 162 (Pellissippi Parkway).

TABLE 3.13–1. —*Existing Average Daily Traffic Flows serving on the ORR serving Y-12 , ORNL, and the Boeing Property*

Road	To	From	Average Daily traffic Vehicles/day
TSR 58	TSR 95	I-40	11,600
TSR 95	TSR 62	TSR 58	16,440
Boeing Road	Westbound Traffic		~102
Boeing Road	Eastbound Traffic		~102
East Bear Creek Road	Westbound Traffic		12,490
West Bear Creek Road	Eastbound Traffic		3,200
East Bethel Valley Road	Westbound Traffic		10,000
West Bethel Valley Road	Eastbound Traffic		6,440

Source: TDOT 1998, USEC 2002e.

CHAPTER 4: ENVIRONMENTAL EFFECTS

4.1 AIR QUALITY AND NOISE

4.1.1 Air Quality

4.1.1.1 No Action Alternative

Under the No Action Alternative, because DOE would not transfer facilities and equipment, the USEC R&D Project would not be conducted at ETTP or the CTC Facility. Therefore, there would be no change in air quality.

4.1.1.2 Proposed Action

Non-radiological Air Quality for ETTP

Modification and Construction. Existing air quality at the ORR/ETTP is in attainment with NAAQS for all the criteria pollutants. Additional criteria pollutants generated as a result of modification and construction activities are expected to be small and would not cause NAAQS violations as almost all the construction activities except concrete pads for a generator, a small cooling tower, a small enclosure for an oil heating unit, and a small refrigeration unit would be within Building K-1600.

It is expected that the best construction management and emission control practices would be used for modification and construction activities at the site to mitigate any airborne releases.

Manufacturing and Operation. The manufacturing and operational phase would consist of the manufacturing of centrifuge components, assembly, testing of assemblies and sub-assemblies, and operation of the completed centrifuge. The manufacturing phase of the centrifuge system, which involves several processes, may generate air emissions. These air emissions can be from the exhaust point or are fugitive and can be generated in an open area. One of the processes in the manufacturing of the centrifuge includes a filament winding process. The filament winding process requires the combination of resins, curing agents or hardeners, and filaments. Final curing of the

resulting parts would occur either in an in-place or remote curing oven or hood. Solvents would be used to clean the produced parts and manufacturing equipment. The curing operations would be expected to generate air emissions. In addition, certain component cleaning processes which would be performed in hoods or clean rooms, would also generate air emissions (Angelelli 2000).

The common chemicals that may be released to the environment from different process areas and emission sources are acetone, alcohols, carbon dioxide, ethanol, Freon 134, resin products, solvent vapors, and n-methyl pyrrolidone (NMP). The projected air emissions from different process areas and emission sources at Building K-1600 are described in Appendix A (USEC 2000f). There are no projections for radionuclides being in the exhaust systems.

There would be 6 to 8 air emission point sources from the facility. These would result from:

The carbon/resin manufacturing/curing hood and small component curing ovens (operational exhausts)
A cleaning area where solvents would be used (a personnel protection exhaust)
Materials (resins and epoxies) preparation hood (for personnel protection)
Vacuum exhaust system
An air turbine exhaust
A clean room exhaust/hood (for personnel protection)

It is projected that none of these sources would result in a quantity of emission that would have any important impact. However, appropriate air permits or exemptions would be obtained prior to operations (USEC 2000c).

Radiological Air Quality for ETTP

It is anticipated that the activities due to the modification, manufacturing and operation phases would not produce any significant additional radiological emissions (USEC 2000f).

Non-radiological Air Quality for the CTC Facility

Modification and Construction. Existing air quality at the CTC Facility is in attainment with NAAQS for all the criteria pollutants (USEC 2002a). Additional criteria pollutants generated as a result of modification and construction activities are expected to be small and would not cause NAAQS violations as almost all construction activities would be within the existing building.

The CTC Facility exterior work would consist of installation of a compressor air system, slight relocation of three fire hydrants, installation of a short section of telecommunication lines and modification to the existing security fence and the erection of additional security fencing. It is expected that the best construction management and emission control practices would be used for modification and construction activities at the site to mitigate any airborne releases.

Manufacturing and Operation. If the CTC Facility is leased, manufacturing and testing operations would be performed in the CTC Facility. The manufacturing and operational phase would consist of the manufacturing of centrifuge components, assembly, testing of assemblies and sub-assemblies, and operation of the completed centrifuge. The manufacturing phase of the centrifuge system which involves several processes may generate air emissions. These air emissions can come from the exhaust point or are fugitive and can be generated in an open area. One of the processes in the manufacturing of the centrifuge includes a filament winding process. The filament winding process requires the combination of resins, curing agents or hardeners, and filaments. Final curing of the resulting parts would occur either in an in-place or remote curing oven or hood. Solvents would be used to clean the produced parts and manufacturing equipment. The curing operations would be expected to generate air emissions. In addition, certain component cleaning processes which would be performed in hoods or clean rooms, would also generate air emissions (Angelelli 2000).

The common chemicals that may be released to the environment from different process areas and emission sources are acetone, alcohols, carbon dioxide, ethanol, Freon 134, resin products, solvent vapors, and NMP. If the manufacturing work is performed at the CTC, the emissions would be consistent with those from similar activities projected for Building K-1600. The projected air emissions from different process areas and emission sources at Building K-1600 are described in Appendix A (USEC 2000f). There are no projections for radionuclides being in the exhaust systems.

Radiological Air Quality for the CTC Facility

Activities at the CTC Facility would not involve any radiological materials, therefore, would not produce any radiological emissions. The operation of the components would not produce any additional radiological emissions (Winebarger 2000).

4.1.2 Noise

4.1.2.1 *No Action Alternative*

Under the No Action Alternative, no leasing for the USEC Gas Centrifuge R&D Project would occur, therefore, there would be no change in the noise levels under this alternative.

4.1.2.2 *Proposed Action*

ETTP

There would be elevated noise levels within Building K-1600 created by the centrifuge machine when being operated at normal operating speed. Appropriate hearing protection measures would be incorporated to protect personnel within the elevated noise areas (USEC 2000c).

Building K-1600 is the only building with operations that have the potential to create major noise levels. Background data on noise levels at Building K-1600 are not available. However, the noise levels 60 m (200 ft) from thoroughfares such as State Route 95 have been estimated from traffic counts during rush hour to be between 55 and 60 dBA (DOE 1997b). Therefore, noise levels at relatively isolated areas within the ETTP are expected to be lower than 55 dBA. The operation of the centrifuge system is not expected to increase the noise levels within the ETTP. Noise associated during the modification and manufacturing phases would also be temporary.

CTC Facility

At the CTC Facility, minimal elevated noise levels would occur within the CTC Facility created by the operation of pneumatic tools and equipment (USEC 2002a). Appropriate hearing protection measures would be incorporated to protect personnel within any elevated noise areas (USEC 2000c).

Noise associated during the modification and manufacturing phases would also be temporary. Background data on noise levels at the CTC Facility is not available.

Noise levels associated with Building K-1600 would be the same as those presented under the Proposed Action.

4.2 PROCESS, MATERIALS, AND WASTE MANAGEMENT

The processes defined for each building in the scope of this EA would change from their historic uses as a result of the modifications and operations defined for this EA. The anticipated work to be performed in each facility in the scope of this EA during the facility's modification, manufacturing and test operation phases and the associated potential impact has been described earlier in Section 2.2.2 (USEC 2000a).

The following information is a projection of the on-site and off-site impacts or conditions during the modification and operational phases. A range of waste projections is also provided based on previous experience or projected uses. In all of the activities, ALARA and waste minimization practices would be incorporated into the planning and actual work (USEC 2000b).

A NEPA evaluation was previously performed for similar facility modifications to accommodate a composite materials laboratory process proposed by ORNL to be performed at buildings at the Y-12 Site. A Categorical Exclusion (CX) No. 1410XHMB, dated July 29, 1991, was granted for the proposed activity.

Modification Phase

During the modification phase, some existing equipment and structures would be removed or relocated, new equipment would be installed, existing equipment would be upgraded, or existing equipment would be cleaned, refurbished or undergo maintenance servicing. These activities would consist of normal construction activities such as material handling and movement, welding, cutting, painting, lubricating, drilling, and grinding. With the exception of concrete pads for an emergency generator, a small cooling tower, a small enclosure for an oil heating unit, and a small refrigeration unit, all construction activities would be within the Building K-1600. There is also the possibility of the expansion of one side of Building K-1600, which is contingent on the leasing of the CTC Facility.

Most of the modifications at the CTC Facility would occur within the building, with the exception of a new security fence built at the northwest corner, bordering the west and south sides and approximately 76.2 m (250 ft) of the eastern side and four small concrete pads. The four new concrete pads would be constructed adjacent to the building. Two of the pads would be located on the south end of the building towards the eastern side of the building to mount/set the exhaust/ventilation system and oil system for the winding machine. One pad would be located on the south end toward the western corner for a small commercial air compressor system to drive pneumatic motors and to supply air for tool use in the building. The fourth pad would be for an HVAC unit that would be located along the west wall toward the western center of the building (USEC 2002b). A short section of underground communication lines would be installed and three fire hydrants would be relocated a short distance.

Waste generated during the facility modification phase would consist of sanitary/industrial waste from ETTP and the CTC Facility and some LLW from the activities that affect currently contaminated areas at Building K-1600. The majority of LLW would be in the form of contaminated scrap metal. Radiological control personal protective equipment (PPE) would also be generated as LLW. A limited quantity of RCRA waste in the form of solvent cleaning residues may be generated during the modification phase.

Building K-1600

Initially USEC will use the existing infrastructure arrangements to obtain utilities. Utilities will be rerouted as necessary.

The removal of valves from the process systems would be done during the modification phase. These valves would be radiologically decontaminated from a removable-contamination standpoint, disassembled for further cleaning, and have new components installed. This activity would generate LLW from the decontamination activity, from removed or damaged parts, and from PPE. RCRA waste would also be generated from the solvent used during the cleaning operations and would be in the form of spent solvent, rags, wipes, etc. Non-halogenated organic solvents would be used for the final cleaning. In limited cases, some surface cleaning may require the use of nitric acid, which could result in the generation of a limited quantity of RCRA characteristic waste. In both the solvent and acid cleaning operations, some RCRA-LLW mixed waste would be generated.

Support equipment would undergo maintenance servicing and checkout. Examples of this activity are lubrication and oil changes in the cranes and pumps. Waste from these activities would be non-regulated lubricants and cleaning materials, and general maintenance debris, which would be sanitary/industrial waste. General sanitary/industrial waste from paper and packing products, wood, and general building trash generated.

Both incandescent and fluorescent light bulb waste and lead acid and non-lead acid battery waste would be generated throughout the project and handled in accordance with established ETTP recycling and disposal programs.

CTC Facility

Only a minimal amount of waste would be generated during the construction phase. This would consist primarily of excess dirt and concrete from the construction of concrete pads and foundation and piping relocation or installation inside and outside the building and asphalt from exterior excavation. There would be some building materials converted to waste during interior modifications. There would be some materials such as wipes (non-hazardous), wood for forming,

and paper generated during the construction phase. Most, if now all, of this waste would go to the sanitary/industrial landfill used by the City of Oak Ridge (USEC 2002b).

Three firewater system post indicator valves, three fire hydrants, guard pipes, and a short section of pipe on each would be relocated by approximately 20-30 feet on the west side of the building. In order to move the post indicators from the inside of the fence to the outside of the fence, a slight amount of excavation of asphalt and dirt would occur (USEC 2002b).

Approximately 46 m (150 ft) of new underground telecommunication lines would be installed from an existing utility right-of-way to the CTC Facility. There would be no major waste generated by this activity.

Almost all of the interior construction and equipment work would occur on the southern portion of the building. A fabrication machine would be installed along the south wall. This machine would require removal of existing concrete floor and excavation for a concrete foundation for the machine. Additional concrete removal and concrete pad installation would be required for two high speed test machines at the southeast corner of the building and for two separate component test machines in the vicinity of the fabrication machine. Some concrete excavation for revised water and drain lines and facilities would be required at the change-house/showers near the center of the building, at the western side (USEC 2002b). This excavation wouldresult in some concrete debris and a small quantity of excess dirt.

Other general industrial equipment, which would be installed and would only need minimal, if any, concrete disturbance will be 4 to 5 hoods, small curing ovens, work and inspection tables, office and wall petitions, storage areas, shelves, cabinets, etc. (USEC 2002b).

Manufacturing Phase For ETTP and the CTC Facility

The manufacturing/assembly phase would consist of the manufacturing of machine components, assembly, testing of sub-assemblies and assemblies, and operation of the completed machines. The manufacturing of the machine includes a filament winding process. This process requires the combination of resins, curing agents or hardeners and filaments. Final curing of the resulting parts occurs either in an in-place or remote curing oven or hood. Solvents are used to clean the produced

parts and manufacturing equipment. Some RCRA waste would be generated through the use of the solvent and would be in the form of excess spent solvent, rags, wipes and other material that came into contact with the spent solvent. Excess fibers, reacted resins, and curing agents would be non-regulated waste.

Some of the smaller parts or sub-assemblies would undergo mechanical testing which would include, in some cases, a planned failure test. A fully assembled machine (assembled at Building K-1600) may also fail during operational testing. If the operational machine contains UF_6 gas, LLW may be generated.

Prior to final assembly or even sub-assembly, final cleaning of all parts would performed. This would generate a small quantity of sanitary waste (dry wipes, rags, etc.) and RCRA waste when a solvent is used for cleaning.

Test Operations Phase At ETTP and the CTC Facility

The machine operations require the use of temperature control during some phases of operation. Originally, Building K-1600 had a dedicated cooling tower and closed loop process water system. However, the Project would use a small cooling tower which would be installed for this project. An auxiliary refrigeration system would be installed on a small pad outside of the building to achieve lower water temperatures. A regulatory-acceptable refrigerant bath would be used in the withdrawal system. Although some makeup of refrigerant would be required, no routine liquid waste discharges are projected for the project.

There would be limited quantities of waste generated from miscellaneous activities during the Project at Building K-1600. An alcohol and dry ice bath would be used to solidify UF_6 during some sampling events. The alcohol would be reused and replenished as required due to evaporation. The quantity of alcohol involved is approximately one quart.

Hydrochloric acid would be used in an acid digestion test. This is a small quantity use and would result in a RCRA characteristic waste.

Alumina traps would be used on the pumping systems and trapping systems at Building K-1600. The useful life of the alumina may be for the entire Project but may have to be changed during the Project. If the alumina has been exposed to process gas, it would be LLW. If it has not been exposed to process gas, the alumina would be non-hazardous waste.

Some excess reacted hard resin-hardener mixtures would result in a small quantity of sanitary waste at Building K-1600 and the CTC Facility.

No asbestos containing material (ACM) is projected to be generated by this Project. Additionally, no TSCA PCB waste is projected for the Project. If either of these materials is found, appropriate control, preventative and waste management measures would be implemented in accordance to established procedures. There are no projected uses of reactive or explosive materials in the Project.

A quantity of operational and maintenance chemicals, supplies, and materials required to maintain Project continuity would be stored within Building K-1600 and the CTC Facility in appropriate storage containers, cabinets, or areas, (i.e., flammable storage cabinets, carcinogen storage cabinets, etc) (USEC 2002b). Appropriate chemical inventory lists would be maintained and MSDS access would be provided.

There would be a minimal impact to the potable water supply system and to the sanitary sewer system. During construction, there may be as many as 30 to 40 people creating a demand for drinking, potable and shower water and a projected 20 people showering during operation with another 6 to 8 non-showering people. This would not create a noticeable impact on either the water supply plant or sewer plant.

USEC would perform the handling and storing of project waste within the facilities. USEC would follow appropriate and applicable ETTP, DOE, state or Federal requirements when performing these activities. Appropriate facility RCRA satellite storage areas and 90-day storage areas would be maintained by USEC. USEC would fully ensure characterization of the waste in accordance with the receiving TSD facility. USEC would contract directly for disposal of all wastes through commercial disposition paths.

At Building K-1600, no waste would be generated if there is no existing TSD outlet unless authorized by DOE. LLW generated at Building K-1600 would be stored in a manner consistent with the agreements between DOE and USEC. Sanitary and industrial waste at ETTP would be transferred or transported by a contractor working directly for USEC to an accepted commercial disposition facility. Sanitary and industrial wastes from the CTC Facility would be disposed at a commercial landfill. Classified wastes would be disposed of by a contractor working directly for USEC at an accepted commercial disposition facility in accordance with security and regulatory requirements and would be disposed at an appropriate site in accordance with DOE instructions.

At Building K-1600, the expected amount of UF_6 in the facility at any given time should not exceed four 227 kg (500 lbs) cylinders and two 23 kg (50 lbs) cylinders. All of the cylinders would contain only depleted UF_6 and there would be no enrichment performed in the facility that would exceed natural U^{235} assays. This assay level precludes the possibility of a criticality. The Building K-1600 SAR evaluated the bounding UF_6 event resulting from a postulated rupture of a feed cylinder pigtail (connection line), which would release 427 g (0.96 lbs) of UF_6 in the first 2 minutes of the event. This minimal quantity released within the facility should pose no elevated risk to the plant population or the public. This would be reconfirmed in subsequent evaluations (USEC 2000c).

There would be only consumer-use type pesticide/herbicide use for localized insect/weed control (USEC 2000c).

Table 4.2–1 shows waste and impact projections for the Project with all activity at ETTP with information available at this time. Table 4.2–2 shows the estimated typical materials usage for Building K-1600. Estimates would continue to be refined and updated on a periodic basis. Table 4.2-3 shows waste and impact projection for Building K-1600 and the CTC Facility. Table 4.2-4 shows the estimated typical materials usage for the CTC Facility.

TABLE 4.2–1.—*Projections of Waste Quantities for Major Waste Types at ETTP*

Material/Activity	Type of Waste Generated	Activity Phase	Projected Annual Rate
Paper, construction debris, wood, concrete	Sanitary/industrial	Modification	400-600 ft^3
Removal of supports and facility structures	Scrap metal	Modification	300-500 ft^3
Removal of supports and facility structures	Rad contaminated scrap metal LLW)	Modification	400-800 ft^3
Paper, construction debris, wood, concrete	LLW DAW	Modification	200-400 ft^3
Spent solvents, rags, PPE, wipes from valve cleaning	RCRA	Modification	150-200 ft^3
Spent solvents, rags, PPE, wipes from valve cleaning	Mixed RCRA/LLW	Modification	100-150 ft^3
Acid from valve cleaning	Mixed RCRA/LLW	Modification	3-5 gal
Rags, wipes, PPE from valve cleaning	LLW DAW	Modification	200-300 ft^3
Excess equipment	Scrap metal	Modification	200-300 ft^3
Excess equipment	LLW scrap metal	Modification	200-300 ft^3
Rad clothing and PPE	LLW DAW	Modification	250-350 ft^3
Paper, office waste, bathroom supplies	Sanitary/industrial	Modification	150-200 yd^3
Lubricants, maintenance debris	Non-regulated	Modifications and operations phases	100-150 ft^3
Light bulbs and batteries	RCRA recycle	Modifications and operations phases	50-75 ft^3
Spent solvents, rags, PPE, wipes from parts cleaning operations	RCRA	Manufacturing	2000-2,500 ft^3
Rags, PPE, wipes from parts cleaning operations	Non-regulated	Manufacturing	1000-1500 ft^3
Excess fibers and reacted resins, curing agents, catalysts, and diluents	Non-regulated/sanitary	Manufacturing	1500-2000 ft^3
Acid from digester	RCRA	Manufacturing	5-10 gal
Paper, office waste, bathroom supplies	Sanitary/industrial	Operational	300-400 yd^3
Refrigerant from withdrawal system	LLW	Operational	40-60 gal
Classified Waste	Non-regulated	Operational	100-150 ft^3
Classified Waste	LLW	Operational	100-150-ft^3
General maintenance and facility materials	Mixed RCRA/LLW	Operational	10-20 ft^3
General maintenance and facility materials	RCRA	Operational	30-50 ft^3
General maintenance and facility materials	LLW	Operational	30-50 ft^3
General maintenance and facility materials	Non-regulated	Operational	50-90 ft^3
PCB waste	TSCA		None projected
Asbestos waste	TSCA		None projected
Scrap metal	LLW	*Project Closeout	2000 ft^3
General maintenance and facility materials, PPE, debris	Sanitary/industrial	*Project Closeout	2000 ft^3
Spent solvents, rags, PPE, wipes from cleaning operations	Mixed RCRA/LLW	*Project Closeout	100 ft^3
Spent solvents, rags, PPE, wipes from cleaning operations	RCRA	Project Closeout	100 ft^3
Classified Waste	non-regulated	*Project Closeout	600 ft^3

Source: USEC 2000c.

* If centrifuge components are transferred to other centrifuge related facilities, there would be essentially no project closeout wastes.

TABLE 4.2–2.—*Typical Materials Usage for Building K-1600*

Carbon Fibers	**Quantity Shipped per Frequency**
Hexcel IM7-GP-12K	(Would receive shipments of one or a
Granco CN-60-60S	combination of the carbon fibers for up to
Granco CN-08-60S	6/years for up to 2.5 years; would be multiple
Toray M30SC	spools in boxes)
Toray T700SC	
Mitsubishi K63712	
Mitsubishi K63312	
Resins Systems	
(Resins, Hardeners, Modifiers)	
Ciba LY1556/HY917/DY070	(would receive shipments of one or
Tactix 123/HY5200	a combination of the resins/hardeners for up to
Tactix 123/HY5200	a combination of the resins/hardeners for up to
Shell EPON 9405/9470	6/year for up to 2.5 years)
Shell EPON 862/W	
Prepregs (Fibers/Resin Systems)	
YLA CN-60/RS-36	(would receive shipments of one or
YLA K63312/RS-36	a combination of these systems for 6 shipments/
YLA M46J/RS-36	year for up to 2.5 years; material would be in rolls/box)
Bryte CN-60/1522-2	
Bryte CN-80/1522-2	
Bryte K63312/1522-2	
Bryte K63712/1522-2	
Hexcel UHMS-GP/F584	
Hexcel UHMS-GP/8552	
Other Materials	**(Below based on 3 years)**
Acetone	Small quantities/shipment and 3-4 times/year
Ethanol	Small quantities/shipment and 3-4 times/year
N-Methyl Pyrrolidone	Small quantities/shipment 3 times per year
WD-40	Small quantities/shipment 4-5 times/year
3-in-1 Oil	Small quantities/shipment 4-5 times/year
Two-Part Epoxy	Small quantities/shipment 3 times/year
Marbocote GRP-ECO	Small quantities/shipment 3-5 times/year
Mold Release RAM 225	Small quantities/shipment 3 times/year
Monocoat E361	Small quantities/shipment 3 times/year
Marvel Mystery Oil	Small quantities/shipment 3 times/year
DUO Seal Pump Oil	Small quantities/shipments 3 times/year
Drierite	Small quantities/shipment 3 times/year
Durham's Water Putty	Small quantities/shipments 3 times/year
Silicone Rubber Adhesive	Small quantities/shipment 4 times/year
DOW Corning High Vacuum Grease	Small quantities/shipment 4 times/year
Oxygen gas cylinder	Small quantities/shipment 5 times/year
Argon gas cylinder	Small quantities/shipment 5 times/year
Nitrogen gas cylinder	Small quantities/shipment 5 times/year
Dry Ice (CO_2)	Small quantities/shipment 12 times/year
Miscellaneous office, maintenance, and janitorial supplies	5 small deliveries/month

Source: USEC 2000e, USEC 2000g, USEC 2000h.

TABLE 4.2–3.—*Projections of Waste Quantities for Major Waste Types Building K-1600 and the CTC Facility*

Material/Activity	Type of Waste Generated	Activity Phase	Projected Annual Rate
CTC Facility			
Paper, construction debris, wood, concrete	Sanitary/industrial	Modification	400-600 ft^3
Removal of supports and facility structures	Rad contaminated scrap metal LLW)	Modification	300-500 ft^3
Excess equipment	Scrap metal	Modification	200-300 ft^3
Paper, office waste, bathroom supplies	Sanitary/industrial	Modification	300-400 yd^3
Lubricants, maintenance debris	Non-regulated	Modifications and operations phases	100-150 ft^3
Light bulbs and batteries	RCRA recycle	Modifications and operations phases	15-25 ft^3
Spent solvents, rags, PPE, wipes from parts cleaning operations	RCRA	Manufacturing	2000-2500 ft^3
Rags, PPE, wipes from parts cleaning operations	Non-regulated	Manufacturing	1000-1500 ft^3
Excess fibers and reacted resins, curing agents, catalysts, and diluents	Non-regulated/sanitary	Manufacturing	1500-2000 ft^3
Acid from digester	RCRA	Manufacturing	5-10 gal
Classified Waste	Non-regulated	Operational	25-50 ft^3
General maintenance and facility materials	RCRA	Operational	20-30 ft^3
General maintenance and facility materials	Non-regulated	Operational	50-90 ft^3
PCB waste	TSCA		None projected
Asbestos waste	TSCA		None projected
K-1600			
Paper, construction debris, wood, concrete	Sanitary/industrial	Modification	400-600 ft^3
Removal of supports and facility structures	Scrap metal	Modification	300-500 ft^3
Removal of supports and facility structures	Rad contaminated scrap metal LLW)	Modification	400-800 ft^3
Paper, construction debris, wood, concrete	LLW DAW	Modification	200-400 ft^3
Spent solvents, rags, PPE, wipes from valve cleaning	RCRA	Modification	150-200 ft^3
Spent solvents, rags, PPE, wipes from valve cleaning	Mixed RCRA/LLW	Modification	100-150 ft^3
Acid from valve cleaning	Mixed RCRA/LLW	Modification	3-5 gal
Rags, wipes, PPE from valve cleaning	LLW DAW	Modification	200-300 ft^3
Excess equipment	Scrap metal	Modification	200-300 ft^3
Excess equipment	LLW scrap metal	Modification	200-300 ft^3
Rad clothing and PPE	LLW DAW	Modification	250-350 ft^3
Lubricants, maintenance debris	non-regulated	Modifications and operations phases	100-150 ft^3
Light bulbs and batteries	RCRA recycle	Modifications and operations phases	50-75 ft^3
Spent solvents, rags, PPE, wipes from parts cleaning operations	RCRA	Operational	100-150 ft^3

TABLE 4.2–3.—*Projections of Waste Quantities for Major Waste Types Building K-1600 and the CTC Facility* (continued)

Material/Activity	Type of Waste Generated	Activity Phase	Projected Annual Rate
Rags, PPE, wipes from parts cleaning operations	non-regulated	Operational	50-75 ft^3
Acid from digester	RCRA	Operational	5-10 gal
Paper, office waste, bathroom supplies	Sanitary/industrial	Modification	150-200 yd^3
Paper, office waste, bathroom supplies	Sanitary/industrial	Operational	200-300 yd^3
Classified Waste	non-regulated	Operational	100-150 ft^3
Classified Waste	LLW	Operational	100-150-ft^3
General maintenance and facility materials	Mixed RCRA/LLW	Operational	10-20 ft^3
General maintenance and facility materials	RCRA	Operational	30-50 ft^3
General maintenance and facility materials	LLW	Operational	30-50 ft^3
General maintenance and facility materials	non-regulated	Operational	50-90 ft^3
PCB waste	TSCA		None projected
Asbestos waste	TSCA		None projected
Scrap metal	LLW	*Project Closeout	2000 ft^3
General maintenance and facility materials, PPE, debris	Sanitary/industrial	*Project Closeout	2000 ft^3
Spent solvents, rags, PPE, wipes from cleaning operations	Mixed RCRA/LLW	*Project Closeout	100 ft^3
Spent solvents, rags, PPE, wipes from cleaning operations	RCRA	*Project Closeout	100 ft^3
Classified Waste	non-regulated	*Project Closeout	600 ft^3

* If centrifuge components are transferred to other centrifuge related facilities, there would be essentially no project closeout wastes.

TABLE 4.2–4—*Typical Materials Usage for the CTC Facility*

Chemical/Material	Quantity Shipped and/or Frequency
CTC FACILITY	
Carbon Fibers	
Hexcel IM7-GP-12K	would receive shipments of one or a
Granco CN-60-60S	combination of the carbon fibers for up to
Granco CN-08-60S	6/year for up to 2 ½ years; would be multiple spools in boxes)
Toray M30SC	
Toray T700SC	
Mitsubishi K63712	
Mitsubishi K63312	
Resins Systems	
(Resins, Hardeners, Modifiers)	
Ciba LY1556/HY917/DY070	would receive drums in shipments of one or
Tactix 123/HY5200	a combination of the resins/hardeners for up to
Shell EPON 9405/9470	6/year for up to 2 ½ years)
Shell EPON 862/W	
Prepregs	
(Fibers/Resin System)	
YLA CN-60/RS-36	would receive shipments of one or
YLA K63312/RS-36	a combination of the prepregs for 6 shipments/
YLA M46J/RS-36	year for up to 2 ½ years; material would be in rolls/box)
Bryte CN-60/1522-2	
Bryte CN-80/1522-2	
Bryte K63312/1522-2	
Bryte K63712/1522-2	
Hexcel UHMS-GP/F584	
Hexcel UHMS-GP/8552	
Other Materials	
Acetone	small quantities/shipment and 3-4 times/year
Ethanol	small quantities /shipment and 6-8 times/year
NMP	small quantities /shipment and 6 times/year
WD-40	small quantities /shipment 6-8 times/year
3-in-1 Oil	small quantities /shipment 6-8 times/year
Two-Part Epoxy	small quantities /shipment 12 times/year
Marbocote GRP-ECO	small quantities /shipment 6 times/year
Mold Release RAM 225	small quantities /shipment 6-8 times/year
Monocoat E361	small quantities/shipment 6-8 times/year
Marvel Mystery Oil	small quantities /shipment 3 times/year
DUO Seal Pump Oil	small quantities /shipments 3 times/year
Drierite	small quantities /shipment 3 times/year
Durham's Water Putty	small quantities /shipments 3 times/year
Silicone Rubber Adhesive	small quantities/ shipment 4 times/year
DOW Corning High Vacuum Grease	small quantities/shipment 4 times/year
Acetylene gas cylinder	small quantities/shipment 5 times/year
Oxygen gas cylinder	small quantities/shipment 5 times/year
Argon gas cylinder	small quantities/shipment 5 times/year
Nitrogen gas cylinder	small quantities/shipment 5 times/year
Dry Ice (CO2)	small quantities /shipment 12 times/year
Miscellaneous office, maintenance, & janitorial supplies	5 Small deliveries per month

4.3 GEOLOGY AND SOILS

The geology and soils analysis considers an ROI which includes the ETTP, the CTC Facility, as well as the rest of the ORR. Impacts to these resource areas were determined by assessing potential changes in existing geology and soils that could result from construction activities and operations under each of the alternatives.

4.3.1 No Action Alternative

Under the No Action Alternative, no leasing for the USEC Gas Centrifuge R&D Project would occur, therefore, no impacts to geology and soils would occur.

4.3.2 Proposed Action

ETTP

The construction of the USEC Gas Centrifuge R&D Project would have no impact on geological resources, and hazards posed by geological conditions are not expected.

Slopes and underlying foundation materials are generally stable at ETTP. Landslides or other nontectonic events are unlikely to affect project activities. Sinkholes are present in the Knox Dolomite, but it is unlikely that they would impact the Project. Sinkholes within the Chickamauga bedrock underlying ETTP are typically small and sparse.

Based on the seismic history of the area, a moderate seismic risk exists at the ETTP Site. This should not hinder project activities. All new building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE O 420.1, *Facility Safety*, and accompanying guidelines.

Soil disturbance from project activities would occur at construction laydown areas, destroying soil profile, and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facility (with respect to drainage and wind patterns); slopes, shape, and area of ground

disturbance; and the duration of time the soil is bare. Soils would not be impacted by the construction of the USEC GAS Centrifuge R&D Project and would not adversely affect the safe operation of project activities.

The potential for soil contamination from project activities would be minimized by current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate the hazardous material releases that could impact soil resources. The potential for soil contamination from construction of the USEC Gas Centrifuge R&D Project would be minimal.

The modification of the CTC Facility would have minimal impact on geological resources, and hazards posed by geological condition are not expected. Based on the seismic history of the area, a moderate seismic risk exists at the CTC Facility. This should not hinder project activities. All new building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with applicable building codes.

Soil disturbance from project activities would occur at construction laydown areas, destroying soil profile, and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. No temporary impact to soils is expected as a result of construction activities. Potential for soil contamination from construction and project activities would be minimized by current waste management procedures.

4.4 BIOLOGICAL RESOURCES

The U.S. Department of Interior's Fish and Wildlife Service (USFWS), the Tennessee Wildlife Resources Agency, Endangered Species Coordinator, TDEC, and Division of Natural Heritage were notified of the Proposed Action. The USFWS has determined that the gray bat (*Myotis grisescens),* Indiana bat (*Myotis sodalis),* and the pink mucket (*Lampsilis abrupta*) have the potential to occur within the project impact areas. The USFWS has recommended that a BA be submitted to determine if the proposed project may affect the species. After review of the BA, the USFWS has concluded, in a letter dated October 16, 2002, that the proposed action is not likely to adversely affect the above mentioned species. Consultation letters and the BA submitted to USFWS are included in Appendix B.

The facilities for the Proposed Action are located on grounds designated as industrial and have been previously disturbed. Therefore, no impacts to special status species, vegetation, aquatic resources, or wildlife are anticipated.

4.5 CULTURAL RESOURCES

No cultural or archaeological impacts are expected to be associated with the Proposed Action. Buildings proposed for use have been previously used for uranium enrichment activities and would continue to be used in accordance with their original mission. Therefore, they are exempt from consultations with the State Historic Preservation Officer (SHPO).

Buildings K-1037 and K-101 are contributing properties to the K-25 Main Plant Historic District. The planned activities associated with these buildings would primarily involve minor indoor renovation and reuse of these facilities. These activities would not result in an adverse effect to these properties. Buildings K-1600 and K-1200 are not contributing properties nor individually eligible for inclusion in the NRHP. The proposed project would not involve any ground-disturbing activities in areas that have not been previously disturbed and/or surveyed and found to contain no cultural or archaeological resources.

The Tennessee Historical Commission and TDEC were notified of the Proposed Action and are being requested to provide comments and recommendations.

4.6 WATER RESOURCES

4.6.1 No Action Alternative

Under the No Action Alternative, no leasing for the USEC Gas Centrifuge R&D Project would occur, therefore, no impacts to water resources would occur.

4.6.2 Proposed Action

Potential short-term impacts to surface water resources could result from sediment loading to surface waterbodies or migration of contaminants. Construction activities would expose varying

areas during project activities. Best management practices, including standard erosion controls such as siltation fences and buffer zones of natural riparian vegetation, during construction activities would minimize the potential impacts to surface water resources. Vegetation preserved in the riparian zone (adjacent to tributaries) would serve as a filter strip for eroded soil, help prevent stream banks from eroding or slumping, and moderate water temperatures through shading.

Potentially contaminated surface runoff would be collected, sampled, and transported to an appropriate facility, as required. The potential for impacts to surface water resources from the migration of contaminants in groundwater would be exceedingly low because of engineered and active controls. Little or no overall short-term impacts to surface water resources would be expected with the exception of direct impacts to any water course. During construction, stormwater control and erosion control measures would be implemented to minimize soil erosion and transport to the Clinch River or Poplar Creek.

There are no plans for routine withdrawal from groundwater resources to support either construction or operation of the USEC Gas Centrifuge R&D Project. There are no anticipated impacts to groundwater as a result of this project.

In addition, impacts to water usage were analyzed at Buildings K-1600, K-1220, K-1037, and K-101, and are expected to be minimal during project operations. The greatest impact to water usage during project operations would occur at Building K-1600. Currently 2,650 L/day (700 Gal/day) of water is used; however, 13,249 L/day (3,500 Gal/day) of water would be used under the Proposed Action. USEC will make provisions to have its utilities and services provided by private companies. Once DOE is unable to provide needed services due to D&D activities.

Because of the absence of waterbodies or surface water in the area of the CTC Facility, no impacts to water resources would occur.

4.7 LAND USE AND VISUAL RESOURCES

4.7.1 Land Use Impacts

The land resources analysis considers an ROI that includes the ETTP geographic Area of Responsibility, which covers 2,405 ha (5,942 acres), as well as the four individual Buildings: K-1600, K-1220, K-1037, and K-101 and the 3.6 ha (9 acres) of the CTC Facility on the Boeing Property. The land use impacts of the No Action Alternative and Preferred Alternative are compared with existing land patterns and facility uses.

4.7.1.1 *No Action Alternative*

Under the No Action Alternative, the current users of Buildings K-1600, K-1220, and K-1037 would remain onsite. Building K-101 and the CTC Facility would remain vacant. Any planned environmental restoration activities would continue in accordance with the site ACP.

4.7.1.2 *Proposed Action*

The following paragraphs describe potential changes in facility uses under the Proposed Action (USEC 2000d).

Building K-1600

Building K-1600 would be used for the Project's manufacturing, assembly, test, and operations facility. The facility was previously designed and used for similar centrifuge activities in the early 1980s. Although a limited amount of smaller support equipment was removed from the facility, it is still equipped with the required utility, support, and operational systems needed for the Project. Facility modifications would need to be made to upgrade the facility to present day operating capabilities (piping, fixtures, valves).

The electrical shop and storage would vacate while 50 percent of the record storage area would be removed. The maintenance glove shop and administrative offices would stay. If the glove shop is relocated, it will not be a result of this project. New residents, however, would move into the office

space. Since Building K-1600 has been previously used to support similar centrifuge operations, this transition should only have minor impacts on the current facility use.

Building K-1220

Centrifuge equipment used in the past for similar research activities remains in this building. USEC plans to inspect this equipment and, depending on the needs of the Project, remove it from this facility for use at Building K-1600. There would be no change in current facility use at Building K-1220.

Building K-1037

USEC currently uses about 25 percent of the total office space (10 percent) in this building. Under this alternative, USEC would continue to use this space and also take over a high bay area for equipment and component storage, testing, cleaning, or assembly. This high bay area was used in the past for industrial/manufacturing operations.

Since the high bay area has been previously used for industrial/manufacturing operations and needs only minor modifications to reuse, the transition in facility use should not have any adverse impacts on current facility use.

Building K-101

This building, currently vacant, would be used for administrative offices on its second floor. The first floor, which has evidence of surface contamination, may be used for limited storage of contaminated equipment. Remedial measures would be taken to ensure the health and safety of the residences on the second floor.

The planned uses at all four buildings are consistent with the industrial land use classification designated for future use of the ETTP as well as the current use of the surrounding facilities at the site. Use of these buildings are bound by the DOE leasing agreement, and no alterations require DOE consent once the lease is signed. Upon the completion of the USEC Project, the four buildings

would be returned by USEC to the condition and status as described by the lease agreement between DOE and USEC.

CTC Facility

The CTC Facility would be used for the Project's manufacturing, assembling, and testing centrifuge components. The facility was constructed in 1983 and was intended to be used to support a DOE-funded project that was part of the Gas Centrifuge Program (Arcadis 2002). DOE terminated its centrifuge programs and resulted in the availability of the facility for other uses by Boeing. Boeing revised the building for light industrial activities, office space, and storage. Since 1989, the building has been used for interim storage of office materials. Currently, it is vacant except for a small amount of material (wooden crates) being stored in the building (USEC 2002b).

The facility would require refurbishment of the interior for use in the USEC Gas Centrifuge R&D Project. Because the facility is currently not in use, refurbishment would cause impacts to current facility use. Modification would also need to be made to the K-1600 Facility, but since Building K-1600 has been previously used to support similar centrifuge operations, this transition should only have minor impacts on the current facility use.

4.7.2 Visual Resources

The visual resources analysis considers an ROI which includes those lands from which ETTP and the CTC Facility is visible (the viewshed). Impacts to this resource area associated with changes in the existing landscape character that could result from construction activities and operations under the No Action and Preferred Alternatives are discussed below.

4.7.2.1 *No Action Alternative*

Under the No Action Alternative, there would be no modifications made to Buildings K-1600, K-1220, K-1037, and K-101 or the CTC Facility. These facilities would be left in their current state and, therefore, would not be impacted. The CTC Facility would continue to be used in accordance to the current owner's decisions. The ETTP would continue to be consistent with the VRM Class

VI classification designated in the Affected Environment section of this EA and the surrounding VRM Class II and III areas would not be impacted by the Project.

4.7.2.2 *Proposed Action*

Under the Proposed Action, the major modifications would only occur to Building K-1600. Activities would be limited to internal modifications to the building and include installation of new equipment, upgrading servicing, refurbishing, and cleaning existing equipment. Construction activities outside of the building would be limited to concrete pads for holding a small cooling tower, a refrigeration unit, a small enclosure for an oil heating unit and an emergency generator which would be left for additional uses by the facility. Visual disruption would also be limited by the use of only small and limited excavation equipment used outside of the building. Most of the construction equipment would consist of hand tools and would be used inside the building. There would be no modifications to the outside of the building. Overall, these modifications would be minor and would not impact the visual quality of the site.

Visual modifications to Buildings K-1220, K-1037, and K-101 would be minor and internal, if any, and would not impact the visual quality of the ETTP Site. ETTP would continue to be consistent with the VRM Class VI classification designated in the Affected Environment section of this EA and the surrounding VRM Class II and III areas would not be impacted.

The modifications at the CTC Facility would primarily be within the building with the exception of the new security fence and the concrete pads to be used for an exhaust/ventilation system, oil system, air compressor system, and a HVAC unit. Overall, these modifications would be minor and not impact the visual quality of the site.

4.8 SOCIOECONOMICS

4.8.1 No Action Alternative

Under the No Action Alternative, there would be no change in employment at the ETTP or the CTC Facility. Therefore, there would be no change in regional employment, income, housing, or demand for public services.

4.8.2 Proposed Action

Under the Proposed Action, there would be a gradual increase of employment on the Project of up to a maximum of 100 people. Most new employees would be from the local areas while a small number would be on temporary assignment from the Portsmouth Site.

4.9 INFRASTRUCTURE

Changes to infrastructure were assessed by comparing current utility usage at each of the four buildings at ETTP (K-1600, K-1220, K-1037, K-101) and the CTC Facility and projected utility usage under the USEC Gas Centrifuge R&D Project. The projected usage was then compared to that which is currently used at ETTP and the CTC Facility to determine the possible impacts to the overall site.

4.9.1 No Action Alternative

Under No Action Alternative, there would be no modifications made to any of the four facilities and personnel assignments would not change. Changes to utilities would be limited to normal maintenance activities. There would be no increase in utility usage and current building space allocation would not be affected. Utility usage under the No Action Alternative would not add to ETTP's contribution to the ORR utility usage and the CTC Facility would not contribute to the City of Oak Ridge's utility usage.

4.9.2 Proposed Action

Under the Proposed Action, Building K-1600 would be used for centrifuge operations and portions of Buildings K-1037, K-1220, and K-101 would support its activities. Impacts to utility usage at Buildings K-1600, K-1220, K-1037, and K-101 resulting from the centrifuge project were analyzed for electricity, water, sewage, air, nitrogen, and natural gas. Utilities at Building K-1220 would not be impacted since activities would be limited to the cleaning, inspection, and eventual transfer of previously used centrifuge equipment on its premises for use at Building K-1600.

Effects on utility usage would be felt mostly in Building K-1600. Activities in Building K-1037 would consist of the continued use of office space that USEC personnel currently occupies and equipment storage, cleaning or inspection in the high bay area. Building K-101 is currently vacant and would be slightly impacted (22,000 kWh/yr in electricity) by use of the second floor for administrative offices. Table 4.9–1 shows the impacts to utilities for each building under the Proposed Action. It is noted that certain utility usages for Building K-1220 are not metered or measured at this time. However, USEC's activities in this facility would be limited to minimal requirements for lighting for short durations and infrequent occasions. A very small amount of potable water would be used in the bathroom facility.

TABLE 4.9-1.—*Current and Projected Utility Usage Under the Proposed Action*

Energy Type	K-1600 Current	K-1600 Projected	K-1220 Current	K-1220 Projected	K-101 Current	K-101 Projected	K-1037 Current	K-1037 Projected
Electrical (kWh/yr)	1.6 M	14.6M	N/M	N/C	17, 000	39,000	4.80 M	4.81 M
Water (L/day)	2,650	13,249	N/M	N/C	N/A	0.4	10,860 L/day	10,860 L/day
Sewage (L/day)	2,650	13,249	N/M	N/C	N/A	0.4	10,860 L/day	10,860 L/day
Air (cfm)	10	1,000	N/M	N/C	0	0	N/C	N/C
Nitrogen (cf/day)	0	4,900	0	0	0	0	N/C	N/C
Steam	N/A	N/A	N/M	N/C	N/A	N/A	N/A	N/A
Natural Gas (scf/hr)	0	5,853	0	0	0	9	N/C	N/C

N/A - Not Applicable
N/C - No Change
N/M - Not Metered, therefore, no quantities are available
Note: Values shown are maximums, they will be reached progressively during the first three years of the Project.
Source: USEC 2000d.

The biggest impact on the ETTP utility usage would come from Building K-1600. Under the Proposed Action, there would be a gradual increase up to 35.1 MWh/yr in electricity usage at the building. During the project, water usage is projected to increase by approximately 10,600 L/day (2,800 gal/day). Additional water usage under this alternative represents an increase of 0.0032 percent in overall site usage. Sewage would also increase by approximately 10,600 L/day (2,800 gal/day). Currently, the ETTP is treating approximately 1,020,800 L/day (269,700 gal/day) of

sewage (FY 2000) (OMI 2000). The additional wastewater stream from this Project (0.01 percent) would not threaten the current treatment plant load capacity. Overall, the ETTP water usage is approximately 3,388,000 L/day (895,000 gal/day).

Utilities at the CTC Facility and Building K-1600 were analyzed for electricity, water, sewage, air, nitrogen, and natural gas. Utility usage at the CTC Facility increased when compared to current rates. The biggest impact on utility usage would come from Building K-1600 and the CTC Facility. Table 4.9-2 shows current and projected utility usage at Building K-1600 and the CTC Facility.

TABLE 4.9-2.—*Current and Projected Utility Usage with Activities at Building K-1600 and the CTC Facility*

Energy Type	K-1600 Current	K-1600 Projected	CTC Facility Current	CTC Facility Projected
Electrical (kWh/yr)	1.6k	8 M	17k	3M
Water (L/day)	700	2,000	70	3,000
Sewage (l/day)	100	2,000	70	3,000
Air (cfm)	10	300	0	1,000
Nitrogen (cf/day)	0	4,900	0	0
Steam	N/A	N/A	0	0
Natural Gas (scf/hr)	0	5,853	~50	4,000 (average)

N/A - Not Applicable.
Source: USEC 2002b.

4.10 ENVIRONMENTAL DESIGN

The fundamentals for Environmental Design require that all aspects of the Project be reviewed for minimizing impacts to the environment from the Project. From the existing information, the amount and types of materials that are going to be used for this Project and the wastes generated at the ETTP site are essentially inconsequential in comparison to the site as a whole. In addition, the calculated amount of air and liquid waste effluent is extremely small and would have minimal impact in

relationship to effects from the entire ETTP site on the environment. The CTC Facility would also have a small amount of air and liquid waste effluent. The solid wastes are consistent with a small manufacturing facility (USEC 2002a).

4.11 HUMAN HEALTH

This section evaluates the potential for occupational hazard, radiological, and chemical exposures under the No Action and Proposed Action alternatives.

4.11.1 No Action Alternative

Under the No Action Alternative, no leasing for the USEC Gas Centrifuge R&D Project would occur, therefore, no impacts to the health of the workers or public would occur.

For the CTC Facility, standard general industrial hazards might exist. Compliance with state and Federal health and safety standards would be sufficient to mitigate these hazards. A detailed safety analysis was not performed for this facility (USEC 2002a).

4.11.2 Proposed Action

The Proposed Action consists of three phases: a modification phase, manufacturing phase, and test operations phase. If the CTC Facility is used, modification and manufacturing would occur there and test operations would occur at Building K-1600. Under the Proposed Action, chemicals may be released to the environment from different process areas and emission sources (USEC 2000f). These chemicals include acetone, alcohols, carbon dioxide, ethanol, Freon 134, resin products, solvent vapors, and NMP. It is projected that none of these sources would result in a quantity of emissions that would reach or exceed regulatory emission limits (USEC 2000c). The following health evaluation is based, in part, upon these projections. It is noted, however, that further evaluation would be conducted with the application for appropriate air permits or exemptions.

4.11.2.1 *Modification Phase*

The Modification Phase would consist of normal construction activities, as well as decontamination and cleaning operations. Normal construction activities projected during this phase would pose standard industrial hazards to the worker associated with material handling and movement, welding, cutting, painting, lubricating, drilling, and grinding. At the ETTP site, DOE requires mitigation of these hazards through the institution of standard industrial practices, and protective engineering controls and equipment as specified in OSHA regulations (29 CFR 1910, *Occupational Safety and Health Standards* and 29 CFR 1926, Safety and Health Regulations for Construction). At the CTC Facility OSHA standards will be used.

During the modification phase, approximately 1,000 existing valves in Building K-1600 would be removed to undergo radiological decontamination and cleaning. During this process, workers could potentially become exposed to residual UF_6. When UF_6 is exposed to moisture in the air, toxic compounds (HF and UO_2F_2) are formed. Chemically, the uranium in UF_6 is toxic to the kidneys. HF is an acid that can cause acid burns on the skin or lungs if it is concentrated. Massive exposure to HF in air can cause destruction of the bronchial mucous membrane and swelling of lung tissue, which can be fatal. The fluoride ion in both HF and UO_2F_2 is also toxic and can penetrate the skin, destroy tissue under the skin, and cause inhibition of vital enzymes and dangerous disturbances in metabolism. Respiratory protection, PPE, and administrative controls (e.g., exhaust hoods, remote operations, respirators) would be used to ensure worker protection from inhalation and dermal contact.

It is expected that acetone and alcohol would be used to clean process components. As such, there is a potential for fugitive releases of these materials during the cleaning operations. Respiratory protection and administrative controls would be employed to ensure that exposures are controlled within applicable OSHA and DOE requirements. It is projected that none of the emission points and fugitive sources would result in a quantity of emission that would reach regulatory emission limits (Section 4.1.1). Therefore, it is expected that emissions from these materials would pose no adverse health impacts to workers or the public.

4.11.2.2 *Manufacturing Phase*

The manufacturing of the centrifuge components consists of operations that may pose a potential for chemical exposure. The manufacturing process for the centrifuge rotor requires the combination of resins, curing agents or hardeners, and filaments. The curing operations would generate air emissions that could contain volatile organic material. While the curing process would be conducted under an exhaust system to protect the worker, it is projected that the quantity of emissions would not reach or exceed regulatory emission limits (USEC 2000c). The impact of the manufacturing process on the health of the public is expected to be negligible because of the small quantities in use and the resulting low levels of emissions.

4.11.2.3 *Test Operations Phase*

Under the test operations phase, there is a potential for workers to be exposed to radiological and chemical hazards. UF_6 is the primary hazardous substance used for the Proposed Action and can be a hazard both from a radiological and a chemical perspective. The potential hazards imposed by the use of UF_6 and the appropriate mitigation factors are discussed in Section 4.11.2.1. Appropriate procedures, training, and controls would be in place to minimize any exposure and to maintain exposures below action levels, to determine and record actual exposures, and to mitigate recurrence of exposures.

The expected use of UF_6 in the facility at any given time should not exceed four 500-pound cylinders and two 50-pound cylinders. All of the cylinders would contain only depleted UF_6, and there would be no enrichment performed in the facility that would exceed natural U^{235} assays. This minimal level precludes the possibility of a criticality (USEC 2000c).

4.11.2.4 *Accident Potential*

Building K-1600 was previously designed and used for similar centrifuge activities in the early 1980s. At that time, a safety analysis was conducted for the activities to be undertaken (FSAR 1984). Because the Project Test Phase is similar to the tests previously conducted at Building K-1600 and the facility infrastructure would essentially remain unchanged, the results of this safety analysis are considered applicable for the Proposed Action.

The safety analysis established a bounding UF_6 release to occur as a result of the postulated rupture of a feed cylinder pigtail. It was calculated that a total of 427 g (0.96 lbs) of UF_6 would be released in the first 2 minutes of this type of accident. The resulting concentrations of HF and soluble uranium were 3.2 ppm and 8.6 mg/m^3, respectively. The total body dose resulting from this scenario was determined to be approximately 1.2×10^{-4} rem, which is well below the allowable 5 rem annual whole body dose.

Impacts on biotic resources from the release of radionuclides would be expected to be less than that on the human population. Humans have generally been shown to be the most sensitive organism to radiation on release (DOE 1986b).

Recently, USEC analyzed the worst case accident and calculated the dose to the MEI (USEC 2000i). Assuming the entire facility maximum uranium inventory of 1,800 pounds is released into the environment under D stability class meteorology and actual ETTP wind conditions then the dose to the MEI is 6.2×10^{-7} rem/hr. The Safety Authorization Basis for the proposed use of the facility must be approved by DOE and communicated to the other onsite entities.

The safety analysis found that there were three likely accident scenarios that could result in the potential for radiological exposure to workers: (1) withdrawal cylinder overloading; (2) sample trap or tube overloading or rupture in control rooms; and (3) vacuum pump failure.

Withdrawal cylinders could be overfilled as a result of an operator inadvertently filling a cylinder beyond its normal fill limit. The primary hazard associated with an overfilled cylinder is the potential for over pressurization and subsequent hydraulic rupture when the cylinder is heated for emptying at another facility. Safety measures such as weighing the cylinders prior to transport and tagging overfilled cylinders should be in place to alert personnel at the receiving facility.

Chemical traps can become overloaded with UF_6 resulting from a mis-valving operation or from failure to follow administrative procedures which require periodic change-out of the chemical trap alumina. UF_6 could pass through the overloaded trap and eventually reach the vacuum pump, and then react with the hydrocarbon pump oil producing degraded pump operations and subsequent pump failure. In the test facility feed purge system, it was determined that the quantities of uranium

and HF released to the atmosphere before the pump failed and before remedial action would be taken would be less than 10 grams.

The safety analysis also determined that the primary mechanical hazard results from the possibility of a machine demounting following a mechanical failure or from the generation of high-energy fragments which penetrate the machine casing following a complete machine breakdown. These mechanical failures were taken into account during the design of the casing and crash ring and are not considered to be likely events.

Fires and explosions were evaluated in the Auditable Safety Analysis (ASA) and the consequences were less than the bounding event. Natural phenomena including tornado, straight wind, flood, and seismic events were also evaluated as part of the final safety analysis. These phenomena were not considered to pose a meaningful risk.

4.12 ENVIRONMENTAL JUSTICE

4.12.1 No Action Alternative

As discussed in the preceding analyses, there would be no impacts to human health or the environment from the No Action Alternative and there are no special circumstances that would result in disproportionately high and adverse impacts on minority or low-income populations. Therefore, there would be no environmental justice impacts.

4.12.2 Proposed Action

As discussed in Section 3.12, Environmental Justice, minority and low-income populations comprise a relatively small proportion of the total population in both an 80 km (50 mi) radius of the ORR and in the socioeconomic ROI. For environmental justice impacts to occur, there must be disproportionately high and adverse human or environmental impacts on minority populations or low-income populations.

As discussed in the preceding analyses, there would be no impacts to human health or the environment from the Preferred Alternative and there are no special circumstances that would result

in disproportionately high and adverse impacts on minority or low-income populations. Therefore, there would be no environmental justice impacts.

4.13 TRANSPORTATION

4.13.1 No Action Alternative

Under the No Action Alternative, the USEC Gas Centrifuge R&D Project would not conduct nor support further development of gaseous centrifuge technologies for uranium enrichment at ETTP or the CTC Facility. No radiological materials would be located at the CTC Facility. Therefore, there would be no increase in transportation risk as compared to the current conditions under this alternative.

4.13.2 Proposed Action

Chemicals and Materials

Different chemicals and materials used for the manufacturing of centrifuge would be transported to Building K-1600 at ETTP. The typical chemicals and materials, origin point, and frequency of shipping are given in Table 4.13-1 and Table 4.13-2. Table 4.13-1 shows materials for Building K-1600, assuming manufacturing would take place at K-1600. Table 4.13-2 shows materials for both Building K-1600 and the CTC Facility, assuming manufacturing would take place in the CTC Facility. The quantities given in the tables are small and would be shipped to ETTP as part of a routine shipment. However, the shipping of chemicals and materials would meet the DOT Hazardous Materials Regulations (Title 49, CFR, Parts 171-180) governing packaging and shipping of hazardous materials.

Also under the Proposed Action, centrifuge components would be shipped to the site of the Lead Cascade Project. The likely location of the Lead Cascade is either PORTS in Ohio or PGDP in Kentucky. These shipments would conform to appropriate DOT and DOE rules and regulations. Since both PORTS and PGDP are facilities leased to USEC and regulated by the NRC, the shipments would conform to NRC rules and regulations upon arrival at either PORTS or PGDP. Transport would also be a standard size tractor-trailer for large components at a frequency of one shipment a week and by smaller vehicles for smaller components, perhaps several times a week.

Risks associated with transporting centrifuge components would be minimal because no radiological materials are involved.

Different chemicals and materials used for the manufacturing of centrifuge would be transported to and from the CTC Facility and Building K-1600. The materials used at Building K-1600 would be used for machine assembly and testing, and materials used at the CTC Facility would be used for fabrication and component assembly.

TABLE 4.13–1.—*Typical Materials for Building K-1600*

Chemical/Material	Origin Point	Quantity Shipped and/or Frequency
Carbon Fibers		
Hexcel IM7-GP-12K	from Decatur, AL	will receive shipments of one or a
Granco CN-60-60S	use San Francisco, CA	combination of the carbon fibers for up to
Granco CN-08-60S	" " " "	6/year for up to 2 ½ years; will be multiple
Toray M30SC	" " " "	spools in boxes)
Toray T700SC	" " " "	
Mitsubishi K63712	Sunnydale, CA	
Mitsubishi K63312	" "	
Resins Systems (Resins, Hardeners, Modifiers)		
Ciba LY1556/HY917/DY070	Brewster, NY	will receive drums in shipments of one or
Tactix 123/HY5200	" "	a combination of the resins/hardeners for up to
Shell EPON 9405/9470	Houston, TX	6/year for up to 2 ½ years)
Shell EPON 862/W	" "	
Prepregs (Fibers/Resin System)		
YLA CN-60/RS-36	Benicia, NY	will receive shipments of one or
YLA K63312/RS-36	" "	a combination of the prepregs for 6 shipments/
YLA M46J/RS-36	" "	year for up to 2 ½ years; material will be in rolls/box)
Bryte CN-60/1522-2	Morgan Hill, CA	
Bryte CN-80/1522-2	" " "	
Bryte K63312/1522-2	" " "	
Bryte K63712/1522-2	" " "	
Hexcel UHMS-GP/F584	Pleasanton, CA	
Hexcel UHMS-GP/8552	" "	
Other Materials		
Acetone	Knoxville, TN	small quantities/shipment and 3-4 times/year
Ethanol	Knoxville, TN	small quantities /shipment and 6-8 times/year
N-Methyl Pyrrolidone	Gibbstown, NJ	small quantities/shipment 6 times per year
WD-40	Knoxville, TN	small quantities /shipment 6-8 times/year
3-in-1 Oil	Knoxville, TN	small quantities /shipment 6-8 times/year
Two-Part Epoxy	Pittsburgh, CA	small quantities /shipment 12 times/year
Marbocote GRP-ECO	Mowell, MI	small quantities /shipment 6 times/year
Mold Release RAM 225	Gardena, CA	small quantities /shipment 6-8 times/year
Monocoat E361	Mowell, MI	small quantities/shipment 6-8 times/year
Marvel Mystery Oil	Knoxville, TN	small quantities /shipment 3 times/year
DUO Seal Pump Oil	Knoxville, TN	small quantities /shipments 3 times/year
Drierite	Phillipsburg, NJ	small quantities /shipment 3 times/year
Durham's Water Putty	Des Moines, IA	small quantities /shipments 3 times/year
Silicone Rubber Adhesive	Knoxville, TN	small quantities/ shipment 4 times/year
DOW Corning High Vacuum Grease	Knoxville, TN	small quantities/shipment 4 times/year
Acetylene gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Oxygen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Argon gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Nitrogen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Dry Ice (CO2)	Knoxville, TN	small quantities /shipment 12 times/year
Miscellaneous office, maintenance, & janitorial supplies	Knoxville, TN	5 Small deliveries per month

Note: Based on number of units for R&D, the Lead Cascade Plant, spares, tests, or defects.

Source: USEC 2000c.

TABLE 4.13–2.—*Typical Materials for Building K-1600 and the CTC Facility*

Chemical/Material	Origin	Point Quantity Shipped and/or Frequency
K-1600		
Acetone	Knoxville, TN	small quantities/shipment and 3-4 times/year
Ethanol	Knoxville, TN	small quantities /shipment and 6-8 times/year
N-Methyl Pyrrolidone	Gibbstown, NJ	small quantities/shipment 6 times per year
WD-40	Knoxville, TN	small quantities /shipment 6-8 times/year
3-in-1 Oil	Knoxville, TN	small quantities /shipment 6-8 times/year
Two-Part Epoxy	Pittsburgh, CA	small quantities /shipment 12 times/year
Marbocote GRP-ECO	Mowell, MI	small quantities /shipment 6 times/year
Mold Release RAM 225	Gardena, CA	small quantities /shipment 6-8 times/year
Monocoat E361	Mowell, MI	small quantities/shipment 6-8 times/year
Marvel Mystery Oil	Knoxville, TN	small quantities /shipment 3 times/year
DUO Seal Pump Oil	Knoxville, TN	small quantities /shipments 3 times/year
Drierite	Phillipsburg, NJ	small quantities /shipment 3 times/year
Durham's Water Putty	Des Moines, IA	small quantities /shipments 3 times/year
Silicone Rubber Adhesive	Knoxville, TN	small quantities/ shipment 4 times/year
DOW Corning High Vacuum Grease	Knoxville, TN	small quantities/shipment 4 times/year
Acetylene gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Oxygen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Argon gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Nitrogen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Dry Ice (CO2)	Knoxville, TN	small quantities /shipment 12 times/year
Miscellaneous office, maintenance & janitorial supplies	Knoxville, TN	5 Small deliveries per month
Hexcel IM7-GP-12K		
Granco CN-60-60S	use San Francisco, CA	combination of the carbon fibers for up to
Granco CN-08-60S	" " " "	6/year for up to 2 ½ years; will be multiple
Toray M30SC	" " " "	spools in boxes)
Toray T700SC	" " " "	
Mitsubishi K63712	Sunnydale, CA	
Mitsubishi K63312	" "	
Resins Systems (Resins, Hardeners, Modifiers)		
Ciba LY1556/HY917/DY070	Brewster, NY	will receive drums in shipments of one or
Tactix 123/HY5200	" "	a combination of the resins/hardeners for up to
Shell EPON 9405/9470	Houston, TX	6/year for up to 2 ½ years)
Shell EPON 862/W	" "	
Prepregs (Fibers/Resin System)		
YLA CN-60/RS-36	Benicia, NY	will receive shipments of one or
YLA K63312/RS-36	" "	a combination of the prepregs for 6 shipments/
YLA M46J/RS-36	" "	year for up to 2 ½ years; material will be in rolls/box)
Bryte CN-60/1522-2	Morgan Hill, CA	
Bryte CN-80/1522-2	" " "	
Bryte K63312/1522-2	" " "	
Bryte K63712/1522-2	" " "	
Hexcel UHMS-GP/F584	Pleasanton, CA	
Hexcel UHMS-GP/8552	" "	
Other Materials		
Acetone	Knoxville, TN	small quantities/shipment and 3-4 times/year
Ethanol	Knoxville, TN	small quantities /shipment and 6-8 times/year
N-Methyl Pyrrolidone	Gibbstown, NJ	small quantities/shipment 6 times per year
WD-40	Knoxville, TN	small quantities /shipment 6-8 times/year
3-in-1 Oil	Knoxville, TN	small quantities /shipment 6-8 times/year
Two-Part Epoxy	Pittsburgh, CA	small quantities /shipment 12 times/year
Marbocote GRP-ECO	Mowell, MI	small quantities /shipment 6 times/year
Mold Release RAM 225	Gardena, CA	small quantities /shipment 6-8 times/year
Monocoat E361	Mowell, MI	small quantities/shipment 6-8 times/year

Table 4.13–2.—*Typical Materials for Building K-1600 and the CTC Facility* (continued)

Chemical/Material	Origin Point	Quantity Shipped and/or Frequency
Marvel Mystery Oil	Knoxville, TN	small quantities /shipment 3 times/year
DUO Seal Pump Oil	Knoxville, TN	small quantities /shipments 3 times/year
Drierite	Phillipsburg, NJ	small quantities /shipment 3 times/year
Durham's Water Putty	Des Moines, IA	small quantities /shipments 3 times/year
Silicone Rubber Adhesive	Knoxville, TN	small quantities/ shipment 4 times/year
DOW Corning High Vacuum Grease	Knoxville, TN	small quantities/shipment 4 times/year
Acetylene gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Oxygen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Argon gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Nitrogen gas cylinder	Knoxville, TN	small quantities/shipment 5 times/year
Dry Ice (CO2)	Knoxville, TN	small quantities /shipment 12 times/year
Miscellaneous office, maintenance, & janitorial supplies	Knoxville, TN	5 Small deliveries per month

Source: USEC 2002e.

Depleted UF_6 Cylinders at Building K-1600

It is expected that initially, one 500-pound cylinder of UF_6 (less than 0.1 percent U^{235} assay), one 50-pound cylinder of UF_6 (less than 0.1 percent U^{235} assay), one empty 500-pound size container, and one empty 50-pound container would be transported in one shipment from PORTS or PGDP. Approximately 6 to 12 months following the initial shipment, another shipment similar to the initial shipment would be received. Immediately after receipt of the second shipment, the first of the original 500-pound cylinder (approximately 60 to 75 percent full), the previously empty 500-pound cylinder (now approximately 25 to 40 percent full), and the two original 50-pound cylinders (each being approximately 50 percent full) would be shipped to PORTS or PGDP. At the end of the Project, the second shipment would be transported back to PORTS or PGDP. The assay would not change due to the expected activities (USEC 2000f). Therefore, there would be approximately four shipments from Paducah, Kentucky or Portsmouth, Ohio to Oak Ridge, Tennessee.

Table 4.13-3 summarizes the total collective radiological risks (i.e., the total risk to all workers and members of the general public potentially exposed for shipments) associated with the UF_6 cylinder transportation from PORTS or PGDP. The radiological risk associated with routine transportation would result from the potential exposure of people to low levels of external radiation near a radioactive shipment (along route or at stops). The vehicular risk associated with routine transportation would result from the potential exposure to increased levels of airborne particulates from vehicular exhaust emissions and from fugitive dusts raised from the roadbed by the transport vehicles. Radiological risks from transportation-related accidents could result from the potential

release and dispersal of radioactive material into the environment during the accident and the subsequent exposure of people through multiple pathways. Finally, the vehicular risks are associated with the road accidents and are not related to the shipment's cargo. The detailed analysis and assumptions for the transportation of depleted UF_6 cylinders is presented in *Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DOE 1999c).

The distance between Paducah, Kentucky and Oak Ridge, Tennessee is approximately 510 km (315 mi) by road. The distance between Portsmouth, Ohio and Oak Ridge, Tennessee, is approximately 560 km (345 mi) by road. The total risks presented in Table 4.13-3 are for a distance of 1,000 km (620 mi). Therefore, the risks associated with the transportation of UF_6 cylinders from PORTS and PGDP would be less than given in Table 4.13-3.

TABLE 4.13–3.— ***Total Routine and Accident Shipment Risks for the Transportation of Depleted UF_6 Cylinders.***

		Risk Over 1000 km (620 miles)							
		Routine Shipments Risks				Accident Shipments Risks			
Facility	Total Shipments (Truck)	Radiological LCF/ shipment	Total Radiological LCF	Vehicular LCF/ shipment	Total Vehicular LCF	Radiological LCF/ shipment	Total Radiological LCF	Vehicular Fatalities/ shipment	Total Vehicular Fatalities
Paducah	4	2.81×10^{-6}	1.12×10^{-5}	3.51×10^{-6}	1.40×10^{-5}	1.05×10^{-8}	4.21×10^{-8}	3.51×10^{-5}	1.40×10^{-4}
Portsmouth	4	1.40×10^{-6}	5.61×10^{-6}	2.10×10^{-6}	8.42×10^{-6}	7.01×10^{-9}	2.81×10^{-8}	1.75×10^{-5}	7.01×10^{-5}

Note: Radiological Potential Latent Cancer Fatalities (LCF) were estimated from the calculated doses using dose to risk conversion factor of 0.0005 and 0.0004 fatality per person-rem for members of the general public and occupational workers, respectively, as recommended in ICRP Publication 60 (ICRP 1991). The approximate corresponding dose received for each radiological fatality risk listed in this table may be obtained by multiplying the fatality risk by 2,500.

Source: DOE 1999c.

CHAPTER 5: CUMULATIVE IMPACTS

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Effects are considered on a cumulative basis because significant effects are often the result of individually minor direct and indirect effects of multiple actions that occur over time. Cumulative effects should be considered over the "lifetime" of the effects rather than the duration of the action.

The DOE-ORO has developed a plan to accelerate completion of the Oak Ridge Environmental Management (EM) Program by 6 years. The ETTP facilities will undergo a streamlined demolition program, a modified reindustrialization approach focusing on the transfer of facilities per the demolition schedule, removal of uranium hexafluoride (UF_6) cylinders, disposition of legacy waste, soil remediation to mitigate risk, and remediation of groundwater.

The closure plan includes the demolition of Buildings K-1600, K-1220 and K-101. If the title to Building K-1037 is transferred prior to the scheduled demolition date, then the building will remain; however, if the title is not transferred prior to the demolition date, the building will be demolished. Title transfer will transfer responsibility of the facility, including future building demolition and utilities and waste management, to the lease and/or title holder.

5.1 NO ACTION ALTERNATIVE

As discussed in Chapter 4, Environmental Effects, neither the Proposed Action nor the No Action Alternative will have any important environmental impacts. Under the No Action Alternative, leasing of facilities and equipment in support of the USEC Gas Centrifuge R&D Project would not occur at ETTP. No activities would occur at the ETTP. Therefore, no cumulative impacts would result.

5.2 CTC FACILITY

At the CTC Facility, with the exception of small concrete pads for an exhaust/ventilation system, an oil system, commercial air compressor system, HVAC unit, relocation of three fire hydrants, installation of a short section of underground telecommunication lines and a new security fence surrounding the facility, all of the activities would occur within the CTC Facility and within the four buildings at the ETTP site. As discussed in Chapter 4, the activities at the CTC Facility would not cause an appreciable increase nor damage to any of the environmental resources. The following section indicates that future potentially adverse cumulative impacts contributed by the actions at the K-1600 Facility and the CTC Facility are also minimal.

5.2.1 Air Quality and Noise

5.2.1.1 *Air Quality*

Air quality for ETTP and the ORR is representative of air quality at the CTC Facility and is located in an attainment area for NAAQS. The activities planned for the modification and manufacturing at the CTC Facility and testing at Building K-1600 is not expected to create cumulative impacts for NAAQS criteria pollutants or other air pollutants (e.g. solvents, etc).

5.2.1.2 *Noise*

There will be elevated noise levels internal to the CTC Facility and Building K-1600 created by manufacturing, assembling and operation/testing of the centrifuge machines. Appropriate hearing protection measures will be incorporated to protect personnel within the elevated noise areas.

The operation of the centrifuge system is not expected to increase the noise levels within ETTP. Noise associated during the modification and manufacturing phases at the CTC Facility would also be temporary. Therefore, the noise levels are not expected to contribute to the cumulative impact.

5.2.2 Process, Materials and Waste Management

5.2.2.1 *Process*

The activities defined for the three stages: Facility Modification, Manufacturing, and Test Operations would not have a major impact in the overall plant activity at the Boeing Property or at ETTP. The requirements for utilities would not provide a major burden to the CTC Facility or ETTP utilities. Some of the ETTP utility infrastructure is being removed as part of other projects in the area of Building K-1600. Once DOE leaves the site and building titles are transferred, responsibility for utilities and waste management will fall on the lease and/or title holder. The utility requirements for the project which are not available from ETTP would be met with small facility units. The waste would not add a large amount to utility needs from the ETTP. Because the CTC Facility is not currently utilized, there will be an increase in utility usage. The activities during the three phases are not expected to impact any plant or leasee activities in the area of the CTC Facility or Building K-1600 or the other buildings that may be used in this project.

5.2.2.2 *Materials*

As discussed in Section 4.2, the amount of materials that are to be used or stored onsite for the duration of this project are so minor that the overall cumulative effect for the CTC Facility or ETTP is minimal.

5.2.2.3 *Waste Management*

As previously described in Chapter 4, the amount of wastes estimated to be generated over the life of this project is minor. The expected waste generation levels would be submitted to DOE as part of the overall waste forecast for the ETTP Site and to the State of Tennessee for the CTC Facility. However, the amount of waste generated from this project is expected to be a small fractional addition to the overall site waste generation levels, or to any commercial TSD Site.

Once DOE leaves the site and building titles are transferred, responsibility for utilities and waste management will fall on the lease and/or title holder.

5.2.3 Geology

As discussed in Section 4.3.2, the construction of the USEC Gas Centrifuge R&D Project at the ETTP and the CTC Facility would have no impact on geological resources, and hazards posed by geological conditions are expected to be minor. Furthermore, soils would not be impacted by construction activities and would not adversely effect the safe operation of project activities. Since most of the activities, except for the concrete pads outside of the facility and relocation of three fire hydrants, installation of a short section of underground telecommunication lines, installation of a new security fence around the CTC Facility, would occur within the buildings, the potential for soil contamination from construction and activities under the Proposed Action would be minimal. Therefore, there would be no overall cumulative effect on the CTC Facility or ETTP's geology and soils from activities performed at the CTC Facility and the ETTP Facility.

5.2.4 Biological Resources

As discussed in Section 4.4, the USFWS has determined that the gray bat (*Myotis grisescens),* Indiana bat (*Myotis sodalis),* and the pink mucket (*Lampsilis abrupta*) have the potential to occur within the project impact areas. The USFWS has recommended that a biological assessment be submitted to determine if the proposed project may affect the species.

The facilities for the Proposed Action are located on grounds designated as industrial and have been previously disturbed. Therefore, no cumulative impacts are anticipated.

5.2.5 Cultural Resources

As discussed in Section 4.5, modification would primarily involve indoor renovation of facilities and would not involve any ground-disturbing activities in areas that have not been previously disturbed and/or surveyed. Therefore, there would be no overall cumulative effect on the CTC Facility or ETTP's cultural resources.

5.2.6 Water Resources

Potential cumulative impacts to the Clinch River and Poplar Creek include adverse effects to water quality from the discharge of treated wastewater during project construction and operation activities

at ETTP. Because of the absence of waterbodies or surface water in the area of the CTC Facility, no cumulative impacts to water resources are expected. Any potential of cumulative impacts to water quality would be avoided through the NPDES permitting process.

5.2.7 Land Use and Visual Resources

5.2.7.1 *Land Use*

It was determined in Section 4.7 that two of the four buildings at ETTP (K-1600 and K-1220) have been used for similar centrifuge operations in the past. Furthermore, the planned land uses at all four facilities and the CTC Facility are consistent with the industrial land use classification designated industrial. Therefore, there would be no overall cumulative effect on the CTC Facility or ETTP's current land use or future land use initiatives from activities performed under the Proposed Action.

5.2.7.2 *Visual Resources*

As discussed in Section 4.7, minor structural modifications would be made to the CTC Facility and Building K-1600 and would be limited to the interior of the building. Activities outside of the building would be limited to the concrete pads, relocation of three fire hydrants, installation of a short section of underground telecommunication lines and a new security fence at the CTC Facility. Short-term and minor visual disruption during construction would result from the use of small and limited excavation equipment outside of the building. The addition of a security fence to the exterior of the CTC Facility is the only planned major outdoor activity. Activities at ETTP would continue to be consistent with the VRM Class IV determination (Section 3.7) and the surrounding VRM Class II and III areas would not be affected. There would be minimal, if any, modifications made to the interiors of Buildings K-1220, K-1037, and K-101. Overall, activities under the Proposed Action would not have an overall cumulative effect on the CTC Facility or ETTP's visual quality.

5.2.8 Socioeconomics

There would be no cumulative impact on the socioeconomic ROI. There are no projects planned in the foreseeable future that would increase employment beyond the existing labor force.

5.2.9 Infrastructure

As discussed in Section 4.9, operation of the USEC Gas Centrifuge R&D Project at the CTC Facility and the ETTP would result in a gradual increase in utilities over the 6-year period. Increases to utility usage for the CTC Facility and Building K-1600 would occur from current usage rates compared to the City of Oak Ridge, mainly because the facility is currently not in use. Overall impacts to utilities would be minimal.

As a result of the ACP, once DOE leaves the ETTP site, utilities will be the responsibility of USEC.

5.2.10 Environmental Design

Environmental Design requires that all activities are designed and implemented to be compliant with the present laws and regulations concerning environmental, health and safety requirements. In addition, considerations for waste minimization and the radiological policy of ALARA will be implemented as part of the Environmental Design. This overall design commitment would work toward minimizing the already small impact of all aspects of this alternative on the CTC Facility and the ETTP site.

5.2.11 Human Health

The cumulative impact of chemical releases from the Proposed Action on public health are also considered to be negligible. The chemicals utilized in the Proposed Action (acetone, ethanol, Freon 134, and NMP) would only be used at ETTP and not known chemicals of concern found in the environmental media at ETTP. No radiological chemicals or materials would be used at the CTC Facility, therefore, no impact to the public is anticipated.

5.2.12 Environmental Justice

There would be no cumulative impact to environmental justice. There are no impacts that would cause a disproportionately high and adverse impact to low-income or minority populations.

5.2.13 Transportation

As discussed in Section 4.13, traffic between the CTC Facility and ETTP would increase as a result of transport of components to Building K-1600. Different chemicals and materials would also be transported to the CTC Facility during modification and manufacturing phases of the project. Transportation of materials between the CTC Facility and ETTP would cause an increase in traffic on State Routes 58, 95 and 62. This impact is expected to be minimal as materials would only be transported approximately once a week by a standard size tractor-trailer and several times a week using smaller vehicles.

5.3 ETTP

Under the Proposed Action, with exception of the construction of small concrete pads for a small cooling tower, an emergency generator, a small enclosure for an oil heating unit, and a refrigeration unit, all of the activities would occur within the four buildings (K-1660, K-1220, K-1037, K-101) and identified. As discussed in Chapter 4, the Proposed Action would not cause an appreciable increase or damage to any of the environmental resources. The following section indicates that future potentially adverse cumulative impacts contributed by the ETTP Proposed Action are also minimal.

5.3.1 Air Quality and Noise

5.3.1.1 *Air Quality*

The ORR is in an attainment area for NAAQS and the activities planned for the modification, manufacturing, and operation of the centrifuge system are not expected to create cumulative impacts for NAAQS criteria pollutants.

It is projected that none of the sources at Building K-1600 for the modification, manufacturing and operation of the centrifuge would result in a quantity of emission that would reach or exceed regulatory emission limits. Appropriate air permits or exemptions or letters to file would be obtained prior to operations (USEC 2000c). The activities in modification, manufacturing and operation phases of the centrifuge system at Building K-1600 are not expected to contribute to the cumulative impact to the radiological air quality of the ORR.

5.3.1.2 *Noise*

There would be elevated noise levels within Building K-1600 created by the centrifuge machine when being operated at normal operating speed. Appropriate hearing protection measures would be incorporated to protect personnel within the elevated noise areas.

The operation of the centrifuge system is not expected to increase the noise levels within the ETTP. Noise associated with the modification and manufacturing phases would also be temporary. Therefore, the noise levels are not expected to contribute to the cumulative impact.

5.3.2 Process, Materials, and Waste Management

5.3.2.1 *Process*

The activities defined for the three stages of this project: Facility Modification, Manufacturing, and Test Operations would not have a major impact in the overall plant activity. The requirements for utilities would not provide a major burden to the ETTP utilities. Some of the ETTP utility infrastructure is being removed as part of other projects in the area of Building K-1600. The utility requirements for this project that are not available from ETTP would be met with small facility units. These units would not add a significant addition to utility needs from ETTP. The activities during the three phases are not expected to impact any plant or leasee activities in the area of Building K-1600 or the other buildings that may be used in this project.

Once DOE leaves the site and building titles are transferred, responsibility for utilities and waste management would fall on the lease and/or title holder.

5.3.2.2 *Materials*

As discussed in Section 4.2, the amount of materials to be used or stored onsite for the duration of this project are so minor that the overall cumulative effect for the ETTP is minimal.

5.3.2.3 *Waste Management*

As previously discussed in Chapter 4, the amount of wastes estimated to be generated over the life of this project is minor compared to the overall wastes being generated by ETTP as a whole. The expected waste generation levels would be submitted to DOE as part of the overall waste forecast for the ETTP Site. However, the amount of waste generated from this project is expected to be a small fractional addition to the overall site waste generation levels.

Once DOE leaves the site and building titles are transferred, responsibility for utilities and waste management would fall on the lease and/or title holder.

5.3.3 Geology

As discussed in Section 4.3, the construction of the USEC Gas Centrifuge R&D Project would have no impact on geological resources, and hazards posed by geological conditions are expected to be minor. Furthermore, soils would not be impacted by construction activities under the Proposed Action and would not adversely effect the safe operation of project activities. Since most of the activities, except for the concrete pads outside of the facility, would occur within the buildings, the potential for soil contamination from construction and activities under the Proposed Action would be minimal. Therefore, there would be no overall cumulative effect on ETTP's geology and soils from activities performed under the Proposed Action.

5.3.4 Biological Resources

As discussed in Section 4.4, the USFWS has determined that the gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), and the pink mucket (*Lampsilis abrupta*) have the potential to occur within the project impact areas. As a result of the BA submitted to USFWS, they have concluded in a letter dated October 16, 2002, that the proposed action is not likely to adversely affect the above mentioned species. Consultation letters and the BA submitted to USFWS are included in Appendix B.

5.3.5 Cultural Resources

As discussed in Section 4.5, modifications would primarily involve indoor renovation of facilities, and would not involve any ground disturbing activities in areas that have not been previously disturbed and/or surveyed and found to contain no cultural or archaeological resources. Therefore, there would be no overall cumulative effect on ETTP's cultural resources from activities performed under the Proposed Action.

5.3.6 Water Resources

The ROI for the cumulative impact analysis is the local groundwater basin underlying the proposed project site and the surface water in the project site area, which includes Clinch River and Poplar Creek. The project is not expected to utilize groundwater and would have pollution prevention plans and structures in place; therefore, there would be no cumulative impacts to groundwater.

Potential cumulative impacts to the Clinch River and Poplar Creek include adverse effects to water quality from the discharge of treated wastewater during project construction and operation activities. The potential of cumulative impacts to water quality would be avoided through the NPDES permitting process.

In addition, the proposed quantity of water to be withdrawn from the Clinch River is relatively small compared to current water usage at ETTP. Therefore, there would be no cumulative impacts to water resources from USEC Gas Centrifuge R&D Project activities.

5.3.7 Land Use and Visual Resources

5.3.7.1 *Land Use Resources*

It was determined in Section 4.7 that two of the four buildings (K-1600 and K-1220) have been used for similar centrifuge operations in the past. Furthermore, the planned land uses at all four facilities are consistent with the industrial land use classification designated for future use at ETTP as well as the current use of the surrounding facilities at the site. Therefore, there would be no overall cumulative effect on ETTP's current land use or future land use initiatives from activities performed under the Proposed Action.

5.3.7.2 *Visual Resources*

As discussed in Section 4.7, minor structural modifications would be made to Building K-1600 and would be limited to the interior of the building. Activities outside of the building would be limited to the concrete pads holding a small cooling tower, a refrigeration unit, a small enclosure for an oil heating unit, and emergency generator which would be left for additional uses by the facility. Short-term and minor visual disruption during construction would result from the use of small and limited excavation equipment outside of the building. There would be no modifications to the outside of the building. Activities at ETTP would continue to be consistent with the VRM Class IV determination (Section 3.7) and the surrounding VRM Class II and III areas would not be affected. There would be minimal, if any, modifications made to the interiors of Buildings K-1220, K-1037, and K-101. Overall, activities under the Proposed Action would not have an overall cumulative effect on ETTP's visual quality.

5.3.8 Socioeconomics

There would be no cumulative impact on the socioeconomic ROI. There are no projects planned in the foreseeable future that would increase employment beyond the existing labor force.

5.3.9 Infrastructure

As discussed in Section 4.9, operation of the USEC Gas Centrifuge R&D Project at the ETTP would result in a gradual increase at the site of up to 35.1 MWh/yr over the 6-year operating period. This represents a 0.04 percent increase in the total amount of electricity used at the ETTP Site. However, compared to ORR's total usage of 726,000 MWh/yr (DOE 1996a), the project represents less than a 0.005 percent increase for the reservation. Similarly, during the project, water usage and sewage amounts at ETTP would add to current ETTP usage by 1.0 percent.

5.3.10 Environmental Design

Environmental Design requires that all activities are designed and implemented to be compliant with the present laws and regulations concerning environmental, health and safety requirements. In addition, considerations for waste minimization and the radiological policy of ALARA would be

implemented as part of the Environmental Design. This overall design commitment would work toward minimizing the already small impact of all aspects of this project on the ETTP Site.

5.3.11 Human Health

The cumulative impact of chemical releases from the Proposed Action on public health are also considered to be negligible. The chemicals utilized in the Proposed Action (acetone, ethanol, Freon 134, and NMP) are not known chemicals of concern found in the environmental media at ETTP or the CTC Facility. Therefore, no impact to the public is anticipated.

Cumulative impacts to workers for both exposure to radionuclides, specifically uranium, and volatile organic chemicals are also anticipated to be negligible. The combinations of emissions from the Proposed Action would not be allowed to exceed permissible limits that are intended to protect human health and the environment.

The calculated collective EDE to the entire population within 80 km (50 mi) of the ORR was about 19 person-rem. The contribution of the ETTP emissions to the collective EDE to the population residing within this area was calculated to be about 7.2 person-rem, which is approximately 38 percent of the collective EDE for the ORR. There are no project emissions from the Proposed Action that would result in an increase in this collective dose.

5.3.12 Environmental Justice

There would be no cumulative impact to environmental justice. There are no impacts that would cause a disproportionately high and adverse impact to low-income or minority populations.

5.3.13 Transportation

Different chemicals and materials used for the manufacture of the centrifuge machines would be transported to Building K-1600 at ETTP. The quantities of chemicals and materials transported are small and would be shipped to ETTP as a part of a routine shipment. The shipping of chemicals and materials would meet the DOT Hazardous Materials Regulations (Title 49, CFR, Parts 171-180) governing packaging and shipping of hazardous materials. In addition, centrifuge components would also be transported to the site of the USEC Lead Cascade in either Portsmouth, Ohio, or

Paducah, Kentucky. These activities are not expected to create cumulative impacts. Table 4.13-3 summarizes the total collective radiological risks associated with the UF_6 cylinder transportation from Paducah or Portsmouth to Oak Ridge.

CHAPTER 6: *NATIONAL ENVIRONMENTAL POLICY ACT* COMPLIANCE AND RELATED DOCUMENTS

6.1 LAWS AND REGULATIONS AND *NATIONAL ENVIRONMENTAL POLICY ACT* REVIEWS

This EA has been prepared in accordance with Section 102(2)c of NEPA of 1969, as amended in the United States Code (42 U.S.C. 4321 et seq.), and regulations promulgated by CEQ within the *Code of Federal Regulations* (40 CFR 1500-1508) and DOE (10 CFR 1021), and follows DOE guidance (DOE 1998). Under NEPA, Federal agencies, such as DOE, proposing major actions that could significantly affect the quality of the human environment are, at a minimum, required to prepare an EA to ensure that the environmental consequences of the proposed action and its alternatives are thoroughly analyzed before decisions to take an action are made.

6.2 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT WITH OTHER NATIONAL ENVIRONMENTAL POLICY REVIEWS

DOE has prepared or is currently preparing other programmatic, project-specific, and site-wide NEPA documents that have influenced or relate to this EA. These documents are discussed below.

***Storage and Disposition of Weapons-Usable Fissile Materials, Final Programmatic Environmental Impact Statement* (DOE/EIS-0229, DOE 1996b).** A ROD was issued on January 14, 1997 (62 FR 3014). In the ROD, DOE decided that Oak Ridge would continue to store nonsurplus HEU (long-term) and surplus HEU (on an interim basis) in upgraded facilities pending disposition.

***Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240).** A ROD was issued on August 5, 1996 (61 FR 40619). Oak Ridge (Y-12 National Security Complex) is one of four domestic sites selected to potentially down-blend weapons-usable surplus HEU to nonweapons-usable low enriched uranium for use as commercial reactor fuel or as a LLW.

***Draft Site-Wide Environmental Impact Statement for the Oak Ridge Y-12 Plant* (DOE/EIS-0309).** The Y-12 SWEIS tiers off of the Storage and Disposition (S&D) PEIS and analyzes alternatives for implementing the decision reached in the S&D PEIS ROD. The ROD decision forms the basis for continuing the HEU Storage Mission at Y-12 and the proposal to construct and operate a new HEU Materials Facility at Y-12. Capabilities exist at Y-12 to perform only small-scale (kg/year) HEU blending operations. The small-scale (kg/year) down-blending of HEU is included in the Y-12 No Action - Planning Basis Operations Alternative. The large-scale (tons/year) down-blending operations cannot be performed at Y-12 without major building and process upgrades or new construction. No projects have been proposed to increase the capacities at Y-12 at this time. Impacts of upgrades or construction will be analyzed when those projects are identified.

***Long-Term Management and Use of Depleted Uranium Hexafluoride Programmatic Environmental Impact Statement* (DOE/EIS-0269).** The Final PEIS was issued in April 1999 and the ROD on August 2, 1999 (64 FR 43358). The ETTP currently manages and stores this material pending transfer to another DOE Site.

***Lease of Land and Facilities Within the East Tennessee Technology Park Environmental Assessment* (DOE/EA-1175, ORO 1997).** A "finding of no significant impact" (FONSI) was issued on December 1, 1997. The EA evaluated impacts of alternatives on future use and/or disposition of surplus facilities at the ETTP on the ORR, and allowed for the lease of some facilities and land to commercial entities.

***Environmental Assessment and FONSI of Parcel ED-1 of the Oak Ridge Reservation by the East Tennessee Economic Council* (EA-1113).** The Final EA/FONSI was issued in April, 1996. DOE determined that this leasing the ED-1 parcel to the ETEC is not a major Federal action that would significantly affect the quality of the human environment. The ETEC plans to develop an industrial park on the leased site (ED-1) which is located on the ETTP and covers 387 ha (957 acres) of land. Plans are to create approximately 1,500 jobs over the next 10 years and to develop a total of approximately 202 ha (500 acres).

***Environmental Assessment for the U.S. Department of Energy, Oak Ridge Operations, Receipt and Storage of Uranium Materials for the Fernald Environmental Management Project Site* (DOE/EA-1299).** The Final EA/FONSI was issued on April 13, 1999. Y-12 and the ETTP are available sites for storage of materials being removed in the cleanup effort at the Fernald Site in Ohio.

CHAPTER 7: STATUTES, REGULATIONS, CONSULTATIONS, AND OTHER REQUIREMENTS

This chapter provides information concerning the environmental standards that regulate or guide proposed plans for the Gas Centrifuge R&D Project at the ETTP and the proposed CTC Facility. This section presents primary environmental compliance requirements that would result from implementation of the proposed action. These requirements are found in Federal and state statutes, regulations, permits, approvals, and consultations and in Executive and DOE Orders, consent orders, *Federal Facility Compliance Act* or agreement (FFCAs), and a FFA. These citations identify the standards to be used for evaluating the ability of the alternative actions to meet the environmental, safety, and health requirements and for obtaining required Federal and state permits and licenses.

The ETTP (formerly known as the Oak Ridge Gaseous Diffusion Plant) was constructed during the 1940s when national security requirements were the dominant considerations for facilities design and operation. In the interim, emphasis on operational safety, worker health and safety, and public and environmental health and safety has resulted in DOE shifting resources to achieve compliance with all applicable requirements. Today, both Federal and state agencies have several types of regulatory authority over the ETTP operations because of compliance agreements between DOE and regulators. These agreements detail schedules for achieving compliance with applicable environmental, health, and safety requirements.

At the ETTP the application of evolving requirements to facilities that are more than 40-years old makes achieving or maintaining compliance an expensive challenge. However, all facilities at the ETTP, whether they are newly constructed or existing, must comply with the increasing number and complexity of regulations. Any action to continue operations or to change operations at the ETTP must comply with the applicable environmental, safety, and health regulations.

Rules and regulations of DOE, Federal, and state agencies include Federal and state environmental, safety, and health regulating agencies in which DOE must cooperate in operation of the ETTP facilities, regulatory requirements employed by DOE and the cooperating regulators to help guide decisions and determine regulatory compliance for continued operation as well as for the EA

proposed action, and regulations requiring DOE consultations with other agencies that may also be required to be completed as part of this EA.

7.1 REGULATORY FRAMEWORK

Federal and state governments mandate environmental, safety, and health requirements for operations at the ETTP through the U.S. Congress, Federal agencies, Executive Orders, the Tennessee State Legislature, and state agencies. Federal statutes establish national programs and policies, create broad legal requirements, and authorize Federal agencies to promulgate regulations that conform to the statutes. Detailed implementation of these statutes is delegated to various Federal agencies including DOE, EPA, DOT, and the U.S. Department of Labor. Executive Orders are issued by the President and establish policies and requirements for Federal Executive Branch agencies, but do not have the force of law or regulation. Many programs under the jurisdiction of the EPA, such as permitting and enforcement, go to state agencies with EPA retaining oversight of the delegated program.

State legislatures issue their own statutes to authorize and mandate promulgation of state regulations. State statutes, like Federal statutes, establish broad legal requirements. State regulations, developed by state agencies, then promulgate specific requirements to enforce state statutes. In Tennessee, statutes passed by the Tennessee State Legislature are found in the Tennessee Codes Annotated. Most state regulations for environmental requirements are in chapter 1200 of the TDEC Rules (TDEC 1997).

7.2 STATUTES AND REGULATIONS

NEPA requires that before action is taken at the ETTP or the CTC Facility, the proposed action and alternative be evaluated for its environmental impact. Regulatory environmental protection requirements are designed to protect human health and the environment, including the air, water, and land. Identification of environmental protection statutes, regulations, and orders with requirements that would be triggered by the proposed action is one means for examining possible harm to the environment before making a decision to carry out this action. Principal requirements are identified by the applicable environmental statutes, regulations, and approval requirements. Compliance with these requirements would allow DOE to accomplish the action being considered to at least a

threshold level of safety. It does not evaluate the significance of the potential effects, but does provide a basis for relative comparison between the No Action and Proposed Action.

The *Atomic Energy Act* of 1954 (AEA) (42 U.S.C. §2011 *et seq*.) makes the Federal government responsible for regulatory control of production, possession, use, and disposal of source, special nuclear, and radioactive material. Included in this responsibility is authorization for DOE to establish standards that protect health and minimize danger to life or property from activities under DOE's jurisdiction. Because the proposed activity is a DOE activity performed under a CRADA with UT-Battelle, DOE would regulate this activity as it regulates other contractor activities. USEC would be required to comply with all applicable DOE ES&H requirements as set forth in an attachment to the Lease Agreement.

The *Federal Compliance with Pollution Control Standards*, Executive Order 12088, requires Federal agencies, including DOE, to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the CAA, *Noise Control Act, Clean Water Act* (CWA), *Safe Drinking Water Act* (SDWA), TSCA, and RCRA. The *General Environmental Protection Program*, DOE Order 5400.1, establishes the environmental protection program requirements, authorities, and responsibilities for DOE operations for ensuring compliance with applicable protection laws and regulations, executive orders, and internal DOE policies. It establishes formal recognition that DOE's environmental management activities are extensively, but not entirely, regulated by EPA and state and local environmental agencies, and it provides requirements for satisfying these externally imposed regulations.

7.2.1 Federal and State Environmental Statutes and Regulations

Applicable regulatory environmental laws and regulations can be categorized by environmental pathways: air, water, land (which includes waste management and pollution prevention), and the subsequent impact to worker safety and health, the public, and the natural environment.

DOE is committed to fully comply with all applicable environmental statutes, regulatory requirements, and Executive and internal orders.

7.2.2 Other Pertinent Laws and Requirements

DOE has entered into agreements with Federal and state regulatory agencies that have substantive provisions in effect for the ETTP. These agreements establish a schedule, the means, interim conditions or actions for achieving full compliance at the DOE facility.

7.3 CONSULTATION

Some environmental laws and Executive Orders are integrated into the NEPA process and establish guidelines for review. Pursuant to NEPA and DOE Regulations (10 CFR 1021), consultations are conducted with outside Federal and state agencies having jurisdiction or special expertise. Agencies involved include those responsible for protecting significant resources, such as, endangered species, critical habitats, or historic resources. Federal and state agencies with jurisdiction or expertise in these areas have been, and will be, consulted during the development of the Gas Centrifuge R&D EA. Copies of letters from DOE inviting the participation of consulting agencies and response letters received by DOE are included in Appendix B.

CHAPTER 8: LIST OF AGENCIES AND PERSONS CONTACTED

This chapter includes a list of agencies and persons contacted by DOE regarding the USEC Gas Centrifuge R&D Project.

Mr. Bruce Anderson,
Tennessee Wildlife Resources Agency

Dr. Andrew Barass,
Tennessee Department of Environmental Conservation, Natural Heritage

Mr. Joseph Garrison,
Tennessee Historical Commission, Department of Environmental Conservation

Mr. Robert M. Hatcher,
Tennessee Wildlife Resources Agency

Mr. Reginald G. Reeves,
State of Tennessee, Division of Natural Heritage

Dr. Lee A. Barclay, PhD
U.S. Fish and Wildlife Service

CHAPTER 9: REFERENCES

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CHAPTER 10: GLOSSARY

Absorbed dose: The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. Expressed in units of radiation absorbed dose or grays, where one radiation absorbed dose equals 0.01 gray. Also, see "radiation absorbed dose."

Acute exposure: The exposure incurred during and shortly after a radiological release. Generally, the period of acute exposure ends when long-term interdiction is established, as necessary. For convenience, the period of acute exposure is normally assumed to end 1 week after the inception of a radiological accident.

Air Quality Control Region (AQCR): Geographic subdivisions of the United States, designed to deal with pollution on a regional or local level. Some regions span more than one state.

Alpha activity: The emission of alpha particles by fissionable materials (uranium or plutonium).

Alpha particle: A positively charged particle, consisting of two protons and two neutrons, that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three common types of radiation (alpha, beta, and gamma).

Aquifer: A saturated geologic unit through which significant quantities of water can migrate under natural hydraulic gradients.

As low as reasonably achievable (ALARA): A concept applied to the quantity of radioactivity released in routine operation of a nuclear system or facility, including "anticipated operational occurrences." It takes into account the state of technology, economics of improvements in relation to benefits to public health and safety, and other societal and economic considerations in relation to the use of nuclear energy in the public interest.

Atmospheric dispersion: The process of air pollutants being dispersed in the atmosphere. This occurs by the wind that carries the pollutants away from their source and by turbulent air motion that results from solar heating of the Earth's surface and air movement over rough terrain and surfaces.

Background radiation: Ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location. Also, see "natural radiation."

Badged worker: A worker equipped with an individual dosimeter who has the potential to be exposed to radiation.

BEIR V: Biological Effects of Ionizing Radiation; referring to the fifth in a series of committee reports from the National Research Council.

Benthic: Plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

Best Available Control Technology: A term used in the Federal *Clean Air Act* that means the most stringent level of air pollutant control considering economics for a specific type of source based on demonstrated technology.

Beta particle: A charged particle emitted from the nucleus of an atom during radioactive decay. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron.

Beyond Evaluation Basis Accident: An accident, generally with more severe impacts to on-site personnel and the public than a Evaluation Basis Accident or Design Basis Accident (DBA), initiated by operational or external causes with an estimated probability of occurrence less than 10^{-6} per year and used for estimating the impacts of a planned new or modified facility and/or process. For those cases where a DBA is defined, these accidents are often referred to as Beyond Design Basis Accidents or Severe Accidents.

Cask (radioactive materials): A container that meets all applicable regulatory requirements for shipping spent nuclear fuel or high-level waste.

Category I, II, III, IV: Designated categories of nuclear material used in the implementation of Department of Energy's graded safeguards program. The material category of a Special Nuclear Materials location (e.g., material balance area, material access area, protested area, facility) is used

to determine and establish the required protection level. Determination of category involves grouping materials by Special Nuclear Material type, attractiveness level, and quantity. Material quantities are element weights for plutonium and ^{233}U and isotope weights for ^{235}U. The table shows category levels for ^{235}U and attractiveness level.

	Attractiveness Level	Contained U-235 Category (quantities in kgs)			
		I	II	III	IV[a]
WEAPONS Assembled weapons and test devices	**A**	**All**	**N/A**	**N/A**	**N/A**
PURE PRODUCTS Pits, major components, button ingots, recastable metal, directly convertible materials	**B**	**≥5**	**≥1<5**	**≥0.4<1**	**<0.4**
HIGH-GRADE MATERIALS	**C**	**≥20**	**≥6<20**	**≥2<6**	**<2**
LOW-GRADE MATERIALS	**D**	**N/A**	**≥50**	**≥8<50**	**<8**

[a] The lower limit for Category IV is equal to reportable quantities.

Chemical oxygen demand: A measure of the quantity of chemically oxidizable components present in water.

Collective committed effective dose equivalent (CEDE): The CEDE of radiation for a population.

Committed dose equivalent: The predicted total dose equivalent to a tissue or organ over a 50-year period after an intake of radionuclide into the body. It does not include external dose contributions. Committed dose equivalent is expressed in units of rem or Sievert. The committed effective dose equivalent is the sum of the committed dose equivalents to various tissues of the body, each multiplied by the appropriate weighting factor.

***Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (CERCLA or Superfund):** This act provides regulatory framework for remediation of past contamination from hazardous waste. If a site meets the act's requirements for designation, it is ranked along with other

"Superfund" sites and is listed on the National Priorities List. This ranking is the Environmental Protection Agency's way of determining which sites have the highest priority for cleanup.

Comprehensive Test Ban Treaty (CTBT): A proposed treaty prohibiting nuclear tests of all magnitudes.

Credible accident: An accident that has a probability of occurrence greater than or equal to one in a million years.

Criteria pollutants: Six air pollutants for which national ambient air quality standards are established by the Environmental Protection Agency under Title I of the Federal *Clean Air Act*: sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, particulate matter (smaller than 10 microns in diameter), and lead.

Critical habitat: Defined in the *Endangered Species Act* of 1973 as "specific areas within the geographical area occupied by [an endangered or threatened] species..., essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species... that are essential for the conservation of the species."

Criticality: The condition in which nuclear fuel sustains a chain reaction. It occurs when the number of neutrons present in one generation cycle equals the number generated in the previous cycle.

Depleted uranium: Uranium whose content of the isotope uranium-235 is less than 0.7 percent, which is the uranium-235 content of naturally occurring uranium.

Disposition: The ultimate "fate" or end use of a surplus Department of Energy facility following the transfer of the facility to the Office of the Assistant Secretary for Environmental Waste Management.

Dose commitment: The dose an organ or tissue would receive during a specified period of time (e.g., 50 to 100 years) as a result of intake (as by ingestion or inhalation) of one or more radionuclides from a defined release, frequently over a year's time.

Dose equivalent: The product of absorbed dose in rad (or gray) and the effect of this type of radiation in tissue, and a quality factor. Dose equivalent is expressed in units of rem or Sievert, where 1 rem equals 0.01 Sievert. The dose equivalent to an organ, tissue, or the whole body will be that received from the direct exposure plus the 50-year committed dose equivalent received from the radionuclides taken into the body during the year.

Dosimeter: A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., TLD - thermoluminescent badge or ionization chamber).

Dual use/dual benefit: Projects that have uses in or benefits for the defense sector and the private industry or civilian sector.

Effective dose equivalent (EDE): The summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health effects risk of the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The EDE includes the CEDE from internal deposition of radionuclides, and the effective dose equivalent due to penetrating radiation from sources external to the body. EDE is expressed in units of rem (or Sievert).

Enduring stockpile: Weapons types expected to be retained in the smaller stockpile for the foreseeable future.

Environment, safety, and health (ES&H) program: In the context of the Department of Energy's Programs, encompasses those Department of Energy requirements, activities, and functions in the conduct of all Department of Energy and Department of Energy-controlled operations. These programs with respect to commercial programs, OSHA, EPA, and applicable consensus standards are concerned with: impacts to the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both operating personnel and the general public to acceptably low levels; and protecting property adequately against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, and process and facilities

safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

ES&H vulnerabilities: Conditions or weaknesses at facilities that could lead to unnecessary or increased exposure of workers or the public to radiation or to HEU associated chemical hazards, or to the release of radioactive materials to the environment.

Evaluation Basis Accident: An accident, generally with small impacts to the public, initiated by operational or external causes with an estimated probability of occurrence greater than 10^{-6} per year and used for estimating the impacts of a planned new or modified facility and/or process when a Safety Analysis Report, that would define a DBA, has not been prepared. A DBA is used to establish the performance requirements of structures, systems, and components that are necessary to maintain them in a safe shutdown condition indefinitely or to prevent or mitigate the consequences of the DBA so that the public and onsite personnel are not exposed to radiation in excess of appropriate guideline values.

Finding of No Significant Impact (FONSI): A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment and will not require an environmental impact statement.

Fissile material: Any material capable of supporting a self-sustaining neutron chain reaction to include uranium-233, enriched uranium, plutonium-239, plutonium-241, americium-242, curium-243, curium-245,-247, californium-249,-251.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas including at a minimum that area inundated by a 1-percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain.

Fugitive emissions: Emissions to the atmosphere from pumps, valves, flanges, seals, and other process points not vented through a stack. Also includes emissions from area sources such as ponds, lagoons, landfills, and piles of stored material.

Gamma rays: High-energy, short-wavelength, electromagnetic radiation accompanying fission and emitted from the nucleus of an atom. Gamma rays are very penetrating and can be stopped only by dense materials (such as lead) or a thick layer of shielding materials.

Gaussian plume: The distribution of material (a plume) in the atmosphere resulting from the release of pollutants from a stack or other source. The distribution of concentrations about the centerline of the plume, which is assumed to decrease as a function of its distance from the source and centerline (Gaussian distribution), depends on the mean wind speed and atmospheric stability.

Glove box: An airtight box used to work with hazardous material, vented to a closed filtering system, having gloves attached inside of the box to protect the worker.

Hazard chemical: Under 29 CFR 1910, Subpart Z, "hazardous chemicals" are defined as "any chemical which is a physical hazard or a health hazard." Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes or mucous membranes.

Hazard Index (HI): A summation of the hazard quotient for all chemicals now being used at a site and those proposed to be added to yield cumulative levels for a site. A HI value of 1.0 or less means that no adverse human health effects (non-cancer) are expected to occur.

Hazard quotient (HQ): The ratio of the estimated exposure (e.g., daily intake rate) to be expected to have no adverse effects. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens.

High-level waste: The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid. High-level waste contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Highly enriched uranium (HEU): Uranium in which the abundance of the isotope ^{235}U is increased well above normal (naturally occurring) levels.

Incident-free risk: The radiological or chemical impacts resulting from packages aboard vehicles in normal transport. This includes the radiation or hazardous chemical exposure of specific population groups such as crew, passengers, and bystanders.

Interim (permit) status: Period during which treatment, storage, and disposal facilities coming under the *Resource Conservation and Recovery Act* of 1980 are temporarily permitted to operate while awaiting denial or issuance of a permanent permit.

Ionizing radiation: Alpha particles, beta particles, gamma rays, x rays, neutrons, high speed electrons, high speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

Isotope: An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons and different atomic masses.

Lacustrine wetland: Lakes, ponds, and other enclosed open waters at least 8 ha (20 acres) in extent and not dominated by trees, shrubs, and emergent vegetation.

Large release: A release of radioactive material that would result in doses greater than 25 rem to the whole body or 300 rem to the thyroid at 1.6 km from the control perimeter (security fence) of a reactor facility.

Latent fatalities: Fatalities associated with acute and chronic environmental exposures to chemicals or radiation.

Low-level waste: Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or "11e(2) by-product material" as defined by DOE Order 5820.2A, *Radioactive Waste Management.* 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 waste is less than 100 nanocuries per

gram. Some low-level waste is considered classified because (1) the nature of the generating process and/or constituents, and (2) the waste would reveal too much about the generating process.

Maximum contaminant level: The maximum permissible level of a contaminant in water delivered to any user of a public water system. Maximum contaminant levels are enforceable standards.

Maximally exposed individual (MEI): A hypothetical person who could potentially receive the maximum dose of radiation or hazardous chemicals.

Mixed waste: Waste that contains both "hazardous waste" and "radioactive waste" as defined in this glossary.

National Ambient Air Quality Standards (NAAQS): Air quality standards established by the *Clean Air Act,* as amended. The primary NAAQS are intended to protect the public health with an adequate margin of safety, and the secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects of a pollutant.

National Emission Standards for Hazardous Air Pollutants (NESHAP): A set of NESHAP emitted from specific classes or categories of new and existing sources. These were implemented in the *Clean Air Act* Amendments of 1977.

***National Environmental Policy Act* of 1969 (NEPA):** This Act is the basic national charter for the protection of the environment. It requires the preparation of an environmental impact statement for every major Federal action that may significantly affect the quality of the human or natural environment. Its main purpose is to provide environmental information to decision makers and the public so that actions are based on an understanding of the potential environmental consequences of a proposed action and its reasonable alternatives.

National Pollutant Discharge Elimination System (NPDES): Federal permitting system required for hazardous effluents regulated through the *Clean Water Act,* as amended.

National Register of Historic Places (NRHP): A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act* of 1935 (16 U.S.C. 462) and Section 101(a)(1)(A) of the NHPA of 1966, as amended.

Nonattainment area: An air quality control region (or portion thereof) in which the Environmental Protection Agency has determined that ambient air concentrations exceed NAAQS for one or more criteria pollutants.

Nuclear grade: Material of a quality adequate for use in a nuclear application.

Nuclear Weapons Complex: The sites supporting the research, development, design, manufacture, testing, assessment, certification and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

Off-site: As used in this EIS, the term denotes a location, facility, or activity occurring outside the boundary of the entire Oak Ridge Reservation site.

On-site: As used in this EIS, the term denotes a location or activity occurring somewhere within the boundary of the Oak Ridge Reservation.

On-site population: Department of Energy and contractor employees who are on duty, and badged on-site visitors.

Operable unit: A discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration or eliminates or mitigates a release, threat of release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units.

Outfall: The discharge point of a drain, sewer, or pipe as it empties into a body of water.

Ozone: The triatomic form of oxygen; in the stratosphere, ozone protects the Earth from the sun's ultraviolet rays, but in lower levels of the atmosphere ozone is considered an air pollutant.

Packaging: The assembly of components necessary to ensure compliance with Federal regulations. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated as part of the packaging.

Palustrine wetland: Nontidal wetlands dominated by trees, shrubs, and emergent vegetation.
Perched groundwater: A body of groundwater of small lateral dimensions lying above a more extensive aquifer.

Performance Categories (PC): Defined in DOE O 420.1, performance categories classify the performance goals of a facility in terms of facility's structural ability to withstand natural phenomena hazards (i.e., earthquakes, winds, and floods). Ranging from 0 to 4, each PC has a qualitative and quantitative description of the performance goal for its category. Both the qualitative description of acceptable performance and the quantitative probability for each PC are equally significant in establishing the design and evaluation criteria. In general, facilities that are classified as (1) PC 0 do not consider safety, mission, or cost considerations, (2) PC 1 must maintain occupant safety, (3) PC 2 must maintain occupant safety and continued operations with minimum interruption, (4) PC 3 must maintain occupant safety, continued operations, and hazard materials confinement, and (5) PC 4 must meet occupant safety, continued operations, and confidence of hazard confinement**.**

Person-rem: The unit of collective radiation dose commitment to a given population; the sum of the individual doses received by a population segment.

Plume: The elongated pattern of contaminated air or water originating at a point source, such as a smokestack or a hazardous waste disposal site.

Prevention of Significant Deterioration: Regulations established by the 1977 *Clean Air Act* Amendments to limit increases in criteria air pollutant concentrations above baseline.

Prime farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor without intolerable soil erosion, as determined by the Secretary of Agriculture (*Farmland Protection Policy Act* of 1981, 7 CFR 7, paragraph 658).

Probable maximum flood: Flood levels predicted for a scenario having hydrological conditions that maximize the flow of surface waters.

Protected area: An area encompassed by physical barriers, subject to access controls, surrounding material access areas, and meeting the standards of DOE Order 5632.1C, *Protection and Control of Safeguards and Security Interests.*

Quality factor: The principal modifying factor that is employed to derive dose equivalent from absorbed dose.

Radiation: The particles or electromagnetic energy emitted from the nuclei of radioactive atoms. Some elements are naturally radioactive; others are induced to become radioactive by bombardment in a reactor. Naturally occurring radiation is indistinguishable from induced radiation.

Radiation absorbed dose (Rad): The basic unit of absorbed dose equal to the absorption of 0.01 joule per kilogram of absorbing material.

Radioactive waste: Materials from nuclear operations that are radioactive or are contaminated with radioactive materials, and for which use, reuse, or recovery are impractical.

Radioactivity: The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

Radioisotopes: Radioactive nuclides of the same element (same number of protons in their nuclei) that differ in the number of neutrons.

Radionuclide: A radioactive element characterized according to its atomic mass and atomic number which can be man-made or naturally occurring. Radionuclides can have a long life as soil or water pollutants, and are believed to have potentially mutagenic or carcinogenic effects on the human body.

RADTRAN: A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

Reasonably Available Control Technology: The lowest emissions limit that a particular source is capable of meeting by the application of control technology that is reasonably available as well as technologically and economically feasible.

Record of Decision (ROD): A document prepared in accordance with the requirements of 40 CFR 1505.2 that provides a concise public record of Department of Energy's decision on a proposed action for which an EIS was prepared. A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced by Department of Energy in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Replacement Secondary Fabrication: This function includes the fabrication, surveillance, and storage of the secondary uranium and lithium portion of a nuclear weapon.

***Resource Conservation and Recovery Act* (RCRA), as amended:** This Act provides "cradle to grave" regulatory program for hazardous waste which established, among other things, a system for managing hazardous waste from its generation until its ultimate disposal.

Riparian wetlands: Wetlands on or around rivers and streams.

Risk assessment (chemical or radiological): The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

Roentgen: A unit of exposure to ionizing X- or gamma radiation equal to or producing 1 electrostatic unit of charge per cubic centimeter of air. It is approximately equal to 1 rad.

Roentgen equivalent man (REM): The unit of radiation dose for biological absorption equal to the product of the absorbed dose, in rads, a quality factor which accounts for the variation in biological effectiveness of different types of radiation. Also known as "rem".

***Safe Drinking Water Act*, as amended:** This Act protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

Safe secure trailer (SST): A specially designed semitrailer, pulled by an armored tractor, which is used for the safe, secure transportation of cargo containing nuclear weapons or special nuclear material.

Safety Analysis Report: A safety document providing a concise but complete description and safety evaluation of a site, design, normal and emergency operation, potential accidents, predicted consequences of such accidents, and the means proposed to prevent such accidents or mitigate their consequences. A safety analysis report is designated as final when it is based on final design information. Otherwise, it is designated as preliminary.

Severe accident: An accident with a frequency rate of less than 10^{-6} per year that would have more severe consequences than a design-basis accident, in terms of damage to the facility, offsite consequences, or both.

Short-lived nuclides: Radioactive isotopes with half-lives no greater than about 30 years (e.g., cesium^{137} and strontium^{90}).

Shrink-swell potential: Refers to the potential for soils to contract while drying and expand after wetting.

Source term: The estimated quantities of radionuclides or chemical pollutants released to the environment.

Special nuclear materials (SNM): As defined in Section 11 of the *Atomic Energy Act* of 1954, special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Nuclear Regulatory Commission determines to be special nuclear material, or (2) any material artificially enriched by any of the foregoing.

Standardization (Epidemiology): Techniques used to control the effects of differences (e.g., age) between populations when comparing disease experience. The two main methods are:

- Direct method, in which specific disease rates in the study population are averaged, using as weights the distribution of the comparison population.

- Indirect method, in which the specific disease rates in the comparison population are averaged, using as weights the distribution of the study population.

Strategic Arms Reduction Talks (START) I and II: Terms which refer to negotiations between the U.S. and Russia (the former Soviet Union during START I negotiations) aimed at limiting and reducing nuclear arms. START I discussions began in 1982 and eventually led to a ratified treaty in 1988. The START II protocol, which has not been fully ratified, will attempt to further reduce the acceptable levels of nuclear weapons ratified in START I.

Strategic reserve: That quantity of plutonium and highly enriched uranium reserved for future weapons use. For the purposes of this SWEIS, strategic reserves of plutonium will be in the form of pits, and strategic reserves of highly enriched uranium will be in the form of canned secondary assemblies. Strategic reserves also include limited quantities of plutonium and highly enriched uranium metal maintained as working inventory at Department of Energy laboratories.

Superfund Amendments and Reauthorization Act **(SARA) of 1986:** Public Law 99-499 passed in 1986 which amends the CERCLA of 1980. SARA more stringently defines hazardous waste cleanup standards and emphasizes remedies that permanently and significantly reduce the mobility, toxicity, or volume of wastes. Title III of SARA, the Emergency Planning and Community Right-to-Know Act, mandates establishment of community emergency planning programs, emergency notification, reporting of chemicals, and emission inventories.

Threshold limit values: The recommended concentrations of contaminants workers may be exposed to according to the American Council of Governmental Industrial Hygienists.

Toxic Substances Control Act **of 1976 (TSCA):** This act authorizes the Environmental Protection Agency to secure information on all new and existing chemical substances and to control any of these substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the Environmental Protection Agency before they are manufactured for commercial purposes.

Transuranic waste: Waste contaminated with alpha-emitting radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries/gram at time of assay.

Unclassified Controlled Nuclear Information (UCNI): Certain unclassified but sensitive Government information concerning nuclear material, weapons, and components whose dissemination is controlled under section 148 of the *Atomic Energy Act*.

Unusual occurrence: Any unusual or unplanned event that adversely affects or potentially affects the performance, reliability, or safety of a facility.

Visual Resource Management (VRM) Class: A class defines the different degrees of modification allowed to the basic elements of landscape. They are Class 1, wilderness areas, wild and scenic rivers, and other similar situations; Class 2, contrasts are seen but do not attract attention; Class 3, contrasts caused by a cultural activity are evident, but remain subordinate to the existing landscape; Class 4, contrasts that attract attention and are dominant features of the landscape in terms of scale, but repeat the contrast of the characteristic landscape; Class 5, applied to areas where unacceptable cultural modification has lowered scenic quality (where natural character of the landscape has been distributed to a point where rehabilitation is needed to bring it up to one of the four other classifications).

Volatile organic compound: A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol.

War Reserve: Operational weapons and materials designated as essential for national security needs.

Waste Isolation Pilot Plant (WIPP): A facility in southeastern New Mexico developed as the disposal site for transuranic waste.

Weapon secondary: Provides additional explosive energy release; composed of lithium deuteride and other materials. As the secondary implodes, the lithium in the isotope form lithium-6 is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

Weapons-grade: Fissionable material in which the abundance of fissionable isotopes is high enough that the material is suitable for use in thermonuclear weapons.

Weighting factor: Represents the fraction of the total health risk resulting from uniform whole-body irradiation that could be contributed to that particular tissue.

Whole-body dose: Dose resulting from the uniform exposure of all organs and tissues in a human body. (Also, see "effective dose equivalent.")

Worker year: Measurement of labor requirement equal to 1 full-time worker employed for 1 year.

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APPENDIX A

UNCLASSIFIED: CENTRIFUGE DEMONSTRATION PROJECT ONLY

Projected Air Emission Points from K-1600

(10-26-00)

Air emission points will be defined as being from an AEXX or AFYY point or source. AE means that the emission is from an exhaust point and AF means that the emission is fugitive or generated in an open area with no specific mechanism to remove it from the building.

Machine Test Area:

Emission Point AE1: This emission point consists of the primary vacuum pump exhaust line, a ~8" diameter line exiting the west wall ~9" from floor level. It is noted that all vacuum pumps have an alumina trap just prior to the pump inlet to trap radionuclide material and have an oil demister/filter unit at the pump discharge to trap and retain oil in the pump. The first time that the systems are evacuated, they will have ambient air in them and this will be the gas that is exhausted. After the initial evacuation, the system is backfilled with dry nitrogen. Therefore, subsequent evacuations will consist of essentially all nitrogen gas.

There are 21 vacuum pumps connected to his line and will probably be 2 more later (withdrawal pumps) for a total of 23 vacuum pumps

- 6 Welch 1398 pumps on the G-stands, which would run for ~ 10 days at a time on 12 occasions annually beginning in FY2002 continuing into FY2005; either 2, 4, or 6 pumps would run at one time; each pump has an initial flowrate of 53.1 cfm which would diminish to 0.0 cfm in about 2-3 hours when the minimum pressure is achieved; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; the G-stands would contain UF6 material but there are no projections for radionuclides being in the vacuum exhaust system,

- 4 Welch 1398 pumps on the M-stands, which would run for ~ 4 days at a time on 20-30 occasions total beginning in FY2002 into FY2005; either 2 or 4 would run at one time; each pump has an initial flowrate of 53.1 cfm which would diminish to 0.0 cfm in about 2-3 hours when the minimum pressure is achieved; each stand in use could be evacuated as many as 5-10 times per session; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; these stands do not contain radioactive materials,

- 3 Welch 1397 pumps which are used to evacuate the process lines to the G and M stands; normally, all 3 pumps would be running at the same time; the pumps would be running for ~15 days on 20-30 occasions total beginning in FY2002 into FY2005; each pump has an initial flowrate of 17.7 cfm which would diminish to 0.0 cfm in about 2-3 hours when the minimum pressure is achieved; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; the G stands contain radiological materials but there are no projections for radionuclides being in the exhaust

  system; as feed material is ejected into the systems, "light" gases (air, water, nitrogen) are vented from the gas-containing systems through this vacuum system,

- 3 Stokes M900-212-62 vacuum pumps which are used as roughing pumps for the M and G stands; normally, all 3 pumps would be running at the same time; the pumps would be running for ~15 days on 20-30 occasions total beginning in FY2002 into FY2005; each pump has an initial flowrate of 240 cfm which would diminish to 0.0 cfm in about 2-3 hours when the minimum pressure is achieved; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; the G stands contain radiological materials but there are no projections for radionuclides being in the exhaust system

- 2 new Welch 1398 pumps which would be used to evacuate the lines to the withdrawal cylinders; normally, both pumps would be running at the same time; these pumps would run for ~4 hours on 20 occasions total beginning in FY2002 into FY2005; each pump has an initial flowrate of 53.1 cfm which would diminish to 0.0 cfm in about 1-2 hours when the minimum pressure is achieved; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; this system contains radiological materials but there are no projections for radionuclides being in the exhaust system,

- Exhaust from up to 5 Welch 1398 vacuum pumps which provide vacuum to the test stands; normally, all 5 pumps would be running at the same time; these pumps would run essentially continuously beginning in FY2003 into Fy2005; each pump has an initial flowrate of 53.1 cfm which would diminish to 0.0 cfm in about 2-3 hours when the minimum pressure is achieved; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header; this system contains radiological materials but there are no projections for radionuclides being in the exhaust system,

Emission Point AE2: One Welch 1397 vacuum pump for the feed lines which goes through a 2" line ~6' off the floor and through the west wall; this pump will run ~10 hours at a time on 10-20 occasions total beginning in FY2002 into FY2005; pump has an initial flowrate of 17.7 cfm which would diminish to 0.0 cfm in about 15-20 minutes when the minimum pressure is achieved. Exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust header. This system contains radiological materials but there are no projections for radionuclides being in the exhaust system.

Emission Points AE3 and AE4: Two separate pit exhaust fans with a flowrate of 650 cfm each pulls air from the bottom of each end of the machine test area and exhausts via two separate ~20"X24" rectangular ducts through the west wall ~9' from the floor. These discharges should only contain ambient air which no contaminants; fans would run continuously; fans are used to ensure fresh air is present in the below grade pit area (confined space).

Emission Point AE5: Spin tank exhaust air would be pulled from the turbine via an exhaust fan currently located in the building; the fan has a flowrate of 1,440 cfm. There is a large oil demister unit on the exhaust line prior to exit from the building. The exit is through the west wall and ~ 10' from the floor; there should be no contaminants in this discharge.

Emission Point AE6: There are four 2,750 cfm exhaust fans with in the ceiling of the high bay

which will be used for comfort-type temperature control. There would be no routine contaminants in this exhaust except for providing air changes within the area; these fans are what will remove the fugitive solvents within the high bay; the solvents are used for cleaning the casings and small ports and fittings (AF2, AF3, AF4).

Emission Point AF4: There will be a very low temperature cold bath used at the withdrawal station; the bath will have a liquid refrigerant media surrounding the withdrawal cylinders. Currently, plans are for the refrigerant media are not complete.

Emission Point AF2: Casing interiors will be cleaned in the high bay area; it is estimated that approximately one (1) gallon of ethanol and one (1) gallon of Freon TA will be used for the cleaning over a one (1) hour time period It is assumed that all of the liquids will evaporate into the high bay; the casings will be cleaned in a one day cycle with ~4-8 days between casing cleaning There will be ~ 5-6 cleaning cycles; this work will occur beginning in FY2002 into FY2003.

Emission Point AF3: On the M and G stands, there will be occasions when instruments and fittings will have to be removed from the stand's casing. At those times, 2-5 ounces of acetone or alcohol will be used to clean surfaces; this will occur over a 2-day period and will consist of 5-10 cleanings locations; this will happen ~100 times beginning in FY2002 into FY2005. It is assumed that all of the solvent will evaporate and be withdrawn through the roof fans (AE6).

Parts and Valve Decontamination and Cleaning Area

The decontamination and cleaning area will be in a small room at the south end of the test area.

Emission Point AE7: There will be two hoods in the room with a common exhaust system discharging through the west wall. Each hood will have a total flowrate of 840 cfm with 500 cfm being make-up air and 340 cfm being hood face flow. One hood will be used for dry cleaning of parts and valves and the second hood will be used for wet cleaning; cleaning material will consist of alcohol, and potentially a decontamination solution; it is assumed that the alcohol and acetone will be released through the hood exhaust. It is projected that approximately one (1) gallon each of acetone and ethanol will be used in an 8-hour shift; the cleaning will involve a 5-shift week for approximately 12 weeks; there will be a HEPA filter on the exhaust of the hoods which would preclude the release of radionuclides through this exhaust, a small vacuum pump, probably a Welch 1396 will be used to evacuate a valve and component leak test station within the room. The flowrate from the pump will initially be 99.1 cfm but will diminish to 0.0m cfm when the minimum pressure is achieved; this pump will run continuously after the testing begins. There should be no contaminants from this vacuum station; exhaust from the pump may contain minute quantities of oil but exhaust would go through a filter and oil demister prior to going into the exhaust system which will be connected to the above hood exhaust.

Large Component Assembly Area (South end of Building)

Emission Point AE8: One hood will be used in this area for final cleaning of some small components; acetone and alcohols will be used for the cleaning; small quantities of these solvents will be released through the hood. The quantities are estimated at 8-16 ounces each of alcohol and acetone in a 2-hour period; no radionuclides will be in this hood.

Emission Point AF5: Some final parts cleaning will be done in the open area of the final assembly area; alcohols and acetone will be used for the cleaning; therefore a small quantity of these solvents will be released as a non-point source (fugitive release). The quantities are estimated at 8-16 ounces each of alcohol and acetone in a 2-hour period. This will occur ~20-30 times beginning in FY2002 into FY2005.

Manufacturing Area

The processes performed in the manufacturing area are discussed below. Because of potential classification issues, only the gross estimated emissions from this area will be provided. The emission point will be Emission Point AE10.

- One large exhaust system will be used for the rotor tube manufacture; the exhaust will be on during the initial stages of manufacture but will only be discharging ambient air at this time; during the final stages of manufacturing, the exhaust will include heated air flowing from around the rotor and will also contain some organic volatiles from the curing cycle,

- The small part fabrication station will utilize the same exhaust system as the main rotor fabrication station but the volatile quantity will only be a fraction of the larger station

- The tool piece will have to be cleaned prior to use and after use; it is estimated that two (2) gallons of cleaner will be used each time the piece is cleaned; this will take approximately 2 hours to do the cleaning; the cleaning will be done 2 times per week during manufacturing times,

- The rotor's interior will have to be cleaned after manufacture; it is estimated that one (1) gallon of ethanol and one gallon of Freon TA will be used for the cleaning; the cleaning will take approximately two (2) hours and will be done twice a week during manufacture,

- There will be a small emission from the cap balance area which will pass through a the large manufacturing exhaust system; there should be no measurable contaminants in this stream

- In the materials and chemical preparations lab, there will be 2 hoods with a common exhaust in the lab; each hood will have a total flowrate of 840 cfm with 500 cfm being make-up air and 340 cfm being hood face flow; when chemicals are mixed, there will be a small quantity of volatiles released into the hood.

Emission Point AE10: The following information is the manufacturing air emissions data. It is in a form that it is not classified. Considered the emissions from total coming from one end of the building.

Processes in the manufacturing area include fabricating, assembling, and curing polymer parts; cleaning metal parts and machinery; and performing various physical and mechanical tests.

Four scenarios can be projected from the combination of daily and cyclic operations. We assume a 6-day workweek beginning in FY2002 into FY2005. Maximum total daily emissions could range from ~1.6 lbs./day to ~2.2 lbs./day. These scenarios represent maximum emission potentials from

the manufacturing operations area, assuming that all processes are running at one time. In actuality, we would expect emissions would be less.

Process Scenario	1	2	3	4
Resin Products (lb.)	1.78	1.62	0.18	0.02
Solvent Vapors (lb.)	0.33	0.55	1.44	1.66
Total Emissions (lb.)	2.11	2.17	1.62	1.68

A worse case evaluation can be made on 1.78 lbs./day of resin products and 1.66 lbs./day of solvent vapors. However, if this evaluation results in an adverse air emission from the manufacturing area, administrative controls can be applied to ensure minimum per day emissions.

The Resin product in a gaseous form consists of, by weight, 99 percent steam (H_2O) and CO_2. The remaining 1 percent consists of a combination of the principal organic material in the resin material that was used to make the product. The solvent vapor consists of ~ 90 percent of Freon TA and 10 percent alcohol, probably ethanol.

Other Emission Points:

Emission Point AE11: In the drive and suspension area, there will be 2 hoods for cleaning small parts and components Each hood will have a total flowrate of 840 cfm with 500 cfm being make-up air and 340 cfm being hood face flow Alcohols and acetone will be used to clean parts; there will be a small quantity of volatiles from these chemicals released to through the hoods. It is projected that 6-10 ounces of each chemical will be used during an 8-hour day and that the usage rate of the hoods would be 8-10 days per month beginning in FY2002 into Fy2005.

Emission Point AE9: In the maintenance shop, there may be a small hood where small parts will be welded; contaminants may include welding fumes and small metallic particulates. The hood may be used on the average of 3-times per week beginning in FY2002 through Fy2005. There will be no radionuclides in the weld hood.

Emission Point AF1: In the Control Room, a small flask of dry ice (solid CO_2) and alcohol will be used to freeze-out materials in a plastic tube. There will be CO_2 gas generated by the sublimation of the CO_2 going from a solid to a gas; when in use, ~ one pound of CO_2 would be generated three times a day; there should be no detectable release of the alcohol. There will occur on an estimated 80-100 occasions beginning in FY2002 into FY2005.

Emission Point AF6: There will be a small ultrasonic cleaner in the manufacturing bay from which a small quantity of volatiles will be released as a fugitive source. This will be a non-radiological station.

Emission Point AF7: There will be cut-off station in the manufacturing area; there will be an

exhaust with a dust collector on the cut-off/sampling station; the dust collector should be suitable to preclude the release of contaminants; this will be a non-radiological station.

APPENDIX B

LETTERS OF CONSULTATION

APPENDIX C

COMMENT RESPONSE DOCUMENT

ETTP EA Comment Response Document				
Document #	**Commentor**	**Comment #**	**Comment**	**Response**
1	***LOC, Inc. Oak Ridge Reservation***	1	Inaccurate title; facilities will be leased, not transferred	Title will be changed to the *Environmental Assessment for the Leasing of Facilities and Equipment to USEC Inc.*
		2	Need document number	DOE/EA-1451 will be included in the Final EA.
		3	EA is poorly written; bad grammar, inacurate word usage	Document has been reviewed and corrected.
		4	Outdated data used.	Census 2000 data has been included in the Socioeconomic analysis.
		5	Update acronym list	List has been reviewed for appropriate acronyms.
		6	Update references (Polestar 2002; DOE 2001)	References have been corrected.
		7	Include Executive Summary	Not required for an Environmental Assessment.
		8	Chapter 11 does identify individuals from Tt as preparers and contributors, but does not explicitly state that Tetra Tech was the preparing contractor	Comment noted.
		9	(A)Should be clearly stated that USEC will lease the facilities directly from DOE; (B) should be mentioned that work is being performed under a CRADA w/ ORNL; (C) should be discussed whether environmental permits or radiological licenses are required	(A) "transfer" has been replaced with "lease" where appropriate (see Secion 1.1) (B) CRADA is discussed in Sections 1.2 and 7.2 (C) Environmental Permits and/or Radiolocical Licenses are discussed in Section 7.2
		10	The role of the CTC Facility is not apparent (part of the action under the preferred alternative; use of the CTC is a different alternative, or whether all work could be done at CTC instead of ETTP	The CTC is part of the Preferred Alternative because DOE-owned equipment will be moved there. See Section 2.2.2.
		11	Should include the alternative of leasing the facilities at ETTP through the Community Reuse Organization of East Tennessee (CROET) instead of directly from DOE	Information included in Section 2.2.1.
		12	The preferred alternative should evaluate the possible effect on Oak Ridge's reindustrialization program (will any company be displaced?)	Facilities subject to this EA are not currently leased.
		13	Phone conversations should be verified from another source.	All phone conversations are documented in written form. Other documents were utilized where available to document technical information. Most personal communications were for clarification.
		14	Maps do not show building that are to be leased; quality of color maps (when reproduced to black and white need to be improved)	Maps are limited due to operational security concerns.

ETTP EA Comment Response Document				
Document #	**Commentor**	**Comment #**	**Comment**	**Response**
		15	Effect ACP will have on USEC's planned activities. EA needs to examine how the buildings can continue to be used and workers kept safe in the presence of large scale D&D	Effects of the ACP are discussed in Section 2.2.3.1. USEC will make provisions to have utilities and services provided by private companies once DOE is unable to provide needed services tdue to D&D activities. Workers will work by Work Smart Standards and the implementation of Regulatory Operational Requirements that will be incorporated into the USEC lease with DOE.
		16	Are K-1600 and K-101 in good condition to accommodate a new project (currently scheduled for D&D)	See Section 2.2.2 for descriptions of K-1600 and K-101.
		17	Who is financially responsible for D&D once USEC has completed project?	USEC will be responsible for any incrementalD&D costs due to the Centrifuge Project.
		18	pg 1-1: include an estimate of the maximum time for the lease	Comment noted. Lease terms are still being negotiated.
		19	Section 1-3: Purpose and Need should include a statement as to why the government should undertake such an action; make clearer whether the centrifuge components to be shipped will be new ones or existing ones	Section 1.3 discusses the Purpose and Need of the action and includes statements explaining DOE interest in centrifuge development.
		20	Section 2.2.1: Section is poorly written and confusing. Bullets are not related to leading statement etc…	Comment noted. Section 2.2.1 corrected. Shipping new or used components does not affect impact analysis.
		21	Section 2.2.3: Portions of this section stray from description of the impact of the no-action alternative	Section 2.2.3 has been rewritten to focus on No Action Alternative.
		22	Pages 2-8 and 2-9: the ORO 1997 is an incorrect citation; should be a 1997 DOE EA about K-25	Reference has been updated.
		23	Page 2-9 (second paragraph): Commentor question regarding current status of equipment lease.	Equipment is not currently leased.
		24	Chapter 3: Too much background and historical environmental data.	Comment noted.
		25	Page 3-31: Discussion of the effects of the buildings and subsurface infrastructure on groundwater flow should be included. The "Groundwater Quality for ETTP' should discuss the degree of contamination at ETTP.	Discussion is found in Section 4.6.2.
		26	Pages 3-37 to 3-38: State if other buildings have contamination, as mentioned in Building K-101.	Discussion on equipment and facility contamination is found in Section 3.7.1.3.

ETTP EA Comment Response Document				
Document #	**Commentor**	**Comment #**	**Comment**	**Response**
		27	Section 3.8 and 3.12: Update using 2000 census data.	See response for Comment #4.
		28	Section 3.11.4: Should include a discussion of health effects on workers that worked on the original centrifuge project in these facilities.	NIOSH study of health effects was conducted, but due to changes in technology its results are not directly applicalbe to the Proposed Action.
		29	Section 3.9.1: Management of ETTP by OMI under contract to CROET should be disussed.	Discussion of management of ETTP is included in background information.
		30	Page 4-2: Comment on HEPA filter testing (a percentage of HEPA filters fails, failed filters have to go back and an estimate of emissions since the last successful in place test should be noted.)	USEC is developing a surveillance and maintenance program for HEPA filters. The potential emissions due to failed HEPA filters are expected to be insignificant as compared to facility operations.
		31	Page 4-3: Commentor question regarding safety and radiological oversight at the CTC Facility.	The CTC Facility is regulated under OSHA and is discussed in Section 3.11.4.
		32	Page 4-5: Modification Phase section should also discuss the possible need for rerouting utility lines at the ETTP.	Initially USEC will use the existing infrastructure arrangements to obtain utilities. Utilities will be rerouted as necessary as discussed in Section 3.9.1.
		33	Section 4.11.2.4: Commentor believes that the reference USEC 2000i, needs to be made available to understand the accident scenario evaluations.	Comment noted. Document requested is classified.
		36	Section 2.2.3.1: Oak Ridge Site Management Plan may be out-of-date and may not reflect the true position of issues at present at ETTP.	Comment noted. See response to Comment #22
		37	Section 4.11.2.4: DOE should provide reasons/explanations to support the decision not to consider fires and explosions as major hazards for this project.	Fires and explosions were considered in the Auditable Safety Analysis.
		38	Section 4.3.2: Editorial comment on sentence. Rewrite.	Sentence has been modified.
		39	Section 4.3.2: Verify the presence of Knox Dolomite at the ETTP site.	Section 4.3.2 has been modified.
		40	Section 7.1 and 7.2: Mention CERCLA activities at ETTP and status of the ORR on the National Priority List (NPL)	CERCLA activities are discussed in Section 2.2.3.1.
3	***Materials and Chemistry Laboratory, Inc. (MCLine)***	41	Commentor wants to express support for the USEC Proposed Action.	Comment noted.

ETTP EA Comment Response Document				
Document #	**Commentor**	**Comment #**	**Comment**	**Response**
4	***Barbara A. Walton***	42	Commentor believes title should be changed to the "Transfer" of technology and the "Lease" of facilities and equipment.	See response for Comment #1.
		43	Section 7.2.2: Discuss FFA and the role of the State of Tennessee and the EPA.	See response for Comment #40.
		44	Section 4.8 and 5.3.8: Discussion of the Accelerated Cleanup Program is needed.	See Chapter 5.
		45	Document should discuss the comparison between the small amount of UF6 for the Proposed Action and the storage of cylinders.	The total maximum quantities of UF6 utilized at K-1600 would be 2,100 lbs. A typical UF6 cylinder loated in the storage yard can contain nearly 28,000 lbs of UF6. There are qpproximately 7,100 cylinders in the ETTP storage yard.
5	***David Level- comments received from Public Comment Meeting***	48	UF6 should be addressed; include a comparison to UF6 Cylinder operations.	See response for Comment #45.
		49	Update demographics from 1999 to 2000.	See response for Comment #4.
		50	Could reference documents be e-mailed to interested individuals.	Specific document requests may be made through the NEPA Document Manager.
		51	Mention the dollar amount for leasing the ETTP Facilities.	consideration is to be determined during lease negotiations.
		52	Clarify title of document.	See response for Comment #1.
		53	"What relaxation, if any, will there be of the ETTP ACP Schedule"	No "relaxation" of the ACP schedule is currently planned.
		54	Identify post-lease activities.	Section 2.2.31 discussed post lease activities.
		55	Address time frame of the lease.	Lease agreement is discussed in Section 2.2.2