DOE/EA-2014

Environmental Assessment of the Emergency Operations Center Project

U.S. Department of Energy
National Nuclear Security Administration

July 2015

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TABLE OF CONTENTS

Figures

List of Tables

List of Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing materials
AGL	above ground level
ALARA	As Low as Reasonably Achievable
AMSL	above mean sea level
AOI	area of influence
AQCR	Air Quality Control Regions
ATSDR	Agency for Toxic Substances and Disease Registry
B&W	Babcock and Wilcox
BLM	Bureau of Land Management
BMAP	Basin Management Action Plan
BMP	Best Management Practices
CCC	Complex Command Center
CDL VII	Construction Demolition Landfill VII
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRMP	Cultural Resources Management Plan
CY	Calendar Year
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DOE-EM	DOE Office of Environmental Management
DOE-ORO	DOE Oak Ridge Office
EA	environmental assessment
ECC	Emergency Command Center
EDE	effective dose equivalent
EFK	EFPC kilometers
EFPC	East Fork Poplar Creek
EISA	Energy Independence and Security Act
EMWMF	Environmental Management Waste Management Facility
EO	Executive Order
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERO	Emergency Response Organization
ETTP	East Tennessee Technology Park
FDAR	Fire Department Alarm Room

FFCA	Federal Facilities Compliance Agreement
FR	Federal Register
FY	Fiscal Year
HEPA	High Efficiency Particulate Air
HVAC	heating, ventilation, and air conditioning
ILFV	Industrial Landfill V
ISMS	Integrated Safety Management System
LEED	Leadership in Energy & Environmental Design
LLRW	low-level radioactive waste
LOS	level-of-service
MCLs	Maximum Concentration Levels
MEI	Maximally Exposed Individual
MLD	million liters per day
MMI	Modified Mercalli Intensity
MT	Meteorological Tower
NAAQS	National Ambient Air Quality Standards
NE	Nuclear Energy
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NNSA	National Nuclear Security Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPO	NNSA Production Office
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSDWS	National Secondary Drinking Water Standard
OMB	Office of Management and Budget
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OS	Office of Science
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PEL	Permissible Exposure Limits
PRGs	Preliminary Remediation Goals
PSAR	Preliminary Safety Analysis Report
PSS	Plant Shift Superintendent
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROI	region of influence

RQ	reportable quantity
SDC	Seismic Design Category
SHPO	State Historic Preservation Officer
Sox	Sulfur Oxides
SWEIS	Site-Wide Environmental Impact Statement
SWMU	Solid Waste Management Units
SWPPP	Storm Water Pollution Prevention Plan
T&E	threatened and endangered
TDEC	Tennessee Department of the Environment and Conservation
TLV	Threshold Limit Value
TMDL	Total Maximum Daily Load
TSC	Technical Support Center
TSCA	Toxic Substances Control Act
TSR	Tennessee State Routes
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
TYSP	Ten-Year Site Plan
UEFPC	Upper East Fork Poplar Creek
UPF	Uranium Processing Facility
USFWS	U.S. Fish and Wildlife Service
USQ	unreviewed safety question
VOCs	Volatile Organic Compounds
VRM	Visual Resource Management
Y-12	Y-12 National Security Complex

Chemicals and Units of Measures

µg/m^3	micrograms per cubic meter
˚C	degrees Celsius
cfs	cubic feet per second
cm	centimeter
CO	carbon monoxide
dB	decibel
dB(A)	decibel A weighted
DCE	1,1-dichloroethane
ft	feet
ft^2	square feet
˚F	degrees Fahrenheit
ha	hectares
HF	hydrogen fluoride
hr	hours
in	inches
km	kilometer
km^2	square kilometers
m^3/s	cubic meters per second
m	meter
mi	mile
MGD	million gallons per day
MGY	million gallons per year
MLD	million liters per day
MLY	million liters per year
mph	miles per hour
mrem	millirem
NO_2	nitrogen dioxide
NOx	oxides of nitrogen
O_3	ozone
Pb	lead
PCBs	polychlorinated biphenyls
PCE	tetrachloroethylene
pCi	picocurie

PM2.5	particulate matter with an aerodynamic diameter less than or equal to 2.5microns
PM10	particulate matter with an aerodynamic diameter less than or equal to 10microns
ppb	parts per billion
ppm	parts per million
psig	pounds per square inch gauge
SO_2	sulfur dioxide
SOx	sulfur oxides
Tc	Technetium
TCE	trichloroethylene
VOCs	volatile organic compounds
yd^3	cubic yard
yr	year

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	100 =	10^{2}
deka-	da	10 =	10^{1}
deci-	d	0.1 =	10^{-1}
centi-	c	0.01 =	10^{-2}
milli-	m	0.001 =	10^{-3}
micro-	μ	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}

1.0 INTRODUCTION

The National Nuclear Security Administration (NNSA) Production Office (NPO) proposes to design and build a new emergency response facility that will more effectively and efficiently support the Y-12 National Security Complex (Y-12) missions by consolidating the Plant Shift Superintendent's (PSS) Office, the Emergency Command Center (ECC), the Technical Support Center (TSC), and the Fire Department Alarm Room (FDAR) from their present locations to a survivable facility. The NPO is preparing this environmental assessment (EA) as part of the decision-making process to assess potential environmental impacts of the project in accordance with the National Environmental Policy Act (NEPA) of 1969 and the U.S. Department of Energy (DOE) NEPA Implementing Procedures (10 Code of Federal Regulations [CFR] Part 1021).

1.1 Purpose and Need for Action

1.1.1 Purpose of the Action.

The purpose of the proposed action is to construct a new emergency response facility that will more effectively and efficiently support Y-12 missions by consolidating the PSS, ECC, TSC, and FDAR from their present locations into a habitable, survivable facility. The NPO proposes to construct a new facility that meets current DOE orders, is survivable and sustainable for 72 hours, and achieves the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold Certification. The project will also include constructing a new parking area and relocating utility lines.

1.1.2 Need for the Action.

Emergency response capabilities at Y-12 reside in three primary facilities: two located onsite (Buildings 9706-2 and 9710-2) and the third located offsite (K-1650) near the Y-12 campus at the East Tennessee Technology Park (ETTP). Building 9706-2 houses the PSS, ECC, and the TSC. Building 9710-2 houses the Fire Station and the FDAR. Building K-1650 houses the command center/Emergency Operations Center (EOC) and the alternate TSC.

Key response functions performed in the PSS/ECC and FDAR during an emergency event include, but are not limited to, the following:

- Monitoring of the Y-12 fire alarm system;
- Receipt of emergency 911 calls;
- Dispatch of emergency responders;
- Categorization and classification of emergency events;
- Formulation and implementation of initial onsite protective actions;
- Activation of the Emergency Response Organization (ERO);
- Off shift supervision for operating facilities;
- Notification of federal, state, and local authorities; and
- Recommendation of offsite protective actions.

Uninterrupted staffing of the ECC/PSS and FDAR is critical during an operational emergency to initiate and direct an effective response. The purpose of the EOC project is to replace the existing facilities with a new centralized facility that meets the current DOE and national standards and codes. The new facility will include habitability measures (pressurized and filtered air systems), seismic construction, and an emergency power supply. It will also be survivable and sustainable for 72 hours.

The EOC project directly contributes to the DOE Strategic Plan's Defense Strategic Goal: To protect our national security by applying advanced science and nuclear technology to the Nation's defense. It also supports achieving DOE General Goal 1 of Nuclear Weapons Stewardship: To ensure that our nuclear weapons continue to serve their essential deterrence role by maintaining and enhancing the safety, security, and reliability of the U.S. nuclear weapons stockpile. The EOC Project will directly contribute to the safety and reliability of one of the nation's most sensitive nuclear weapons sites.

1.2 Background

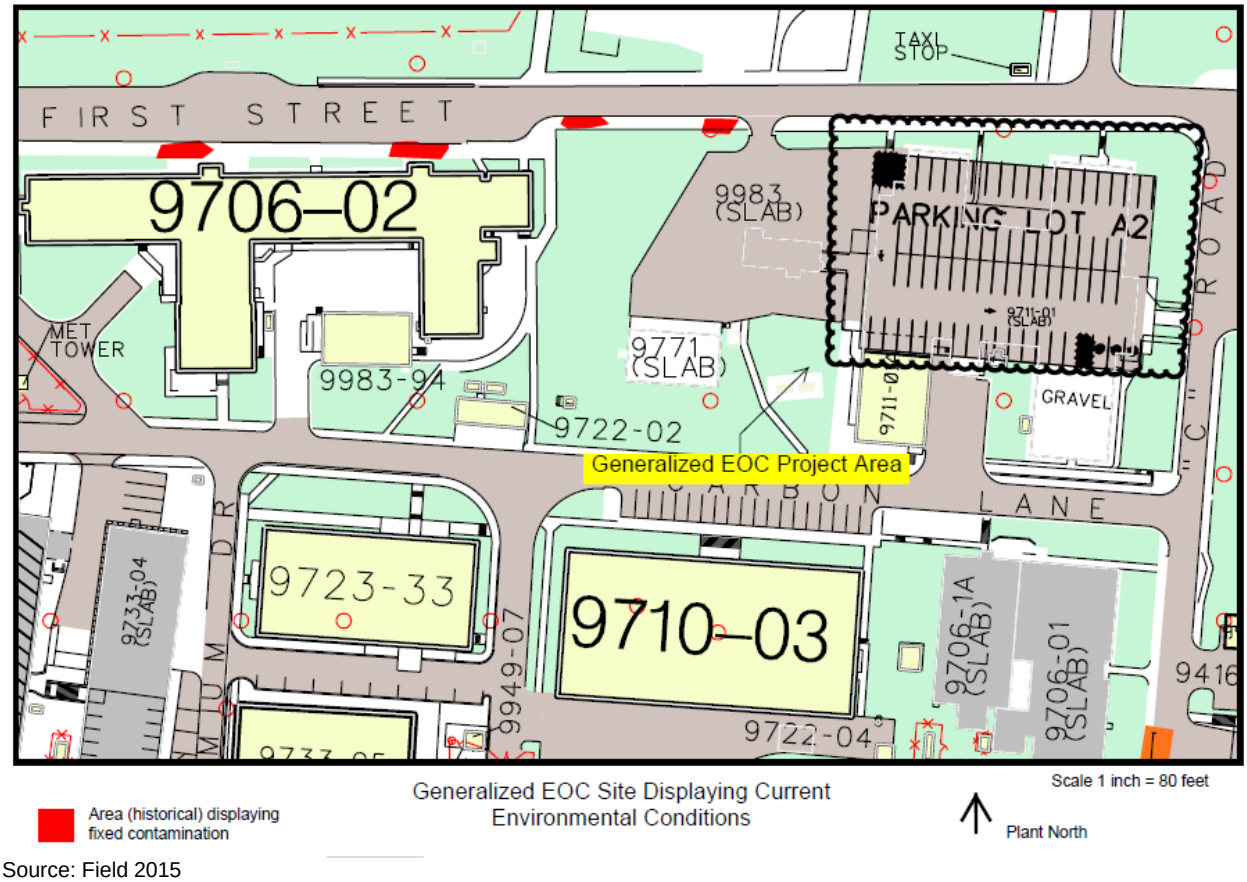
It is the policy of the DOE to have a comprehensive emergency management system that provides the framework for the development, coordination, control, and direction of all emergency planning, preparedness, readiness assurance, response, and recovery

actions. The DOE owns facilities, including Y-12, which store, handle, and process hazardous materials. Any potential release of hazardous materials during a natural phenomenon or operational incident would pose risks to the workers, the public, and/or the environment and would create emergency conditions that require a coordinated response. Such emergencies need to be monitored from a central location that will be accessible to all emergency responders and management at any time.

Specific requirements for emergency operations response capabilities are driven by DOE Order 151.1C, *Comprehensive Emergency Management System*. A command center or EOC is the central location from which resources are coordinated and operations managed to support the first responders on the scene of an emergency as they mitigate consequences and control the event. The existence and operation of a working EOC that is capable of responding to site and facility hazards, as identified in Hazards Survey and Emergency Planning Hazards Assessments at each site as required by DOE Order 151.1C, is an essential element of the DOE mission. Thus, the existence and operation of a working emergency facility that is capable of responding to site and facility hazards is an essential element of the DOE mission.

A July 2011 study by the DOE Office of Health, Safety and Security, *Independent Oversight Evaluation of Emergency Response Facilities at the Y-12 National Security Complex*, revealed the existing emergency facilities at Y-12 lack the basic features and functionality that are critical to safely and effectively monitoring, commanding, and controlling emergency situations. This is partially due to the facilities being located in three separate locations. In addition, due to the age and construction of the buildings, they do not meet the habitability and structural integrity requirements of current DOE standards. The TSC also has accessibility vulnerabilities, because when Emergency Response Organization personnel have to relocate to the TSC, they may be prohibited by a hazardous material release or security event. The report also states that Y-12 relies on the integrated response of the three command centers to manage operational emergencies, with each of the facilities' having a unique and critical role in Y-12's response operations. Degradation of any of the command centers will negatively impact Y-12's capability to integrate response operations and manage operational emergencies.

The Y-12 CERCLA Screen Team met on 8/13/2014 to review the proposed actions of the construction of the EOC (Figure 1.2-1). The project team described activities that would involve excavation and soil disturbances at the project site. Project activities would include excavation for footers and utility connections, shallow trenching to be dug for electrical connections, and jack and bore might be done for a natural gas line. Soil sampling/characterization is planned after CD-1 approval for geotechnical, environmental, and waste disposition purposes. There are no known areas of soil contamination within the project footprint. During this CERCLA Screening, it was determined that the EOC project did not require CERCLA oversight.



Source: Field 2015

Figure 1.2-1. General EOC Site Map Displaying Current Environmental Conditions

1.3 Scope of EA Analysis

This EA conforms to the requirement of the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) implementing the NEPA and DOE Implementing Procedures (10 CFR 1021).

This EA is tiered from the *Final Site-Wide Environmental Impact Statement* (SWEIS) *for the Y-12 National Security Complex* (DOE/EIS-0387 2011). The No Action Alternative of the Y-12 SWEIS includes the continued implementation of planned modernization actions announced in the 2011 Record of Decision (ROD), as modified by subsequent actions, as well as new actions subsequent to the 2011 ROD that have undergone separate NEPA review. The actions announced in the 2011 ROD, modifications to the actions of the 2011 ROD, and actions undertaken since the 2011 ROD are included in the No Action Alternative. The environmental conditions described in the Y-12 SWEIS reflect the baseline operational impacts of these missions for the foreseeable future. The Y-12 SWEIS also evaluates environmental impacts under five alternatives for continuing operations at Y-12: the No Action Alternative, Uranium Processing Facility (UPF) Alternative, Upgrade In-place Alternative, Capability-sized UPF Alternative, and the No Net Production/Capability-sized UPF Alternative. Three of these alternatives included construction of a facility similar to the Proposed Action of this document.

1.4 Public Involvement

No public meetings have been conducted for this EA. However, NPO is providing the public an opportunity to review and comment on the Draft EA, prior to the issuance of the Final EA. The NPO published in local newspapers a public notice announcing the availability of the Draft EA, the length of the comment period, and where copies of the draft could be obtained.

2.0 DESCRIPTION OF ALTERNATIVES

An alternatives analysis for the EOC project was performed in accordance with the requirements of the Office of Management and Budget (OMB) Circular A-11, *Preparation, Submission and Execution of the Budget*, and A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*. The three alternatives evaluated in this EA were identified in this alternatives analysis and analyzed both qualitatively and quantitatively. The evaluation criteria were grouped into four major categories:

1. Strategic Objectives;
2. Implementation;
3. Risk Reduction; and
4. Programmatic Requirements.

An overall rating was then assigned based on the scenario's rating in each of the qualitative evaluation criteria. Each scenario was given a score for its ability to meet or exceed the requirements of each criterion. Details of this analysis are found in the *Conceptual Design Report for the Y-12 Emergency Operations Center* (CNS 2015a). Based on the information evaluated, the project team elected to develop Alternative 3 (New Facility), which is evaluated as Alternative 1 (Proposed Action) in this EA. The other two alternatives received lower scores due to either the inability to meet strategic objectives or risk reduction goals.

2.1 Alternative 1 – New Facility Alternative (Proposed Action)

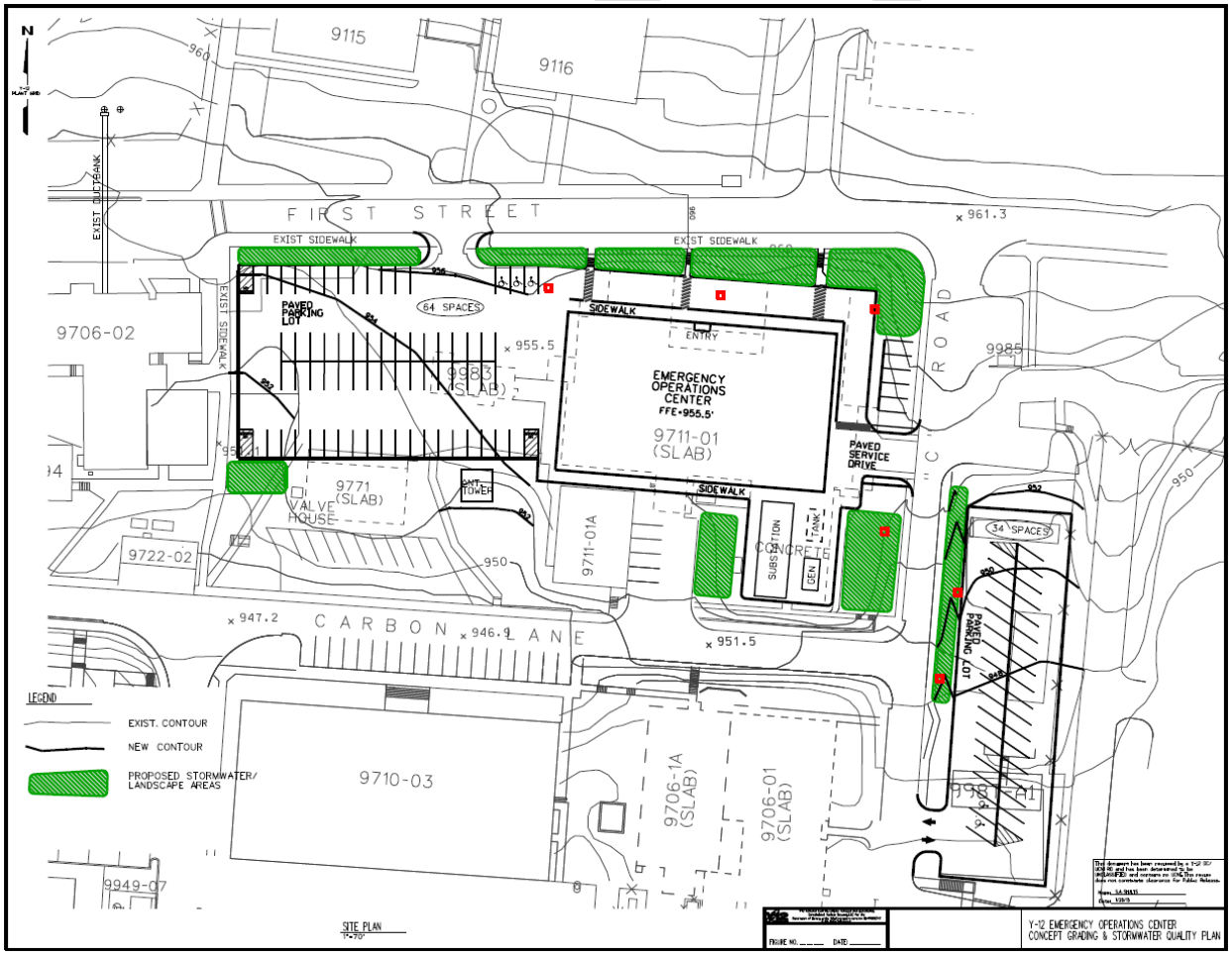
Under the Proposed Action, a new facility would be constructed on the proposed site, which currently contains parking lot A-2. The building will be approximately 17,000 ft^2 in size plus heating, ventilation, and air conditioning (HVAC) structures.

The proposed EOC would include the following facilities and building systems:

- PSS/ECC and FDAR, which are manned 24/7 and house eight personnel;
- Space to house up to 30 emergency response staff;
- Air-handling system including filtration systems and positive pressure capability;

- Uninterruptable power supply;
- Back-up emergency diesel generator;
- Food preparation and storage area;
- Support facilities, including storage, fire protection, and security systems; and
- Illuminated paved parking area.

The facility would be designed to meet current DOE habitability and structural integrity requirements. Another goal will be to construct the building to achieve the U.S. Green Building Council's LEED Gold Certification. The proposed site layout is shown in Figure 2-1.1.



Source: DOE/EIS-0387 2011

Figure 2.1-1. EOC Project Site Layout

This alternative was recommended by the Alternatives Analysis because it is the most efficient use of capital funds that also meets the safety and technical objectives required

by plant operations. This alternative would offer an efficient space layout outfitted with modern information, communication, and building systems that meet habitability requirements. Current and future programmatic space needs of the consolidated services would be met, including 24-hour operations. The new facility would centralize Emergency Services personnel, increasing operational efficiency and emergency management effectiveness. Over the long run, normal facilities operating costs would likely be lower for this alternative than under the No Action or Renovate Existing Locations Alternative. Following a consolidation of services to the new facility, vacated facilities could be demolished, reducing Y-12's footprint. In short, consolidating to a newly constructed PSS/ECC would better enable these services to fulfill their mission.

This alternative is similar to an additional action evaluated under Alternatives 3 through 5 of the Y-12 SWEIS (DOE/EIS-0387 2011). This action, the Complex Command Center (CCC), was intended to house the PSS, EOC, and the entire Y-12 Fire Department. The proposed CCC would have been larger than the facility proposed in this alternative (50,000 to 80,000 ft2). The proposed location of the CCC is on the east end of Y-12. The impacts of construction of this facility, which are similar to the impacts of this alternative, were evaluated in the Y-12 SWEIS. The proposed CCC, which was to include a Fire Station, PSS, and EOC, was included in all Alternatives (Except the "No Action" Alternative) in the 2011 SWEIS. However, NNSA decided to select Alternative 4, to continue operation of Y-12, and to construct and operate one new facility–a capability-sized UPF. The decision to construct and operate a CCC was reserved for later (DOE/EIS-0387 2011).

The project will include installing duplicate FDAR, TSC, and PSS systems. Ethernet switches, distribution amplifiers, or other system modifications will be needed to ensure that the capability of the existing FDAR, TSC, and PSS systems are not impacted during construction of the new systems. Upon completion of installation, testing, and transition, the existing systems will only report to the new building.

Site Development.

The site is located over a demolished building slab (9711-1) that has since been developed into a surface parking lot. Site preparation will include addressing telecommunication and power lines on the western edge of the building slab area; rerouting or abandoning storm sewer, sanitary sewer, and water lines in the projected building slab area; and rerouting the steam line on the eastern edge of the building slab. Excavation will include removing some of the old building floor slab and footings, as well as abandoned utility lines that formerly served Building 9711-1. These utilities include building storm drains, roof drains, sanitary sewer, potable water, and fire water. The project will also include constructing a paved surface parking area west of the building, which currently contains demolished building slabs (9983 and 9711), as well as paved and unpaved areas.

A geotechnical investigation will be performed by a subcontractor to Y-12. The geotechnical report will describe the soil, rock, and groundwater conditions and make appropriate recommendations so that a satisfactory and economical foundation can be designed.

Erosion and sediment control would be provided prior to any land disturbance to prevent both erosion and transport of sediment beyond the limits of the site. The project site would be graded and topsoil removed and stockpiled according to the *Soil Management Plan for the Oak Ridge Y-12 National Security Complex* (Y/SUB/92-28B99923C-Y05, Rev. 2) with appropriate run-on/run-off protection. Site development activities would be conducted to minimize environmental impacts and to be in compliance with applicable laws and regulations. Temporary construction fencing, signs, and flagging will surround the construction work area to warn and restrict access.

Construction Laydown Area.

The construction staging and laydown area will be located on the site in the asphalt area west of the proposed building. The construction entrance will be installed entering from First Street.

2.2 Alternative 2 – Renovate Existing Locations Alternative

Under the Renovate Existing Locations Alternative, the existing emergency services facilities would be renovated to meet current codes and standards. In this option, existing space will be renovated. However, because of the construction materials and techniques utilized when the building was constructed in 1945, the existing structure will not be able to be upgraded without substantial expense. The existing PSS function would be relocated to a temporary location, and the existing structure substantially demolished. The existing building uses wooden trusses and concrete/clay blocks, neither of which will be able to be upgraded to meet seismic or wind design criteria. Operations and maintenance costs would stabilize over the long run. Actions proposed under this alternative would extend the useful life of the buildings by 5-10 years. By keeping the facilities in their current locations, no increase in efficiency or synergic benefits stemming from collocation would be realized.

2.3 Alternative 3 – No Action Alternative

Under the No Action Alternative, the emergency services facilities would not be replaced or renovated. The existing 70-year old buildings would continue to age and be well beyond their useful life. Operations and maintenance costs would likely increase, and system failures would ultimately mean that significant capital investments would be required for this alternative to remain tenable. From a mission fulfillment standpoint, the aging facilities would become even more functionally and technologically obsolescent and could see further deceases in efficiency and effectiveness as the buildings become increasingly inadequate. By keeping the facilities in their current locations, no increase in efficiency or synergic benefits stemming from collocation would be realized.

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3.0 AFFECTED ENVIRONMENT

The affected environment provides the context for understanding the environmental consequences described in Chapter 4 and serves as a baseline from which any environmental changes that would result from implementing the alternatives can be evaluated. The baseline conditions are the currently existing conditions. The affected environment at Y-12, EOC project site is described for the following resource areas: land use, visual resources, site infrastructure, traffic and transportation safety, geology and soils, climate and air quality, noise, water resources, ecological resources, cultural resources, socioeconomics, environmental justice, occupational and public health and safety, and waste management.

3.1 Land Use

Y-12 is located entirely within the DOE Oak Ridge Reservation “229 Boundary” established under the Atomic Energy Act of 1954. The main land area of Y-12 is largely industrially developed and encompasses approximately 800 acres. Because Y-12 is an active production and special nuclear materials management facility, nearly 600 acres are considered a high security location and are contained within a boundary area that is enclosed by perimeter security fences. The main site, which has restricted access, is roughly 2.5 miles in length and 0.5 miles wide. The Y-12 Site Map is presented in Figure 3.1-1.

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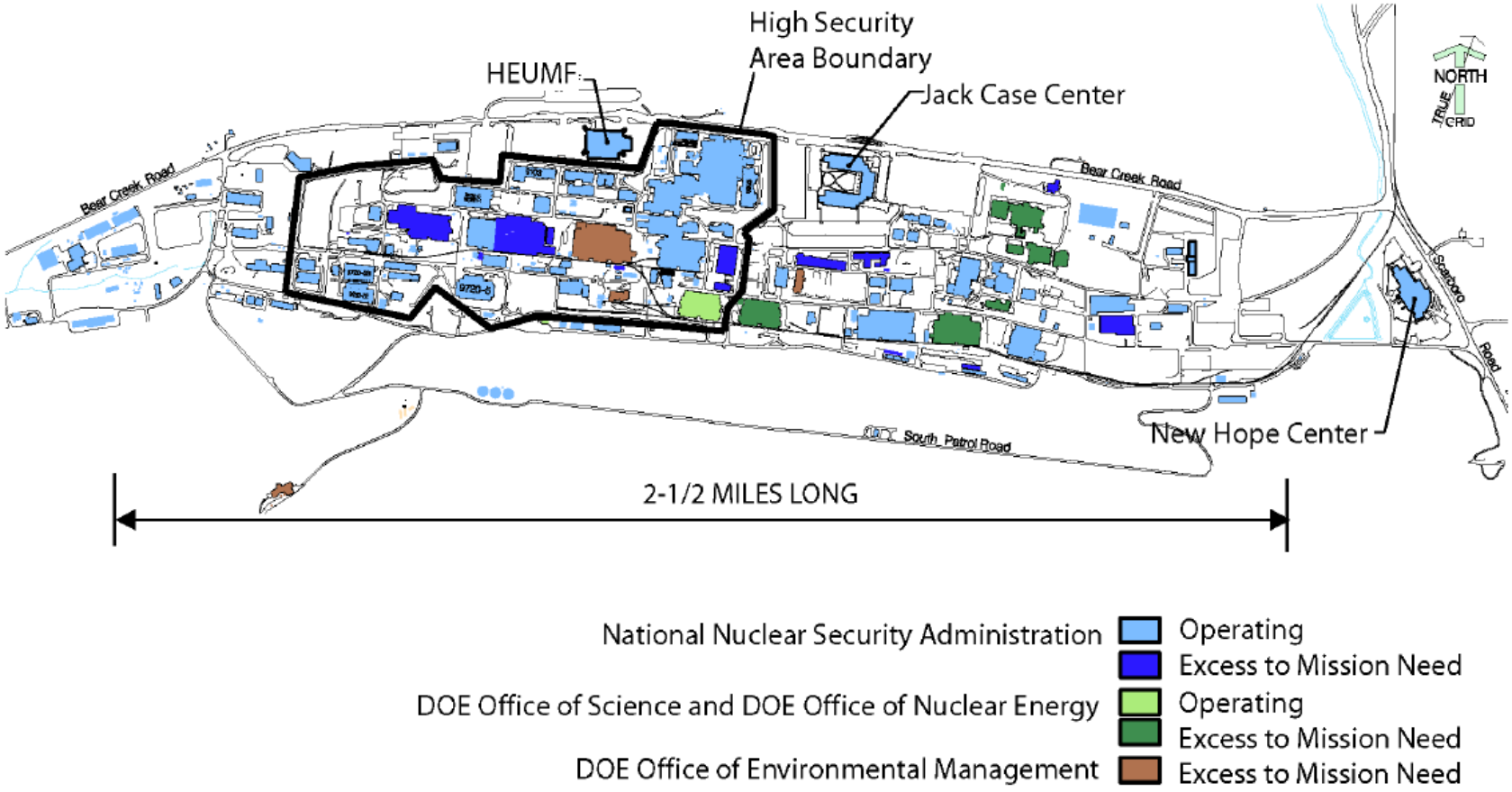

Source: DOE/EIS-0387 2011

Figure 3.1-1. Major Operational Facilities Currently Supporting Y-12 Mission

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3.1.1 Land Use Designation

The eastern portion of Y-12 is occupied by Lake Reality and the former New Hope Pond (now closed), maintenance facilities, office space, training facilities, change houses, and former ORNL Biology Division facilities. The far western portion of Y-12 consists primarily of waste management facilities and construction contractor support areas. The central and west-central portions of Y-12 encompass the high-security portion, which supports core National Nuclear Security Administration (NNSA) missions. There are a few small wetlands within the Y-12 fenced boundary that have been identified in recent years. The immediate areas surrounding Y-12 are, for security reasons, not open for regulated hunting.

At the start of fiscal year (FY) 2012, real property at Y-12 included over 386 facilities in various states of utilization that total approximately 5.4 million ft^2 of NNSA-owned and leased space. While NNSA is responsible for approximately 67 percent of the floor space, other DOE program offices have responsibility for almost 25 percent (both leased and real property). DOE's Offices of Science (SC) and Nuclear Energy (NE) are responsible for approximately 1.2 million ft^2 of space, and DOE's Office of Environmental Management (DOE-EM) owns approximately 0.6 million ft^2 (NNSA 2011). Contractors currently lease another 0.5 million ft^2 of property.

3.1.2 Future Land Use and Leasing Agreements

The anticipated future land use is controlled industrial use, unrestricted industrial use within the eastern and south-central plant area, and open recreational use outside the plant area (DOE 2002).

3.2 Visual Resources

The landscape surrounding Y-12 is characterized by a continuous series of ridges and valleys that trend in a northeast-to-southwest direction. The vegetation is dominated by deciduous forest mixed with scattered coniferous forest. The view-shed, which is the extent of the area that may be viewed from Y-12, consists mainly of an industrial park, then rural or wooded space. The city of Oak Ridge is the only adjoining urban area.

Viewpoints affected by DOE facilities are primarily associated with the public access roadways. Views are typically limited by the rising terrain, substantial vegetation, and commonly hazy atmospheric conditions. Some partial views of the city of Oak Ridge Water Treatment Plant facilities, located at Y-12, can be seen (DOE/EIS-0387 2011).

Y-12 is situated in the Bear Creek Valley at the eastern boundary of the Oak Ridge Reservation (ORR). It is bounded by Pine Ridge to the north and Chestnut Ridge to the south. The area surrounding Y-12 consists of a mixture of wooded and undeveloped areas. Facilities at Y-12 are brightly lit at night, making them especially visible. Structures are mostly low profile, reaching heights of three stories or less, and were built in the 1940s, mostly of masonry and concrete. The tallest structure is the meteorological tower, erected in 1985 and located on the west end of Y-12. There was also an east tower constructed at the same time as the west tower, but has been removed. Today, the New Hope Center is located where the east tower once stood. The west tower is located on a slight rise across from the intersection of Old Bear Creek Road and Bear Creek Road. The west tower reaches a height of 197 ft, and is used to measure and collect meteorological data. The Scarboro Community is the closest developed community to Y-12 (approximately 0.6 mile), and is located to the north. However, as a result of their separation by Pine Ridge, Y-12 is not visible from the Scarboro Community (DOE 2011).

For the purpose of rating the scenic quality of Y-12 and surrounding areas, the Bureau of Land Management's (BLM) Visual Resource Management (VRM) Classification System was used. Although this classification system is designed for undeveloped and open land managed by BLM, this is one of the only systems of its kind available for the analysis of visual resource management and planning activities. Currently, there is no BLM classification for Y-12; however, the level of development at Y-12 is consistent with VRM Class IV, a highly developed area. Most of the land immediately surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes) (BLM 2012; DOE/EIS-0387 2011).

3.3 Geology and Soils

3.3.1 Physiography

Y-12 lies in the Valley and Ridge Physiographic Province of eastern Tennessee. The topography of the surrounding area consists of alternating valleys and ridges that have a northeast to southwest development. In general, the ridges consist of resistant siltstone, sandstone, and dolomite units. The valleys, which resulted from stream erosion along the fault traces, consist of less-resistant shales and shale-rich carbonates (DOE/EIS-0387 2011).

The topography within the Oak Ridge Reservation (ORR) ranges from a low of 750 ft above mean sea level (AMSL) along the Clinch River to a high of 1,260 ft AMSL along Pine Ridge. Within ORR, the topographic relief between the valley floors and ridge crests is generally between 300 to 350 ft (DOE/EIS-0387 2011).

3.3.2 Geology

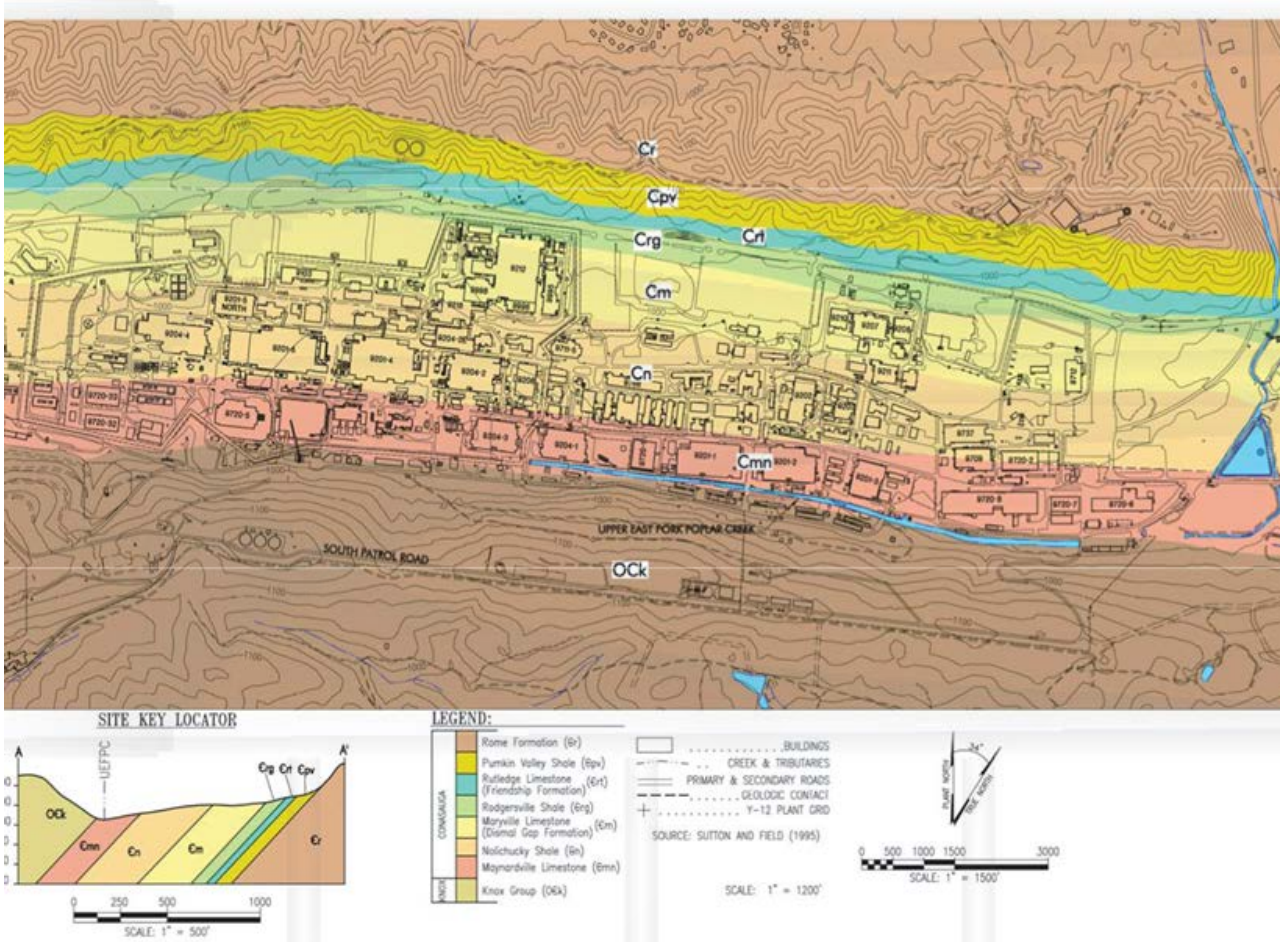
Many geologic formations are present in the ORR area. A geologic map and stratigraphic column of the area are shown in Figures 3.3-1 and 3.3-2, respectively. The Rome Formation, which is present north of Y-12 and forms Pine Ridge, consists of very large to thinly bedded sandstones interbedded with minor amounts of thinly bedded, silty mudstones, shales, and dolomites. Within 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, consists primarily of calcareous shales, siltstone, and limestone. The Knox Group, which is present immediately south of Y-12, can be divided into five formations of dolomite and limestone. The Knox Group, which underlies Chestnut Ridge, is estimated to be approximately 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/EIS-0387 2011).

The entire Y-12 site is located within Bear Creek Valley, which is underlain by Middle to Late Cambrian strata of the Conasauga Group (see Figure 3.3-1). The Conasauga Group consists primarily of highly fractured and jointed shale, siltstone, calcareous siltstone, and

limestone in the site area. The upper part of the group is mainly limestone, while the lower part consists mostly of shale (LMER 1999a). This group can be divided into six discrete formations, which are, in ascending order; the Pumpkin Valley Shale, the Rutledge Limestone, the Rogersville Shale, the Maryville Limestone, the Nolichucky Shale, and the Maynardville Limestone. The thickness of each of these formations varies.

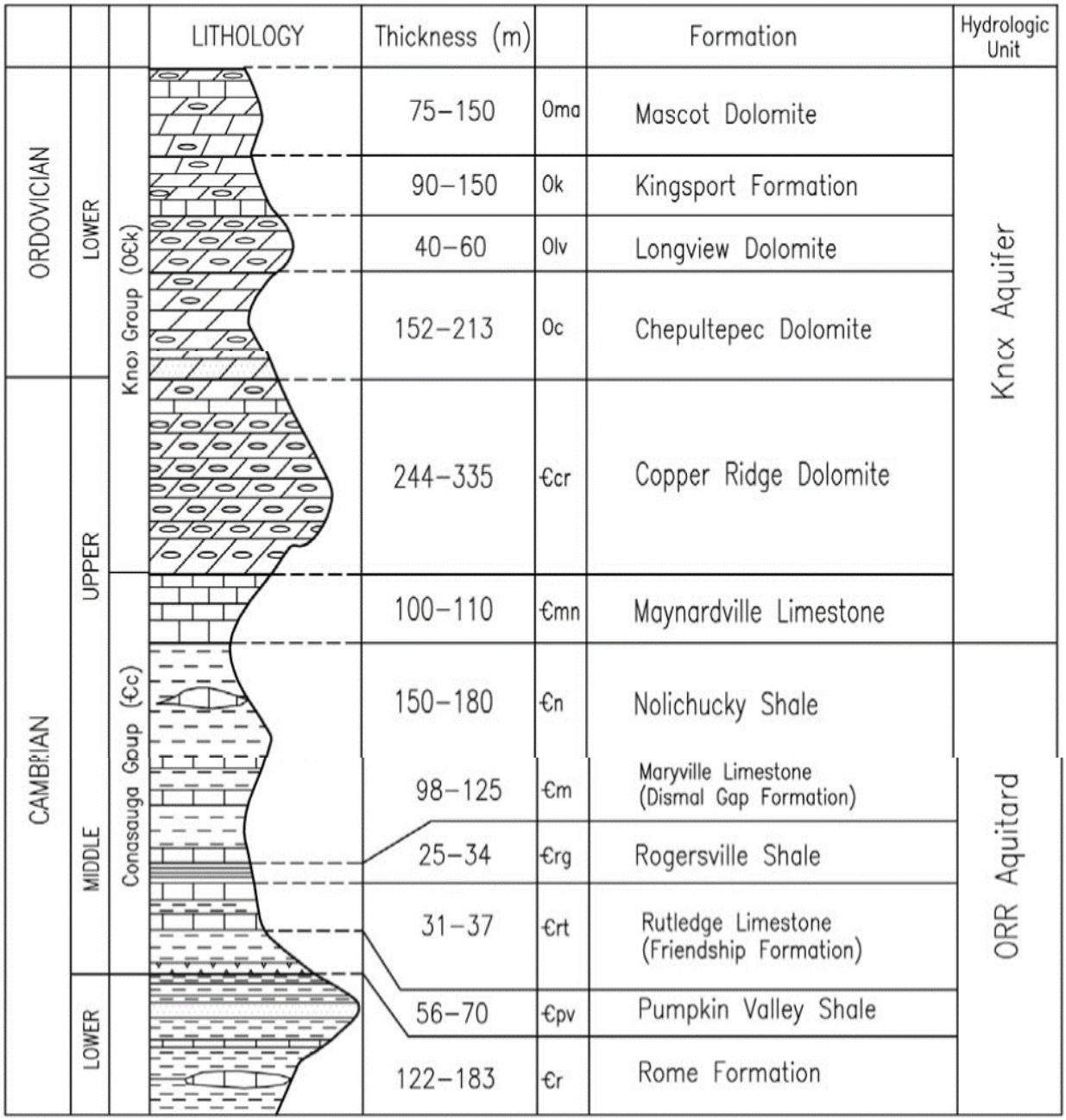
Y-12 is placed on carbonate bedrock such that groundwater flow and contaminant transport are controlled by solution conduits that are in the bedrock. These karst features, including large fractures, cavities, and conduits, are most widespread in the Maynardville Limestone and the Knox Group. These cavities and conduits are often connected and typically found at depths greater than roughly 1,000 ft (DOE/EIS-0387 2011).

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 through. Numerous surface indications of karst development have been identified throughout the ORR. This surface evidence of karst development includes sinking streams (swallets) and overflow swallets, karst and overflow springs, accessible caves, and numerous sinkholes of varying size. In general, karst appears most developed in association with the Knox Group carbonate bedrock, as the highest density of sinkholes occurs in this group (DOE/EIS-0387 2011).



Source: DOE 2001

Figure 3.3-1. Generalized Bedrock Map for Y-12



Source: DOE 2011

Figure 3.3-2. Generalized Stratigraphic Column in the Y-12 Characterization Area

Y-12 is situated in the Upper East Fork Poplar Creek (UEFPC) watershed. Unconsolidated materials overlying bedrock in the UEFPC watershed include alluvium (stream-laid deposits), colluvium (material transported down-slope), man-made fill, fine-grained residuum from the weathering of the bedrock, saprolite (a transitional mixture of fine-grained residuum and bedrock remains), and weathered bedrock. The overall

thickness of these materials in the Y-12 area is typically less than 40 ft. In the undeveloped areas of Y-12, the saprolite retains primary texture features of the unweathered bedrock including fractures (DOE/EIS-0387 2011).

3.3.3 Seismicity

The ORR area lies in Class C Seismic Design Category (SDC) of the Building Seismic Safety Council's recommended seismic provisions (2009), indicating that minor to moderate damage could typically be expected from an earthquake (Figure 3.3-3 and Table 3.3-1).Y-12 is cut by many inactive faults formed during the late Paleozoic Era and there is no recorded evidence of capable faults in the immediate area of Oak Ridge, as defined by 10 CFR Part 100 (surface movement within the past 35,000 years or movement of a recurring nature within the past 500,000 years), (DOE/EIS-0387 2011).

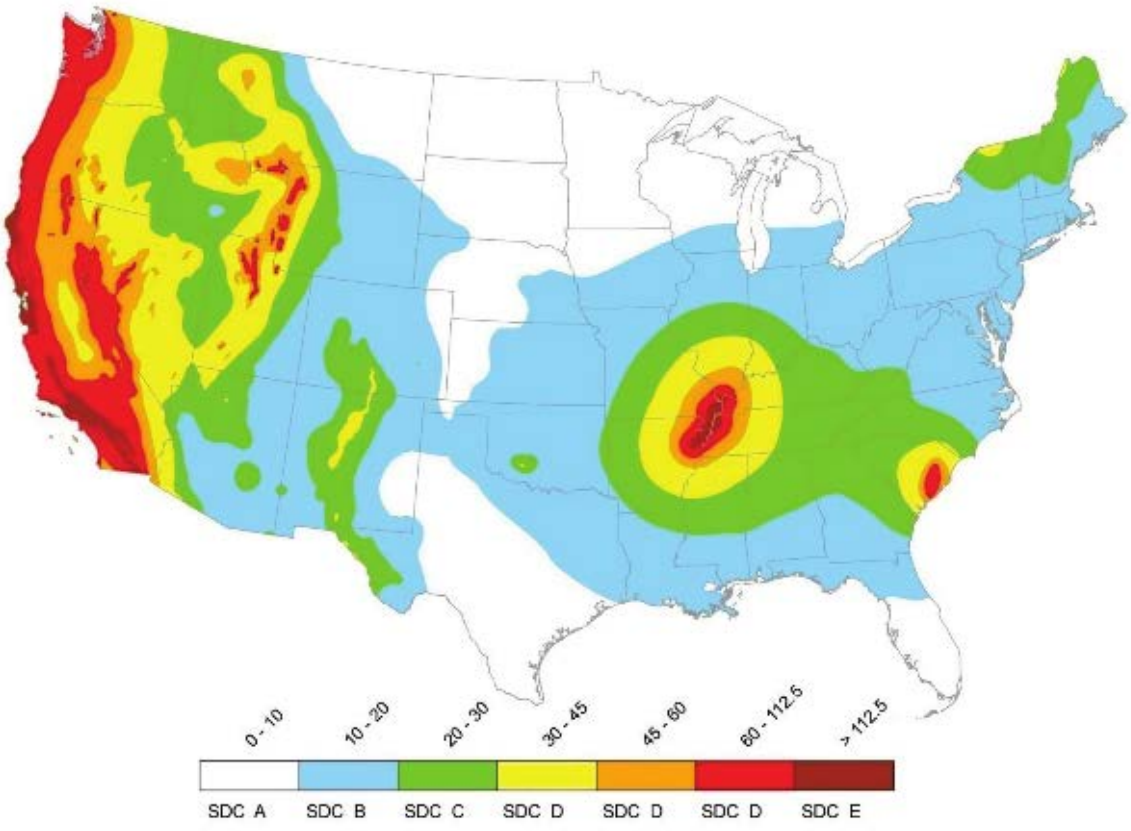


Figure 3.3-3. Map illustrating values of the MCER 1-second spectral response acceleration parameter and associated regions of Seismic Design Category

Table 3.3-1. Seismic Design Categories (SDC), Risk, and Seismic Design Criteria

SDC	Building Type & Expected Modified Mercalli Intensity (MMI)	Seismic Criteria
A	Buildings located in regions having a very small probability of experiencing damaging earthquakes	No specific seismic design requirements, but need to meet basic structural integrity criteria
B	Structures of ordinary occupancy that could experience moderate (MMI IV) intensity shaking	Structures must be designed to resist seismic forces
C	Structures of ordinary occupancy that could experience strong (MMI VII) and important structures that could experience moderate (MMI VI) shaking	Structures must be designed to resist seismic forces. Critical nonstructural components must be provided with seismic restraint.
D	Structures of ordinary occupancy that could experience very strong shaking (MMI VIII) and important structures that could experience strong (MMI VII) shaking	Structures must be designed to resist seismic forces. Only structural systems capable of providing good performance are permitted. Nonstructural components that could cause injury must be provided with seismic restraint. Nonstructural systems required for life safety protection must be demonstrated to be capable of post-earthquake functionality. Special construction quality assurance measures are required.
E	Structures of ordinary occupancy located within a few kilometers of major active faults capable of producing MMI IX or more intense shaking	Structures must be designed to resist seismic forces. Only structural systems capable of providing superior performance are permitted. Many types of irregularities are prohibited. Nonstructural components that could cause injury must be provided with seismic restraint. Nonstructural systems required for life safety protection must be demonstrated to be capable of post-earthquake functionality. Special construction quality assurance measures are required.
F	Critically important structures located within a few kilometers of major active faults capable of producing MMI IX or more intense shaking	Structures must be designed to resist seismic forces. Only structural systems capable of providing superior performance are permitted. Many types of irregularities are prohibited. Nonstructural components that could cause injury must be provided with seismic restraint. Nonstructural systems required for life safety protection must be demonstrated to be capable of post-earthquake functionality. Special construction quality assurance measures are required.

Source: NIBS 2010

The nearest faults capable of producing Modified Mercalli Intensity (MMI) VIII or larger are approximately 300 miles west of ORR in the New Madrid Fault zone (DOE 2005).

Since the New Madrid earthquakes of 1811 to 1812, at least 26 other earthquakes with a MMI (see Table 3.3-2), of III to VI have been felt in the Oak Ridge area, 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 that occurred on the ORR took place in 1930; its epicenter was 5 miles away (DOE/EIS-0387 2011). This earthquake had an estimated intensity of VII at the epicenter and an approximate intensity of V to VI in the Oak Ridge area. Maximum horizontal ground surface accelerations of 0.06 to 0.30 due to gravity at ORR are estimated to result from an earthquake that could occur once every 500 to 2,000 years.

Table 3.3-2. Description of the levels of Modified Mercalli Intensity (MMI)

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 2014, abridged from *The Severity of an Earthquake*, a U. S. Geological Survey General Interest Publication. U.S. GOVERNMENT PRINTING OFFICE: 1989-288-913

On January 4, 1843, a severe earthquake (intensity VIII) affected Memphis and other places in western Tennessee. The shock was reported to have lasted 2 minutes, though this is probably exaggerated. Walls were cracked, chimneys fell, and windows were broken. The total felt area was about 1 million km^2. The shock was strongly felt in Knoxville and caused considerable alarm but did no damage. It was also sharply felt in Nashville. Another tremor on November 28, 1844, caused some bricks to fall from chimneys in Knoxville (VI). Windows and dishes rattled and sounds like distant thunder were heard. Memphis experienced additional damage from a July 19, 1895, earthquake. Walls and chimneys cracked, and people were in panic (VI), (DOE/EIS-0387 2011).

A strong shock centered at Knoxville on March 28, 1913, was felt over an area of 7,000 km^2 in eastern Tennessee. Two shocks were felt in many places. Movable objects were overthrown, and bricks fell from chimneys (VII). A number of false alarms were set off at fire stations and buildings throughout the city violently shook. The Knox County Courthouse, made of brick, noticeably trembled. It was noted that people outdoors experienced a distinct rise and fall in the ground and there were some cases of nausea (USGS 1977).

An earthquake sequence consisting of one foreshock, a magnitude 4.6 main shock, and more than 30 aftershocks occurred south of Knoxville during the latter part of 1973. The foreshock, magnitude 3.4, on October 30, was felt over an area of 2,100 km^2, with a maximum intensity of V. The main shock caused minor damage (VI) in several towns in eastern Tennessee, Georgia, Kentucky, and North Carolina. Minor cracks in walls at the University of Tennessee Hospital at Knoxville were reported. Minor damage to walls, windows, and chimneys occurred in Maryville and Alcoa in Blount County. The shock disrupted relay contacts at the Alcoa switching station, causing a temporary loss of power. The total felt area, including parts of South Carolina, Virginia, and West Virginia, as well as the region mentioned above, covered about 65,000 km^2. A network of eight portable seismographs was installed in the main epicenter area. This network was operational from December 2 through December 12 and recorded 30 small magnitude aftershocks. Additional aftershocks were reported on December 13, 14, and 21 (USGS 2014).

3.3.4 Soils

Y-12 is located in Bear Creek Valley at the eastern boundary of the ORR. Bear Creek Valley lies on well- to moderately well-drained soils underlain by shale, siltstone, and silty limestone (DOE/EIS-0387 2011). Developed portions of the valley are designated as urban, industrial land. The observed soil erosion from past land uses has ranged from slight to severe. The 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 almost flat-lying permeable soils that have a loamy texture. Additionally, shrink-swell potential is low to moderate and the soils are generally acceptable for standard construction techniques and activities (DOE/EIS-0387 2011).

Y-12 lies on soils of the Armuchee-Montevallo-Hamblen, the Fullerton-Claiborne-Bodine, and the Lewhew-Armuchee-Muskinghum associations (DOE/EIS-0387 2011). Due to the extensive cut-and-fill grading during the construction of Y-12, very few areas within the UEFPC watershed have a sequence of natural soil horizons. Soil erosion due to past land use has ranged from slight to severe. The finer textured soils of the Armuchee-Montevallo-Hamblen association have been designated as prime farmland when drained (DOE/EIS-0387 2011).

Historical data shows that mercury, polychlorinated biphenyls (PCBs), and isotopes of uranium are present at detectable levels in sediment. Therefore, as a best management practice, Y-12 maintains an annual sampling program to determine whether these constituents are accumulating in the sediments of East Fork Poplar Creek (EFPC) and Bear Creek as a result of Y-12 discharges. Recent monitoring results in October 2013 indicated an elevated level of cadmium (DOE 2013).

In 2004, the Tennessee Department of the Environment and Conservation (TDEC) Environmental Monitoring and Compliance Program sampled sediments at 34 sites, 11 of which were located on the Clinch River and two on the Tennessee River. The other 21 sites were located on tributaries of the Clinch River draining from ORR; these are considered “exit pathways.” None were on a stream, such as White Oak Creek or Poplar Creek, that has already been identified as contaminated and currently monitored by DOE.

Samples were analyzed for organic, inorganic, and radiological contaminants. The results were compared with standards, known as Preliminary Remediation Goals, established for ORR based on guidance from the U.S. Environmental Protection Agency (EPA). These standards were used because there are no regulatory guidelines for sediment quality, either at the state or federal level. The sediments met the standards for recreational use, meaning that people can safely engage in activities such as fishing, hiking, and playing at these locations (TDEC 2005). More recent (2012-13) TDEC monitoring results showed no unacceptable risk to the public (TDEC 2013).

3.4 Climate and Air Quality

3.4.1 Climate

Y-12 lies within the Great Valley of East Tennessee between the Cumberland and Great Smoky Mountain ranges and is bordered by the Clinch River. The Cumberland Mountains are located about 16 km (10 mi) to the northwest; and the Great Smoky Mountains are 51 km (32 mi) to the southeast (DOE 2014). The Region of Influence (ROI) specific to air quality is primarily the Bear Creek Valley for Y-12. This valley is bordered by ridges that generally confine facility emissions to the valley between the ridges (DOE/EIS-0387 2011).

The climate of the region may be broadly classified as humid subtropical and is characterized by significant temperature changes between summer and winter. Oak Ridge winters are characterized by synoptic weather systems that produce significant precipitation events every 3 to 5 days. These wet periods are occasionally followed by arctic air outbreaks. Although snow and ice are not associated with many of these systems, occasional snowfall does occur in the Oak Ridge area. Winter cloud cover tends to be enhanced by the regional terrain (due to cold air wedging and moisture trapping). Severe thunderstorms are most frequent during spring but can occur at any time of the year. The Cumberland Mountains and Cumberland Plateau often inhibit the intensity of severe systems that traverse the region due to the downward momentum created as the storms move off higher terrain into the Great Valley.

Summers are characterized by very warm, humid conditions. Occasional frontal systems may produce organized lines of thunderstorms (and rare damaging tornados). More frequently, however, summer precipitation results from “air mass” thundershowers that form as a consequence of daytime heating, rising humid air, and local terrain features. Although adequate precipitation usually occurs during the fall, the months of August through October represent the driest period of the year. The occurrence of precipitation during the fall tends to be less cyclical than for other seasons but is occasionally enhanced by decaying tropical cyclones moving north from the Gulf of Mexico. During November, winter–type cyclones again begin to dominate the weather and may continue until April or May (DOE 2014).

Tornadoes and winds that exceed 30 km/hr (18.7 mph) are rare in the Oak Ridge area. However, in February 1993, a tornado touched down in the east end of Y-12 and uprooted trees and downed some primary electrical power lines, causing minimal damage to buildings and equipment (DOE/EIS-0387 2011).

The 30-year mean temperature between 1981 and 2010 was 14.9°C (58.8°F). The average temperature for the Oak Ridge area during 2013 was 14.8°C (58.7°F). The coldest month is usually January, with temperatures averaging about 3.2°C (37.7°F). During 2013, January temperatures were above normal at 5.6°C (42.0°F). July tends to be the warmest month, with average temperatures of 25.8°C (78.5°F). However during the 2000s, August temperatures were slightly warmer than July [25.7°C (78.3°F) vs. 25.4°C (77.7°F)]. July 2013 temperatures averaged 24.6°C (76.2°F), below the 30-year average.

Average annual precipitation in the Oak Ridge area for the 30-year period from 1981 to 2010 was 1,293.5 mm (50.91 in.), including about 21.3 cm (8.4 in.) of snowfall annually. Total precipitation during 2013 [measured at the Oak Ridge National Weather Service meteorological tower (MT)] was 1,712 mm (67.37 in.), 32% above the 30-year average. Total 2013 snowfall was 9.4 cm (3.7in.), 60% below the 30-year average.

In 2013, wind speeds at ORNL Tower C (MT2) measured at 10 m (32.8 ft) above ground level (AGL) averaged 1.1m/s (2.5 mph). This value increased to about 2.9 m/s (6.4 mph)

for winds at 100m (328ft) AGL (about the height of local ridge tops). The local ridge-and-valley terrain reduces average wind speeds at valley bottoms, resulting in frequent periods of calm or near calm conditions, particularly during clear early morning hours in weak synoptic weather environments. (DOE 2014).

3.4.2 Air Quality

Regional Air Quality. As directed by the *Clean Air Act* of 1970 (42 U.S.C. §7401), the U.S. 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 with an aerodynamic diameter less than or equal to 10 microns in diameter (PM10), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). In 1997, the EPA finalized new air quality standards for ozone and PM2.5 (particles with an aerodynamic diameter less than or equal to 2.5 microns). Despite a series of legal challenges in the U.S. Court of Appeals, in February 2001, the U.S. Supreme Court upheld the NAAQS for PM2.5 and ozone. Based on the ambient (outdoor) levels of the criteria pollutants, EPA evaluates individual Air Quality Control Regions (AQCRs) to establish whether or not they satisfy the NAAQS. Areas that satisfy the NAAQS are classified as attainment areas, and areas that exceed the NAAQS for a particular pollutant are classified as non-attainment areas for that pollutant.

The Oak Ridge Reservation (ORR) is located in Anderson and Roane Counties in the Eastern Tennessee-Southwestern Virginia AQCR 207, and Y-12 is located completely within Anderson County. The EPA has designated Anderson County as a basic non-attainment area for the 8-hour O_3 standard as part of the larger Knoxville basic 8-hour O_3 non-attainment area that encompasses several counties, and for PM2.5 based on a revision to the standards. For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS (EPA 2015a).

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 (μg/m3). 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, and 3 hours).

The averaging times shown in the tables in this section correspond to the regulatory averaging times for the individual pollutants. Table 3.4-1 presents the NAAQS and Tennessee State ambient air quality standards.

Table 3.4-1. National and Tennessee Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS (µg/m3)	Tennessee Standard (µg/m3)
Sulfur Dioxide	Annual[1]	80 (0.03 ppm)	80 (0.03 ppm)
	24 Hour[2]	365 (0.014 ppm) [a]	365 (0.014 ppm)
	3 Hour[2]	1,300 (0.5 ppm)[a]	1,300 (0.5 ppm)
PM_{10}	Annual[1]	50	50
	24 Hour[2]	150[b]	150
$PM_{2.5}$	Annual[1]	15[c]	15
	24 Hour[2]	35[d]	35
Carbon Monoxide	8 Hour[2]	10,000 (9 ppm) [a]	10,000 (9 ppm)
	1 Hour [2]	40,000 (35 ppm) [a]	40,000 (35 ppm)
Ozone	8 Hour[3]	157 (0.08 ppm) [e]	157 (0.08 ppm)
	1 Hour [2]	235 (0.12 ppm) [f]	235 (0.12 ppm)
Nitrogen Dioxide	Annual[1]	100 (0.05 ppm)	100 (0.05 ppm)
Lead	Quarter[1]	1.5	1.5

Key:
a Not to be exceeded more than once per year.
annual PM_{10} standard in 2006 (effective December 17, 2006).
b Not to be exceeded more than once per year on average over 3 years.
c To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m_3$.
d To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m_3$ (effective December 17, 2006).
e To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
f (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas.
1. Arithmetic mean.
2. Block average.
3. Rolling Average.
$\mu g/m_3$ = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion
Source: EPA 2015b and DOE/EIS-0387 2011.

Air Quality and Emissions on the Oak Ridge Reservation. Airborne discharges from DOE Oak Ridge facilities, both radioactive and nonradioactive, are subject to regulation by the EPA, the Tennessee Department of Environmental Control (TDEC), and DOE Orders. Y-12 has a comprehensive air regulation compliance assurance and monitoring

program to ensure that airborne emissions satisfy all regulatory requirements and do not adversely affect ambient air quality. Common air pollution control devices employed on the ORR include exhaust gas scrubbers, fabric filters, and High Efficiency Particulate Air (HEPA) filtration systems designed to remove contaminants from exhaust gases before release to the atmosphere. Process modifications and material substitutions are also made to minimize air emissions. In addition, administrative control plays a role in regulation of emissions. Both effluent and ambient air are sampled on the ORR. Effluent air flows into the environment from a source, such as an exhaust stack, and ambient air is the air that exists in the surrounding area. Radiological air emissions are monitored. Sample results show that ORR operations have an insignificant effect on local air quality (DOE/EIS-0387 2011).

The release of non-radiological contaminants into the atmosphere at Y-12 occurs as a result of plant production, maintenance, waste management operations, and steam generation. Most process operations are served by ventilation systems that remove air contaminants from the workplace.

In calendar year (CY) 2006, Y-12 implemented complete compliance and reporting activities for its first Major Source (Title V) Operating Air Permit. The permit covers 37 air emission sources and more than 100 air emission points. Other emission sources at Y-12 are categorized as being insignificant and exempt from air permitting. Under the Title V operating permit for the complex, sampling, continuous monitoring, and record keeping of key process parameters are recorded and reported to TDEC in semiannual and annual reports.

Approximately three-fifths of the permitted air sources release primarily non-radiological contaminants. The remaining two-fifths of the permitted sources process primarily radiological materials. TDEC air permits for the non-radiological sources do not require stack sampling or monitoring. For non-radiological sources where direct monitoring of airborne emissions is not required, or is required infrequently, monitoring of key process parameters is done to ensure compliance with all permitted emission limits (DOE 2014).

The primary source of criteria pollutants at Y-12 is the steam plant, where natural gas and Number 2 Fuel Oil are burned (DOE 2014). Actual and allowable emissions from the steam plant are shown in Table 3.4; actual emissions are well below allowable emission limits.

Table 3.4-2. Actual vs. Allowable Air Emissions from the Oak Ridge Y-12 Steam Plant, 2014

Pollutant	Emissions (tons/year)[a]		Percentage of Allowable
	Actual	Allowable	
Particulate	3.98	41	9.7
Sulfur Dioxide	0.31	39	0.8
Nitrogen Oxides[b]	16.76	81	20.7
Volatile Organic Compounds (VOCs)[b]	2.88	9.4	30.6
Carbon Monoxide[b]	44	139	31.6

Note: The emissions are based on fuel usage data for January through December 2014. The emissions also included the fuel used during testing.

a 1 ton = 907.2 kg

b When there is no applicable standard or enforceable permit condition for some pollutants, the allowable emissions are based on the maximum actual emissions calculation as defined in Tennessee Department of Environment and Conservation Rule 1200-3-26-.02(2)(d)3 (maximum design capacity for 8760 hours/year). The emissions for both the actual and allowable emissions were calculated based on the latest EPA compilation of air pollutant emission factors. (EPA 1995 and 1998. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources. Environmental Protection Agency, Research Triangle Park, N.C. January 1995 and September 1998.)

Source: DOE 2014

Radiological and Hazardous Air Emissions. The release of radiological contaminants, primarily uranium, into the atmosphere at Y-12 occurs as a result of plant production, maintenance, and waste management activities. Atmospheric emissions of radionuclides from DOE facilities are limited by EPA regulations found under National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations (40 CFR 61, Subpart H), which have been delegated to TDEC for implementation. All three ORR facilities are operated in accordance with the Tennessee regulatory dose limits for Hazardous Air Pollutants for Radionuclides and have met all emission and test procedures. The NESHAP establishes a dose limit of 10 millirem (mrem) per year for any member of the public. The total 2013 dose to the maximally exposed individual (MEI) from the entire Oak Ridge reservation activities was 0.4 mrem (DOE 2014). Details on the annual radionuclide compliance modeling and other NESHAP that cover asbestos and specific source categories on the ORR are reported in the 2013 *Oak Ridge Reservation Annual Site*

Environmental Report (DOE 2014). No releases of reportable quantities of asbestos were reported at Y-12 in 2013.

Since 1986, ambient air monitoring of mercury concentrations has been conducted at Y-12 as a best management practice. Two atmospheric mercury monitoring stations located near the east and west boundaries of Y-12 are currently in operation. Since 1986, these stations have monitored mercury in ambient air continuously, except for short periods of downtime due to electrical or equipment outages. Average mercury vapor concentrations at Y-12 monitoring stations have declined significantly since monitoring began. Annual average mercury concentrations during 2013 at Y-12 east and west boundary monitoring stations are comparable to reference levels measured on Chestnut Ridge in 1988 and 1989, and only slightly elevated above values reported for continental background. These concentrations are well below current environmental and occupational health standards for inhalation exposure to mercury vapor (DOE 2014).

The ORR maintains a perimeter air monitoring network of eight stations at the reservation perimeter and one at an offsite reference location. Surveillance of airborne radionuclides includes measurement of ambient levels of alpha-, beta-, and gamma-emitting radionuclides and tritium. Additional information on monitoring locations and activities is provided in the Y-12 SWEIS (DOE/EIS-0387 2011).

3.5 Noise

The acoustic environment along Y-12 site boundary, in rural areas, and at nearby residences away from traffic noise, is typical of a rural location with a day-night average sound level (DNL) in the range of 35 to 50 decibel (dBA). Areas near Y-12 within Oak Ridge are typical of a suburban area, with a DNL in the range of 53 to 62 dBA. The primary source of noise at Y-12 site boundary and at residences located near roads is traffic. During peak hours, Y-12 worker traffic is a major contributor to traffic noise levels in the area.

Major noise emission sources within Y-12 include various industrial facilities, equipment, and machines (e.g., cooling systems, transformers, engines, pumps, boilers, steam vents,

paging systems, construction and materials-handling equipment, and vehicles). Most of the Y-12 industrial facilities are at a sufficient distance from the site boundary so that noise levels at the boundary from these sources are not distinguishable from background noise levels. Within the Y-12 site boundary, noise levels from Y-12 mission operations range between 50 and 70 dBA, which is typical for industrial facilities. The area of the proposed project is within the Y-12 main plant areas, with noise levels typical of the rest of this area.

The State of Tennessee has not established specific community noise standards applicable to Y-12; however, Anderson County has quantitative noise-limit regulations as shown in Table 3.5-1 (Anderson County 2009).

Table 3.5-1. Allowable Noise Level by Zoning District in Anderson County, Tennessee

Zoning District	Allowable Noise Level (in dBA)	
	7 AM – 10 PM	10 PM – 7 AM
Suburban Residential (R-1)	60	55
Rural Residential (A-2)	65	60
Agricultural – Forest (A-1)	65	60
General Commercial (C-1)	70	65
Light Industrial (I-1)	70	70
Heavy Industrial (I-2)	80	80
Floodway (F-1)	80	80

3.6 Water Resources

3.6.1 Groundwater

The Y-12 site, bound on the north by Pine Ridge and on the south by Chestnut Ridge, is located near the boundary between the Knox Aquifer and the ORR aquitards. The ORR aquitards underlie Pine Ridge and Bear Creek Valley, which includes the main plant area of Y-12 and the disposal facilities of western Bear Creek Valley. The Knox Aquifer underlies Chestnut Ridge and the stream channels of Bear Creek and Upper East Fork Poplar Creek (UEFPC). Bedrock formations comprising the aquitards are hydraulically up-gradient of the aquifer, which functions as a hydrologic drain in Bear Creek Valley. Fractures provide the principal groundwater flow paths in both the aquifer and aquitards. Dissolution of carbonates in the aquifer has enlarged fractures and produced solution

cavities and conduits that greatly enhance its hydraulic conductivity relative to the aquitards. An air stripper treatment unit is operated, pursuant to a CERCLA Action Memorandum, near the eastern Y-12 boundary to arrest the off-site migration of volatile organic compounds (VOCs) into Union Valley.

Groundwater at Y-12 is divided into three hydrogeologic regimes: (1) surface water drainage patterns; (2) topography; and (3) groundwater flow characteristics. The regimes are further defined by the waste sites they contain. These regimes include the Bear Creek Hydrogeologic Regime, the UEFPC Hydrogeologic Regime, and the Chestnut Ridge Hydrogeologic Regime. For more details on these hydrogeologic regimes, refer to Section 4.5 of the Y-12 SWEIS (DOE/EIS-0387 2011).

Recharge occurs over most of the area but is most effective where overburden soils are thin or permeable. Groundwater flow in the aquitard and the aquifer is primarily parallel to bedding planes. There are no Class I sole-source aquifers that lie beneath the ORR. All aquifers are considered Class II aquifers (current potential sources of drinking water). Because of the abundance of surface water and its proximity to the points of use, very little groundwater is used at the ORR. Only one water supply well exists on the ORR and it serves as a supplemental water supply to an aquatics laboratory during extended droughts.

Groundwater Quality. Groundwater samples are collected semiannually and annually from a representative number of monitoring wells located throughout the ORR. Historical groundwater monitoring efforts have shown that four types of contaminants have impacted groundwater quality at Y-12: nitrates, VOCs, metals, and radionuclides. Of these, nitrates and VOCs are the most widespread. Some radionuclides, particularly uranium and technetium (99Tc), are found principally in the Bear Creek regime and the western and central portions of the UEFPC regime.

Groundwater in Bear Creek Valley west of Y-12 has been contaminated by hazardous chemicals and radionuclides from past weapons production waste disposal activities. The primary groundwater contaminants in the Bear Creek Regime are nitrates, trace metals, VOCs, and radionuclides. The contaminant sources include past waste disposal facilities

sited on aquitard bedrock north of Bear Creek. Former disposal facilities and Solid Waste Management Units (SWMUs) in the Bear Creek Valley include the S-3 Site, Oil Landfarm, Boneyard/Burnyard site, New Hope Pond, and the Bear Creek Burial Grounds, all closed between 1988 and 1995 (DOE/EIS-0387 2011, DOE 2014).

Among the three hydrogeologic regimes at Y-12, the UEFPC regime encompasses most of the known and potential sources of groundwater contamination. The groundwater contamination is the result of a co-mingling of releases from multiple sources within Y-12. Nitrates and 99Tc from the S-3 Site are the primary groundwater contaminants in the western portion of the UEFPC regime, while groundwater in the eastern portion including Union Valley is predominantly contaminated with VOCs, such as tetrachloroethylene (PCE), trichloroethylene (TCE), 1, 1-dichloroethane (DCE), carbon tetrachloride, and chloroform; and fuel components such as benzene, toluene, ethylbenzene, and xylene (BTEX). The most frequently detected metals are boron, beryllium, cobalt, copper, chromium, lead, lithium, mercury, manganese, nickel, and total uranium (DOE/EIS-0387 2011, DOE 2014).

The Chestnut Ridge hydrogeologic area is dominated by several closed and operating disposal facilities, including the closed Chestnut Ridge Security Pits, Chestnut Ridge Sediment Disposal Basin, United Nuclear Corporation Site, and seven nonhazardous waste landfills. Groundwater monitoring data collected since the mid-1980s indicate a definable VOC contaminant plume in groundwater that is associated with the Chestnut Ridge Security Pits and extends approximately 792 m (2,600 ft) east of that facility.

In addition, shallow groundwater within the water table interval near New Hope Pond (closed SWMU), Lake Reality, and UEFPC is monitored. Historically, VOCs have been detected near Lake Reality from wells, a dewatering sump, and the New Hope Pond distribution channel underdrain. In this area, shallow groundwater flows north-northeast through the water table interval east of New Hope Pond and Lake Reality, following the path of the distribution channel for UEFPC. During calendar year (CY) 2013, the observed concentrations of VOCs at the New Hope Pond distribution channel continue to remain low (DOE 2014).

3.6.2 Surface Water

Waters drained from the ORR eventually reach the Tennessee River via the Clinch River, which forms the southern and western boundaries of the ORR. Within Y-12, the two major surface water drainage basins are those of Bear Creek and East Fork Poplar Creek (EFPC). The upper reaches of the EFPC drains the majority of the industrial facilities at Y-12. The reach of EFPC upstream of Bear Creek Road has been designated as the UEFPC. EFPC, which discharges into Poplar Creek east of the ETTP, flows northeast along the south side of Y-12. Various Y-12 wastewater discharges to the UEFPC from the late 1940s to the early 1980s left a legacy of contamination, such as mercury, PCBs, and uranium that has been the subject of water quality improvement initiatives for more than 30 years.

The natural drainage pattern of UEFPC was altered during the construction of Y-12 in the 1940s. The UEFPC channel has been extensively modified over the years by installation of structures such as road crossings and weirs and through significant use of riprap and erosion controls. Flow in UEFPC is derived partially from groundwater captured by the buried channels and funneled to the creek. In addition, outfalls into UEFPC add a combination of groundwater, storm water, and effluents generated by plant operations. Streamflow in UEFPC is characterized by a relatively low baseflow in the range of 800 to 1,000 gallons per minute during dry conditions, with significantly increased flow during storm events, peaking as high as 40,000 gallons per minute or more (DOE 2014a). To improve downstream water quality, Y-12's 2006 National Pollutant Discharge Elimination System (NPDES) permit required supplementing flow in UEFPC by the addition of raw water from the Clinch River. Starting in mid-1996, was added to the western portion of the open channel in order to maintain flow of 19 MLD at Station 17, downstream of Lake Reality just before the creek exits the Y-12 boundary on the east end. A new NPDES permit that became effective December 1, 2011, contained a requirement to provide a schedule for the relocation of the addition of raw water to EFPC downstream of its current location to reduce the potential for mercury being suspended by the higher flow due to raw water addition at the headwaters of EFPC (DOE 2014). The State of Tennessee required Y-12 to eliminate the use of raw water to EFPC effective May 1, 2014.

Bear Creek Valley west of Y-12 is drained by Bear Creek. Bear Creek begins near the westernmost portion of Y-12 and flows west for approximately 8.3 km (5.2 mi). At the location where Bear Creek reaches U.S. Highway 95, it turns north and flows through a gap in Pine Ridge to its confluence with EFPC, just above its confluence with Poplar Creek. Bear Creek flow is maintained by inputs from tributary streams flowing in from the north from Pine Ridge. Flow in Bear Creek is further supplemented by discharges from several springs at the base of Chestnut Ridge and underdrains from the Environmental Management Waste Management Facility (EMWMF).

The Clinch River is the source of potable water for the City of Oak Ridge which provides potable water for Y-12 and ORNL. The Clinch River has an average flow of 132,000 liters per second (L/s) (4,656 cfs) as measured at the downstream side of Melton Hill Dam at mile 23.1. The average flow of Bear Creek near Y-12 is 110 L/s (3.9 cfs). Base flow, measured downstream of Y-12 averages 1,300 L/s (46 cfs). Y-12 uses approximately 7,530 million liters per year (MLY) (2,000 MGY) of water while the ORR uses approximately twice as much. The City of Oak Ridge, which has a capacity of 44,347 MLY (11,715 MGY), supplies water to Y-12 and ORNL, as well as Oak Ridge residents.

Clinch River water levels in the vicinity of the ORR are regulated by a system of dams operated by the Tennessee Valley Authority (TVA). 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 of the lower end of the Clinch River, affects the flow of the Clinch River along the southeast side of the ORR.

Surface Water Quality. The streams and creeks of Tennessee are classified by 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 water body 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.

There are five wastewater treatment facilities that operate under NPDES permits at Y-12. Another facility, known as the Big Springs Water Treatment Facility, began operation in 2005 as an interim remedial action to remove mercury under a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) ROD. This facility diverts flow from outfall 051 and discharges through a CERCLA outfall into the UEFPC. Sanitary and certain industrial wastewaters are permitted for discharge to the City of Oak Ridge wastewater collection and treatment systems.

The water quality of surface streams in the vicinity of Y-12 is affected by current and past operations. While storm water, groundwater, and wastewater flows may contribute contaminants to UEFPC, the water quality and ecological health of this stream has greatly improved over the last 20 years. This is primarily due to rerouting of discharge pipes, construction and operation of wastewater treatment facilities, dechlorination of process waters, and other ongoing environmental protection activities at Y-12.

Among the three hydrogeologic regimes at Y-12, the UEFPC regime contains most of the known and potential sources of surface water contamination. Surface water contaminants in UEFPC include metals (particularly mercury and uranium), organics, and radionuclides (especially uranium isotopes). Water quality in Bear Creek is influenced significantly by a groundwater hydraulic connection either directly to Bear Creek or to tributaries to Bear Creek.

Contaminants in Bear Creek, from multiple formerly used waste burial trenches and pits, include nitrates, metals (e.g., uranium), radionuclides (e.g., uranium isotopes, 99Tc), and chlorinated organics (DOE 2005, DOE/EIS-0387 2011, DOE 2014).

The current Y-12 NPDES permit (TN0002968) requires sampling, analysis, and reporting for about 56 outfalls. The number is subject to change as outfalls are eliminated or consolidated or if permitted discharges are added. Currently, Y-12 has outfalls and monitoring points in the following water drainage areas: EFPC, Bear Creek, and several tributaries on the south side of Chestnut Ridge; all of which eventually drain to the Clinch River. Routine surface water surveillance monitoring, above and beyond that required by the NPDES permit, is performed as a best management practice. Y-12 monitors the

surface water as it exits each of the three hydrogeologic regimes that serve as an exit pathway for surface water.

In 2013, there was one NPDES permit limit excursion for cadmium (monthly average permit limit 0.001 mg/L). Cadmium analytical results of a composite surface water sample collected from Outfall 200 in October 3, 2013, identified a concentration of 0.0174 mg/L, which is below the daily maximum value but above the monthly average value of 0.001 mg/L. The cause of the elevated cadmium at Outfall 200 is not exactly known. A grab sample collected upstream in the storm drain system indicated the presence of cadmium. Cadmium has also been detected in a nearby groundwater well. Composite sampling is planned in the future for this area of the storm drain system, where groundwater data indicate the presence of cadmium.

Surface water monitoring is conducted at ten locations at Y-12, plus two springs which are sampled as part of the groundwater sampling program. Comparisons with the Tennessee water quality criteria indicate that only mercury, chromium, zinc, and copper from samples collected at Station 17 were detected above the criteria maximum (DOE 2014).

Surface Water Rights and Permits. In Tennessee, the state's water rights are codified in the *Water Quality Control Act*. In effect, the water rights are similar to riparian rights in that the designated usages of a water body cannot be impaired. The only requirement to withdraw from surface water would be a TDEC Chapter 1200-5-8 Water Registration Requirement, and the U.S. Army Corps of Engineers and TVA permits to construct intake structures.

3.7 Ecological Resources

This section describes ecological resources on or near the ORR (which includes Y-12) containing terrestrial and aquatic resources, threatened and endangered (T&E) species, floodplains and wetlands.

3.7.1 Terrestrial and Aquatic Resources

Terrestrial Resources. The ORR is mostly contiguous native eastern deciduous forest found throughout the reservation. Local plant life is characteristic of the intermountain regions of central and southern Appalachia; pine and pine-hardwood forest and oak-hickory forest are the most extensive plant communities found at ORR (DOE/EIS-0387 2011). The forests are mostly oak, hickory, pine-hardwood, or pine. Minor areas of other hardwood forest cover types are found, including northern hardwoods, a few small natural stands of hemlock or white pine, and floodplain forests. Over 1,100 vascular plant species are found on ORR (ORNL 2002). Animal species include approximately 59 species of amphibians and reptiles; up to 260 species of migratory, transient, and resident birds; and 38 species of mammals (DOE/EIS-0387 2011). White-tailed deer, wild turkey, and geese populations on the ORR are controlled through managed hunts at several times throughout the year.

Within the fenced, developed portion of Y-12, grassy and unvegetated areas surround the entire facility. Building and parking lots dominate the landscape with limited vegetation present. Fauna within the Y-12 area is limited due to the lack of large green areas of natural habitat for animals to travel and rest.

However, DOE has set aside large tracts of land for conservation on the ORR, including approximately 3,000 acres set aside in April 2005. This conservation land is located on the western end of ORR and features mature forests, wetlands, river bluffs, cliffs and caves and is home to several rare species.

Aquatic Resources. Aquatic habitat on or adjacent to the ORR ranges from small, free-flowing streams in undisturbed watersheds to larger streams with altered flow patterns due to dam construction (DOE/EIS-0387 2011). These aquatic habitats include tailwaters, impoundments, reservoir embayments, and large and small perennial streams. Aquatic areas within ORR also include seasonal and intermittent streams (DOE/EIS-0387 2011).

Sixty-three fish species have been collected on or adjacent to the ORR (ORNL 2002). The minnow family has the largest number of species and is numerically dominant in most streams (DOE/EIS-0387 2011). Fish species representative of the Clinch River in the

vicinity of ORR include shad and herring (*Clupeidae*), common carp (*Cyprinus carpio*), catfish and bullheads (*Ictaluridae*), bluegill (*Lepomis macrochirus*), crappie (*Pomoxis spp*.), and freshwater drum (*Aplodinotus grunniens*) (ORNL 1981). The most important fish species taken commercially in ORR area are common carp and catfish. Recreational species consist of crappie, largemouth bass (*Micropterus salmoides*), sauger (*Stizostedion canadense*), sunfish (*Lepomis spp.),* and catfish. The redbreast sunfish (*Lepomis auritus*) and rock bass (*Ambloplites rupestris*) are used in bioaccumulation studies for mercury and PCB concentrations as part of Y-12's Basin Management Action Plan (DOE 2008). Sport fishing is not currently permitted within the ORR.

In 2006 the Agency for Toxic Substances and Disease Registry (ATSDR) released a fish consumption recommendation based on the level of PCBs found in the muscle and fatty tissues of several local fish species inhabiting waterways on or near the vicinity of Y-12 (Clinch River, EFPC, and Poplar Creek). Based on the levels of PCBs detected in fish, geese, and turtles, the ATSDR determined it is safe to eat up to one meal of any type of fish per month. However, the ATSDR suggests limiting the consumption of largemouth bass, catfish, striped bass, and white bass to one fish meal per week (ATSDR 2006). In addition the ATSDR advises against eating turtle fat from turtle species that occur concomitantly with the aforementioned fish species (ATSDR 2006). The report states that the PCBs in local waterways came from plant operations and former waste disposal practices at ORR's Y-12, K-25, X-10, and S-50 sites (ATSDR 2006).

3.7.2 Threatened and Endangered Species.

There are three special status species known to occur on ORR, the gray bat (*Myotis grisescens*), a federally and state-listed endangered species; the state-listed threatened northern saw-whet owl (*Aegolius acadicus*) and the state-listed endangered peregrine falcon (*Falco peregrinus*) (the peregrine falcon was federally delisted on August 25, 1999). These species, along with 17 other species of animals listed as species of concern known to be present on ORR (excluding the Clinch River bordering the reservation) are shown along with their status in Table 3.7-1. Birds, fish, and aquatic invertebrates are the most thoroughly surveyed animal groups on ORR. Table 3.7-1 illustrates the diversity of birds on ORR, which is also habitat for many species, some of which are in decline

nationally or regionally. Other federally and/or state-listed species may also be present on ORR, although they have not been observed recently. These include several species of mollusks (such as the spiny river snail [Io fluvialis]), amphibians (such as the hellbender [Cryptobranchus alleganiensis]), birds (such as Bachman's sparrow [Aimophila aestivalis]), and mammals (such as the smoky shrew [Sorex fumeus]). The only federally listed animal species that has recently been observed on ORR is the gray bat, which was observed over water bordering ORR (the Clinch River) in 2003 and over a pond on ORR in 2004 (DOE 2008). A gray bat was also mist-netted in an area bordering the Clinch River in 2013 (DOE 2013).

Table 3.7-1. Animal species of special concern reported on the Oak Ridge Reservation[a]

Scientific Name	**Common Name**	**Status[b]**		
		Federal	**State**	**PIF[c]**
	FISH			
Phoxinus tennesseensis	Tennessee dace		NM	
	AMPHIBIANS & REPTILES			
Crytobranchus alleganiensis	Hellbender	MC	NM	
Hemidactylium scutatum	Four-toed salamander		NM	
	BIRDS			
	- Darters -			
Anhinga anhinga	Anhinga		NM	
	- Bitterns & Herons -			
Ixobrychus exilis	Least bittern	MC	NM	
Ardea alba	Great egret		NM	
Egretta caerulea	Little blue heron	MC	NM	
Egretta thula	Snowy egret	MC	NM	
	- Kites, Hawks, Eagles & Allies -			
Haliaeetus leucocephlus	Bald eagle	MC[d]	NM	
Circus cyaneus	Northern harrier		NM	
Accipiter striatus	Sharp shinned hawk	MC	NM	
Buteo lineatus	Red-shouldered hawk			RI
Buteo platypterus	Broad-winged hawk			RI
	- Falcons -			
Falco peregrinus	Peregrine falcon	MC[e]	E	RI
Falco sparverius	American kestrel	MC		RI
	- Grouse, Turkey & Quail -			
Bonasa umbellus	Ruffed grouse			RI
Colinus virginianus	Northern bobwhite			RI
	- Owls -			
Aegolius acadicus	Northern saw-whet owl	MC	T	RI
Tyto alba	Barn owl		NM	
	- Goatsuckers -			
Caprimulgus carolinensis	Chuck-will's-widow	MC		RI

Scientific Name	**Common Name**	**Status[b]**		
		Federal	**State**	**PIF[c]**
Caprimulgus vociferous	Eastern whip-poor-will	MC		RI
	- Swifts -			
Chaetura pelagica	Chimney swift			RI
	- Kingfishers -			
Megaceryle alcyon	Belted kingfisher			RI
	- Woodpeckers -			
Melanerpes erythrocephalus	Red-headed woodpecker	MC		RI
Sphyrapicus varius	Yellow-bellied sapsucker	MC	NM	
Picoides pubescens	Downy woodpecker			RI
Colaptes auratus	Northern flicker			RI
	- Tyrant Flycatchers -			
Contopus cooperi	Olive-sided flycatcher	MC	NM	RI
Contopus virens	Eastern wood-pewee			RI
Empidonax virescens	Acadian flycatcher			RI
Empidonax trailii	Willow flycatcher			RI
	- Swallows -			
Progne subis	Purple martin			RI
Riparia riparia	Bank swallow			RI
Hirundo rustica	Barn swallow			RI
	- Titmice & Chickadees -			
Poecile atricapillus	Black-capped chickadee	MC	NM	
Poecile carolinensis	Carolina chickadee			RI
	- Nuthatches -			
Sitta pusilla	Brown-headed nuthatch	MC		RI
	- Wrens -			
Troglodytes troglodytes	Winter wren			RI
Thryothorus ludovicianus	Carolina wren			RI
	- Kinglets, Gnatcatchers & Thrushes -			
Hylocichla mustelina	Wood thrush	MC		RI
	- Thrashers & Mockingbirds -			
Toxostoma rufum	Brown thrasher			RI
	- Waxwings -			
Bombycilla cedrorum	Cedar waxwing			RI
	- Shrikes -			
Lanius ludovicianus	Loggerhead shrike	MC	NM	RI
	- Vireos -			
Vireo Flavifrons	Yellow-throated vireo			RI
Vireo solitarius	Blue-headed vireo			RI
Vireo griseus	White-eyed vireo			RI
	- Wood Warblers -			
Vermivora chrysoptera	Golden-winged warbler	MC	NM	RI
Vermivora cyanoptera	Blue-winged warbler	MC		RI
Setophaga discolor	Prairie warbler	MC		RI
Setophaga dominica	Yellow-throated warbler			RI
Mniotilta varia	Black-and-white warbler			RI
Helmitheros vermivorum	Worm-eating warbler	MC		RI

Scientific Name	**Common Name**	**Status[b]**		
		Federal	**State**	**PIF[c]**
Parkesia motacilla	Louisiana waterthrush	MC		RI
Protonotaria citrea	Prothonotary warbler	MC		RI
Geothlypis formosa	Kentucky warbler	MC		RI
Cardellina canadensis	Canada warbler	MC		RI
Setophaga citrina	Hooded warbler			RI
Icteria virens	Yellow-breasted chat			RI
Setophaga pinus	Pine warbler			RI
Cardellina pusilla	Wilson's warbler			RI
Setophaga magnolia	Magnolia warbler			RI
Setophaga fusca	Blackburnian warbler			RI
Setophaga pennsylvanica	Chestnut-sided warbler			RI
Setophaga virens	Black-throated green warbler			RI
	- Tanagers -			
Piranga olivacea	Scarlet tanager			RI
Piranga rubra	Summer tanager			RI
	- Cardinals, Grosbeaks & Allies -			
Passerina cyanea	Indigo bunting			RI
	- Towhees, Sparrows & Allies -			
Pipilo erythrophthalmus	Eastern towhee			RI
Spizella pusilla	Field Sparrow			RI
Ammodramus savannarum	Grasshopper sparrow			RI
Pooecetes gramineus	Vesper sparrow		NM	
Ammodramus henslowii	Henslow's sparrow	MC	NM	RI
Melospiza Georgiana	Swamp sparrow			RI
	- Blackbirds & Allies -			
Dolichonyx oryzivorus	Bobolink			RI
Sturnella magna	Eastern meadowlark			RI
	- Finches & Allies -			
Spinus tristis	American goldfinch			RI
	MAMMALS			
Myotis grisescens	Grey bat	E	E	
Myotis sodalist	Indiana bat[f]	E	E	
Myotis septentrionalis	Northern long-eared bat	PE		
Sorex longirostris	Southeastern shrew		NM	
Sorex cinereus	Masked shrew		NM	
Zapus hudsonius	Meadow jumping mouse		NM	

[a]Land and surface waters of the ORR exclusive of the Clinch River, which borders the ORR.
[b]Status Code:

E = endangered
T = threatened
PE = proposed endangered
MC = of management concern
NM = in need of management
RI = regional importance

[c]Partners in Flight – an international organization devoted to conserving bird populations in the Western Hemisphere.
[d]The bald eagle was federally delisted effective August 8, 2007.
[e]The peregrine falcon was federally delisted effective August 25, 1999.
[f]Single specimen captured in mist net bordering the Clinch River, June 2013.

U.S. Fish and Wildlife Service (USFWS) records indicate that the Federal listed endangered Indiana bat (*Myotis sodalis*) may also be present in the vicinity of Y-12, however, this bat has not been observed at Y-12 or other parts of ORR (DOE/EIS-0387 2011). The peregrine falcon and northern saw-whet owl are only very rare transients on the site. Similarly, several state-listed bird species, such as the anhinga (*Anhinga anhinga*), olive-sided flycatcher (*Contopus cooperi*), and little blue heron (*Egretta caerulea*), are currently uncommon migrants or visitors to ORR; however, the little blue heron is probably increasing in numbers. The cerulean warbler (*Dendroica cerulea*), listed by the state as in need of management, has been recorded during the breeding season; however, this species is not actually known to breed at ORR. The bald eagle (*Haliaeetus leucocephalus*), also listed by the state as in need of management, is increasingly seen in winter and may well begin nesting at ORR within a few years. Others, such as the northern harrier (*Circus cyaneus*), great egret (*Ardea alba*), and yellow-bellied sapsucker (*Sphyrapicus varius*), are migrants or winter residents that do not nest on the reservation. The golden-winged warbler (*Vermivora chrysoptera*), listed by the state as in need of management, has been sighted once on the reservation. Barn owls (*Tyto alba*) have been known to nest on the reservation in the past. One Federal and state threatened species, the spotfin chub (*Cyprinella monnacha*), has been sighted and collected in the EFPC. The Tennessee dace has been found in some sections of Grassy Creek (DOE 2008).

Table 3.7-2. Vascular plant species listed by state or federal agencies and sited or reported on or near the Oak Ridge Reservation, 2013

Species	Common name	Habitat on ORR	Status code[a]
Currently known to be or previously reported on ORR			
Aureolaria patula	Spreading false foxglove	River bluff	FSC, S
Berberis canadensis	American barberry	Rocky bluff	S
Bolboschoenus fluviatilis	River bulrush	Wetland	S
Delphinium exaltatum	Tall larkspur	Barrens & Woodlands	FSC, E
Diervilla lonicera	Northern bush-honeysuckle	Rocky River bluff	T

Species	Common name	Habitat on ORR	Status code[a]
Draba ramosissima	Branching whitlow-grass	Limestone cliff	S
Elodea nuttallii	Nuttall waterweed	Pond, embayment	S
Eupatorium godfreyanum	Godfrey's thoroughwort	Dry woods edge	S
Fothergilla major	Mountain witch-alder	Woods	T
Helianthus occidentalis	Naked-stem sunflower	Barrens	S
Juglans cinerea	Butternut	Lake shore	FSC, T
Liparis loeselii	Fen orchid	Forested wetland	E
Panax quinquifolius	American ginseng	Rich woods	S-CE
Platanthera flava var. herbiola	Tuberculed rein-orchid	Forested wetland	T
Spiranthes lucida	Shining ladies'-tresses	Boggy wetland	T
Thuja occidentalis	Northern white cedar	Rocky river bluffs	S
Rare plants that occur near and could be present on ORR			
Agalinis auriculata	Earleaf false foxglove	Calcareous barren	FSC, E
Allium burdickii or A. tricoccom[b]	Ramps	Moist woods	S, CE
Pseudognaphalium helleri	Heller's catfoot	Dry woodland edge	S
Lathyrus palustris	Marsh pea	Moist meadows	S
Liatris cylindracea	Slender blazing star	Calcareous barren	E
Lonicera dioica	Mountain honeysuckle	Rocky river bluff	S
Meehania cordata	Heartleaf meehania	Moist calcareous woods	T
Pedicularis lanceolata	Swamp lousewort	Calcareous wet meadow	S
Pycnanthemum torrei	Torrey's mountain mint	Calcareous barren edge	S
Solidago ptarmicoides	Prairie goldenrod	Calcareous barren	E

[a]Status Codes:

CE = Status due to commercial exploitation
E = Endangered in Tennessee
FSC = Federal Species of Concern; formally designated as C2. See Federal Register, 2/28/96.
S = Special Concern in Tennessee
T = Threatened in Tennessee

[b]Ramps have been reported near ORR, but there is not sufficient information to determine which of the two species is present or whether the occurrence may have been introduced by planting. Both species of ramps have the same state status.

There are no Federal-listed threatened or endangered plant species on ORR (DOE/EIS-0387 2011). Table 3.7-2 presents vascular plant species known or previously reported from ORR and rare plants that occur near and could be present on ORR. No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act*, exists on ORR (DOE/EIS-0387 2011).

3.7.3 Floodplains and Wetlands

Floodplains. A floodplain is defined as the valley floor adjacent to a streambed or arroyo channel that may be inundated during high water. The Tennessee Valley Authority (TVA) conducted floodplain studies along the Clinch River, Bear Creek, and EFPC. Eastern Portions of Y-12 lie within the 100- and 500-year floodplains of EFPC; however, the proposed project is located outside of the 100- and 500-year floodplains.

Wetlands. Approximately 600 acres of wetlands exist on ORR, with most classified as forested palustrine, scrub/shrub, and emergent wetlands (DOE 2008). Wetlands occur across ORR at lower elevations, primarily in the riparian zones of headwater streams and their receiving streams, as well as in the Clinch River embayments. Wetlands identified to date range in size from several square yards at small seeps and springs to approximately 24.7 acres at White Oak Lake (DOE 2008).

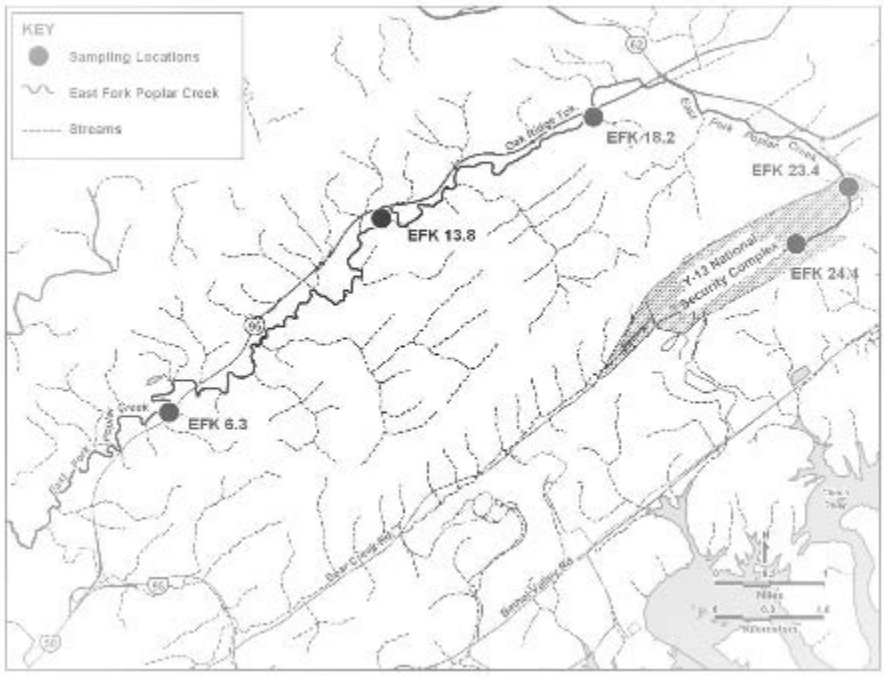
Wetlands are protected under Executive Order (EO) 11990 [42 Federal Register (FR) 26961, May 24, 1977]. A wetlands survey of the Y-12 area found palustrine, scrub/shrub, and emergent wetlands. An emergent wetland was found at the eastern end of Y-12, at a seep by a small tributary of EFPC, between New Hope Cemetery and Bear Creek Road. Eleven small wetlands have been identified north of Bear Creek Road in remnants of the UEFPC. A relatively undisturbed, forested wetland was identified in the stream bottomland of Bear Creek Tributary 1, between Bear Creek Road and the power line right-of-way (LMES 1997). Headwater areas of small unnamed tributaries to Bear Creek, some of which contain wetlands, were identified near the Haul Road extension.

3.7.4 Biological Monitoring and Abatement Programs

The National Pollutant Discharge Elimination System (NPDES) permit issued for Y-12 mandates a Biological Monitoring and Abatement Program (BMAP) with the objective of demonstrating that the effluent limitations established for the facility protect the classified uses of the receiving stream, EFPC. The 2013 BMAP sampling report followed the 2011 permit requirements. BMAP, which has been monitoring the ecological health of EFPC since 1985, currently consists of three major tasks that reflect complementary approaches to evaluating the effects of the Y-12 Complex discharges on the aquatic integrity of EFPC.

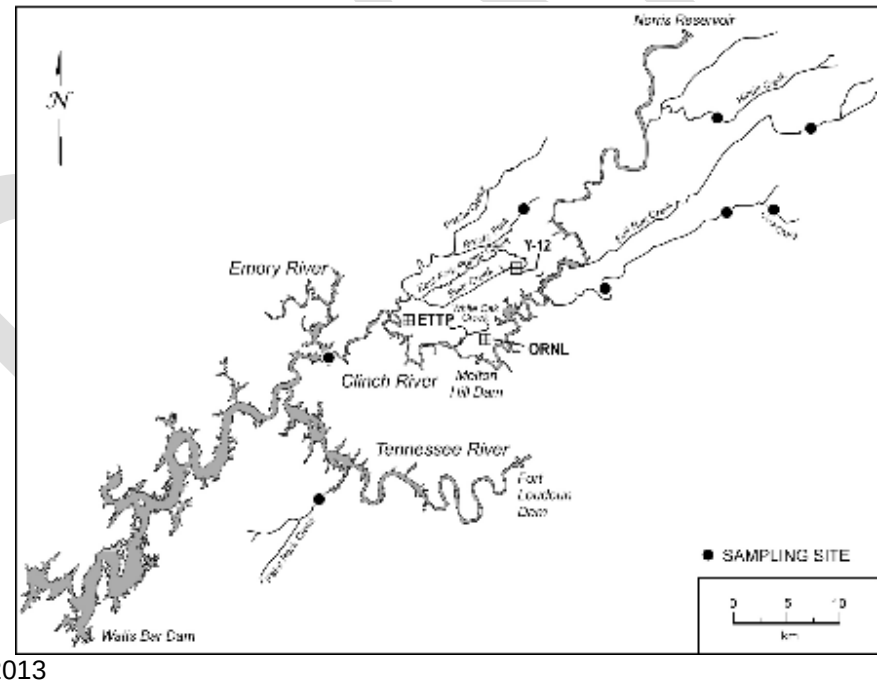
These tasks include (1) bioaccumulation monitoring, (2) benthic macroinvertebrate community monitoring, and (3) fish community monitoring. Data collected on contaminant bioaccumulation and the composition and abundance of communities of aquatic organisms provide a direct evaluation of the effectiveness of abatement and remedial measures in improving ecological conditions in the stream (DOE 2013).

Monitoring is currently being conducted at five primary EFPC sites, although sites may be excluded or added depending on the specific objectives of the various tasks. The primary sampling sites include upper EFPC at EFPC kilometers (EFKs) 24.4 and 23.4 (upstream and downstream of Lake Reality, respectively); EFK 18.7 (also EFK 18.2), located off ORR and below an area of intensive commercial and light industrial development; EFK 13.8, located upstream from the Oak Ridge Wastewater Treatment Facility; and EFK 6.3, located about 1.4 km downstream of the ORR boundary (Fig. 3.7-2). Brushy Fork at Brushy Fork kilometer 7.6 is used as a reference stream in two BMAP tasks. Additional sites off ORR are also occasionally used for reference, including Beaver Creek, Bull Run, Cox Creek, Hinds Creek, Paint Rock Creek, and Emory River in the Watts Bar Reservoir (Fig. 3.7-3). Significant increases in species richness and diversity in EFPC over the last two decades demonstrate that the overall ecological health of the stream continues to improve. However, the pace of improvement in the upper reach of EFPC near Y-12 has slowed in recent years, and fish and invertebrate communities continue to be less diverse than the corresponding communities in reference streams.



Source: DOE 2013

Figure 3.7-1. Locations of biological monitoring sites on EFPC in relation to Y-12 (EFK=East Fork Poplar Creek Kilometer)



Source: DOE 2013

Figure 3.7-2. Locations of biological monitoring in relation to ETTP, Y-12 & ORNL

3.7.5 Bioaccumulation Studies

Mercury and PCB levels in fish from EFPC have been historically elevated relative to fish in uncontaminated reference streams. Fish in EFPC are monitored regularly for mercury and PCBs to assess spatial and temporal trends in bioaccumulation associated with ongoing remedial activities and Y-12 operations (DOE 2013).

As part of this monitoring effort, redbreast sunfish (*Lepomis auritus*) and rock bass (*Ambloplites rupestris*) are collected twice a year from five sites throughout the length of EFPC and are analyzed for tissue concentrations of mercury (twice yearly) and PCBs (annually). A new sampling site was added in 2013 at EFK 13.0, just downstream of the Oak Ridge Sewage Treatment Plant. Mercury concentrations remained higher in fish from EFPC in 2013 than in fish from reference streams. Elevated mercury concentrations in fish from the upper reach of EFPC indicate that the Y-12 remains a continuing source of mercury to fish in the stream. Multiple ongoing investigations are being conducted to better understand mercury bioaccumulation dynamics in this creek (DOE 2013).

The mean total PCB concentration in sunfish fillets in 2013, remained much lower than the peak levels observed in the mid-1990s. Regulatory guidance and human health risk levels have varied widely for PCBs, depending on the regulatory program and the assumptions used in the risk analysis. In the state of Tennessee, assessments of impairment for water body segments as well as public fishing advisories are based on fish tissue concentrations. Most recently, the water quality criterion has been used to calculate the fish tissue concentration triggering impairment and a Total Maximum Daily Load (TMDL) (TDEC 2007); this concentration is 0.02 mg/kg PCBs in fish fillets (TDEC 2010). The fish PCB concentrations in UEFPC, about 0.2 µg/g in fish fillets, are well above this concentration (DOE 2013).

3.8 Cultural Resources

Cultural resources are the aspects of the physical environment that relate to human culture and society, as well as cultural institutions that hold communities together and link them to their surroundings. The legal jurisdiction over cultural resources, dating back to 1906 with the passage of the Antiquities Act (16 U.S.C. 431-433), demonstrates a

continuing concern on the part of Americans for their cultural resources. Among these statutes are the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470), and its revised implementing regulations (36 CFR Part 800). This statute describes the process for the identification and evaluation of cultural resources, assessment of effects of Federal actions on historic resources, and consultation to avoid, reduce, or mitigate adverse effects.

More recently, President Obama signed the National Defense Authorization Act into law on December 19, 2014. This Defense Act authorizes the establishment of the Manhattan Project National Historical Park as a unit of the NPS no later than one year after enactment (December 19, 2015). Prior to establishing the park, the Secretary of the Interior and the Secretary of Energy are required by the act to enter into an agreement defining the respective roles and responsibilities of the departments in administering the park. The agreement will include provisions for enhanced public access, management, interpretation, and historic preservation to include the Y-12 site (DOE 2015).

Section 106 of the NHPA (16 U.S.C. 470) requires federal agencies take into account the effects of their undertakings on properties included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). To comply with Section 106 of the NHPA and its implementing regulations at 36 CFR Part 800, DOE Oak Ridge Office (DOE-ORO) was instrumental in the ratification of the *Programmatic Agreement Among Department Of Energy Operations Office, the National Nuclear Security Administration, The Tennessee State Historic Preservation Office, and the Advisory Council on Historic Preservation Concerning The Management of Historical and Cultural Properties at the Y-12 National Security Complex* (PA), approved August 25, 2003.

3.8.1 Cultural Resources at Proposed EOC Site

The site selected for the new EOC is the former location of Building 9711-1 and is adjacent to Buildings 9202 and 9706-2 which are eligible for inclusion in the NRHP. Building 9711-1 completed in July of 1943, was constructed by Stone and Webster Engineering Corporation and originally housed one of the plant's cafeterias. Over time, it housed the Technical Library, Oak Ridge National Laboratory offices, Criticality

Safety, and Health Physics. Building 9202 completed in November 1943, and known as the “Chemical Building” has housed such diversified facilities as Budgets, Ceramics and Plastics, Chemical Engineering, Metallurgical Development, and Chemical Development. It was also constructed by Stone and Webster Engineering Corporation and is currently being used as the Development Facility. Building 9706-2, completed in July of 1944, has housed the medical offices and the Plant Shift Superintendent offices. Also constructed by Stone and Webster Engineering Corporation, it continues to be used as the Plant Shift Superintendent offices. The historic layout of Y-12 is shown in Figure 3.8-1.

3.8.2 Paleontological Resources

Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geologic age. Paleontological resources are important mainly for their potential to provide scientific information on paleoenvironments and the evolutionary history of plants and animals. Impact assessments for paleontological resources are based on the research potential of the resource, the quality of the fossil preservation in the deposit, and on the numbers and kind of resources that could be affected (DOE/EIS-0387 2011).

Paleontological Resources of ORR and Y-12. The ORR is underlain by bedrock formations predominated by calcareous siltstones, limestones, sandstones, siliceous shales, and siliceous dolostones. The majority of geologic units with surface exposures on the ORR contain paleontological materials. All of these paleontological materials consist of common invertebrate remains which are doubtful to be unique from those available throughout the East Tennessee region (DOE/EIS-0387 2011).

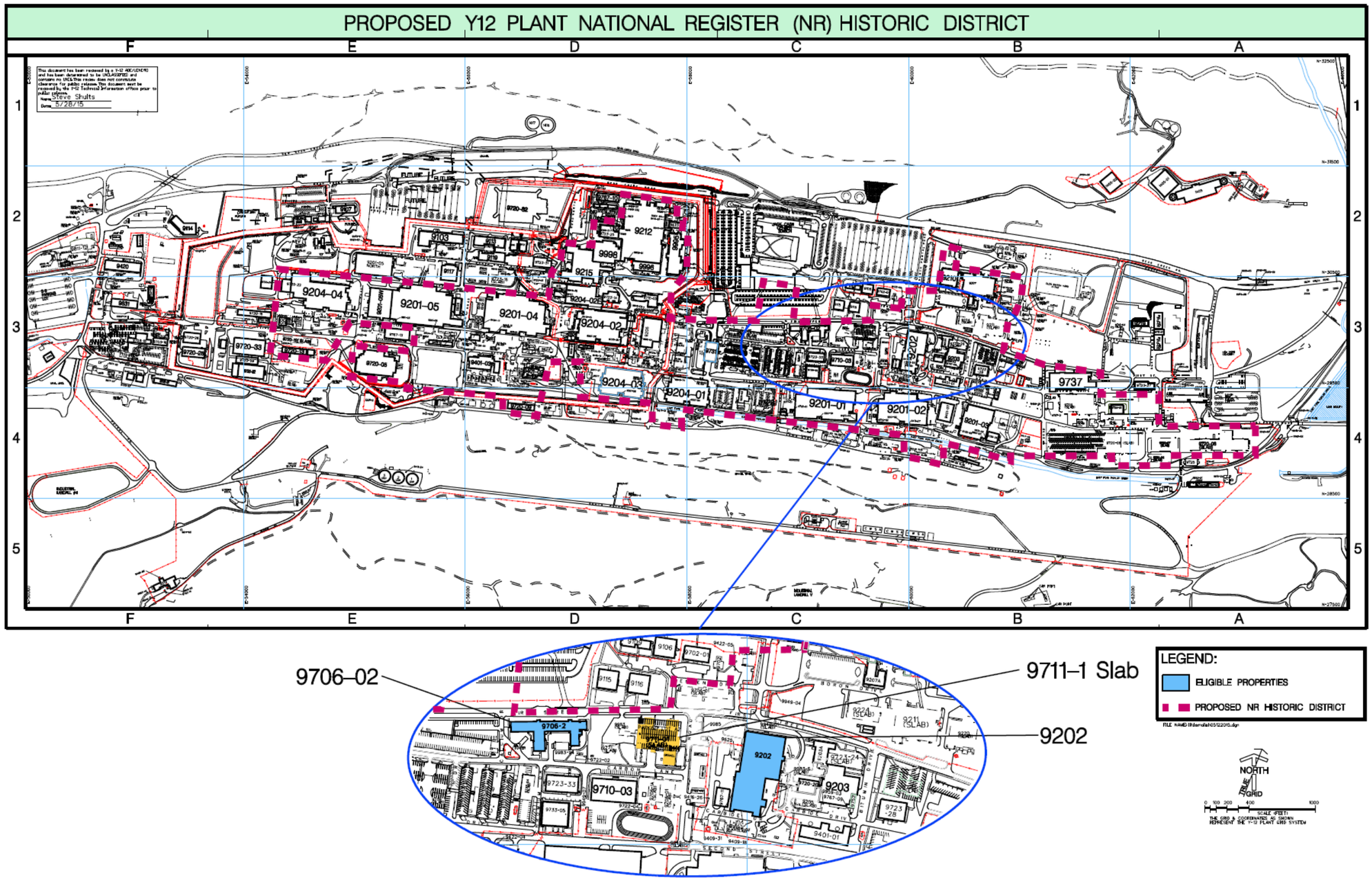


Figure 3.8-1. Proposed Y-12 Plant National Register (NR) Historic District

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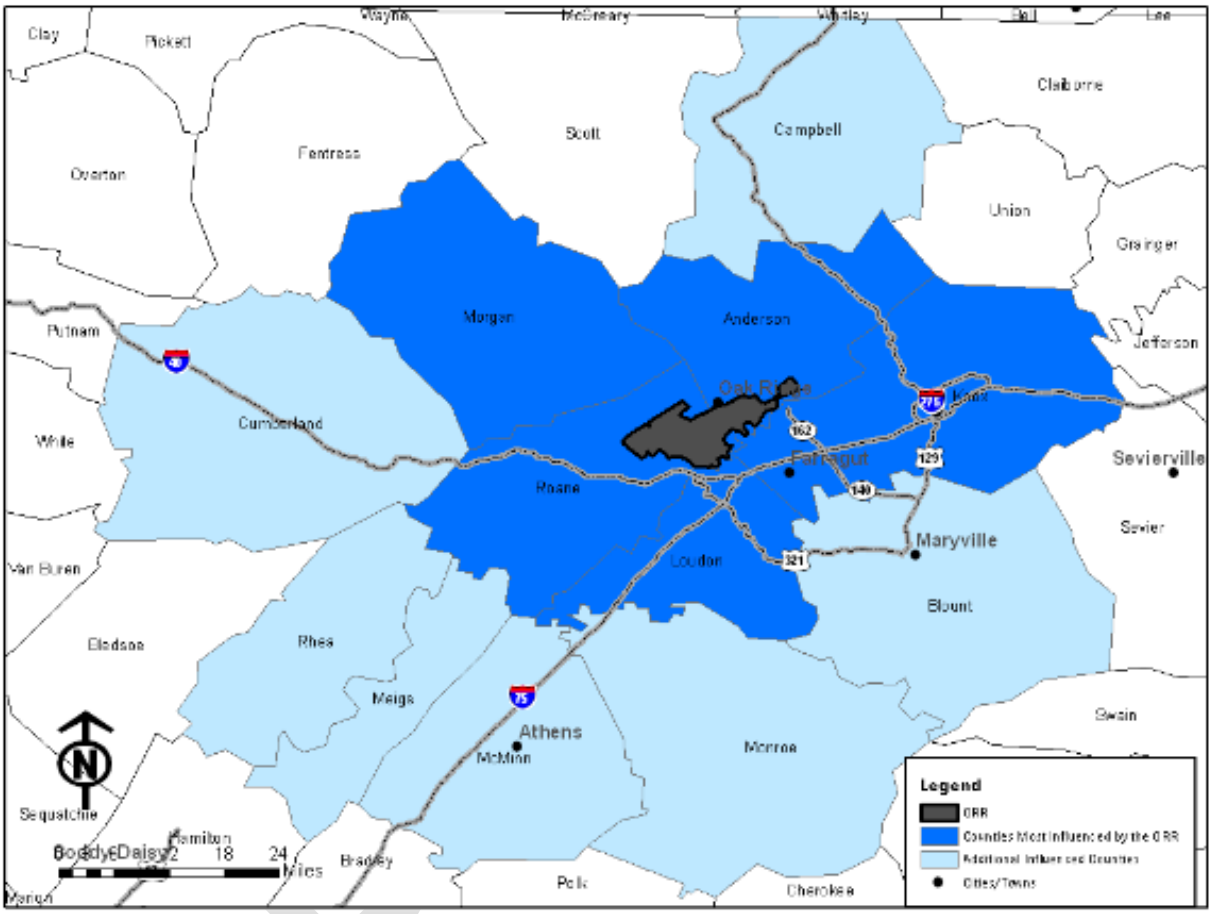
3.9 Socioeconomics

This section describes current socioeconomic conditions within both a ROI where a large majority of the ORR workforce resides, as well as the ORR socioeconomic characteristics. The ROI is a five-county area in East Tennessee comprised of Anderson, Knox, Loudon, Morgan and Roane Counties. Figure 3.9-1 shows all the surrounding counties influenced by the ORR.



Source: DOE/EIS-0387 2011

Figure 3.9-1. Location of Oak Ridge Reservation (ORR) and Surrounding Cities/Counties

3.9.1 Employment and Income

The ORR has historically been dependent on manufacturing, professional, management, administrative, waste management, and government employment. More recent trends show growth in the educational services, health care and social assistance sectors and a steady number of jobs in the professional, management, administrative and government

employment. Table 3.9-1 presents current employment percentages for the major sectors of the ORR economy.

Table 3.9-1. ORR Employment by Sector

Employment Sectors	Percentage of Workforce in ORR
Agriculture, Forestry, Fishing, Hunting, Mining	< 1%
Construction	6.2%
Manufacturing	9.5%
Wholesale Trade	1.5%
Retail Trade	11.2%
Transportation, Warehousing & Utilities	3.6%
Information	1.6%
Finance, Insurance, Real Estate, Rental, Leasing	4.4%
Professional, Management, Administrative and Waste Management Services	21.1%
Educational Services, Health Care and Social Assistance	23%
Arts, Entertainment, Recreation, Accommodation & Food Services	7.5%
Other Services (Except Public Administration)	4.7%
Public Administration	5.4%

Source: USCB 2015 (2013 ACS Data)

In 2015, unemployment rates within the ROI ranged from a low of 4.7 percent in Knox County to a high of 7.9 percent in Morgan County (Table 3.9-2). The March 2015 unemployment rate in Tennessee was 5.9 percent (BLS 2015).

Table 3.9-2. ORR ROI Unemployment Rates

County or State	% Unemployment
Anderson	6.0
Knox	4.7
Loudon	5.7
Morgan	7.9
Roane	6.7
Tennessee	5.9

Source: BLS (March 2015 Data)

Per capita personal income statistics for 2009 to 2014 are shown in Table 3.9-3. The average per capita income in the ROI was $36,740 in 2013, a 13.3 percent increase from the 2009 level of $32,418. Per capita income in 2013 in the ROI ranged from a low of $26,708 in Morgan County to a high of $41,533 in Knox County. The per capita income in Tennessee was $39,557 in 2013 (FRED 2015).

Table 3.9-3. Per Capita Personal Income in ROI

County/Region or State	2009	2010	2011	2012	2013	2014
Anderson	$34,261	$35,464	$37,394	$38,576	$39,148	N/A
Knox	$36,341	$37,367	$39,602	$40,972	$41,533	N/A
Loudon	$35,241	$35,963	$37,836	$39,483	$39,561	N/A
Morgan	$23,708	$24,399	$25,382	$26,277	$26,690	N/A
Roane	$32,541	$34,113	$35,297	$36,292	$36,768	N/A
ROI Average	$32,418	$33,461	$35,102	$36,320	$36,740	N/A
Tennessee	$33,711	$35,103	$36,567	$37,678	$39,557	$40,730

Source: FRED 2015

3.9.2 Population and Housing

Between 2000 and 2010, population growth in the ROI (11.6%) was just slightly higher than population growth for the entire State of Tennessee (11.5%) during the same period of time. Loudon County experienced the fastest rate of population growth, averaging 2.42 percent annually between 2000 and 2010, while Roane County's population has increased an average of only 0.44 percent annually (UT CBER 2012). Populations in all counties in the ROI are projected to continue to grow at a slower rate between 2010 and 2030, as shown in Table 3.9-4.

Table 3.9-4. Historic and Projected Population in the ORR ROI

County/Region or State	2000	2010	2020	2030
Anderson	71,330	75,129	73,382	71,627
Knox	382,032	432,226	471,912	491,100
Loudon	39,086	48,556	57,763	61,283
Morgan	19,757	21,987	21,438	22,172
Roane	51,910	54,181	56,776	56,604
ROI	564,115	632,079	681,271	702,786
Tennessee	5,689,283	6,346,105	6,860,231	7,397,302

Source: USCB 2001, UT CBER & TACIR 2009

The Supplemental Assessment for the SWEIS uses a four-county area for the ROI, including Anderson, Knox, Loudon, and Roane Counties, where more than 90 percent of the Y-12 workforce resides. The SWEIS used 2000 Census data in its analysis. As would be expected, socioeconomic conditions in the ROI have changed since then. The SA

uses data from the 2010 Census. Table 3.9-6 lists relevant socioeconomic information for the ROI from both the SWEIS and based on the most current data available.

Table 3.9-5. Socioeconomic Data for the SWEIS ROI

Parameter	SWEIS Value	Current Value
ROI Population	596,192	623,659
ROI Labor Force	312,211	391,725
ROI Unemployment Rate	Low: 7.0% in Knox County; High: 8.8% in Anderson County	Low: 5.4% in Knox County; High: 6.4% in Roane County
Y-12 Employment	6,500	6,200

Source NNSA 2011; USCB 2015

3.9.3 Community Services

Community services in the ROI include public schools, law enforcement, and medical services. Eight public school districts, with almost 150 public K-12 or adult education schools, provide educational services for everyone in the ROI (TDOE 2014). Higher education opportunities are also numerous in the region and include the University of Tennessee, Knoxville, as well as several private colleges and two major community colleges: Roane State Community College and Pellissippi State Technical Community College.

Throughout the region, there are several significant outdoor park and recreational opportunities for citizens including Melton Hill Park, the Haw Ridge trail system, regional greenway trail systems, Fort Loudon and Watts Bar Lake, Frozen Head State Park, Obed Wild and Scenic River, and over 100 other locations to be active and spend time outside.

3.10 Environmental Justice

Environmental justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA 2015). Concern that minority and/or low-income populations might be bearing a disproportionate share of adverse health and environmental impacts led President Clinton to issue an Executive Order (EO) in 1994 to address these issues. That Order, EO 12898, *Federal Actions to Address Environmental Justice in Minority*

Populations and Low-Income Populations, directs Federal agencies to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. When conducting NEPA evaluations, DOE incorporates environmental justice considerations into both its technical analyses and its public involvement program in accordance with EPA and the CEQ regulations (CEQ 1997).

Demographic information from the U.S. Census Bureau was used to identify minority and low income populations in the ROI. Information on locations and numbers of minority and low-income populations was obtained from the 2010 U.S. Census. Census data are reported on the level of census tracts, a geographical area that varies with size depending largely on population density (low-population density census tracts generally cover larger geographical areas).

Minority refers to people who classified themselves in the 2010 U.S. Census as Black or African American, Asian or Pacific Islander, American Indian or Alaskan Native, Hispanic of any race or origin, or other non-White races (CEQ 1997). Environmental Justice guidance defines “low income” using statistical poverty thresholds used by the U.S. Census Bureau, the most recent guidelines were updated in January of 2015 by the U.S. Department for Health and Human Service’s Assistant Secretary for Planning and Evaluation and are listed below in Table 3.10-1.

Table 3.10-1. 2015 Poverty Guidelines for the 48 Contiguous States and District of Columbia

Number of Persons in family/household	Poverty Guideline
1	$11,770
2	$15,930
3	$20,090
4	$24,250
5	$28,410
6	$32,570
7	$36,730
8	$40,890
For families or households with more than 8 persons, add $4,160 for each additional person.	

Source: USDHHS 2015

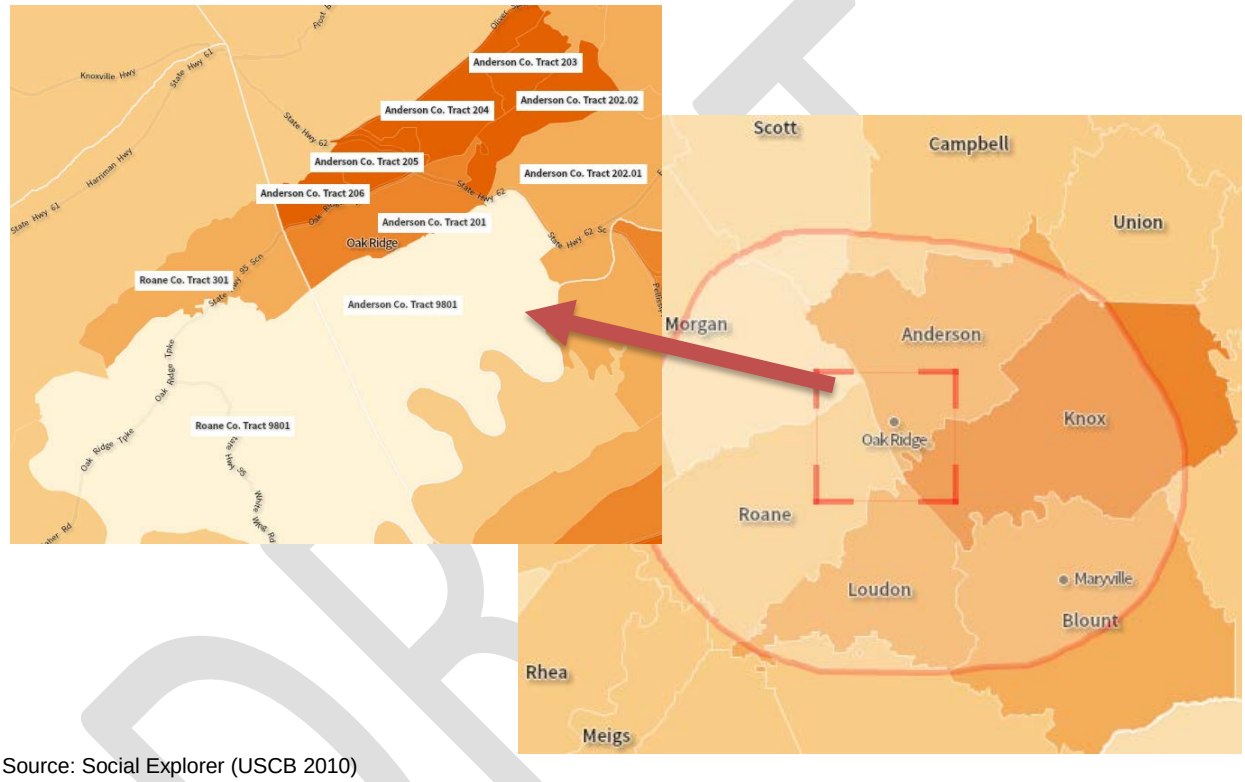
The CEQ identifies minority and low-income populations when either (1) the minority or low income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater (i.e., 20 percentage points greater) than the minority population percentage in the general population or appropriate unit of geographical analysis. The geographic area of comparison for this analysis is the State of Tennessee.

Any disproportionately high and adverse human health or environmental effects on minority populations and/or low-income populations that could result from the alternatives being considered for Y-12 are assessed for the census tract which contains the site, the area for which health effects are assessed. Health effects resulting from discharge to water pathways would also be assessed for this area.

Figure 3.10-1 shows the Anderson and Roane County census tracts containing the ORR. Minority populations for these tracts are shown in Table 3.10-2 and low-income populations are shown in Table 3.10-3.

Approximately 28,873 people live within the 10 census tracts containing the City of Oak Ridge and the ORR. The two census tracks that comprise the ORR do not contain any 2010 population data. Minorities comprise almost 20 percent of the Oak Ridge population (USCB 2010). In 2013, minorities comprised 22.3 percent of the population nationally and 21.9 percent of the population in Tennessee. There are no Federally-

recognized Native American groups within 80 km (50 mi) of Y-12. For census tract 201 in Anderson County, City of Oak Ridge, the aggregate of all minorities category represents 35.8 percent of the total population. This meets one of the criteria for determining the existence of sensitive populations within the area (i.e., more than 20 percentage points greater than the average for a geographic area of comparison; in this case, the State of Tennessee). None of the census tracts met the “greater than 50 percent” criterion.



Source: Social Explorer (USCB 2010)

Figure 3.10-1. Oak Ridge Census Tracts with the Oak Ridge Reservation and Region of Influence

Table 3.10-2. Demographic Profile of the City of Oak Ridge that includes the ORR (Surrounding Y-12), 2010

Population Group	Number of People	Percent Total
Minority	**5767**	**19.9%**
Hispanic Alone	1175	4.1%
Black or African American	2937	10.2%
American Indian & Alaskan Native	134	0.5%
Asian	735	2.5%
Native Hawaiian & Other Pacific Islander	0	0%
Other Race	201	0.7%
Two or More Races	585	2.0%
White Alone	23,201	80.1%
TOTAL POPULATION	**28,968**	**100.1%**

Source: UCSB 2010

Census tracts were considered low-income census tracts if the percentage of the populations living below the poverty threshold exceeded 50 percent. Using 2010 Census data, the only segments of the overall population that were measured for poverty were those based on age. Table 3.10-3 shows the percentage of the population (measured by age) that is living in poverty within the City of Oak Ridge (including the ORR). There are two census tracts in Anderson County where the population of children, 18 year of age and younger, have been determined to be living in poverty due to over 50 percent of these census tracts having a population of children living below the Federal poverty threshold.

Table 3.10-3. Percentage of Oak Ridge Populations Measured, Living In Poverty

Census Tract	Population Measured	Total Population	Percent (%) Living in Poverty
Roane Co. **301**	18 Years of Age and Younger	673	2.82%
	19 to 64 Years of Age	1860	5.22%
	65 Years of Age and Older	701	1.43%
Anderson Co. **201**	**18 Years of Age and Younger**	**1119**	**56.12%**
	19 to 64 Years of Age	2056	23.83%
	65 Years of Age and Older	355	17.18%
Anderson Co. **202.01**	18 Years of Age and Younger	741	0%
	19 to 64 Years of Age	2302	2.0%
	65 Years of Age and Older	530	2.45%
Anderson Co. **202.02**	18 Years of Age and Younger	874	34.67%
	19 to 64 Years of Age	2189	11.83%
	65 Years of Age and Older	1027	5.74%
Anderson Co. **203**	18 Years of Age and Younger	880	27.05%
	19 to 64 Years of Age	2422	12.39%
	65 Years of Age and Older	673	8.62%
Anderson Co. **204**	18 Years of Age and Younger	902	23.38%
	19 to 64 Years of Age	2758	19.58%
	65 Years of Age and Older	816	4.29%
Anderson Co. **205**	**18 Years of Age and Younger**	**784**	**53.19%**
	19 to 64 Years of Age	1979	30.02%
	65 Years of Age and Older	428	13.79%
Anderson Co. **206**	18 Years of Age and Younger	677	0%
	19 to 64 Years of Age	1354	2.36%
	65 Years of Age and Older	551	5.26%

Source: USCB 2010

According to 2010 census data, approximately 4,498 individuals, the large majority being individuals 18 years of age or younger, are living in poverty in the City of Oak Ridge which includes the ORR. This represents approximately 15.6 percent of the total population for the City. In 2013, 17.6 percent of individuals were determined to be living in poverty in Tennessee and 15.4 percent in the United States.

The Environmental Protection Agency (EPA) completed a study of soil and water quality in the Scarboro community in April of 2003 (EPA 2003). The Scarboro Community is an urban minority community located closer to the boundary of ORR than any other residential community. EPA's study looked for hazardous substances and radionuclides associated with the operations of Y-12. None of the EPA radionuclide analytical values exceeded normal background levels, maximum concentration levels (MCLs) or preliminary remediation goals (PRGs) that could indicate a health concern. None of the

mercury samples were above the MCL or PRG. The *National Secondary Drinking Water Standard* (NSDWS) and PRG levels were exceeded for aluminum, iron and manganese in a few water, sediment and soil samples. However, aluminum, iron and manganese are naturally occurring in the geographic area of Oak Ridge, indicating that these are not directly related to releases from DOE operations and do not present a health risk. All other metals were undetected or below the MCLs, NSDWSs, or PRGs. EPA's work gives a completed representation of any contamination that might have been encountered to date.

The EPA study concludes that the residents of Scarboro are not currently being exposed to substances that pose an unreasonable risk to health or the environment. The soil, sediment, and water quality in this community does not pose a risk to human health and the environment. The EPA does not propose to conduct any further environmental sampling in the Scarboro community unless such work is needed as part of future studies within the entire Oak Ridge community. These results confirm that existing soil and water quality pose no risk to human health within the Scarboro community.

Hazardous substances regulated by *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), are substances that are considered to be severely harmful to human health and the environment. Many are commonly used substances that are harmless in their normal uses but are quite dangerous when released. CERCLA establishes a corresponding reportable quantity (RQ) for each hazardous substance. Any hazardous substance release exceeding an RQ triggers reports to the National Response Center, the State Emergency Response Center, and community coordinators in the ORR. Discharges of oil must be reported if they "cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines" [40 CFR 110.3(b)]. During 2013, according to the *ORR Annual Site Environmental Report*, there were no releases of hazardous substances exceeding an RQ or observed oil sheens at Y-12, ETTP, or ORNL. There was a reportable occurrence due to a potable water line break that occurred at Y-12 on June 8, 2013. Chlorinated water from the point of the break entered the storm drain system and resulted in a fish

kill. To keep the public informed of comment periods and other matters related to cleanup activities on the ORR, DOE publishes a monthly newsletter, Public Involvement News (http://www.ucor.com/public_involvement_news.html). DOE also keeps the public informed by publishing notices in local newspapers and conducting public meetings.

3.11 Traffic and Transportation Safety

3.11.1 On-site Traffic

Y-12 is located within 80 km (50 mi) of three interstate highways: I-40, I-75, and I-81. Primary roads on the ORR serving Y-12 include Tennessee State Routes (TSRs) 58, 62, 95, and 170 (Bethel Valley Road) and Bear Creek Road. The daily traffic numbers for various roads at the ORR are provided in Table 3.11-1.

Table 3.11-1. Existing Average Daily Traffic Counts on the ORR Serving Y-12 National Security Complex

Road	To	From	Annual Average Daily Traffic Vehicles/day
TSR 58	TSR 95	I-40	10,373
TSR 95	TSR 62	TSR 58	22,630
TSR 62	TSR 170	N/A	27,887
TSR 170 (Bethel Valley Road)	TSR 62	N/A	8,624

Source: TDOT 2013.

3.11.2 Off-site Traffic

Y-12 is located within 80 km (50 mi) of three interstate highways: I-40, I-75, and I- 81. Interstate 40, an east-west highway, extends from North Carolina to California. Interstate 75 is a north-south highway extending from Michigan to Florida. Interstate 81 is a north-south interstate extending from New York to Tennessee. Interstate 81 connects with I-40 east of Knoxville, and I-40 and I-75 connect west of Knoxville near the City of Oak Ridge. In addition, State Route (SR) 61, SR 162, and US 25W at Clinton also serve Y-12 transportation needs off site (DOE/EIS-0387 2011).

3.12 Occupational and Public Health and Safety

Current activities associated with routine operations at Y-12 have the potential to affect worker and public health. Air emissions at Y-12 can expose both groups to radioactive

and non-radioactive materials. Liquid effluents discharged to near waterbodies may affect downstream populations using the water for drinking water purposes or recreation. Additionally, workers are exposed to occupational hazards similar to those experienced at most industrial work sites.

3.12.1 Worker Health

Hazardous materials used at Y-12 that are of particular concern, due to their historical or current uses in plant operations or due to their potential adverse health effects from exposure, include radionuclides, mercury, beryllium, PCBs, polycyclic aromatic hydrocarbons, and VOCs. In addition to the risks from these chemicals, workers at Y-12 are at risk from potential standard industrial hazards that if not controlled can lead to accidents, injuries, and illnesses due to everyday operations.

Work control processes are implemented utilizing Integrated Safety Management systems (ISMS) in accordance with DOE Policy 450.4, *Safety Management System Policy*. The core functions of ISMS include defining the scope of work, analyzing the hazards and risks, developing and implementing hazard controls, performing work within controls and providing feedback and continuous improvement.

Worker Safety and Health Program, 10 CFR Part 851, regulates the health and safety of workers at all DOE sites. This comprehensive standard directs DOE contractor's to establish the framework for an effective worker protection program that will reduce or prevent injuries, illnesses, and accidental losses by providing DOE Federal and contractor workers with a safe and healthful workplace. Baseline exposure assessments are outlined in this requirement, along with day-by-day health and safety responsibilities.

Industrial hygiene limits for occupational chemical exposures at Federal sites are regulated by 29 CFR 1910 and 29 CFR 1926, *Occupational Safety and Health Standards*, including the permissible exposure limits (PELs) set by the Occupational Safety and Health Administration (OSHA). DOE requires that all sites comply with the PELs unless a lower limit (more protective) exists in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). In addition, potential beryllium exposure is regulated by 10 CFR Part 850, *Chronic Beryllium Disease*

Prevention Program. The Y-12 Safety Program conducts investigations of plant accidents according to DOE Order 225.1A, *Accident Investigations,* and reports work-related fatalities, injuries, and illnesses according to DOE Order 231.1, *Environment, Safety and Health Reporting*.

One of the major goals of DOE is to keep worker exposures to radiation and radioactive material as low as reasonably achievable (ALARA). The purpose of an ALARA program is to minimize doses from both external and internal exposures. The average annual dose to an involved worker at Y-12 during 2011 was 19.9 mrem. The dose to the involved workforce of 2,450 radiation workers was estimated to be 49 person-rem (DOE/EIS-0387 2011). The Y-12 worker doses have typically been well below DOE worker exposure limits.

3.12.2 Public Health

In 2013, the total effective dose equivalent (EDE) to the maximally exposed individual (MEI) from Y-12 operations was 0.4 mrem. The MEI for Y-12 was located approximately 2,270 m (1.4 mi) northeast of the main Y-12 release point. Inhalation and ingestion of uranium isotopes accounted for more than 98 percent of the dose to the MEI (DOE 2014). The NESHAP standard for airborne releases is 10 mrem per year and applies to the sum of doses from all airborne pathways (inhalation, submersion in a plume, exposure to radionuclides deposited on the ground, and consumption of foods contaminated as a result of deposition of radionuclides). The DOE Order 5400.5 MEI dose standard for all pathways is 100 mrem per year. Waterborne releases using the worst case EDE for all pathways in a water-body segment resulted in an MEI dose of 0.4 mrem in 2004 (DOE/EIS-0387 2011). The DOE standard is 4 mrem per year to the MEI from the drinking water pathway.

The population within an 80 km (50 mi) radius of ORR was 1,172,530 in 2010. In 2013, based on the 2010 census data, the 50-year committed collective EDE to the population within 80 km (50 mi) of the ORR was 35.3 person-rem for all pathways, 1.2 person-rem from atmospheric releases at Y-12, and as high as 0.7 person-rem from waterborne releases (DOE 2013). Based on a dose to risk conversion factor of 5.0×10^{-4} fatal cancers

per person-rem (ICRP 1991), the collective EDE of 12 person-rem would statistically result in less than one additional latent cancer death within the population.

Several epidemiological studies have been completed on Y-12 workers to evaluate the potential health effects from radiation and chemical exposures. Y-12 workers have also been included in many site-wide health studies. In addition to these reviews, community-wide health patterns have been studied in Anderson and Roane counties. There are several ongoing occupational health studies dealing with Y-12, including an ongoing study of the public health impact from releases of hazardous materials from the DOE operations at Oak Ridge. This assessment will help identify and characterize both the current and past exposures of offsite populations to radiological and chemical contaminants. For additional information on worker and surrounding public health, refer to the Y-12 SWEIS (DOE/EIS-0387 2011), Section 4.12.1-2 and Appendix D.8, "Human Health and Accidents."

3.13 Waste Management

The *Federal Facility Compliance Act* and CERCLA are two laws passed by Congress to address hazardous and radioactive waste. The *Federal Facility Compliance Agreement*, made in accordance with the *Federal Facility Compliance Act*, requires that all DOE facilities manage and dispose of waste in accordance with their respective site treatment plans. The Waste Disposition and Waste Operations projects address waste stored, treated, disposed of, or recycled on the ORR in accordance with the Site Treatment Plan. The DOE Environmental Management (EM) program also operates and maintains waste treatment, storage, disposal, and recycling facilities at each of the three Oak Ridge sites (ETTP, ORNL, and Y-12). The TDEC regulates the management of hazardous and non-hazardous waste streams under the *Resource Conservation and Recovery Act* (RCRA) and TDEC Chapter 1200-1-7, "Solid Waste Regulations." CERCLA demolition waste is disposed of at the EMWMF.

Waste management services at Y-12 include a pollution prevention program, sanitary waste; recycle waste, legacy waste disposition, and a hazardous waste management

program. In addition, Y-12 houses several on-site waste management facilities including the west end treatment facility, tank farms, and tanker terminal.

3.13.1 Waste Generation from Routine Operations

The major waste types generated at Y-12 from routine operations include low level waste (LLW), mixed-LLW (MLLW), hazardous waste, and nonhazardous waste. Table 3.13-1 presents a summary of waste generation totals for routine operations at Y-12 for Fiscal Year (FY) 2014. Other waste includes sanitary and industrial wastewater, construction debris, general refuse, and medical wastes. Y-12 does not generate or manage high-level radiological waste or transuranic waste.

Table 3.13-1. Summary of Waste Generation Totals by Waste Type for Routine Operations at Y-12 National Security Complex Waste Type Waste Volume (FY 2014)

Waste Type	Waste Volume
Low-Level Waste (Liquid)	4,179 liters (1,104 gallons)
Low-Level Waste (Solid)	4,746.36 m^3 (6,208 yd^3)
Mixed Low Level Waste (Liquid)	22,360 liters (5,907 gallons)
Mixed Low Level Waste (Solid)	181.2 m^3 (237 yd^3)
RCRA Waste	4.2 metric tons (4.63 short tons)
Industrial and Construction/Demolition Waste (FY2013)	37,178.5 m^3 (36,435 yd^3)

Source: NNSA 2011; NNSA 2015; DOE 2014

Low-Level Waste (LLW). Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, and process equipment is generated at Y-12. Liquid LLW is treated in several facilities, including the West End Treatment Facility (WETF). Y-12 is the largest generator of routine LLW at Oak Ridge.

Mixed Low-Level Waste (MLLW). Mixed waste and LLW subject to treatment requirements to meet Land Disposal Restrictions (LDRs) under RCRA are generated and stored at Y-12. DOE is under a State Commissioner's Order (October 1, 1995) to treat and dispose of these wastes in accordance with milestones established in the *Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation* and to comply with a *Federal Facilities Compliance Act* (FFC Act) that went into effect on June 12, 1992. *Toxic*

Substance Control Act (TSCA)-regulated waste (containing PCBs) that is also radioactive waste is managed under a separate Federal Facilities Compliance Agreement (FFCA), effective February 20, 1992.

Hazardous Waste (HW). RCRA-hazardous waste is generated through a wide variety of production and maintenance operations. The majority of RCRA-hazardous waste is in solid form. The hazardous waste is shipped offsite for treatment and disposal at either DOE or commercially permitted facilities (Jackson 2008).

Other Waste Types. Treated industrial wastewater is discharged to the UEFPC under a NPDES permit issued by the State of Tennessee. Sanitary wastewater is discharged to the City of Oak Ridge publicly-owned treatment works. PCBs are transported to permitted facilities for treatment and disposal. Medical wastes are autoclaved to render them noninfectious and are then sent to the Y-12 sanitary industrial landfill, as are asbestos wastes and general refuse. Construction, demolition, and nonhazardous industrial materials are disposed of in a construction/demolition landfill at Y-12.

Capacities. Excess treatment and disposal capacity exists both onsite and offsite for hazardous waste at Y-12. Storage capacities at Y-12 are currently adequate for hazardous, mixed, and low-level waste.

3.13.2 Waste Generation from Environmental Restoration Activities

Environmental Restoration Waste. EPA placed the ORR on the National Priority List on November 21, 1989. DOE, EPA Region IV, and TDEC entered into a Federal Facilities Agreement (FFA) effective January 1, 1992. This agreement coordinated the ORR inactive site assessment and remedial action. Groundwater, surface water, and soil contamination will be remediated to a level consistent with future use of these sites as identified in the CERCLA and RCRA processes. CERCLA demolition waste is disposed of at the EMWMF.

4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes the environmental consequences of the Y-12 Emergency Operations Center (EOC) Environmental Assessment (EA) alternatives. The Chapter discusses the consequences of each alternative by resource area, in a format consistent with Chapter 3. This chapter also describes the environmental impacts common to all alternatives. Where applicable, it also discusses potential mitigation measures that could be employed to reduce impacts. For each resource in Chapter 4, the impacts of the No Action Alternative and the two action alternatives are presented.

4.1 Land Use

The land use resources analysis considers the entire Y-12 site to be the AOI which covers approximately 5,400 acres. The land use impacts of all the alternatives are compared with the complex's existing land use patterns, plans and policies.

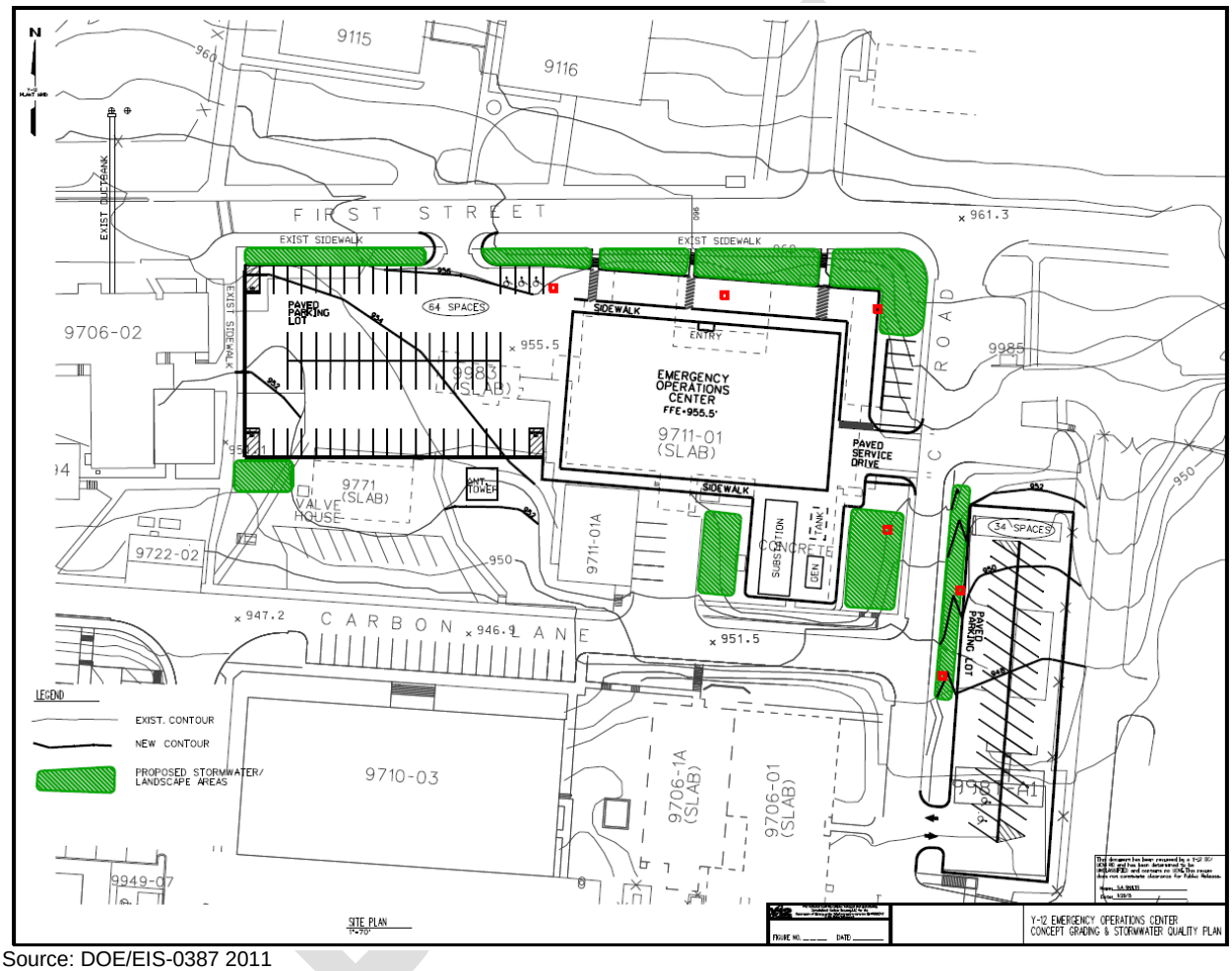
4.1.1 Alternative 1 – New Facility

Construction. A new EOC facility would be compatible and consistent with the current land use at Y-12 and would not change the current industrial use classification that exists. The new EOC would consolidate four emergency response units including the PSS Office, the ECC, the TSC, and the FDAR into one, survivable facility. Construction of and future operations at the EOC would be consistent with the current plan. The proposed EOC site is located east of the existing 9706-2 building, in a parking lot known as A2. This site is bordered by First Street to the north and Carbon Lane to the south. Figure 4.1-1 shows the location of the proposed EOC relative to other buildings at Y-12. The majority of the site for the proposed EOC is presently covered with old concrete slabs from what were buildings 9983 and 9711-1 as well as asphalt pavement.

The construction of the EOC would require, but not be limited to site preparation, demolition, erosion and sediment control, earthwork, grading, storm water management, sanitary sewer, parking spaces pedestrian accessibility, and landscaping. The proposed

EOC site location minimizes the below and above ground utilities to be re-routed and provides close proximity to the existing PSS location.

Operation. The New EOC Facility would consolidate emergency response capabilities at Y-12. The proposed EOC facility will more effectively and efficiently support Y-12 missions by consolidating functions into a habitable, survivable facility that also provides space for a technical support team. Impacts to land use adjacent to Y-12 is not projected.



Source: DOE/EIS-0387 2011

Figure 4.1-1. EOC Project Site Layout

4.1.2 Alternative 2 – Renovate Existing Facility

Construction. The Renovate Existing Facility Alternative would be both compatible and consistent with current land use at Y-12 and would not change the current industrial use classification. Construction activities would consist of modifications to existing Y-12 facilities to complete the construction of the EOC. Overall, there would be no appreciable

land use impacts or changes beyond those described for the No Action Alternative. Impacts to land use adjacent to Y-12 are not projected.

Operation. Operation of the renovated facilities would have no impact on the current land use at Y-12 and would not change the current industrial use classification. Once operational, the EOC would occupy just under two acres of land.

4.1.3 Alternative 3 – No Action Alternative

The main area of Y-12 (approximately 800 acres) is largely developed and classified as "industrial use." The land surrounding the Y-12 area is used primarily for environmental restoration, waste management, and environmental field research activities. The No Action Alternative activities at Y-12 are consistent with current land use plans, classifications, and policies. Under the No Action Alternative, recurring NNSA and DOE activities would continue. Y-12 would continue to downsize its land footprint resulting in more facilities being declared surplus and recommended for decontamination and decommissioning (D&D).

The long term plan for Y-12 is to consolidate operations and reduce the number of excess facilities. This is an ongoing mission that will continue for the foreseeable future, and while specific land usage within Y-12 may change, the overall industrial use classification would likely remain the same. Y-12 would continue to require security and emergency response buffers, so the real estate associated with eliminating excess facilities would likely not be released for public use, with no local land use benefits. Impacts to land use adjacent to Y-12 are not projected.

4.2 Geology and Soils

The geology and soils analysis considers an ROI that includes the Y-12 area as well as the rest of 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.

4.2.1 Alternative 1 – New Facility

Construction. Although it would affect just under two acres of land, construction of a New EOC would have no impact on undisturbed geological resources (e.g., bedrock outcrops), and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other non-tectonic events are unlikely to affect the construction sites. Sinkholes are present in the Knox Dolomite, but it is unlikely that they would impact the project, as the Knox Dolomite is not present in the Y-12 area.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not impact the construction and operation of the EOC. Past earthquake events in this area have not resulted in liquefaction of foundation soils. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and all other accompanying safety guidelines.

During construction activities, excavation of soil, limestone, and shale bedrock would occur. There is sufficient capacity to either stockpile these materials or dispose of them during the construction at the sites. Soil disturbance from new construction would occur at building, parking, and construction laydown areas, and lead to a possible temporary increase in erosion as a result of storm water runoff and wind action. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of ground disturbance; and the duration of time the soil is bare. A small volume of soil, limestone, and shale bedrock may be excavated during the construction process. However, this material could be stockpiled for use as fill.

The potential for additional soil contamination from project activities at the EOC site would be minimized by complying with waste management procedures DOE Order 435.1, *Radioactive Waste Management*, and DOE Order 450.1A, *Environmental Protection Programs*.

Operation. During operation, minor soil erosion impacts are expected, but detention basins, runoff control ditches, and cell design components would minimize impacts. The EOC would have no added impact on geology or soils during operation because of site design and engineered control measures.

Potential Mitigation Measures. Given control measures such as use of barriers, watering to minimize fugitive dust emissions, water retention systems, and other techniques to minimize soil and geologic disturbance, which would be taken by NNSA during design, construction, and operational phases, any potential impacts to geology and soils would be minimized under all alternatives. A New EOC facility would be designed to withstand reasonably anticipated geological hazards, such as earthquakes, slope failure, etc. No additional mitigation measures would be required.

4.2.2 Alternative 2 – Renovate Existing Facility

Construction. The Renovate Existing Facility Alternative would involve internal upgrades to existing facilities. Overall, the Renovate Existing Alternative would not change the current geological or soil impacts at Y-12. During renovation, temporary facilities may be required for continuation of existing operations. However, such facilities will have minimal impact on the environment.

Operation. Operation of renovated facilities would have no impact on undisturbed geological or soil resources at Y-12.

4.2.3 Alternative 3 – No Action Alternative

Under the No Action Alternative, there would be no change from current conditions.

4.3 Climate and Air Quality

4.3.1 Alternative 1 – New Facility

Construction. Under the Proposed Action, New Facility Alternative, construction of the new facility would temporarily affect air quality. During preparation and construction, the use of heavy equipment would generate combustion engine exhaust that contains air pollutants associated with diesel combustion (NOx, CO, SOx [sulfur oxides], PM10 and

VOCs). Similar air emissions would be generated from delivery vehicles that bring supplies and equipment to the construction site and from construction workers that commute to work in their personal vehicles. There would be a relatively limited amount of construction equipment and small number of construction workers. The quantities of air pollutants produced by vehicles and equipment associated with construction would not be a substantial contribution to the total emissions from mobile sources that already operate in the area and would not be expected to significantly change air quality at Y-12.

In addition, construction activities could generate an increase in fugitive dust (i.e., airborne particulate matter that escapes from a construction site) from earthmoving and other construction vehicle movement. Air emissions generated during construction would not be subject to additional permitting requirements, but would be subject to state regulations that limit fugitive emissions (TDEC Rules Chapter 1200-3-8). Appropriate mitigation measures would be implemented in accordance with TDEC Rules for Fugitive Dust. These measures include, but are not limited to, the following:

- Using, where possible, water or chemicals for control of dust associated with foundation demolition, utility removal, land clearing, and construction operations.
- Applying asphalt, water, or suitable chemicals on dirt roads, material stock piles, and other surfaces that can create airborne dusts.
- Installing and using hoods, fans, and fabric filters to enclose and mitigate release of dusty materials. Adequate containment methods will be employed during sandblasting or other similar operations.

The potential effect on ambient air quality from construction activities would be temporary and localized and would not affect the overall air quality of the region. The Proposed Action would not have a net effect on regional climatic conditions.

Operation. Under this alternative, a diesel-fueled emergency generator and a natural gas-fueled HVAC system would be installed in the new facility. The fuel oil storage tank and emergency generator will be located on a concrete pad, south of the building. The generator and HVAC equipment will be designed and located to prevent air intake to the

facility from the generator exhaust. During design, a natural gas generator will be considered. State issued clean air construction and operating permits would be obtained prior to constructing and operating the proposed generator system. The construction air permit conditions will be transferred to the Y-12 Title V operating permit (after installation of the engine/generator) through the minor modification permitting process. As the existing ECC/PSS and TSC facilities would now be vacant, the diesel-fueled emergency generators and the HVAC systems at these facilities would no longer be operated. The FDAR is inside of the Y-12 Fire Department, so the emergency generator and HVAC systems at that facility would remain in operation. Therefore, total pollutant emissions should be unchanged or slightly less than under the No Action Alternative. As the new sources are diesel and natural gas fueled, radiological and hazardous air emissions will not be affected.

4.3.2 Alternative 2 – Renovate Existing Facility

Construction. Under the Renovate Existing Locations Alternative, there would be no change in emissions sources. The Y-12 Steam Plant would continue to be a primary source of criteria pollutants. All expected criteria pollutant concentration would remain below national and TDEC standards, except for 8-hour ozone and PM2.5, which currently exceeds standards throughout the region. Construction activities would involve extensive renovation or reconstruction of the existing buildings, but minimal land disturbing activity and limited use of construction equipment would occur. Therefore, there would be no additional impact on the air quality and climate.

Operation. There would be no change in emission sources from present operations and conditions. The existing emergency generator systems at the ECC/PSS, TSC, and Y-12 Fire Department would continue to operate.

4.3.3 Alternative 3 – No Action Alternative

Construction. Under the No Action Alternative, there would be no change in emissions sources. No new construction or land disturbing activities beyond those previously assessed in the Y-12 SWEIS (DOE/EIS-0387 2011) and subsequent NEPA documents

are expected to occur. Therefore, there would be no additional impact on the air quality and climate.

Operation. Emissions from existing sources would remain unchanged, and there would be no impact on air quality and climate.

4.4 Noise

4.4.1 Alternative 1 – New Facility

Construction. The onsite and offsite acoustical environments would be impacted during construction of the new facility. Construction activities would generate noise produced by heavy construction equipment, trucks, and power tools. In addition, traffic noise would be expected to increase during construction onsite and along offsite local and regional transportation routes used to bring construction material and workers to the site. The levels of noise would be representative of levels at a medium-scale construction site. Table 4.4-1 describes peak attenuated noise levels expected from operation of construction equipment.

Relatively high and continuous levels of noise in the range of 89 to 108 dBA would be produced by heavy equipment operations during the site preparation phase of construction; however, heavy equipment noise from this phase would become more sporadic and brief in duration. The noise from trucks, power tools, and percussion equipment would be sustained through most of the construction and equipment installation activities on the proposed facility site.

Construction activities normally would be limited to daytime hours and thus would not impact existing background noise levels at night. As construction activities reach their conclusion, sound levels on the proposed site would decrease to levels typical of daily facility operations (50 to 70 dBA). These construction noise levels would contribute to the ambient background noise levels for the duration of construction, after which ambient background noise levels would return to pre-construction levels (DOE/EIS-0387 2011).

Table 4.4-1. Peak Attenuated Noise Levels (in dBA) Expected from Operation of Construction Equipment

Source	Peak Noise Level	Distance from Source						
		15 m (50 ft)	30 m (100 ft)	61 m (200 ft)	100 m (400 ft)	305 m (1,000 ft)	518 m (1,700 ft)	762 m (2,500 ft)
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump Trucks	108	88	82	76	70	62	58	54
Concrete Mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Dragline	105	85	79	73	67	59	55	51
Pile Driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Note: 1 ft = 0.305 m.
Source: Golden et al., 1980.

Peak attenuated noise levels at offsite locations within the City of Oak Ridge from construction activities would be similar to background noise levels (53 to 62 dBA) as shown in Table 4.4-1. The *Noise Control Act* of 1972 (42 U.S.C. §4901), and *Occupational Noise Exposure* (29 CFR 1910.95) include noise reduction and mitigation measures. For sound levels that exceed those listed in Table 4.4-1, feasible administrative or engineered controls would be used. If such controls fail to reduce sound levels to within the levels shown in Table 4.4-2, personal protective equipment ([PPE] e.g., ear plugs) would be provided and used to reduce sound levels to within acceptable levels. Continued compliance measures would be taken to ensure personnel do not experience hearing damage or loss.

Operation. Operation of the proposed facility would generate noise that is consistent with existing conditions. The only significant source of noise would be the emergency

generator, which would generate noise similar to the existing generators. Operation under the Proposed Action would therefore have a negligible effect on ambient noise levels, and the facility would satisfy the noise regulations established by Anderson County (Table 3.5-1). Operation under this alternative would not require the addition of workers and would therefore, not produce an increase in noise from private motor vehicles used by workers to commute to and from work.

Table 4.4-2. Permissible Noise Exposure

Duration Per day, hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Note: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.
Source: DOE/EIS-0387 2011.

4.4.2 Alternative 2 – Renovate Existing Facility

Construction. The onsite and offsite acoustical environments would be impacted during renovation of the existing facilities. Construction activities under this alternative would involve extensive renovation or reconstruction of the existing buildings, but minimal land disturbing activity and limited use of construction equipment would occur. Therefore, the impact on noise would be similar to but slightly less than the Proposed Action.

Operation. As in the Proposed Action, operation of the renovated facilities would generate noise that is consistent with existing conditions. The existing noise sources would continue to operate, and no additional workers would be hired. Operation under this alternative would therefore have a negligible effect on ambient noise levels, and the facility would satisfy the noise regulations established by Anderson County.

4.4.3 Alternative 3 – No Action Alternative

Construction. Under the No Action alternative, no new construction or land disturbing activities beyond those previously assessed in the Y-12 SWEIS (DOE/EIS-0387 2011) and subsequent NEPA documents are expected to occur, therefore there would be no impact on noise levels at Y-12.

Operation. Under the No Action alternative, no new construction or land disturbing activities beyond those previously assessed in the Y-12 SWEIS (DOE/EIS-0387 2011) and subsequent NEPA documents are expected to occur. The No Action alternative would not result in any changes to the current noise levels at Y-12.

4.5 Water Resources

4.5.1 Alternative 1 – New Facility

Construction. The Proposed Action would include earthmoving activities, including demolition of building foundations, utility line removal, and building construction. In order to effectively reduce erosion and sedimentation impacts, BMPs must be designed, installed, and maintained on the construction sites. All erosion and sediment control measures will be in accordance with TDEC Erosion & Sediment Control Handbook. A *Storm Water Pollution Prevention Plan* (SWPPP) will be developed and a Notice of Intent (NOI) obtained in accordance with TDEC if the area to be disturbed is one acre or greater. The need for storm water detention needs to be evaluated during design. If required, the detention details will be provided to in the design package.

Y-12 surface water withdrawals and discharges would not increase substantially during construction. Construction water requirements for the Proposed Action are very small and would not substantially raise the Y-12 average daily water use.

Operation. Under all alternatives, water for Y-12 operations would be taken from the Clinch River. Average annual water use at Y-12 is approximately 2,000 million gal/yr; water usage from this project is minimal compared to total facility use. All utility and sanitary wastewater would be treated prior to discharge in accordance with the applicable

permits. No groundwater would be used for operations of facilities and no plans exist for routine withdrawal from groundwater.

Only 50% of the EOC building site and proposed parking project site will be composed of impervious surfaces, such as building foundations and paved parking areas. The increase in impervious surfaces and corresponding storm water flow would be small. Impacts to storm water flow would be minimized by appropriate design of the facility storm water system. While complete design of the facility has not been finalized, the design of pervious asphalt or concrete pavement will be considered for the new parking lots to assist with the retaining of the 95th percentile storm event on site. There are several grass areas both north and south of the EOC site that could be considered for storm water retention and percolation areas (CNS 2015a).

Storm water runoff and building roof drains shall be designed to ensure positive drainage away from the facility and accessible walkways. Storm water runoff design will include site planning, design, construction, and maintenance strategies for the site to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow. This goal can be achieved under the *Energy Independence and Security Act* (EISA) 438 guidance by retaining the 95th percentile storm event (1.5 inches) onsite through the use of bio-retention areas, rock gardens, permeable pavements, cisterns/recycling, and or green roofs (CNS 2015a).

4.5.2 Alternative 2 – Renovate Existing Facility

Construction. Under this alternative, construction activities would involve extensive renovation or reconstruction of the existing buildings, but minimal land disturbing activity would occur. As in the Proposed Action, best management practices (BMPs) would be used to control erosion and minimize the impact of any runoff to surface water from any land disturbing activity.

Operation. Once the existing facilities are renovated, operations and water use would continue unchanged from current operations. There would be no impact to surface water or groundwater under continued current operations.

4.5.3 Alternative 3 – No Action Alternative

Construction. Under the No Action Alternative, no new construction activities beyond those previously assessed in the Y-12 SWEIS (DOE/EIS-0387 2011) and subsequent NEPA documents are expected to occur. Therefore, there would be no impact on surface water or groundwater resources at Y-12.

Operation. As in the Renovate Existing Locations Alternative, water use would remain unchanged, and there would be no impact to surface water or groundwater.

4.6 Ecological Resources

Potential impacts are evaluated based on the degree to which various habitats or species could be affected by Y-12 proposed actions and alternatives. Impacts to wildlife are evaluated in terms of disturbance, displacement, or loss of wildlife. Impacts to wetlands are assessed based on their proximity to Y-12 current mission operations, the proposed construction and the operation of new facilities.

4.6.1 Alternative 1 – New Facility

Construction. Most ecological impacts at the Y-12 site would remain the same as in the No Action Alternative. However, there could be some short-term impacts due to construction of new facilities.

The EOC would be constructed on just under 2 acres of land, which include laydown areas and a parking lot. There could be some disturbance to terrestrial biotic resources during associated utility hook-ups and rerouting, and site access by construction vehicles. Some dislocation of small urban type species (i.e., rodents) could be expected, and large animals would be mostly excluded from the controlled areas. Because the areas on which these facilities would be constructed are largely developed and paved, there would be minimal terrestrial biotic impacts.

Rain events that occur during construction could cause erosion and transport of soil and other materials from the construction site. NNSA would utilize appropriate storm water management techniques to prevent and pollutants or extreme soil erosion from entering local waterways, and thus aquatic resources should not be negatively impacted beyond what is discussed in the No Action Alternative.

Operation. Impacts to terrestrial biotic resources from the operation of the EOC and other new facilities would be similar to those currently observed under the No Action Alternative. The proposed EOC site is developed and paved and would be located in a previously developed area. When the facilities become operational, similar impacts would be seen as those discussed in the No Action Alternative. Impacts to T&E species and special status species would be the same as in the No Action Alternative. Monitoring to assure that there is no negative impact to the T&E species and other special status species, such as the gray bat and other state listed endangered plants, which have been observed on ORR (but not at Y-12) would continue as in the No Action Alternative.

On January 19, 2007, NNSA conducted consultations with the USFWS to discuss the potential impacts of the UPF on both the Indiana bat and gray bat. A biological assessment was completed for the bat species, and based on the information presented in the assessment, the proposed action at Y-12 is not likely to adversely affect the gray or Indiana bat (NNSA 2011, Stair 2008).

Potential Mitigation Measures. To date, no T&E or species of concern have been identified at Y-12. The developed portions of Y-12 do not contain suitable species habitat; conservation easements exist at Y-12 and will continue in order to protect, restore, and enhance wildlife and suitable habitat. For any of the alternatives discussed, potential impacts to terrestrial plant and animal species would be mitigated to avoid or minimize any potential impacts. Proposed construction sites would be surveyed for the presence of special status species before construction begins, and mitigation actions would be developed at that time. Appropriate runoff and siltation controls would be implemented to minimize potential impacts to adjacent areas during construction and operation. Following construction, temporary structures would be removed and the sites reclaimed.

4.6.2 Alternative 2 - Renovate Existing Facility

Construction. Under this alternative, ecological impacts at the Y-12 site would be the same as those described under the No Action Alternative. Construction activities would consist of internal modifications to existing facilities. No impacts to ecological resources from the Renovate Existing Alternative are expected because land disturbance would be minimal and areas associated with the renovation have been previously disturbed.

Operation. Operation of the EOC would have no impact on the current ecological resources at Y-12, as there would be no significant change to facility operations compared to the No Action Alternative. Impacts to T&E species and other special status species would be the same as in the No Action Alternative.

4.6.3 Alternative 3–No Action Alternative

There would be no change from the current conditions.

4.7 Cultural Resources

The proposed undertaking to construct the EOC will be reviewed in accordance with the PA for each alternative to determine the extent of the Section 106 review. The proposed project area for the new the EOC is located adjacent to two historic properties, Buildings 9202 and 9706-2.

4.7.1 Alternative 1 – New Facility

Construction. The New Facility Alternative would be compatible with the existing historic facilities located adjacent to the proposed new facility project area. To ensure the new construction would not have an adverse impact on the two adjacent historic properties, mitigation activities would include designing the exterior of the new EOC to be compatible with one of those properties. It should be compatible in architectural design, materials, and color (DOE/NNSA/TNHPO/ACHP PA under Section VII.A.2.f).

Operation. Operation of any of the EOC Alternatives would have no impact on the current cultural and historic resources at Y-12.

4.7.2 Alternative 2 – Renovate Existing Facility

Construction. The Renovate Existing Alternative would be reviewed in accordance with the PA to determine the extent of the Section 106 review and may require consultation with the SHPO.

Operation. Operation of the EOC and upgraded facilities would not have any additional impact on the current cultural or historic resources at Y-12, as all operations this alternative would be similar to existing operations.

4.7.3 Alternative 3 – No Action Alternative

The No Action Alternative would not have an impact on historic properties eligible for inclusion in the NRHP, and, therefore, no Section 106 review would be required.

4.8 Socioeconomics

The socioeconomic analysis considers both a ROI, and the City of Oak Ridge, where the majority of the ORR workforce resides. The ROI is a five-county area in Tennessee comprised of Anderson, Knox, Loudon, Morgan, and Roane Counties. The socioeconomic impacts of all the alternatives are addressed in terms of both direct and indirect impacts.

4.8.1 Alternative 1 – New Facility

Construction. The construction of a new EOC would resemble the construction requirements of the Renovate Existing Alternative. Based on the ROI average earnings of $35,020 for the construction industry, direct income would increase between $1.5 million and $2.63 million, for the length of the project (estimating that the project's construction would take a year and a half to two years to complete). This would also generate additional indirect income in supporting industries (this analysis uses the average ROI earnings of $40,400 for other indirect jobs). The total impact to the ROI income would be between $7.3 million and $12.6 million (between $1.5 and $2.63 million direct and $5.8 to $9.96 million indirect). The construction workforce for the EOC is expected to employ 30-50 contractor employees.

Operation. Upon completion of all new construction, the operational workforce for the EOC is expected to employ 10 to 20 Y-12 employees and be capable of accommodating another 20 potential workers (Y-12 or contractor).The change from baseline Y-12 employment would be minor and no noticeable impacts to ROI employment, income, population, housing, or community services would be expected.

4.8.2 Alternative 2 – Renovate Existing Facility

Construction. The Renovate Existing Alternative, would require approximately 30 to 50 workers, generating a range of 30 to 160 jobs (30 to 50 direct and 96 to 160 indirect, using the multiplier of 3.2 indirect jobs for every DOE-related direct job) in the ROI during the peak time of construction. These changes would be temporary, lasting only the duration of the construction period, and would be much less in magnitude than the socioeconomic impacts that were experienced during other construction projects at Y-12. The existing ROI labor force could likely fill all of the jobs generated by the increased employment and expenditures. Therefore, there would be no impacts to the ROI's population or housing sector. Since there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI. Based on the ROI average earnings of $35,020 for the construction industry, direct income would increase between $1.5 million and $2.63 million, for the length of the project (estimating that the project's construction would take a year and a half to two years to complete). This would also generate additional indirect income in supporting industries (this analysis uses the average ROI earnings of $40,400 for other indirect jobs). The total impact to the ROI income would be between $7.3 million and $12.6 million (between $1.5 and $2.63 million direct and $5.8 to $9.96 million indirect).

Operation. Upon completion of the renovation, operation of the renovated facility would not result in any significant change in Y-12 workforce requirements and the facilities would be staffed by the existing Y-12 workforce. Therefore, there would be no change from the baseline employment, and no impacts to ROI employment, income, population, housing, or community services.

4.8.3 Alternative 3 –No Action Alternative

There would be no appreciable changes in the regional or local (City of Oak Ridge) socioeconomic characteristics resulting from continuance of the No Action Alternative.

4.9 Environmental Justice

Based on the analysis of impacts for resource areas, no significant adverse effects are expected from construction and operation activities at Y-12 under any of the alternatives. For those impacts that would occur, NNSA expects the impacts to affect all populations in the area equally. There would be no discernable adverse impacts to any populations, land uses, visual resources, noise, water, air quality, geology and soils, biological resources, socioeconomic resources, or cultural and archeological resources.

Construction. The short-term socioeconomic impacts during any construction activities would be positive and not result in any disproportionately high and adverse effects on any population. With respect to human health, occupational impacts during construction would be expected, but would not be significant. Therefore, no disproportionately high and adverse effects on minority populations, low-income, or American Indian populations would be expected during construction for any alternative.

Operation. None of the proposed alternatives would pose significant health risks to the public and radiological emissions would remain below the annual dose limit of 10 mrem (the maximum MEI dose is 0.15 mrem per year). Consequently, there are no special circumstances that would result in any greater impact on minority, low-income, or American Indian populations than the population as a whole.

4.10 Traffic and Transportation Safety

4.10.1 Alternative 1 – New Facility

Construction. Under the Proposed Action, there would be a minimal increase in traffic during construction of the EOC. Construction related traffic would add a negligible number of additional worker vehicles per day. Minor traffic interruptions would be expected near

the project site due to construction vehicles entering and leaving the site. Construction activities would be temporary and would not result in long-term effects.

Operation. The Proposed Action would result in the relocation of 10 to 20 workers within Y-12. The workforce would not increase and no additional worker vehicles would be on site. Therefore, operations under the Proposed Action would not change the LOS on nearby roads.

4.10.2 Alternative 2 – Renovate Existing Facility

Construction. Under the Renovate Existing Facility Alternative, there would be a minimal increase in traffic during construction of the EOC, similar to the Proposed Action. Construction related traffic would add a negligible number of additional worker vehicles per day. Minor traffic interruptions would be expected near the project site due to construction vehicles entering and leaving the site. Construction activities would be temporary and would not result in long-term effects.

Operation. The workforce would not increase and no additional worker vehicles would be on site. Therefore, operations under the Renovate Existing Facility Alternative would not change the LOS on nearby roads.

4.10.3 Alternative 3 – No Action Alternative

The workforce would not increase and no additional worker vehicles would be on site. Therefore, operations under the No Action Alternative would not change the LOS on nearby roads.

4.11 Occupational and Public Health and Safety

4.11.1 Alternative 1 – New Facility

Construction. Occupational hazards associated with construction of the facility would be considered standard industrial hazards. Such hazards are defined as meeting one of the following criteria: (1) routinely encountered or accepted by the public in everyday life; (2) encountered in general industry and significantly affecting a large number of people; or (3) encountered in general industry and controlled through the application of recognized

codes and safety standards (e.g., OSHA standards). Workers will comply with "DOE Worker Safety and Health requirements" in 10 CFR 851 and the Y-12 safety provisions to mitigate the incidence of construction related injuries or illnesses.

All activities would be conducted in full accordance with DOE/NNSA requirements regarding protection of personnel and the environment. Any materials removed from the construction site, such as wastes, would be contained and checked for radioactivity/toxicity and disposed of based on the content of the waste. To avoid exposure from potential spills of liquids during construction, construction personnel would be trained in accordance with the Y-12 spill prevention control countermeasures and contingency plans.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. However, this should not impact the construction and operation of the EOC facilities since the design criteria considers appropriate structural design factors for natural phenomena (seismic). There are no known currently active faults within or adjacent to the proposed project site. Slopes and underlying foundation materials are generally stable at Y-12. The foundation soils are not susceptible to liquefaction.

Operation. Construction of the EOC would enable emergency services and management to better fulfill its mission and improve overall campus security, therefore reducing risk to the Y-12 workers and the surrounding public.

The Proposed Action would require the transport, storage, use, and/or disposal of hazardous materials such as No. 2 fuel oil. As this is the same material used in the existing emergency generators, there would be no additional impact to safety compared to the No Action Alternative.

The Proposed Action would not introduce any hazardous material, with the exception of a diesel fuel generator, which is designed to keep the EOC power independent for 72 hours. This aboveground storage tank would be stored in accordance with local, state, and Federal regulations located outside the building, separate from occupied spaces.

Y-12 prepares a Preliminary Safety Analysis Report (PSAR) for new facilities and for major modifications to existing facilities as needed. The need for a PSAR for modifications is determined in part by whether the modification involves an unreviewed safety question (USQ) that would result in a significant revision to existing safety analysis documentation. Y74-800, *Facility Safety Program*, specifies requirements, roles, and responsibilities for implementing a program of its type within Y-12. The document applies primarily to operations involving significant nuclear and/or chemical hazards and is focused on the prevention and mitigation of accidents that have potentially significant consequences as well as modifications that could affect nuclear facilities systems' safety performance. Accidents associated with standard industrial hazards are normally excluded from the PSAR *Facility Safety Program* but are controlled by application of the various Y-12 ES&H program requirements (e.g., industrial safety).

To meet the primary focus of the *Facility Safety Program*, all Y-12 activities are subject to hazardous material identification and facility classification processes. Facility Safety Engineering has been briefed on the conceptual design basis of the EOC project. Facility Safety representatives have concluded that, at this point in the design process, the facility provided by the EOC project introduces no new hazardous materials. The review of existing safety basis documents found that the existing PSS building is not identified as a safety system, structure, or component (SSC) required to prevent or mitigate accidents identified in safety basis documents. Thus, the construction of the facility provided by the EOC project is not required to be engineered or qualified as "safety class" or "safety significant" in support of nuclear facilities. This determination is documented in PLN 970404-F-0001 00000, Preliminary Project Execution Plan/or the Y-12 Emergency Operations Center Project (CNS 2015b).

4.11.2 Alternative 2 – Renovate Existing Facility

Construction. Occupational hazards associated with renovation of existing locations would be considered standard industrial hazards. These hazards would be similar to those under the Proposed Action.

As the existing structures are all 1940s era design, Alternative 2 may not be able to renovate the buildings to current building codes to address the moderate seismic risk that exists at Y-12. In addition, the emergency facilities that make up the proposed EOC would continue to be in separate buildings, which reduces the effectiveness of any emergency response, resulting in a direct impact on the Y-12 mission and on the health and safety of Y-12 workers and the surrounding public.

4.11.3 Alternative 3 – No Action Alternative

Construction. No construction or renovation activities would occur under this alternative. Therefore, there would be no construction impact to health and safety.

Operation. Under the No Action alternative, the emergency facilities that make up the proposed EOC would continue to be in separate, increasingly obsolete buildings, which reduces the effectiveness of any emergency response, resulting in a direct impact on the Y-12 mission and on the health and safety of Y-12 workers and the surrounding public. In addition, this alternative does not address the moderate seismic risk that exists at Y-12.

As in the other alternatives, operation of the existing emergency generators would continue to involve the transport, storage, use, and/or disposal of No. 2 fuel oil, a hazardous material. The potential hazards from this material are managed under the Y-12 Facility Safety Program.

4.12 Waste Management

4.12.1 Alternative 1 – New Facility

Construction. Under the Proposed Action, the EOC would be constructed for the central housing of various emergency facilities. The existing structures, consisting of paved lot, previous building slabs, and underground utilities, would be removed by the project. Waste and recycle materials would be surveyed or reviewed and tagged by Radiological Control personnel unless noted otherwise. Waste materials, not including recyclable materials, would be characterized and packaged in accordance with the requirements of

the master waste profiles in effect at the time of generation. The following procedures would be followed to minimize impacts on waste generation:

Soil. Soil disturbance will occur during construction of the EOC. There is a strong possibility that it will be necessary to excavate and replace the existing soil with an engineered fill due to unsuitability for construction. The material removed, though not environmentally contaminated, may require disposal and would be handled according to the *Soil Management Plan for the Oak Ridge Y-12 National Security Complex* (Y/SUB/92-28B9923C-Y05 Rev. 2) (DOE 2005a).

Storm water and groundwater. Control and discharge of storm water and groundwater would be in accordance with the BMP Plan and *Storm Water Control Plan*. Environmental Compliance personnel would approve, on a case-by-case basis, any discharge to the storm drain that is not covered by the BMP Plan or *Storm Water Control Plan*.

Sanitary refuse. Sanitary refuse such as lunch bags, food waste, plastic, and paper would be deposited in green sanitary waste dumpsters or transported to the onsite Industrial Landfill V (ILFV) or state-approved landfill.

Wood. Scrap wood, including excess pallets, would be segregated into painted or treated wood and unpainted or untreated wood. Painted or treated wood would be transported to the onsite Construction Demolition Landfill VII (CDL VII) or state-approved landfill. Unpainted untreated wood would be recycled (DOE 2005).

Scrap metal. Unpainted scrap metal that has not been in a posted radiological area and that is approved by Radiological Control personnel for release to the public would be recycled. Scrap metal that is generated from a posted radiological area cannot be recycled. Clean scrap metal would be transported to the onsite CDL VII for disposal. Painted metal with PCB concentrations of 50 ppm or greater would be managed as bulk PCB regulated waste. Radiologically contaminated metal with bulk PCB concentration of 50 ppm or greater would be containerized as mixed waste.

Asphalt and concrete. Asphalt and concrete would be surveyed and evaluated by Radiological Control personnel before being disturbed. Any radiologically-contaminated asphalt or concrete would be removed and containerized as low-level radioactive waste (LLRW) and managed in accordance with Procedure Y71-936, Radioactive Waste Management at Y-12. Asphalt and concrete approved by Radiological Control personnel would be transported to the onsite CDL VII for disposal.

Sewer pipe. Clay, concrete, or cast iron pipe from storm and sanitary sewer lines may be encountered. Pipe that can be approved by Radiological Control personnel would be disposed of in CDL VII. Large accumulations of sediment within the pipe should be evaluated by the Environmental Compliance organization to determine the need for sampling for possible hazardous constituents. Pipe that is determined to be radiologically contaminated would be containerized for disposal as LLRW.

Asbestos insulation. Friable asbestos-containing materials (ACM), such as underground pipe insulation that can be approved by Radiological Control personnel, would be packaged and sealed tightly in double-bagged 6-mil-thick plastic bags, double-wrapped 6-mil-thick plastic sheeting, or secured in drums or boxes. Asbestos insulation would be removed from pipes greater than 20 cm (8 in) in diameter. Insulation may be left on pipes with diameter of 20 cm (8 in) or less, and the entire waste may be managed as ACM. ACM approved by Radiological Control personnel would be disposed of as a special waste onsite at ILFV.

Non-asbestos insulation. Non-asbestos insulation would be surveyed by Radiological Control personnel before removal. Insulation that can be approved by Radiological Control personnel would be packaged and tightly sealed in single 6-mil-thick plastic bags, wrapped in 6-mil-thick plastic sheets, fiber drums, metal drums, plywood boxes, or metal boxes. The packages would be transported to ILFV by the construction subcontractor in such a manner to prevent airborne release or loss of the waste.

Corrugated cardboard and aluminum beverage cans. Corrugated cardboard and aluminum beverage cans would be recycled. There would be no environmental impact resulting from waste management of generated wastes from the Proposed Action.

Operation. The waste generation from the operation of the Proposed Action would be the same or marginally higher as the current waste generation, as the same activities would be conducted in the new facility.

4.12.2 Alternative 2 – Renovate Existing Facility

Renovation. Under the Renovate Existing Locations alternative, the existing facilities would be renovated to upgrade them with modern information and communication systems to improve emergency response efficiency. The existing structures are all 1940s era buildings, and would require the renovation of building materials, including walls, ceilings, floors, utilities, and potentially foundation and roof. Waste and recycle materials would be surveyed or reviewed and tagged by Radiological Control personnel unless noted otherwise. Waste materials, not including recyclable materials, would be characterized and packaged in accordance with the requirements of the master waste profiles in effect at the time of generation. The same procedures as those used under the Proposed Alternative would be followed to minimize impacts on waste generation with the following exceptions:

Soil. It is unlikely that substantial soil disturbance would occur under this alternative. However, if it is determined that is required to excavate and replace the existing soil with an engineered fill due to unsuitability for construction, the material removed, though not environmentally contaminated, may require disposal and would be handled according to the *Soil Management Plan for the Oak Ridge Y-12 National Security Complex* (Y/SUB/92-28B9923C-Y05 Rev. 2) (DOE 2005a).

Storm water and groundwater. No disturbance to the existing storm water and groundwater is anticipated during renovation of the existing buildings.

Operation. The waste generation from the operation of this alternative would be the same or marginally higher as the current waste generation, as the same activities would be conducted in the new facility.

4.12.3 Alternative 3 – No Action Alternative

Construction. As no construction is proposed under the No Action Alternative, no construction waste would be generated.

Operation. Under the No Action Alternative, there would be no change to waste generation from that of current operations.

4.13 Visual Resources

The visual resources analysis considers an area that addresses the entire Y-12 site, which covers approximately 5,400 acres. The impacts of the alternatives are evaluated for visual impacts.

4.13.1 Alternative 1 – New Facility

Construction. The New Facility Alternative would include construction of a 17,000 ft^2 EOC. The EOC would be compatible and consistent with the current visual appearances at Y-12 and would be located in an already built area of Y-12. Construction work would create short-term visual impacts, but would not be out of character for an industrial site such as Y-12. The construction laydown areas, temporary parking, and temporary construction office trailers would also be typical for an industrial site. After construction of the facilities is complete, temporary construction equipment and items would be removed, and construction laydown areas would be re-graded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel.

Operation. Upon completion of construction (approximately 2017), the EOC would be a one-story structure and would not impact the visual character of Y-12. Y-12 would remain

a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

4.13.2 Alternative 2 – Renovate Existing Facility

Construction. The Renovate Existing Facility Alternative would consist mainly of internal upgrades to existing facilities and would not change the current visual impact of Y-12. The complex would still remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

Operations. Operation of the upgraded facilities and the EOC would have no impact on the current visual impact of Y-12. Upgrading existing facilities would not significantly reduce the density of industrial facilities in the protected area of Y-12.

4.13.3 Alternative 3 – No Action Alternative

The majority of the existing structures at Y-12 are low-profile, reaching heights of three stories or less, and were built mainly in the 1940s and 1950s of masonry and concrete. Facilities at Y-12 are also brightly lit at night, making them especially visible. Although there is no Bureau of Land Management (BLM) classification for Y-12, the level of development at Y-12 is consistent with Visual Resource Management (VRM) Class IV which is used to describe a highly developed area. Most of the land surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes).

Under the No Action Alternative, reoccurring activities associated with NNSA and DOE would continue. The long term plan for Y-12 is to consolidate operations and reduce the number of excess facilities. Although there would be some reduction in the density of industrial facilities as a result, Y-12 would still remain a highly developed area with an industrial appearance and operations, therefore no change to the VRM classification is projected.

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5.0 CUMULATIVE IMPACTS

Under all the alternatives analyzed in this EA, cumulative impacts would be minor or insignificant for all resource areas assessed. Impacts to land use would not extend beyond those for the No Action Alternative for the construction of the new facility. This would involve significantly less than one 1 percent of the available land at Y-12.

The Proposed Action or Renovate Existing Locations Alternative would have no cumulative impact to geology and soils because of the stability of soils at Y-12, and because all facilities would comply with regulatory requirements. Air quality at Y-12 is generally good. With the exception of the 8-hour O_3 (ozone) and PM2.5 standards, the greater Knoxville and Oak Ridge areas are in attainment with the National Ambient Air Quality Standards (NAAQS) for all other criteria pollutants for which EPA has made attainment designations. Actual emissions are expected to be similar or slightly lower under the Proposed Action versus current operations. The alternatives analyzed in this EA would not have an adverse cumulative impact on air quality or regional climatic conditions.

All the alternatives analyzed would have no negative effects on the groundwater and surface water resources. Similarly, no cumulative impacts to ecological resources are expected due to the absence of any critical habitats for threatened or endangered species and significant ecological resources at locations potentially affected by the alternatives. This conclusion is also true for cultural resources. Socioeconomics would be relatively unchanged by any of the alternatives because the alternatives would not create a significant number of jobs or exceed housing demands, community services, or transportation capabilities. With respect to worker safety, the Proposed Action would enable emergency services and management to better fulfill its mission and improve overall campus security, therefore reducing risk to Y-12 workers the surrounding public. Waste management activities would be unaffected by the alternatives. All wastes generated would be managed and disposed of in accordance with the project-specific waste management plan and in compliance with all regulatory requirements.

The CEQ regulations implementing NEPA (40 CFR Part 1508) define cumulative effects as “impacts on the environment which result from the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” The regulations also state that “cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time.”

Although outside the scope of this EA’s Proposed Action, a preliminary analysis of the decontamination, decommissioning, and demolition of the PSS/ECC and TSC buildings at Y-12 determined that impacts on the various resources areas would be negligible. However, this action would meet the Y-12 goals of reducing the plant footprint and reducing management and operating costs. The identified negligible cumulative impacts associated with waste management, as well as with health and safety, are due to the generation of demolition waste, possibly containing asbestos and other hazardous materials. A final resource area, socioeconomics, was identified to have a negligible cumulative impact due to the employment estimates for the construction of the Proposed Action.

For any unforeseen future actions that may indeed occur, regardless of what agency (federal or non-federal) or person undertakes such actions, cumulative impacts might result from individually minor but collectively significant actions over a period of time. Only one project (Y-12 Fire Station Construction Project) has been identified as a foreseeable action that could contribute to cumulative impacts in conjunction with the proposed actions in the EOC EA. The future construction and operation of the Fire Station would have minimal cumulative impacts to environmental resources in the area of the EOC project. However, there are sustainability design requirements, as previously described and included in project plans, for the building to achieve a LEED Gold standard.

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Appendix A
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Appendix B
COMMENT RESPONSE MATRIX

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COMMENT RESPONSE MATRIX
Environmental Assessment Documentation of the
Emergency Operations Center Project
Draft Comments

Comment #	Commentor	Comment Summary	Response (Contractor)

Comment #	Commentor	Comment Summary	Response (Contractor)

Comment #	Commentor	Comment Summary	Response (Contractor)