DOE/EA-2144

ENVIRONMENTAL ASSESSMENT FOR THE OAK RIDGE ENHANCED TECHNOLOGY AND TRAINING CENTER

Final
November 2020

Approved for Public Release

Executive Summary

The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the United States (U.S.) Department of Energy (DOE), has the primary responsibility to maintain and enhance the safety, security, and effectiveness of the U.S. nuclear weapons stockpile. In addition, NNSA works to reduce the global danger from weapons of mass destruction and responds to nuclear and radiological emergencies in the U.S. and abroad. NNSA has prepared this environmental assessment (EA) (DOE/EA-2144) to analyze the potential environmental impacts associated with constructing and operating the Oak Ridge Enhanced Technology and Training Center (ORETTC) on property currently owned by NNSA on the Oak Ridge Reservation (ORR). The proposed location, which is approximately five miles west of the Y-12 National Security Complex (Y-12), is across from the Horizon Center Industrial Park on the Oak Ridge Turnpike, and approximately 1.5 miles east of the State Route (SR) 95 – SR 58 interchange. ORETTC would be used to train first responders and other experts in nuclear operations, safeguards, and emergency response to support the National Security Enterprise. The Final EA also includes analysis of an alternative that would locate the ORETTC at the East Tennessee Technology Park (ETTP). As described in Section 1.2 of this Final EA, the lack of a dedicated, centralized training facility reduces the effectiveness and efficiency of first responder training.

As discussed in Chapter 3 of this EA, construction of the ORETTC at the proposed site shown in Figure 1-1 would disturb approximately 24.1 acres, or approximately 0.06 percent of the total land at ORR. Of this 24.1 acres, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road. The other 16.4 acres would be temporarily disturbed (i.e., surfaces would remain pervious) to grade the land and provide greenspace around the ORETTC to enhance the campus-feel. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. Depending upon the specific siting location and facility configuration at the ETTP Alternative site, the amount of land disturbance could be of similar magnitude as the land disturbance at the proposed site. Once operational at the ETTP Alternative site, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road.

No appreciable visual resource impacts are expected, as the ORETTC proposed site is largely wooded and would only be visible from traffic on the Oak Ridge Turnpike. If located at the ETTP Alternative site, the ORETTC would be visible from the Oak Ridge Turnpike and would be in character with the mix of industrial use and open space at ETTP. The area is in attainment for all air quality standards and emissions from the Proposed Action or ETTP Alternative would be below *de minimis* thresholds. There are no sensitive noise receptors in the vicinity of either of the site alternatives and there would be no notable noise sources associated with the ORETTC.

No water quality impacts are expected from operations as stormwater and fire-training runoff water would be managed under existing permits. At the proposed site, disturbance in the stream riparian buffers would be limited to approximately 0.70 acres for the road corridor and a pedestrian crossing. Approximately 0.05 acres of wetlands would be impacted. There are no floodplains at the ORETTC proposed site. Depending upon the specific siting location and facility configuration at the ETTP Alternative site, floodplains and wetlands could be impacted.

No historic properties eligible or potentially eligible for listing in the National Register of Historic Places would be affected at either of the site alternatives. During this EA process, NNSA conducted informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to threatened, endangered, or sensitive species, particularly the Indiana bat (endangered), northern long-eared bat (threatened), and gray bat (endangered). As a result of that consultation, the USFWS concluded that NNSA has adequately addressed potential direct, indirect, and cumulative effects to federally listed species and their habitats. For the ETTP Alternative, adverse environmental impacts to existing ecological receptors would be limited because construction activities would primarily occur within previously disturbed areas (DOE 2011). The potentially affected areas are primarily industrialized, fragmented, and disturbed; no rare, threatened, and endangered plant and animal species are known to occur, therefore adverse impacts are not anticipated (DOE 2016a).

The construction and operational workforce would be the same for both of the site alternatives. Because the peak construction workforce (75 persons) and operational/training workforce (270 persons) would be negligible compared to the projected population in the ROI, socioeconomic impacts, although beneficial, are expected to be negligible. Temporary increases in traffic would be minimal compared to existing activities in the ROI for both of the site alternatives. No environmental justice populations were identified within the census tracts where ORETTC would be located. No offsite human health impacts are expected. Solid non-hazardous waste would be recycled or transported to an appropriate ORR landfill for disposal. Less than 100 pounds of hazardous waste associated with cleaning supplies and spent training materials would be generated annually, which is less than 0.01 percent of the hazardous waste generate at ORR. Construction of the ORETTC would have minimal impacts on infrastructure capacity. The capacity of the existing infrastructure in the region would be adequate to support the ORETTC at either of the alternative sites.

TABLE OF CONTENTS

Section **Page**

LIST OF FIGURES

Figure **Page**

LIST OF TABLES

Table **Page**

ACRONYMS AND ABBREVIATIONS

ARAP	Aquatic Resource Alteration Permit
BLS	Bureau of Labor Statistics
BMP	Best Management Practices
BTU	British thermal units
CAA	*Clean Air Act of 1990*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CNS	Consolidated Nuclear Security, LLC
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
CROET	Community Reuse Organization of East Tennessee
CTF	Central Training Facility
D&D	decontamination and decommissioning
DOE EM	DOE Environmental Management
dB	decibels
dBA	A-weighted decibels
DNL	Day-night Sound Level
DOE	U.S. Department of Energy
EA	environmental assessment
EFPC	East Fork Poplar Creek
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERTF	Emergency Response Training Facility
ETTP	East Tennessee Technology Park
FEMA	Federal Emergency Management Agency
FIR	Federal Industry and Research
FONSI	finding of no significant impact
FR	*Federal Register*
GHG	greenhouse gas
gpm	gallons per minute
HPP	historic preservation plan
IPaC	Information for Planning and Consultation
kV	kilovolt
L_{eq}	Equivalent Sound Level
MBTA	*Migratory Bird Treaty Act*
MVA	megavolt-amperes
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NEPA	*National Environmental Policy Act of 1969*
NERP	National Environmental Research Park

NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	*National Historic Preservation Act*
NIOSH	National Institute for Occupational Safety and Health
NNSA	National Nuclear Security Administration
NOx	oxides of nitrogen
NOC	Notice of Coverage
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	ozone
ORETTC	Oak Ridge Enhanced Technology and Training Center
ORIDB	Oak Ridge Industrial Development Board
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
ORUD	Oak Ridge Utility District
OST	Office of Secure Transportation
PA	Programmatic Agreement
PILT	Payments in Lieu of Taxes
PM_n	particulate matter less than or equal to n microns in aerodynamic diameter
PPE	personal protective equipment
psi	pounds per square inch
RCIDB	Roane County Industrial Development Board
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
ROI	region-of-influence
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SNRAF	Simulated Nuclear and Radiological Activities Facility
SR	State Route
SSP	Self-Sustaining Parcel
SWPPP	Stormwater Pollution Prevention Plan
TDA	Tennessee Department of Agriculture
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
THC	Tennessee Historical Commission
TRO	total residual oxidant
TRTA	Technical Rescue Training Area
TVA	Tennessee Valley Authority
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFA	United States Fire Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Y-12	Y-12 National Security Complex

1 INTRODUCTION

1.1 Introduction and Background

The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the United States (U.S.) Department of Energy (DOE), has the primary responsibility to maintain and enhance the safety, security, and effectiveness of the U.S. nuclear weapons stockpile. In addition, NNSA works to reduce the global danger from weapons of mass destruction and responds to nuclear and radiological emergencies in the U.S. and abroad. The National Security Enterprise, overseen by the NNSA, includes production sites and design laboratories across the country. The Y-12 National Security Complex (Y-12), which is located on the Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee, is a critical production site, spanning 811 acres, 150 high-security acres, and 7.3 million square feet of laboratory, machining, dismantlement, and research and development and office areas.

In accordance with the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) Parts 1500−1508[1] and DOE *National Environmental Policy Act* (NEPA) implementing procedures at 10 CFR Part 1021, NNSA has prepared this environmental assessment (EA) to analyze the potential environmental impacts associated with constructing and operating the Oak Ridge Enhanced Technology and Training Center (ORETTC) to train first responders and other experts in nuclear operations, safeguards, and emergency response to support the National Security Enterprise.

Depending on the results of this EA, NNSA could: (1) determine that the potential environmental impacts of the Proposed Action would be significant to human health and the environment, in which case NNSA would prepare an environmental impact statement (EIS); or (2) determine that a finding of no significant impact (FONSI) is appropriate, in which case NNSA could proceed with the Proposed Action with no additional NEPA documentation.

Environmental Assessment (EA)

A primary purpose of an EA is to determine if a Proposed Action would have significant environmental impacts. If there would be none, no further NEPA documentation is required. If there would be significant environmental impacts, an EIS is required.

1.2 Purpose and Need for Agency Action

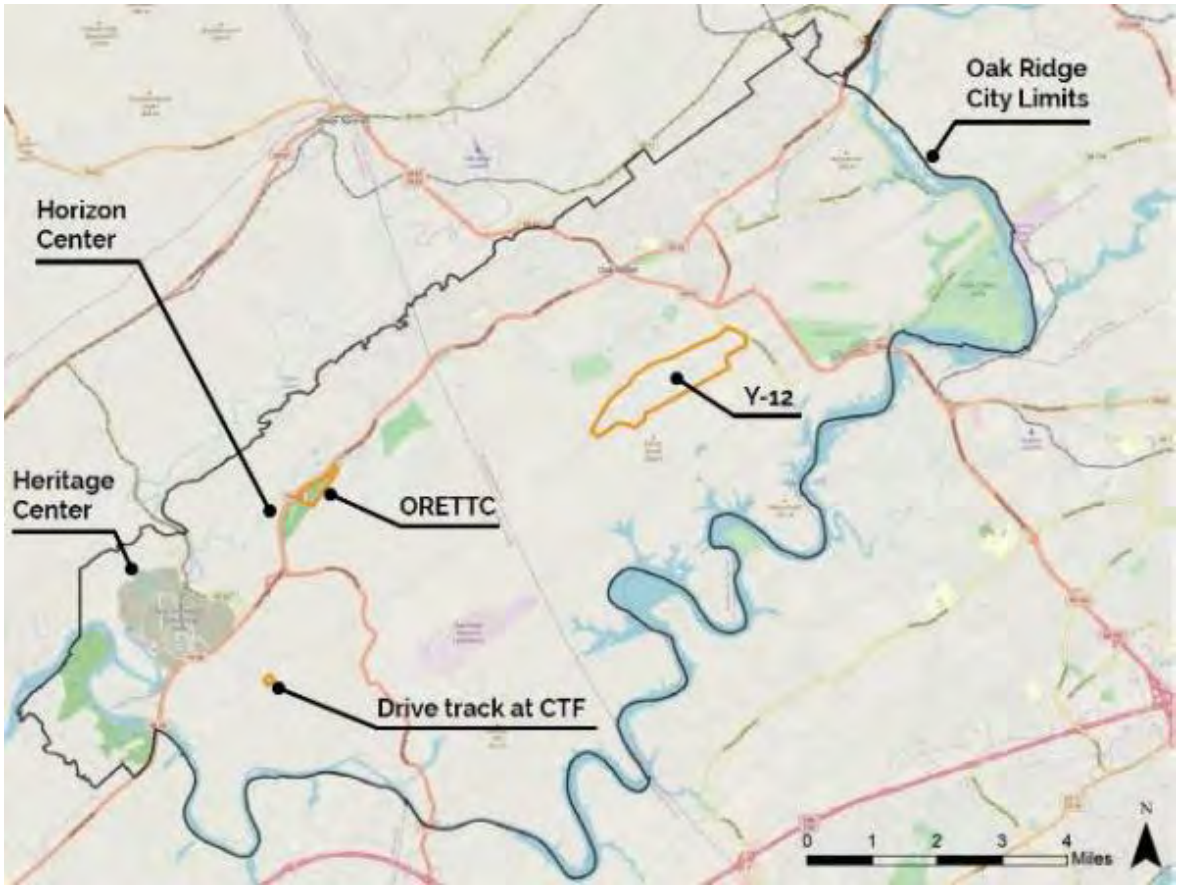
NNSA requires highly specialized industrial training facilities and equipment with national-level emergency response experts to train first responders and other experts in nuclear operations, safeguards, and emergency response to support the National Security Enterprise. Currently, such training occurs in bifurcated facilities at Y-12, across the National Security Enterprise, and in non-NNSA facilities across the country. The lack of a dedicated, centralized training facility reduces the effectiveness and efficiency of training. The ORETTC is envisioned as a state-of-the-art center with highly specialized industrial training facilities and equipment with national-level emergency response experts, which would differentiate this center from other training facilities. The ORETTC would act as the center of excellence for advanced emergency response training, high

[1] On July 16, 2020, the CEQ issued a final rule to update its regulations for federal agencies to implement NEPA (85 *Federal Register* 43304). The effective date for the new regulations is September 14, 2020. Because this EA was initiated prior to that effective date, this EA has been prepared in accordance with the CEQ regulations dated 1978, as amended in 1986 and 2005.

consequence operations, and processes that would challenge critical thinking and problem solving for key state, regional, national, and global collaborators (CNS 2020a). On average, approximately 200-250 personnel would be trained at the ORETTC daily.

1.3 Proposed Action Evaluated in this Environmental Assessment

NNSA's Proposed Action is to construct and operate the ORETTC on property currently owned by NNSA on the ORR, approximately five miles west of the main facilities at Y-12.[2] An 81-acre area adjacent to the Oak Ridge Turnpike/State Route (SR) 95 has been designated as the proposed site for the proposed ORETTC facilities (see Figure 1-1). The ORETTC would consist of: (1) a Simulated Nuclear and Radiological Activities Facility (SNRAF) and a Technical Rescue Training Area (TRTA), consisting of a Live Burn Fire Tower and Rubble Pit to be developed by NNSA at the proposed site; (2) an Emergency Response Training Facility (ERTF) at the proposed site, which would be funded by the State of Tennessee and developed by the Roane County Industrial



Note: *see* Chapter 4 for a discussion of the Drive Track.
Source: CNS 2020a.

Figure 1-1. Location of Proposed ORETTC Facilities

[2] Legally, land is owned by the United States of America and in the custody of a particular federal agency, but for the purposes of this EA, the term 'owned' is used to refer to land "in the custody of the NNSA."

Development Board (RCIDB); (3) a maintenance building; and (4) utilities, roads, and supporting infrastructure. Although ownership of the proposed site has been transferred from DOE to NNSA, a portion of the site (approximately 24 acres) would need to be transferred from NNSA to the RCIDB for development of the ERTF (CNS 2020a). A detailed description of the Proposed Action is presented in Section 2.1.

1.4 Scope of this Environmental Assessment and Organization

In addition to analyzing the potential environmental impacts of NNSA's proposal to construct the NNSA-owned portions of the ORETTC, this EA analyzes the impacts associated with the proposed transfer of land (approximately 24 acres) from NNSA to the RCIDB for development of the ERTF. The construction and operation of the ERTF is also evaluated as part of the Proposed Action in this EA.[3] In response to public comments received on the Draft EA, NNSA has reevaluated the potential use of the East Tennessee Technology Park (ETTP) as a site alternative for the ORETTC and has added an analysis of it to this Final EA (*see* Section 2.2).

The organization of this EA includes:

- An introduction and background discussion of the Proposed Action and the purpose and need for the NNSA action (Chapter 1);
- A description of the Proposed Action, ETTP Alternative, and the No-Action Alternative (Chapter 2);
- A description of the existing environment relevant to potential impacts of the Proposed Action, ETTP Alternative, and the No-Action Alternative (Chapter 3);
- An analysis of the potential direct and indirect environmental impacts that could result from the Proposed Action, ETTP Alternative, and the No-Action Alternative (Chapter 3);
- Identification and characterization of cumulative impacts that could result from the construction and operation of the ORETTC in relation to past, present, and other reasonably foreseeable actions within the surrounding area (Chapter 4); and
- A listing of the references cited in this EA (Chapter 5).

1.5 Public Participation

In August 2020, NNSA published the Draft EA on the DOE NEPA web page (https://www.energy.gov/nepa/doe-environmental-assessments) and the NNSA NEPA web page (https://www.energy.gov/nnsa/nnsa-nepa-reading-room) for public review and comment.[4] As shown in Table 1-1, NNSA announced the availability of the Draft EA in local newspapers and provided an email address and postal address where comments could be submitted.

NNSA received eight comment documents on the Draft EA. Comments on the Draft EA, as well as NNSA's corresponding responses to those comments, are presented in Appendix C of this EA. All comment documents received are included in the Administrative Record for this EA.

[3] Although the ERTF would be the responsibility of the RCIDB, this EA analyzes the construction and operation of both the NNSA facilities at the ORETTC as well as the state-funded, RCIDB-owned ERTF.

[4] The Draft EA was published on the DOE NEPA web page on August 20, 2020 and on the NNSA NEPA web page on August 24, 2020.

Table 1-1. Newspaper Notices for the Draft EA

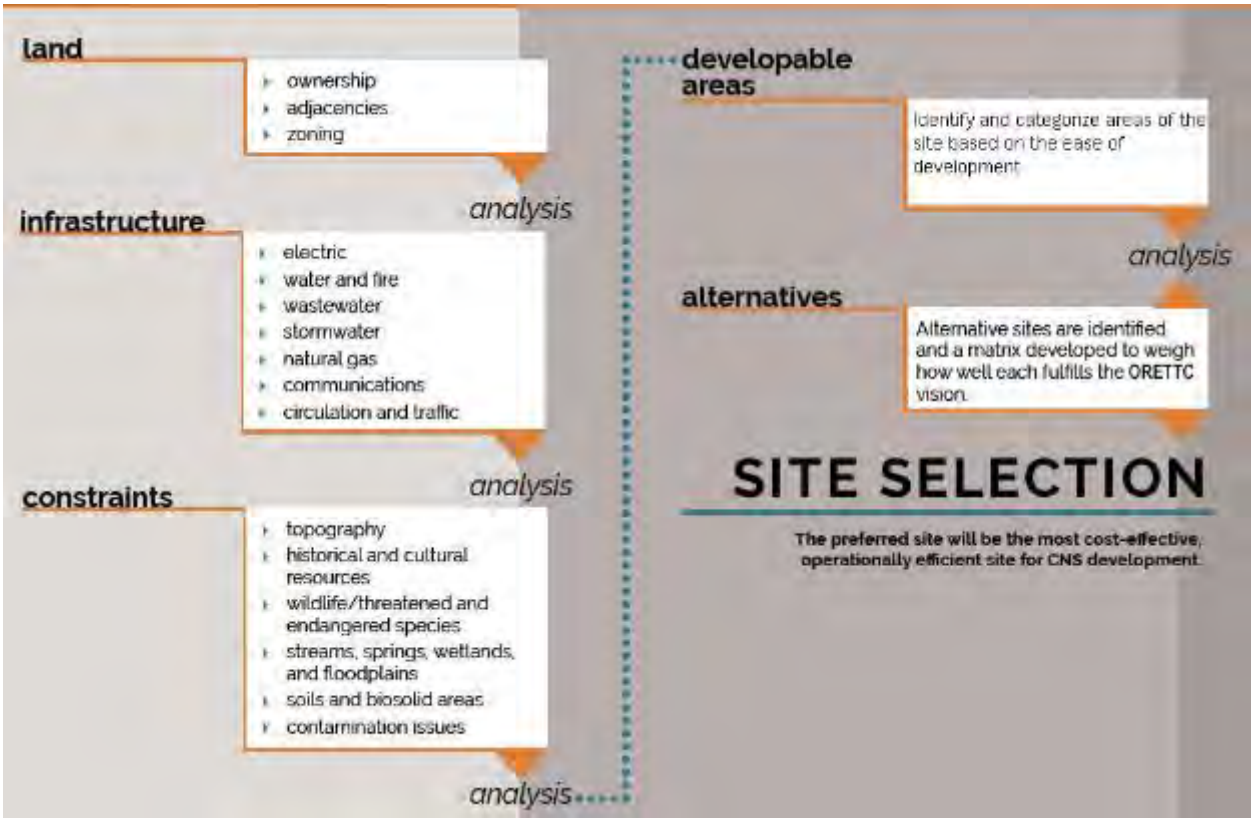
Newspaper	Media	Publication Date
Knox News-Sentinel	Print/Web	8/19/2020 and 8/26/2020
The Oak Ridger	Print	8/21/2020 and 8/27/2020
Roane County News	Print	8/19/2020 and 8/26/2020
Oak Ridge Today	Web	8/19/2020

In the process of preparing this Final EA, NNSA reviewed and considered all comments received on the Draft EA. Based on the comments and other considerations, NNSA has made revisions to the EA, as appropriate. This Final EA is available to the public on the DOE NEPA web page (https://www.energy.gov/nepa/doe-environmental-assessments) and the NNSA NEPA web page (https://www.energy.gov/nnsa/nnsa-nepa-reading-room).

2 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action: Construct and Operate ORETTC at Proposed Site

As stated in Section 1.3, NNSA's Proposed Action is to construct and operate the ORETTC at the proposed site shown in Figure 1-1. The proposed site was identified through a detailed site-evaluation process which considered the following factors: land, infrastructure, constraints, developable areas, and alternatives (CNS 2020b). Figure 2-1 depicts the site-evaluation process. The proposed site was rated to be the most cost-effective and operationally efficient location for the ORETTC. Section 2.4 discusses other sites that were considered by NNSA for the ORETTC and explains why those sites were eliminated from consideration.

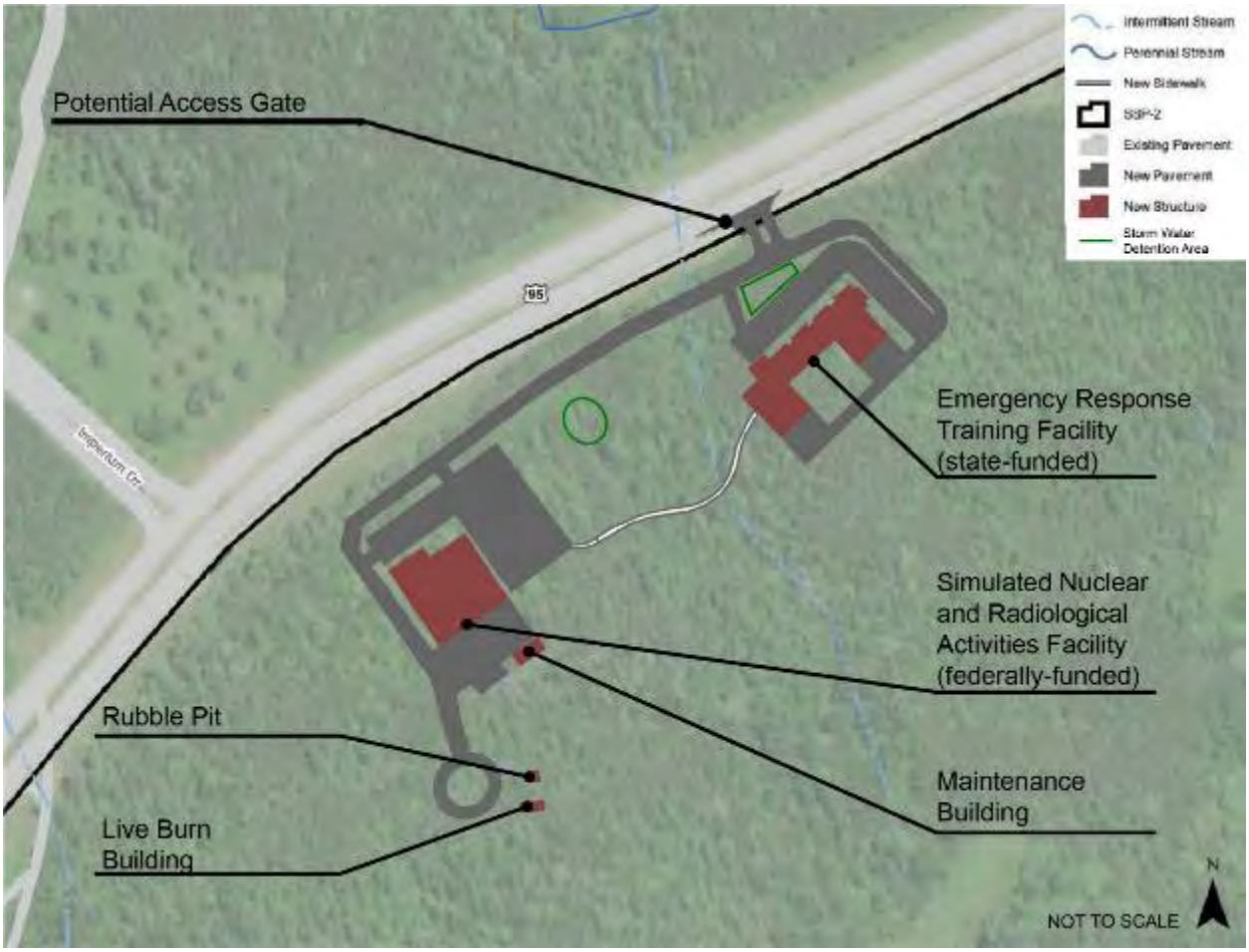


Source: CNS 2020b.

Figure 2-1. Site Evaluation Process for the ORETTC

As shown on Figure 2-2, the ORETTC facilities at the proposed site would consist of: (1) a federally-funded, NNSA-owned SNRAF (process and demonstration training facility) and a TRTA, consisting of a Live Burn Fire Tower and Rubble Pit; (2) a state-funded, RCIDB-owned ERTF; (3) a maintenance building; and (4) utilities, roads, and supporting infrastructure. The SNRAF would feature configurable space to support a variety of high-consequence emergency response training exercises, such as detection and disposition of an improvised explosive device. The ERTF would feature classroom and virtual reality tools to support NNSA and state training desires. The TRTA would be used for firefighting training, including collapsed building and live fire training.

The proposed site for the ORETTC ("Alternative 1" in Section 2.4) is an 81-acre area within the ORR and the City of Oak Ridge city limits (Roane County). The land has minimal to moderate slopes and is heavily vegetated. This area is undisturbed, with no previous development, and no existing utilities. Ownership of the ORETTC site has been transferred from the DOE Office of Science Consolidated Service Center to NNSA,[5] with a portion still to be transferred from NNSA to the RCIDB (approximately 24 acres)[6] for development of the ERTF.



Source: Modified from CNS 2020a.

Figure 2-2. Conceptual Layout[7] of ORETTC Facilities at the Proposed Site

Construction. Construction of the ORETTC would start in November 2020 and be completed in 18-months, in approximately early 2022. The two main facilities— the SNRAF and the ERTF —would each be two-stories high and each approximately 40,000 square feet in size. Through the planning and design processes, the footprint for one or both facilities may change depending on interior configuration and funding. Each facility would have a dedicated parking lot with a

[5] On June 8, 2020, custody of the proposed ORETTC land was transferred from the DOE Office of Science Consolidated Service Center to NNSA after both organizations determined that the action was categorically excluded from further NEPA review (CX-ORR-24-001).

[6] Of the 24 acres that would be transferred to the RCIDB, only 2.3 acres would be permanently disturbed by the ERTF. Approximately 6.9 acres would be temporarily disturbed (final surface to be pervious) during construction.

[7] Layout shown is conceptual and not intended to reflect the potential final design/layout.

capacity of approximately 200 vehicles at the SNRAF and approximately 100 vehicles at the ERTF. The facilities and parking lots would be joined by sidewalks (CNS 2020a). Table 2-1 presents notable parameters associated with the ORETTC construction, which also includes construction of the state-funded, RCIDB-owned ERTF.

As shown on Figure 2-2, access to the ORETTC would consist of a single frontage road with a single access gate from the Oak Ridge Turnpike approximately 1,200 feet northeast of Imperium Drive. This access would lead into the RCIDB-owned land, providing direct access to support construction. NNSA is continuing to investigate access requirements and will coordinate with the Tennessee Department of Transportation (TDOT) on the permitting for access to the ORETTC (CNS 2020a). In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources (*see* Figure 2-3).

Table 2-1. Construction Requirements for ORETTC

Requirements	Consumption/Use
Total land disturbed during construction at proposed site (acres)[a]	24.1[a]
Permanent facility footprint, including roads, at proposed site (acres)	7.7[b]
Stormwater/firefighting water detention ponds to be constructed at proposed site (acres)	≤1
Water requirement for construction (gallons/year)	1,100,000
Total construction employment (worker-years)	125
Peak construction employment (workers)	75
Construction period (years)	1.5 years

a. Construction of the ORETTC would disturb approximately 24.1 acres. Of this 24.1 acres, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road. The other 16.4 acres would be temporarily disturbed (i.e., surfaces would remain pervious) to grade the land and provide greenspace around the ORETTC to enhance the campus-feel. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources (*see* Figure 2-3).

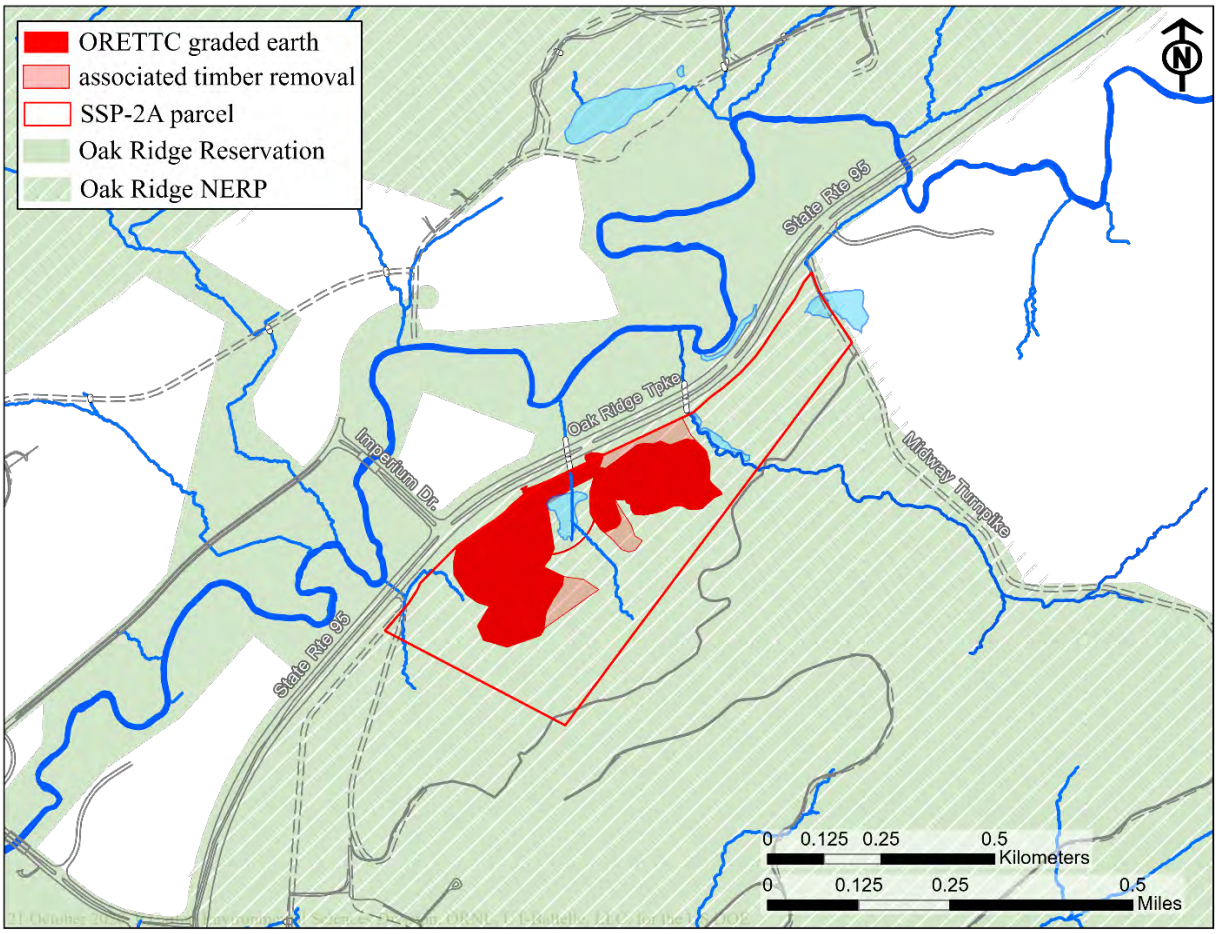
b. Footprint of NNSA facilities: 5.0 acres; footprint of state-funded, RCIDB-owned ERTF: 2.7 acres.

Source: CNS 2020c.

Operation. After the ORETTC is constructed, operations would be expected to begin in approximately early 2022. The operational workforce at ORETTC (including the state-funded, RCIDB-owned ERTF) is estimated to be 20 persons. In addition, a daily average of 250 personnel are expected to be trained at the ORETTC. Utilities required by the ORETTC would include: electricity, communications (internet and telephone), natural gas, potable and firefighting water, and firefighting water collection.

The Live Burn Fire Tower could utilize large volumes of water to conduct firefighting training at the ORETTC. According to the manufacturers of similar live burn buildings, average training operations with the burn building would likely utilize about 5,000 gallons per day.[8] A common way of managing the runoff from the fire training facilities is through ponds. A pond with a minimum volume of 15,000 cubic feet could be constructed on-site to manage the runoff from the fire training facilities. With regard to stormwater management, a detention pond with a volume of at least 12,000 cubic feet would manage the volume of stormwater runoff from the site.

[8] One day per week of live firefighting training is expected at ORETTC, resulting in approximately 5,000 gallons of water use for firefighting training, or approximately 250,000 gallons per year.



Note: Areas represented by light brown shading ("associated timber removal") are for wildfire fuel reduction.

Figure 2-3. Forest Thinning for Wildfire Fuel Reduction

Consequently, two detention ponds– one with a volume of approximately 31,500 cubic feet and one with a volume of approximately 18,000 cubic feet– are proposed to accommodate both firefighting water and stormwater at the proposed site (*see* Figure 2-2).[9] Each pond would be less than one acre foot (43,560 cubic feet). The area the ponds would cover would be less than approximately one acre (CNS 2020c). Table 2-2 displays the operational requirements associated with the ORETTC, including the state-funded, RCIDB-owned ERTF.

[9] Depending upon final design, the western-most pond shown on Figure 2-2 could be moved further south, closer to the Live Burn Fire Tower.

Table 2-2. Operational Requirements for ORETTC

Requirements	Consumption/Use
Operational Workers (number of workers)	20
Average Number of Daily Trainees	250
Annual Electricity Use (kilowatt-hours)[a]	1,800,000
Potable Water Use (gallons/year)[b]	2,362,500
Firefighting training water use (average gallons/year)[c]	250,000
Natural gas use (cubic feet/year)[d]	1,920,000
Wastewater (gallons/year)[e]	2,000,000
Waste Generation	
Hazardous waste (pounds/yr)	<100
Nonhazardous waste (tons/yr)[f]	100

a. Based on 22.5 kilowatt-hours/square foot/year. The SNRAF and ERTF would total approximately 80,000 square feet.
b. Based on potable water use of 35 gallons/day/person.
c. Based on 5,000 gallons of water/week of firefighting training.
d. Based on 24 cubic feet/square foot/year. The SNRAF and ERTF would total approximately 80,000 square feet.
e. Based on wastewater generation of 25 gallons/person/day.
f. Based on generation of 3 pounds of nonhazardous waste/person/day.
Source: CNS 2020c.

2.2 East Tennessee Technology Park Alternative

ETTP was initially considered as a potential siting location for the ORETTC, but was eliminated based on a pairwise analysis[10] that scored ETTP lower than the proposed location (*see* Section 2.4). In response to public comments on the Draft EA, NNSA reevaluated the potential use of the ETTP as a site for the ORETTC, and decided to include an analysis of that site in this Final EA.

NNSA has identified a potential parcel at the ETTP that could be used for the ORETTC. The parcel is located in the Powerhouse Area/S-50, which is in the southwest portion of the ETTP, as shown on Figure 2-4. The parcel contains approximately 400 acres; however, only approximately 70-100 are available for immediate development.[11] Although some of that area is cleared and flat, it also contains wetlands and some of the area is within a floodplain. Depending on the specific layout of the ORETTC facilities, some additional land clearing may be required prior to construction, and there is uncertainty whether wetlands and floodplains could be avoided (CNS 2020c). Much of the land at ETTP is primarily industrialized, fragmented, and disturbed, and no rare, threatened, and endangered plant and animal species are known to occur (DOE 2016a).

In 2016, an Environmental Baseline Survey (DOE 2016a) was completed for the Powerhouse Area. As a result of that survey, DOE decided that the property could be developed for industrial use, and that land use controls would be implemented to prohibit disturbance of any portion of the property deeper than 10 feet without prior authorization from DOE (DOE 2016a). A Covenant Deferral Request has been completed for that parcel, which certifies that DOE has taken all remedial action necessary to protect human health and the environment with respect to any hazardous substances, and the property is uncontaminated by hazardous substances for future

[10] A pairwise analysis is generally is any process of comparing entities in pairs to judge which of each entity is preferred, or has a greater amount of some quantitative property, or whether or not the two entities are identical.
[11] The available land is currently leased by the Community Reuse Organization of East Tennessee (CROET), who subleases it to a private woodchip processing business. In order to use the property for the ORETTC, the current long-term lease would have to be terminated and the property vacated (and remediated, if necessary).

industrial use (CNS 2020c). That Covenant Deferral Request limits use of the property to industrial use.

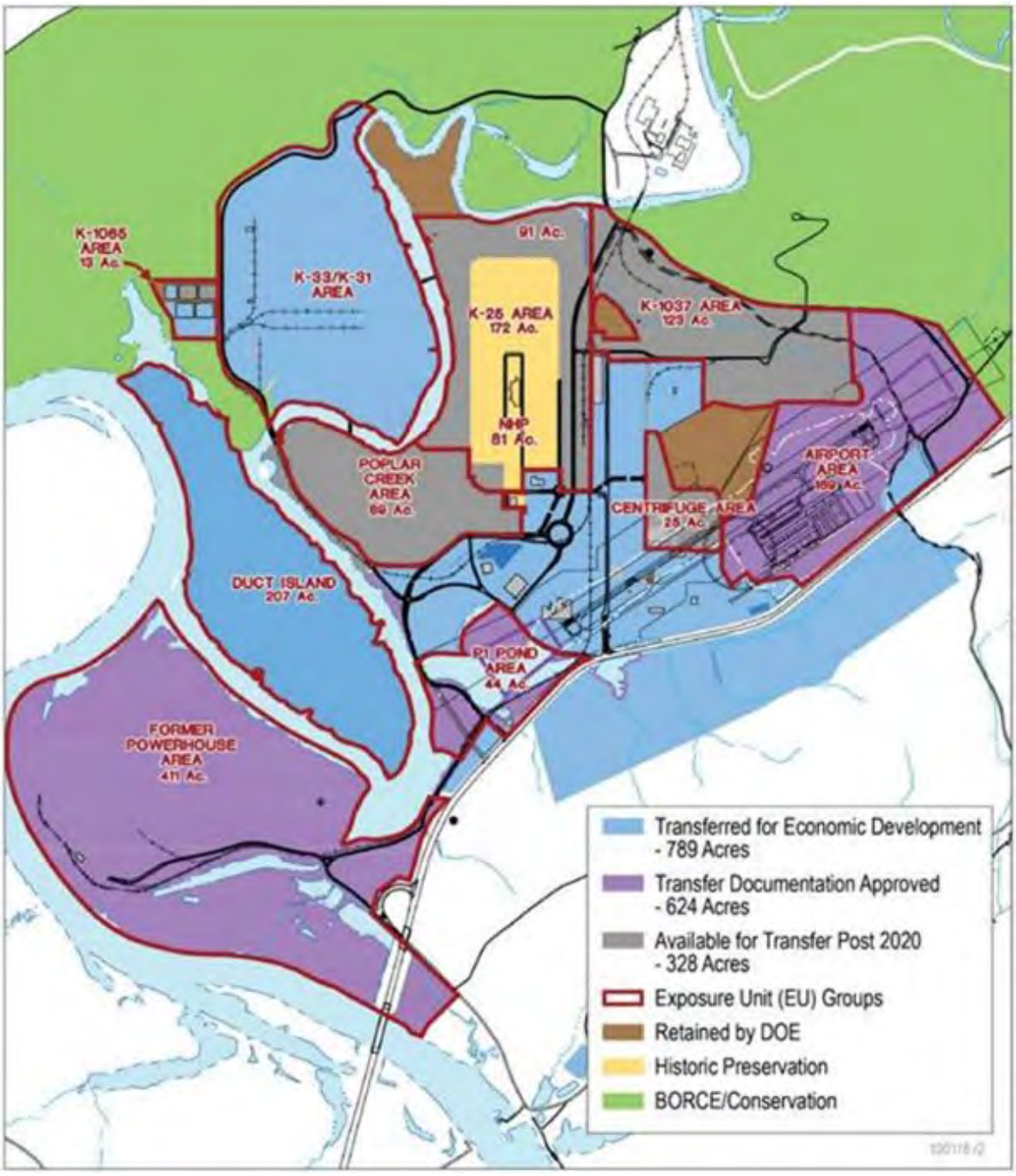


Figure 2-4. ETTP Site Alternative for the ORETTC

The construction requirements would be the same as shown in Table 2-1, and approximately 7.7 acres would be permanently disturbed by the facility footprint, parking lots, and the access road. Because much of the Powerhouse Area/S-50 has been previously disturbed, only a maximum of 5

additional acres would be permanently disturbed by construction activities. With regard to operations, the requirements presented in Table 2-2 would be the same for the ETTP Alternative.

2.3 No-Action Alternative

Under the No-Action Alternative, NNSA would not construct and operate the ORETTC. First responders and other experts in nuclear operations, safeguards, and emergency response would continue to be trained in facilities at Y-12, across the National Security Enterprise, and in non-NNSA facilities across the country.

2.4 Alternatives Considered but Eliminated from Detailed Analysis

In the process of developing the Proposed Action analyzed in this EA, NNSA considered siting the ORETTC outside of the Oak Ridge area. However, because a significant portion of NNSA's corporate expertise in emergency response is located at ORR, sites outside the Oak Ridge area were eliminated from detailed analysis. With regard to siting alternatives for the ORETTC in the Oak Ridge area, NNSA considered: (1) another ORR location (i.e., the Central Training Facility [CTF], about 9 miles southwest of Y-12); (2) offsite locations, including the ETTP, and a site near Bethel Valley Road and Scarborough Road; and (3) onsite at Y-12. Those locations were eliminated from detailed analysis for the reasons that follow.

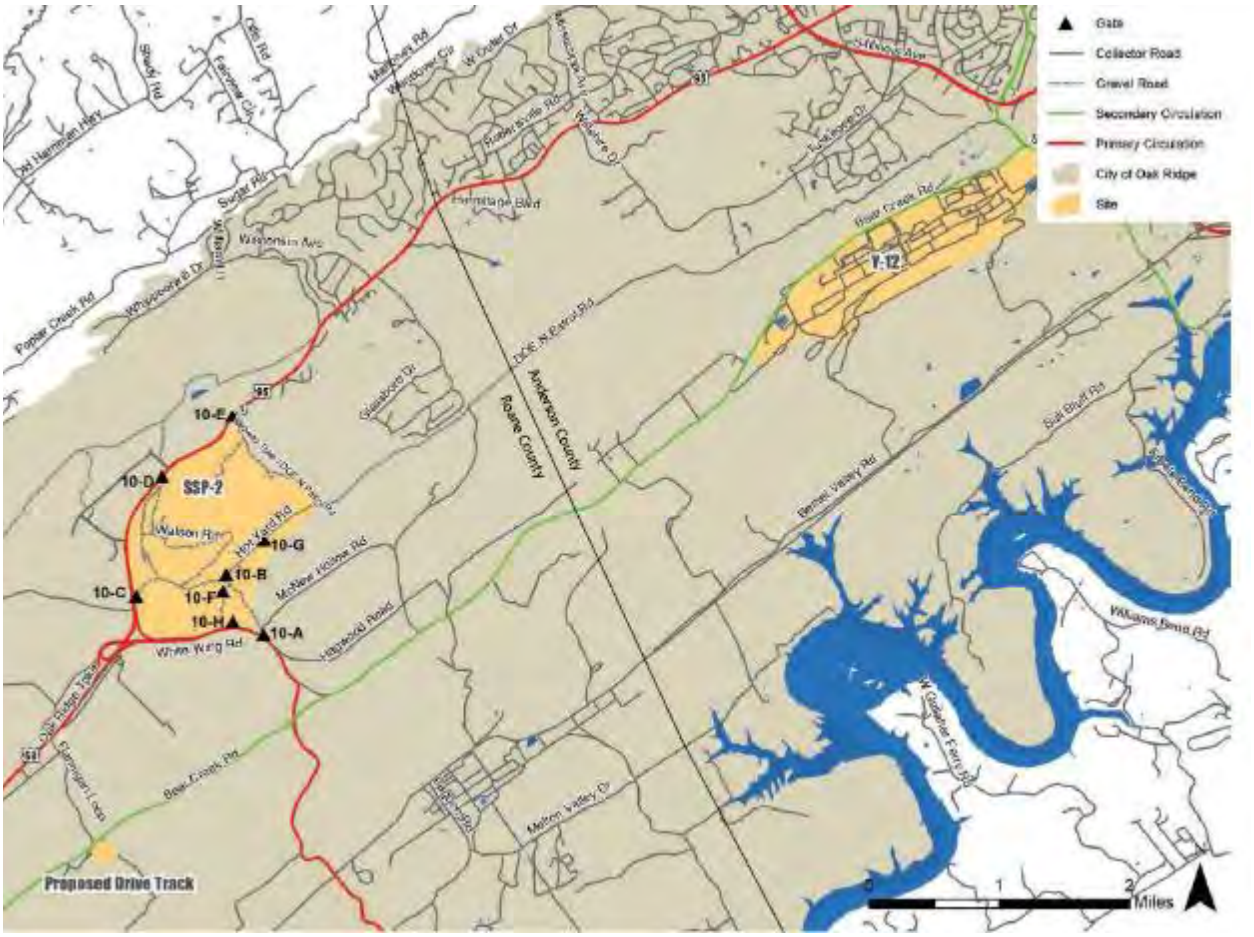
A location at CTF was determined to be unreasonable because of site access restrictions to U.S. citizens and DOE's Office of Secure Transportation (OST) has reserved that site for other future uses.

Offsite locations in the Oak Ridge vicinity, including ETTP, were initially identified as potential sites for the ORETTC. A pairwise analysis was performed on the potential sites based on attributes that included public access, environmental concerns, cost to construct, and expandability. ETTP receiving a lesser score than other locations. Additionally, the planned construction of the Oak Ridge airport further restricted future expansion (CNS 2020c). As discussed in Section 2.2 of this Final EA, NNSA has reevaluated the potential use of the ETTP for the ORETTC, and has decided to include an analysis of that site in this Final EA.

The Bethel Valley Road and Scarborough Road location also had several notable disadvantages, including: (1) significant grading/backfill requirements; (2) inadequate utilities; and (3) location in Anderson County, which would not allow the RCIDB to develop the state-funded project (CNS 2020c).

Locating the ORETTC at Y-12 was considered unreasonable because the site does not have the required number of contiguous acreage available to construct the ORETTC, as envisioned. In addition, access for foreign national training would not be allowable. Lastly, NNSA would not have been able to provide a location on Y-12 for the ERTF, which is part of the state-federal partnership for the ORETTC.

With regard to the parcel of land evaluated in this EA, NNSA identified approximately 950 acres of undeveloped land for ORETTC siting consideration. That area is referred to as Self-Sustaining Parcel (SSP)-2 (*see* Figure 2-5).



Source: CNS 2020b.

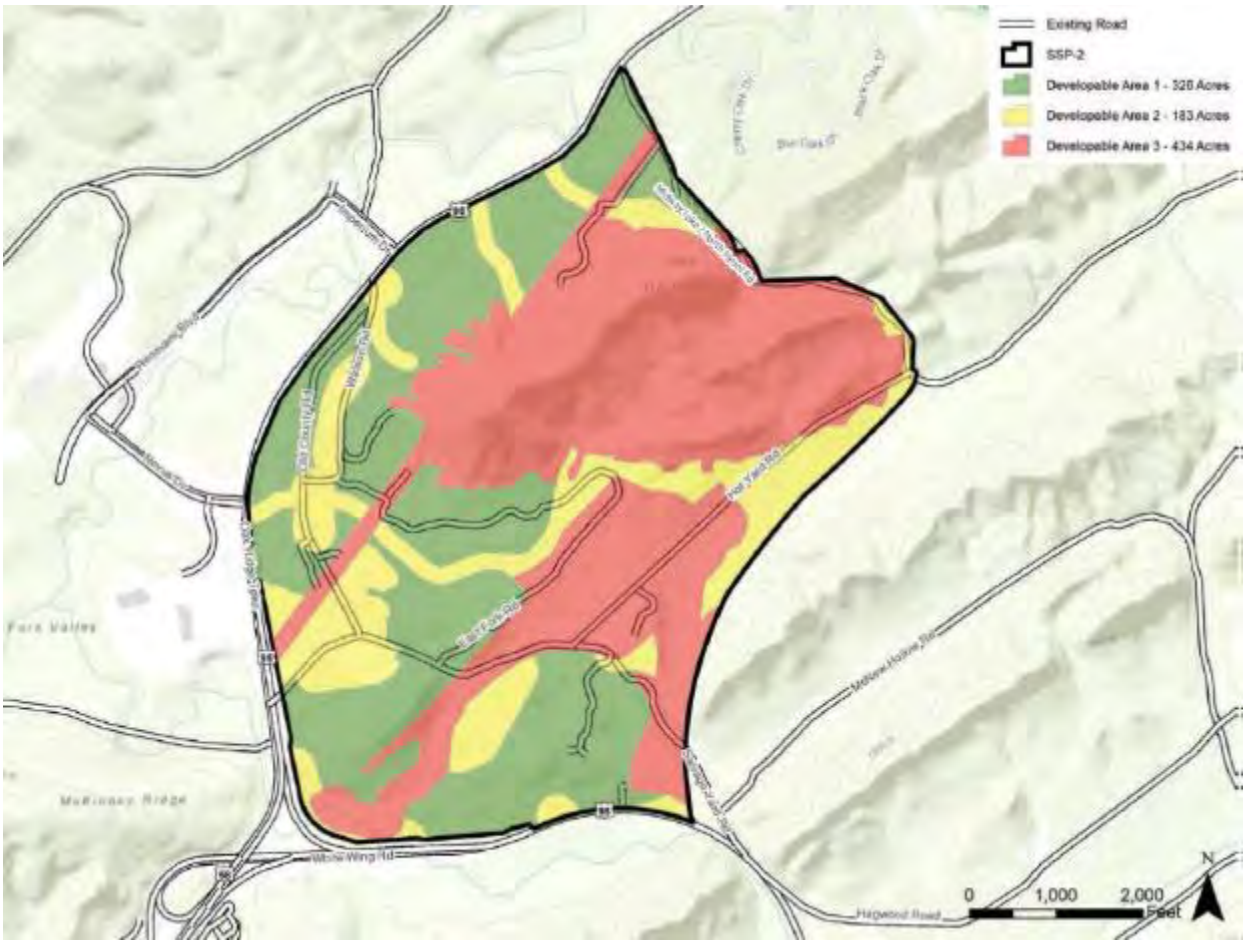
Figure 2-5. Self-Sustaining Parcel-2

Within SSP-2, NNSA characterized the available land into three development categories as shown on Figure 2-6:

- Developable Area 1 (None to Limited Constraints to Development): Land that can be developed with minimal remediation. May contain: minor roads; vegetation that must be cleared; relatively flat areas/minimal to moderate slopes.

- Developable Area 2 (Minor Constraints to Development): Land requiring additional costs and remediation in order to be developed, or that should be preserved. May contain: historical sites (plus 250-foot buffer); biosolid application fields; hydrological features (streams, springs, etc.) (100-foot buffer on streams); known protected fauna and flora habitat; moderately sloped areas.

- Developable Area 3 (Major Constraints to Development): Land associated with significant costs or remediation, or areas not available for development. May contain: floodplains; highly-sloped areas (greater than 15 percent); transmission lines (plus 100-foot buffer).



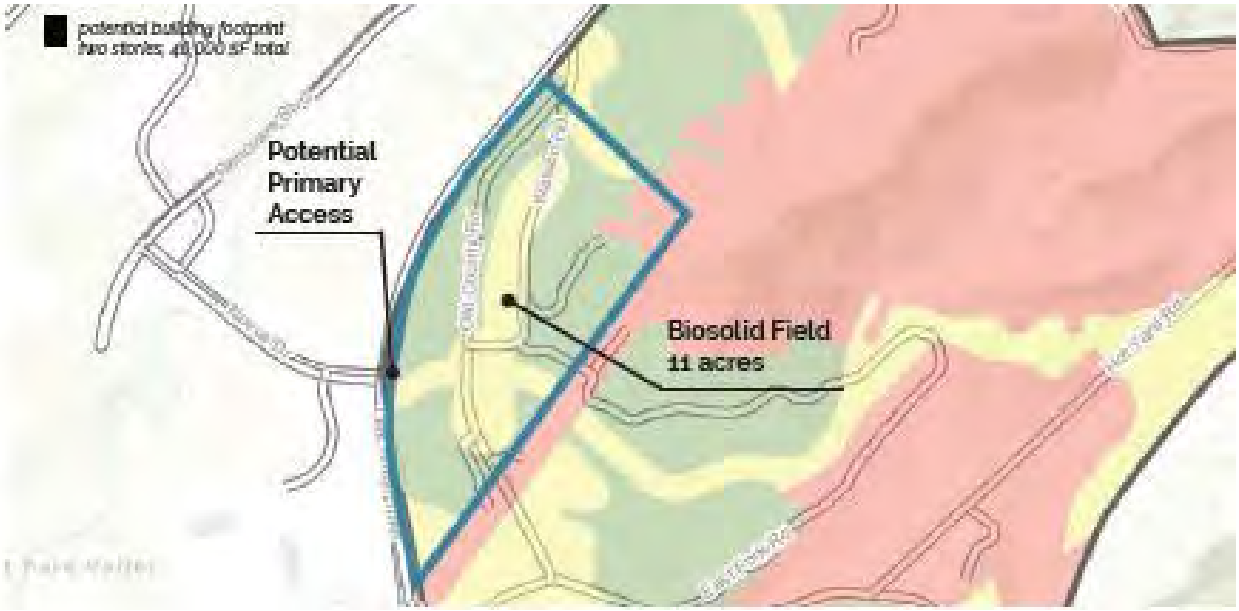
Source: CNS 2020b.

Figure 2-6. Developable Areas within Self Sustaining Parcel-2

Based on the developable areas within SSP-2, NNSA developed and considered four alternative configurations of the ORETTC, as shown in Figures 2-7 through 2-10. NNSA evaluated the four alternative configurations of the ORETTC against 20 criteria (including contiguous developable area, site access, proximity to utilities, and environmental considerations, such as the potential to impact cultural resources, endangered species, and wetlands). Of the four alternative configurations of the ORETTC, Alternative 1 had the highest net advantages compared to disadvantages, and scored the highest in the comparative analysis. Alternative 1 offers a large portion of undeveloped land adjacent to the Oak Ridge Turnpike, offering ideal access and the least potential for costly- or time-consuming issues during the design-build process (CNS 2020b). Alternatives 2-4 scored the lowest in the comparative analysis. Consequently, those alternatives were eliminated from detailed analysis (CNS 2020b).

Source: CNS 2020b.

Figure 2-7. Alternative 1 (ORETTC Proposed Site)



Source: CNS 2020b.

Figure 2-8. Alternative 2

Source: CNS 2020b.

Figure 2-9. Alternative 3

Source: CNS 2020b.

Figure 2-10. Alternative 4

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter includes an analysis of the potential environmental consequences or impacts that could result from the Proposed Action (Alternative 1), the ETTP Alternative, and the No-Action Alternative. The affected or existing environment is the result of past and present activities in the area and provides the baseline from which to compare impacts from the Proposed Action, the ETTP Alternative, and the No-Action Alternative, as well as the baseline to which reasonably foreseeable future actions and the incremental impact of the Proposed Action or the ETTP Alternative are added for the cumulative impacts analysis presented in Chapter 4.

The purpose of this EA is to enable NNSA to determine if the potential environmental impacts of the Proposed Action and the alternatives would be significant to human health and the environment.[12] Certain aspects of the Proposed Action and alternatives have a greater potential for creating adverse environmental impacts than others. For this reason, CEQ regulations (40 CFR 1502.1 and 1502.2) recommend a "sliding-scale" approach so that those actions with greater potential effect can be discussed in greater detail in NEPA documents than those that have little potential for impact. Preparation of this EA was guided by that sliding-scale approach, but all resource areas are addressed.

Sections 3.2 through 3.14 present the affected environment and potential environmental consequences for each of the resource areas analyzed in detail. This EA considers the potential direct, indirect, and cumulative impacts. Direct impacts are those that would occur as a direct result of the Proposed Action and alternatives. Indirect impacts are those that are caused by the Proposed Action and alternatives but would occur later in time and/or farther away in distance; perhaps outside of the study area. Cumulative impacts (*see* Chapter 4) are impacts that result when the incremental impacts on resources from the Proposed Action and alternatives when added to impacts that have occurred or could occur to that resource from other actions, including past, present, or reasonably foreseeable future actions.

This EA evaluates the environmental impacts of the alternatives within a defined region of influence (ROI), as described for each resource below. The ROIs encompass geographic areas within which any notable impact would be expected to occur. The level of detail in the description of each resource varies with the likelihood of a potential impact to the resource. The following resources are described/evaluated in this chapter.

- **Land use and visual resources:** land use practices and land ownership information; visual resources in terms of land formations, vegetation, and the occurrence of unique natural views. The ROI for land use and visual resources is the proposed site, alternative site, and areas immediately adjacent to those sites.

  Geology and soils: the geologic characteristics of the area at and below the ground surface, the frequency and severity of seismic activity, and the kinds and qualities of soils. The

[12] The analysis in this EA includes construction and operation of both the NNSA facilities at the ORETTC as well as the state-funded, RCIDB-owned ERTF.

ROI for geology and soils is the proposed site, alternative site, and areas immediately adjacent to those sites.

- **Water resources:** surface-water and groundwater features, water quality, and water use. The ROI for water resources is onsite and adjacent surface water bodies and groundwater.

- **Meteorology, air quality, and noise:** climatic conditions such as temperature and precipitation, the quality of the air, and greenhouse gas emissions; baseline noise environment for the proposed site and alternative site. The ROI for meteorology, air quality, and noise is the proposed site, alternative site, and nearby offsite areas within Roane County where air quality or noise impacts could potentially occur.

- **Biological resources:** plants and animals that live in the area, including aquatic life in the surrounding surface waters, and the occurrence of threatened or endangered species. The ROI for ecological resources is the proposed site, alternative site, and adjacent areas.

- **Cultural and paleontological resources:** historic and archaeological resources of the area and the importance of those resources. The ROI for cultural resources is the proposed site, alternative site, and adjacent areas.

- **Socioeconomics and environmental justice:** the labor market, population, housing, some public services, and personal income; location of low-income and minority populations in the vicinity of the project location. The socioeconomics ROI is a four-county area in Tennessee comprised of Anderson, Knox, Loudon, and Roane counties where a majority of the ORR workforce resides.

- **Waste management:** solid waste generation and management practices. The ROI for waste management is ORR and offsite locations where recycling and waste management activities could occur.

- **Human health and safety:** the existing public and occupational safety conditions and baseline conditions to support analysis of potential accident scenarios. Because the proposed ORETTC would not utilize releasable quantities of radiological materials[13] nor any large quantities of hazardous materials, no potential impacts related to health, safety, and accidents are expected to occur offsite. Consequently, the human health and safety analysis focuses on impacts to workers and training personnel, and the ROI is the proposed site and alternative site.

- **Transportation:** the existing transportation systems in the area to facilitate analysis of impacts locally. The ROI for transportation is the proposed site, alternative site, and adjacent areas where transportation could occur.

[13] Limited sealed sources will be utilized for training purposes and stored on-site. A sealed source is radioactive material that is permanently sealed in a capsule or bonded and in a solid form. The capsule of a sealed radioactive source is designed to prevent the radioactive material from escaping or being released during normal usage and under probable accident conditions.

- **Infrastructure:** utilities, energy, and site services, including capacities and demands in the immediate area of the proposed ORETTC. The ROI for infrastructure is the proposed site, alternative site, and adjacent areas.

3.2 Land Use

3.2.1 Affected Environment

This section summarizes existing onsite and surrounding land uses at the proposed site, alternative site, as well as adopted land use plans applicable to surrounding areas. It also describes local land use plans and city programs. The ORETTC proposed site is an 81-acre undeveloped parcel on the ORR which lies entirely within the city limits of Oak Ridge in Roane County. The proposed site is 25 miles west of Knoxville, Tennessee, five miles west of Y-12, and three miles northwest of the Oak Ridge National Laboratory (ORNL). It is a greenfield site, unconstrained by previous development with minimal to moderate slopes. Figure 3-1 highlights the ORETTC proposed site.

Figure 3-1. Aerial View of ORETTC Proposed Site and ETTP Alternative Site

The ORETTC proposed site is bounded by Oak Ridge Turnpike/SR 95 to the northwest and Midway Turnpike/North Patrol Road to the northeast. The remaining portions of the site are constrained by topography and vegetation to the southwest and southeast and buffered against encroachment by a 950-acre parcel owned by DOE known as SSP-2 and outlined in Figure 3-2. The ETTP is located north of the Oak Ridge Turnpike/SR 95, approximately three miles west of the ORETTC proposed site.

The entire ORR, which includes the ORETTC proposed site, was designated a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) site by EPA in 1989. The ORETTC proposed site has never had any hazardous substance stored on it for one year or more,

has not been known to have any hazardous substance released/spilled on it, or been used to dispose of any hazardous substance. This was confirmed in an Environmental Baseline Survey (DOE 2013) conducted in 2013. According to that Environmental Baseline Survey, DOE identified no evidence of past activities involving hazardous substances prior to federal land acquisition. Post-acquisition activities primarily include ecological and environmental studies that resulted in no unacceptable contamination, though several areas outside the 81-acre ORETTC proposed site have been environmentally contaminated by activities involving hazardous substances. DOE has determined the parcels satisfy the statutory criteria for identification of the parcel as uncontaminated by hazardous substances (DOE 2013).[14]

Source: CNS 2020a.

Figure 3-2. ORETTC Land Transfer Map

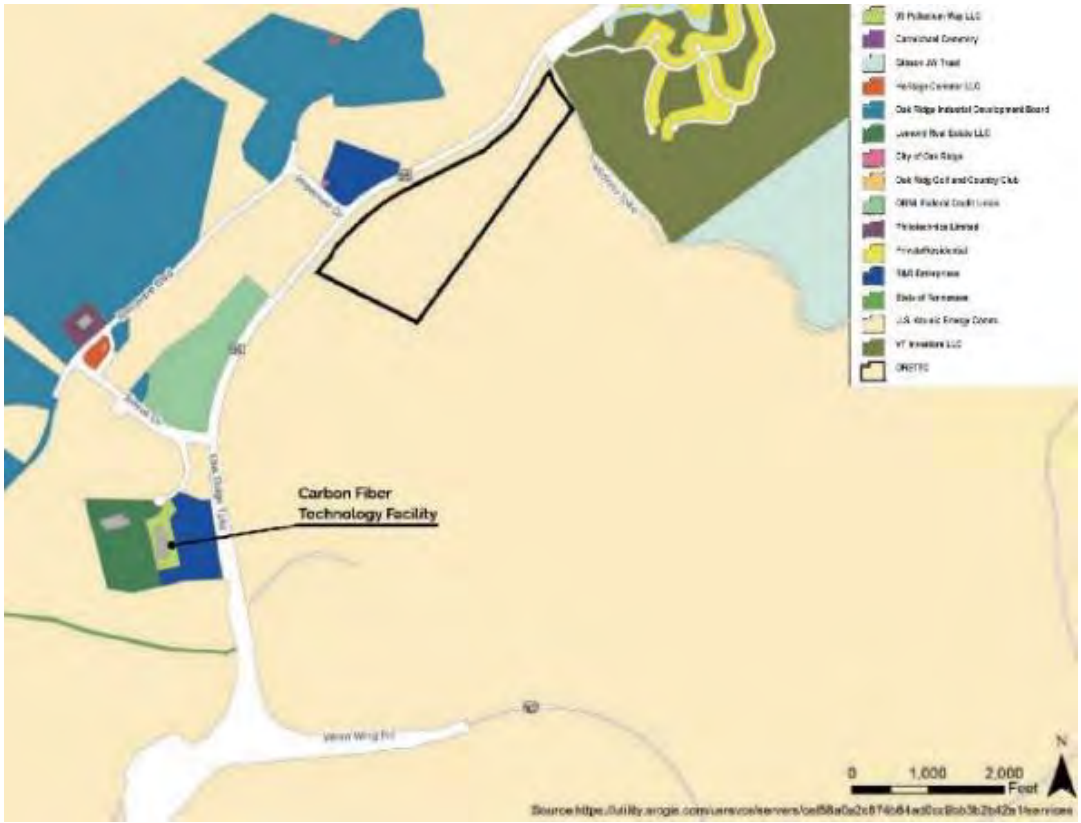
With regard to the land at ETTP, the ETTP mission has been to remediate the site, as well as reindustrialize and reuse site assets through leasing and title transfer of underutilized facilities and land parcels. Projects at ETTP have included both CERCLA remedial action and decontamination and decommissioning (D&D) activities. Remedial action projects typically address contaminant releases to the environment by addressing contaminated soil, water, sediment, or biota. Remedial

[14] The proposed site for the ORETTC had previously been recommended and approved for a "No Further Investigation" designation under the Federal Facility Agreement.

action projects are based on land use goals and the associated exposure risks as analyzed in a Record of Decision (ROD) document. In many instances, remediation efforts result in long-term controls on the use of land. D&D projects address contamination in facilities and structures and can also include demolition. The ETTP Alternative site is currently uncontaminated, with the exception of groundwater. The portion of the property above the floodplain is notably sloped, significantly wooded, and dissected by three different power lines (CNS 2020c).

Land Ownership. The ORETTC proposed site is currently part of the ORR, which is managed by the DOE ORNL Site Office. The entire 81-acre ORETTC proposed site (which is part of SSP-2) was previously transferred from the DOE Office of Science Consolidated Service Center to the NNSA. A second land transfer would change ownership of an approximately 24-acre area from NNSA to the RCIDB. This must be completed prior to initiation of construction of the state-funded ERTF. The NNSA would retain the remaining acres as depicted in Figure 3-2.

Figure 3-3 shows the land ownership of adjacent properties and properties in the general vicinity. The majority of land surrounding and bordering the ORETTC proposed site is owned by DOE. The land north and west of the ORETTC proposed site is part of the Horizon Center Industrial Park. The Oak Ridge Industrial Development Board (ORIDB) manages the Horizon Center Industrial Park, which is focused on development as research facilities, light manufacturing, and office space. The land east of the ORETTC proposed site is private/residential.



Source: CNS 2020a.

Figure 3-3. ORETTC Land Ownership

With respect to the ETTP Alternative site in the Powerhouse Area/S-50, that land is currently owned by the DOE Environmental Management (DOE EM) and is currently being leased to the Community Reuse Organization of East Tennessee (CROET). While title has not yet been transferred, approval from EPA and TDEC has been issued for the transfer (CNS 2020c).

Planning. The City of Oak Ridge Comprehensive Plan, updated in 1988 and amended in 1997, includes a Land Use and Development Plan that identifies the ORETTC site as Open Space-Park. While the Plan does not list a specific definition for Open Space, it does define Undeveloped area: "Intended to be undeveloped or used for agriculture or similar activity. May also include occasional, isolated residences with no public sewer or water connection." For DOE property, this category would allow scattered storage or similar activity (CNS 2020a).

Figure 3-4 displays the land use of the area surrounding the ORETTC proposed site. The area in green is government-owned (i.e., DOE-owned) and classified as public use. Public use is defined simply as "Parcels owned by either the federal, state, county, or city government." Y-12 is also considered public use. The dark- and light-purple areas are industrial sites that were transferred

Source: CNS 2020a.

Figure 3-4. ORETTC Land Use

from the ORIDB's Horizon Center complex. The land to the northeast across Midway Turnpike[15] is classified as an Agricultural Tract. According to the Tennessee Property Viewer, this land is owned by VT Investors LLC. The Rarity Oaks Subdivision lies within this area (CNS 2020a).

Zoning. The ORETTC proposed site falls into the Federal Industry and Research (FIR) zoning district. Per the City of Oak Ridge Zoning Ordinance, which was last amended in 2019, the FIR district is assigned to areas of the city that are part of the ORR. The ordinance does not provide guidelines on use within the FIR district. If land is transferred from NNSA to the RCIDB for construction and operation of the state-funded ERTF, a zoning change would be required for the transferred land. In that case, "the City of Oak Ridge Regional Planning Commission shall study and make recommendations to City Council concerning the appropriate zoning district designation. Upon receipt of such recommendation, the City Council may, after public hearings as required by law, adopt an ordinance establishing the zoning district classification as other than FIR" (CNS 2020a).

The nearby Horizon Center is zoned as Industrial (IND-2), which is defined as a general industrial district "established to provide areas in which the principal use of land is for processing, manufacturing, assembling, fabrication and for warehousing." The permitted primary uses for IND-2 include manufacturing; warehousing and wholesaling facilities; offices, administrative, technical, and professional services; public utility facilities; broadcasting, publishing, recording, and telecommunications; storage facilities for coal, coke, building material, sand, gravel, stone, lumber, open storage of construction contractor equipment and supplies and junk yards; medical isotope manufacturing; and kennel (CNS 2020a).

Per the Oak Ridge Zoning Ordinance Section 8.02, IND-2 regulations include the following: a maximum usable floor area to lot area of 60 percent where usable floor area for nonresidential uses shall be to the exterior face of exterior walls on the first story and any other story connected by a fixed stairway or elevator and shall include the floor area of all accessory buildings measured similarly a minimum setback of 30 feet from the front and 25 feet from the side and rear of buildings, where setback refers to means an open space that must be maintained from the property line. FIR regulations do not include usable floor area to lot area ratio or setbacks (CNS 2020a).

With regard to the ETTP Alternative, use of that land for the ORETTC would be consistent with the uses and zoning designations identified in the 2011 EA that evaluated the transfer of that land to CROET (DOE 2011) and the Covenant Deferral Request, which limits use of the property to industrial use.

3.2.2 Proposed Action Impacts

Approximately 25,000 of the ORR's roughly 35,000 acres have remained undeveloped in a relatively natural state. Approximately 20,000 of the 25,000 acres have been designated a DOE National Environmental Research Park, an international biosphere reserve, and part of the Southern Appalachian Man and the Biosphere Cooperative. At the time of initial acquisition in the 1940s, the landscape was primarily agrarian in nature and generally considered to be about 50

[15] Midway Turnpike is also referred to as "North Patrol Road."

percent forested. In 1994, remote-sensing analyses revealed an expansion of forest cover to about 70 percent of the ORR (Mann et al. 1996).

Construction of the ORETTC would disturb approximately 24.1 acres, or approximately 0.06 percent of the total land at ORR. Of this 24.1 acres, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road. The other 16.4 acres would be temporarily disturbed (i.e., surfaces would remain pervious) to grade the land and provide greenspace around the ORETTC to enhance the campus-feel. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. No change to the zoning designation for the DOE-owned land would be required, and use of the DOE-owned land for the ORETTC would be consistent with the current zoning designation and historic uses of ORR land.

A zoning change would be required for the 24-acre area that would be transferred from NNSA to the RCIDB for construction and operation of the state-funded ERTF. As discussed in Section 3.2.1, the City of Oak Ridge Regional Planning Commission would study and make recommendations to the City Council concerning the appropriate zoning district designation. It is likely that parcel would be zoned IND-2, consistent with the zoning for the nearby Horizon Center. Because hazardous substance were not stored for 1 year or more, or were not known to have been released or disposed of on that parcel, Section 120(h) of CERCLA would not apply to the transfer of land from NNSA to the RCIDB. NNSA does not anticipate that any land use controls would be required for the property transfer, although such issues are beyond the scope of this EA.

3.2.3 ETTP Alternative Impacts

Some of the acreage on the ETTP Alternative site has been previously disturbed. Although some of that area is cleared and flat, depending on the specific layout of the ORETTC facilities, some additional land clearing may be required prior to construction. The amount of land disturbance could be of similar magnitude as the disturbance at the proposed site. The permanent footprint of the ORETTC, including roads, would be 7.7 acres.

No change to the zoning designation for the DOE-owned land would be required, and use of the DOE-owned land for the ORETTC would be consistent with the current zoning designation and historic uses at the ETTP. To implement the ORETTC at the ETTP Alternative site, the land would need to be withdrawn from CROET consideration and transferred to NNSA. Additionally, for the ERTF, land would need to be transferred from NNSA to the RCIDB. Because of past contamination on the ETTP, and ongoing concerns that could affect project implementation, there is a higher potential for project delays associated with that transfer (CNS 2020c). A zoning change would be required for the 24-acre area that would be transferred to the RCIDB for construction and operation of the state-funded ERTF. It is likely that the site would be zoned IND-2, consistent with the zoning for other property at ETTP and the nearby Horizon Center.

3.2.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. Land use would remain as is, there would be no land disturbance, and no property transfer from NNSA to RCIDB.

3.3 Visual Resources

3.3.1 Affected Environment

The scenic quality or character of an area consists of the landscape features and social environment from which they are viewed. The landscape features that define an area of high visual quality may be natural, such as mountain views, or man-made, such as city skyline. To assess the quality of visual resources in the project area, this section describes the overall visual character and distinct visual features on or in the viewshed of the proposed ORETTC.

Locations of visual sensitivity are defined in general terms as areas where high concentrations of people may be present or areas that are readily accessible to large numbers of people. They are further defined in terms of several site-specific factors, including:

- Areas of high scenic quality (i.e., designated scenic corridors or locations);
- Recreation areas characterized by high numbers of users with sensitivity to visual quality (i.e., parks, preserves, and private recreation areas); and
- Important historic or archaeological locations.

Oak Ridge lies in the Valley and Ridge geographic region, and the majority of Roane County is of Ordovician-Cambrian geologic age. A series of parallel narrow, elongated ridges and valleys follow a northeast-to-southwest trend in the Oak Ridge area. The topographic relief between valley floors and ridge crests is generally about 300 to 350 feet. The ORETTC proposed site is located in the East Fork Valley between Black Oak Ridge and East Fork Ridge at an elevation of approximately 800 feet. Topography in this valley is relatively flat, characterized by dense forests and mountain streams. No visually sensitive locations are defined on the ORETTC proposed site. As shown in Figures 3-1 and 3-5, the ORETTC proposed site is largely wooded and unremarkable and indistinguishable from the woodlands of the surrounding areas.

Source: CNS 2020a.

Figure 3-5. ORETTC Proposed Site

With regard to the ETTP, topography in this area is relatively flat, with a visual character consisting of a mix of industrial use and open space (*see* Figure 3-6).

Figure 3-6. ETTP Site

3.3.2 Proposed Action Impacts

Development and building design at the ORETTC would be driven by function and purpose and would attempt to create a community hub and campus-like feel. Pedestrian paths and native plantings would be used to enhance the campus and welcome visitors. Figures 3-7 and 3-8 depict preliminary architectural elevations of the two primary ORETTC facilities, the SNRAF and ERTF. Because the ORETTC proposed site is a greenfield site and there are few buildings in the vicinity, there are no common architectural styles to which to adhere. Nearby facilities are zoned Industrial, and their exteriors reflect their use.

The ORETTC facilities would be set back from the site boundary and screened from viewsheds and motor vehicle traffic by existing and new vegetation. Viewsheds in the area around the ORETTC are severely constrained by topography and vegetation. The ORETTC access gate would be visible from the Oak Ridge Turnpike, and the two primary structures may also be visible from the road. Vegetative screening and topography would obscure many of the features associated with the ORETTC, particularly the Live Burn Fire Tower, which would be set back farthest from the Oak Ridge Turnpike. Figure 3-9 shows a vehicular view of the proposed site entrance at the intersection of the Oak Ridge Turnpike and Imperium Drive.

Source: CNS 2020a.

Figure 3-7. Rendering of the Simulated Nuclear and Radiological Activities Facility (looking south toward the Live Burn Fire Tower)

Source: CNS 2020a.

Figure 3-8. Rendering of the Emergency Response Training Facility (looking northwest toward the Oak Ridge Turnpike)

Figure 3-9. View South along Oak Ridge Turnpike at Intersection of Imperium Drive

3.3.3 ETTP Alternative Impacts

Figures 3-7 and 3-8 depict preliminary architectural elevations of the two primary ORETTC facilities, the SNRAF and ERTF, that could be constructed at the ETTP. Nearby facilities are zoned Industrial, and their exteriors reflect their use. The ORETTC facilities would be visible from the Oak Ridge Turnpike, and would be in character with the mix of industrial use and open space at ETTP.

3.3.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no changes to existing visual resources.

3.4 Air Quality

3.4.1 Affected Environment

Air pollution is the presence in the atmosphere of one or more contaminants (e.g., dust, fumes, gas, mist, odor, smoke, and vapor) such as to be injurious to human, plant, or animal life. Air quality as a resource incorporates several components that describe the levels of overall air pollution within a region, sources of air emissions, and regulations governing air emissions. The following sections include a discussion of the existing conditions and the environmental consequences of the Proposed Action and No-Action Alternative.

Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The levels of pollutants are generally expressed on a concentration basis in units of parts per million or micrograms per cubic meter. The baseline standards for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS) and state air quality standards established under the *Clean Air Act of 1990* (CAA). These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare. The NAAQS specify acceptable concentration levels of six criteria pollutants: particulate matter (measured as both particulate matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead.

All areas of the U.S. are designated as having air quality better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Areas where there are insufficient air quality data for the U.S. Environmental Protection Agency (EPA) to form a basis for attainment status are unclassifiable. Thus, such areas are treated as attainment areas until proven otherwise. "Maintenance areas" are those that were previously classified as nonattainment but where air pollution concentrations have been successfully reduced to levels below the standard. Maintenance areas are subject to special maintenance plans to ensure compliance with the NAAQS.

The proposed action would occur in Roane County, which is used as the ROI for the air quality analysis. According to EPA, Roane County is in attainment for all criteria pollutants (EPA 2020a). Roane County emissions were obtained from the latest EPA National Emissions Inventory (NEI), as shown in Table 3-1. The county data include emissions amounts from point sources, area sources, and mobile sources. *Point sources* are stationary sources that can be identified by name and location. *Area sources* are point sources from which emissions are too low to track individually, such as a home or small office building, or a diffuse stationary source, such as wildfires or agricultural tilling. *Mobile sources* are any kind of vehicle or equipment with gasoline or diesel engine, an airplane, or a ship. Two types of mobile sources are considered: on-road and non-road. On-road sources consist of vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Non-road sources are aircraft, locomotives, diesel and gasoline boats and ships, personal watercraft, lawn and garden equipment, agricultural and construction equipment, and recreational vehicles (EPA 2017).

Table 3-1. Baseline Criteria Pollutant Emissions Inventory for Roane County, TN

Area	Criteria pollutant (tons/year)					
	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2	VOCs
Roane County	17,087	4,369	2,632	1,242	1,778	12,514

Source: EPA 2017.

Greenhouse gases. Greenhouse gases (GHGs) are gases that trap heat in the atmosphere; the accumulation of these gases in the atmosphere has been attributed to the regulation of Earth's temperature. Regulations to inventory and decrease emissions of GHGs have been promulgated. On October 30, 2009, the EPA published a rule for the mandatory reporting of GHGs from sources that, in general, emit 25,000 metric tons or more of carbon dioxide equivalent (CO_2e) per year in the United States (74 *Federal Register* [FR] 56260). With regard to this EA, on June 26, 2019, the CEQ published draft guidance on how NEPA analysis and documentation should address GHG emissions (84 FR 30097). Based on that guidance, CEQ stated that, "agencies should attempt to quantify a proposed action's projected direct and reasonably foreseeable indirect GHG emissions when the amount of those emissions is substantial enough to warrant quantification, and when it is practicable to quantify them using available data and GHG quantification tools." CEQ also stated that, "where GHG inventory information is available, an agency may also reference local, regional, national, or sector-wide emission estimates to provide context for understanding the relative magnitude of a proposed action's GHG emissions. This approach, together with a qualitative summary discussion of the effects of GHG emissions based on an appropriate literature review, allows an agency to present the environmental impacts of a proposed action in clear terms and with sufficient information to make a reasoned choice among the alternatives. Such a discussion satisfies NEPA's requirement that agencies analyze the cumulative effects of a proposed action because the potential effects of GHG emissions are inherently a global cumulative effect. Therefore, a separate cumulative effects analysis is not required." Baseline GHG emissions, which are represented by CO_2e, for Roane County and the State of Tennessee, are presented in Table 3-2.

Table 3-2. Baseline Greenhouse Gas Emissions Inventory for Roane County, TN

Area	Greenhouse gases (million metric tons/year)
	CO_2e
Roane County	5.8
Tennessee	99.8

Source: USEIA 2018.

3.4.2 Proposed Action Impacts

There would be short- and long-term minimal adverse effects to air quality. Short-term effects would be due to generating airborne dust and other pollutants during construction. Long-term effects would be due to personnel commutes and the heating/cooling of the new facilities. Air quality effects would be minor unless the emissions would exceed the general conformity rule *de minimis* (of minimal importance) threshold values, or would contribute to a violation of any federal, state, or local air regulation.

Construction emissions were estimated for fugitive dust, on- and off-road diesel equipment and vehicles, worker trips, and paving off-gasses for the 18-month construction duration (Table 3-3).

Small changes in facilities site and ultimate design, and moderate changes in quantity and types of equipment used would not substantially change these emission estimates, and would not change the determination under the general conformity rule or level of effects under NEPA. No new stationary sources of air emissions would be associated with the ORETTC. During construction, NNSA would take reasonable precautions to prevent fugitive dust from becoming airborne. Reasonable precautions might include using water to control dust from land clearing, building construction, and road grading.

Table 3-3. Maximum Annual Air Emissions Compared to *De Minimis* Thresholds

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	*De Minimis Threshold* [tpy]	Exceeds *De Minimis* Thresholds? [Yes/No]
Construction Emissions	4.4	4.4	2.8	<0.1	19.5	0.2	100	No
Operational Emission	6.9	0.8	0.6	<0.1	<0.1	<0.1	100	No

Source: USAF 2020.

Operational emissions were estimated for changes in heated/cooled space and emissions associated with commuting workers and training personnel. Although the area is in attainment and the general conformity rules do not apply, the *de minimis* threshold values were carried forward to determine the level of effects under NEPA. The estimated emissions from the Proposed Action would be below the *de minimis* thresholds; therefore, the level of effects would be minor.

The ORETTC would conduct live firefighting drills on a weekly basis, with approximately one live burn weekly. The fires associated with those drills would typically last less than one hour. The live fires would be created with pre-constructed smoke boxes and would not be created with natural gas or burning structures. The smoke plume created from the fire would be a contributor to potential air contamination. Smoke is a mix of particles and chemicals produced by incomplete burning of carbon-containing materials. The same pollutants that are found in smoke from fires are commonly found in the air from sources such as vehicles, power plants, factories, incinerators, restaurants, and wood stoves. A major difference between pollutants released to air from these sources and smoke from fires is that smoke from fires is often more concentrated and poses more of an immediate, short-term health concern to someone breathing it (Purser et al., 2015). No hazardous air pollutants would be emitted from the ORETTC.

Greenhouse Gases and Climate Change. Per the CEQ draft guidance (84 FR 30097), this EA quantifies the reasonably foreseeable GHG emissions associated with the Proposed Action by examining GHGs as a category of air emissions. Table 3-4 compares the estimated GHG emissions from the Proposed Action compared to the global, nationwide, and statewide GHG emissions. The estimated increase would be minimal.

Table 3-4. Global, Countrywide, and Statewide GHG Emissions

Scale	CO_2e Emissions (million metric tons/year)	Change from the Proposed Action
Global	43,125	0.000002%
United States	6,870	0.00001%
Tennessee	99.8	0.001%
Roane County, Tennessee	5.8	0.01%
Proposed Action	0.0009	-

Sources: USAF 2020, EPA 2017, USEIA 2018, EPA 2020b.

Climate-related challenges are expected to involve: (1) resolving increasing competition among land, water, and energy resources; (2) developing and maintaining sustainable agricultural systems; (3) conserving vibrant and diverse ecological systems; and (4) enhancing the resilience of the region's people to the impacts of climate extremes (NCA 2014). Table 3-5 outlines potential climate stressors and their effects from the construction and operation of the ORETTC. The proposed ORETTC in and of itself is only indirectly dependent on any of the elements associated with future climate scenarios (e.g., meteorological changes). At this time, no future climate scenario or climate stressor would have appreciable effects on any element of the Proposed Action.

Table 3-5. Effects of Potential Climate Stressors

Potential Climate Stressor	Effects on the Proposed ORETTC
More frequent and intense heat waves	negligible
Longer fire seasons and more severe wildfires	negligible
Changes in precipitation patterns	negligible
Increased drought	negligible
Harm to water resources, agriculture, wildlife, ecosystems	negligible

Source: NCA 2014.

3.4.3 ETTP Alternative Impacts

Constructing and operating the ORETTC at ETTP would have similar impacts to air quality as the Proposed Action, although construction emissions could be smaller if less land clearing activities were required. Based on the air quality modelling for construction, the maximum annual air emissions during construction could be reduced by approximately 33 percent compared to the values presented in Table 3-3. Operational emissions would be the same as shown in Table 3-3. Although the area is in attainment and the general conformity rules do not apply, the *de minimis* threshold values were carried forward to determine the level of effects under NEPA. The estimated emissions from the Proposed Action would be below the *de minimis* thresholds; therefore, the level of effects would be minor.

3.4.4 No-Action Alternative

Under the No-Action Alternative, no new facilities would be constructed and no additional air emissions would occur. Air quality would be unaffected compared to baseline levels discussed in Section 3.4.1.

3.5 Noise

3.5.1 Affected Environment

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise is often generated by activities essential to a community's *quality of life*, such as construction or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighing", measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. Sounds encountered in daily life and their dBA levels are provided in Table 3-6.

The dBA noise metric describes steady noise levels, although very few noises are, in fact, constant. Therefore, A-weighted Day-night Sound Level has been developed. Day-night Sound Level (DNL) is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10:00 p.m. to 7:00 a.m.). DNL is a useful descriptor for noise because: (1) it averages ongoing yet intermittent noise, and (2) it measures total sound energy over a 24-hour period. In addition, Equivalent Sound Level (L_{eq}) is often used to describe the overall noise environment. L_{eq} is the average sound level in dB.

Table 3-6. Common Sounds and Their Levels

Outdoor	Sound Level (dBA)	Indoor
Motorcycle	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Harris 1998.

The *Noise Control Act of 1972* (PL 92-574) directs federal agencies to comply with applicable federal, state, and local noise control regulations. In 1974, the EPA provided information suggesting continuous and long-term noise levels in excess of DNL 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. Neither the state of Tennessee, nor Roane County, maintain noise ordinances that set strict not-to-exceed levels.

Because the ORETTC proposed site is a greenfield site, there are no existing noise sources. There are no sensitive noise receptors (schools, churches, daycare facilities, etc.) within 1 mile of the ORETTC proposed site. The nearest sensitive noise receptor is the George Jones Memorial Baptist Church, which is approximately 1.5 miles southwest of the ORETTC proposed site. The nearest residence to the ORETTC proposed site is approximately 0.75 miles to the northeast, separated by relatively dense trees. That residence is approximately 100 yards south of the Oak Ridge Turnpike, so baseline traffic noise is relatively high near that residence.

3.5.2 Proposed Action Impacts

Construction of the ORETTC would require site preparation and construction of facilities and roads. Maximum noise levels generated by construction equipment types commonly used on this type of project are listed in Table 3-7 at a reference distance of 1,000 feet. At this distance, the highest noise level generated by the equipment types listed would be 64 dBA. Under a highly conservative scenario in which all of the listed equipment types are operating during a single day at a single location, the L_{eq} during workday hours at a distance of 1,000 feet would be 64 dBA.

The area surrounding the proposed ORETTC is generally used for industrial purposes or transportation corridor (Oak Ridge Turnpike) and is not considered to be noise sensitive. The construction activities associated with the proposed ORETTC would take place in an industrial area that is relatively insensitive to noise. Construction noise would be temporary, lasting only approximately 1.5 years.

Table 3-7. Noise Levels of Common Construction Equipment

Equipment type	Lmax at 1,000 ft
Crane	55
Dozer	56
Dump Truck	50
Excavator	55
Fork Lift	49
Front End Loader	53
Concrete Saw	64
L_{eq} during workday hours at 1,000 ft (Total)	**64**

Source: FHWA 2006.

Although construction-related noise impacts would be minor, the following best management practices would be performed to reduce the already limited noise effects:

- Construction and demolition would primarily occur during daytime hours;
- Equipment mufflers would be properly maintained and in good working order; and
- On-site personnel, and particularly equipment operators, would don adequate personal hearing protection to limit exposure and ensure compliance with federal health and safety regulations.

No long-term increases in the overall noise environment (e.g., L_{eq}) would be expected with the operation of the ORETTC. Most training activities would occur within the SNRAF and the ERTF. Drills conducted at the rubble pit and Live Burn Fire Tower would generate minimal noises that

would generally be of short duration and not daily occurrences. There would be no major sources of noise from the ORETTC; therefore, no long-term changes in the noise environment would occur.

3.5.3 ETTP Alternative Impacts

Constructing and operating the ORETTC at ETTP would have similar impacts to noise as the Proposed Action. There are no sensitive noise receptors (schools, churches, daycare facilities, etc.) within one mile of the Powerhouse Area/S-50 on the ETTP.

3.5.4 No-Action Alternative

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to noise resources.

3.6 Water Resources

3.6.1 Affected Environment

Groundwater. The water table at the ORR generally mimics topography with shallow groundwater flowing from higher topographic areas to the nearby surface water bodies. Groundwater flow through bedrock is primarily controlled by fractures, bedding planes, and hydraulic gradient, and specific flow paths are difficult to discern; however, investigations on the ORR have shown that a primary flow direction is along geologic strike (DOE 2018).

Although there are no groundwater monitoring wells at the ORETTC proposed site, based on the topography, fault orientation, and stream drainage, groundwater is expected to flow to the west-southwest towards the East Fork Poplar Creek, a tributary to Poplar Creek, which drains to the Clinch River. Due to the site's location within the East Fork valley and proximity to the East Fork Poplar Creek, groundwater is expected at shallow depth (ORNL 2006). Groundwater studies for the ORR have not identified any groundwater contamination issues near the ORETTC site. In general, groundwater contamination issues within the industrialized areas of the ORR including ETTP, Y-12, and ORNL have been identified. The ORETTC site has not been developed, and is hydraulically upgradient or at distance from these industrial areas, and therefore groundwater contamination is not expected. The ORETTC site is located in the Chickamauga Formation, which is considered an aquitard because of its low permeability. The ORETTC site is about 3.5 miles northwest of a source water protection area for groundwater in Bethel Valley (ORNL 2006). According to that Environmental Baseline Survey, DOE identified no evidence of unacceptable contamination at the proposed site, including from biosolid fields located within SSP-2 (DOE 2013).

With regard to groundwater at the ETTP Alternative site, the depth to groundwater is expected to range from 4 feet near the banks of the Clinch River and Poplar Creek, to as much as 40 feet in the higher topographic areas. The water table at ETTP generally mimics topography with shallow groundwater flowing from higher topographic areas to the surrounding surface water bodies. Groundwater data indicate the presence of volatile organic compounds in shallow groundwater (DOE 2016a).

Surface water. The project is located in the Lower Clinch River watershed. Waters drained from the ORR eventually reach the Tennessee River via the Clinch River, which forms the southern and eastern boundaries of the ORR. Surface-water hydrology on the ORR is characterized by a network of small streams that are tributaries of the Clinch River. Water levels in the Clinch River are regulated by the Tennessee Valley Authority (TVA), and fluctuations in the river can have an effect on streams draining the ORR (DOE 2018).

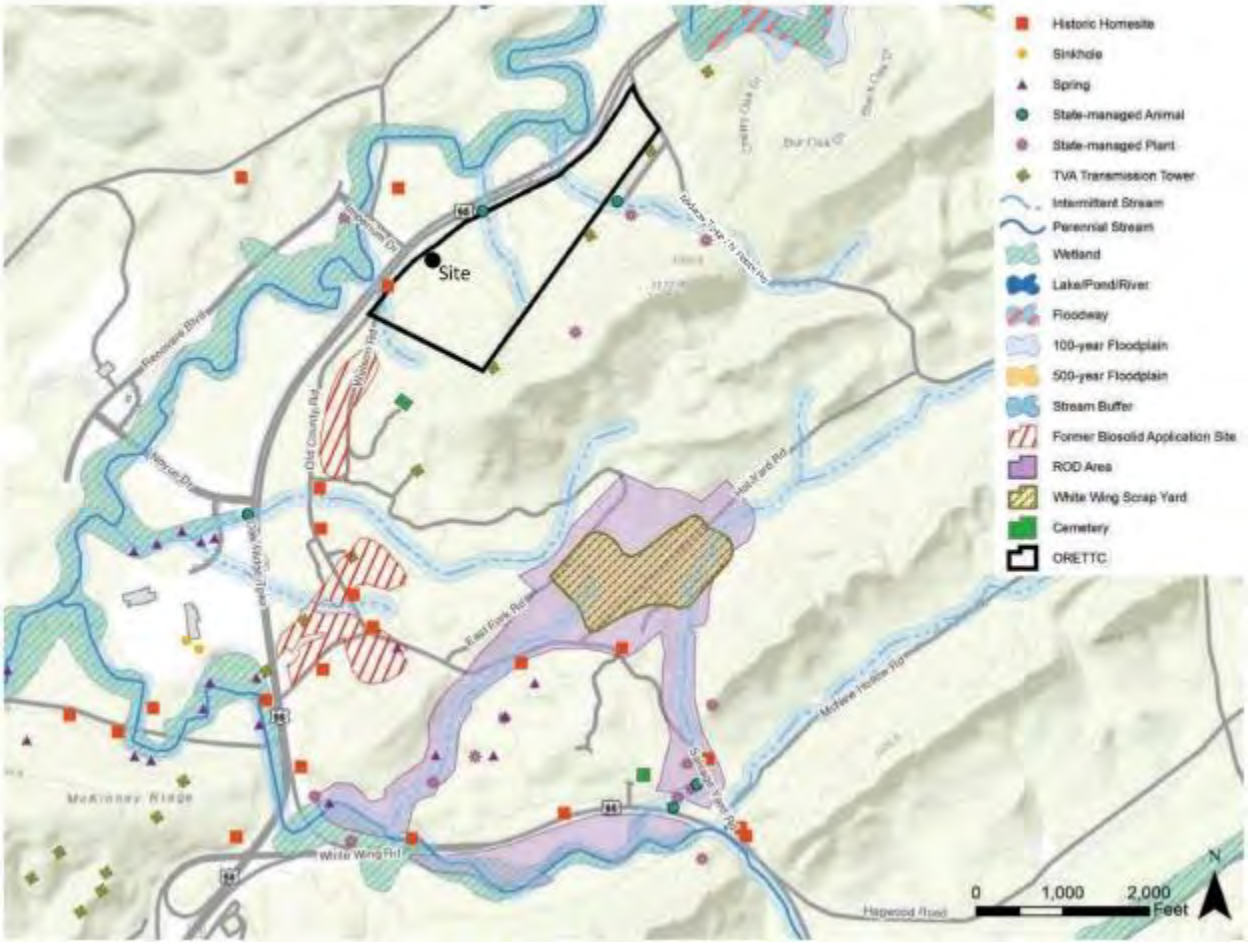
As shown in Figure 3-10, there are three streams within the ORETTC site, which flow north/northwest to East Fork Poplar Creek. Recent preliminary surveys classify the northern-most stream as perennial, the central stream as perennial along its lower portion, and the southern stream as ephemeral. Additionally, several springs were identified within the stream riparian areas (Figure 3-11). The East Fork Poplar Creek discharges into Poplar Creek east of ETTP, which passes through the ETTP discharging directly into the Clinch River.

The ORETTC site and vicinity were investigated as part of the East Fork Ridge/White Wing (Parcel 4a) investigations during an Environmental Baseline Survey Report completed in 2013. Five surface water samples were collected during this study and analyzed for metals and uranium. The study concluded that low-level metal detections were natural or pre-date federal acquisition; and uranium detections represent potential contamination from the White Wing Scrapyard. The study determined an acceptable human health risk and no further ecological evaluation was warranted. An all-media no-further-investigation determination was recommended (DOE 2013).

With regard to the ETTP site, the area is bounded to the west and southwest by the Clinch River and Poplar Creek, which bounds Duct Island and the eastern portion of the Powerhouse Area. Storm drains traverse some areas of the property and discharge storm water runoff to the Clinch River. These storm drain outfalls are maintained and monitored under the ETTP NPDES permit (TN0002950). The K-1007-P1 Pond, which is located within property, was formed in the 1944-1945 timeframe by the construction of Burchfield Road and a weir across a backwater of Poplar Creek. The pond received a mix of natural runoff and effluent from laboratory drains through the storm drain system. Although various organic compounds, metals, and radionuclides are detected in sediment and fish in the pond, the greatest threat to human health and the environment was determined to be due to the presence of polychlorinated biphenyls in fish. A non-time critical removal action to enhance the ecological conditions of the pond began in 2009. The removal action consisted of draining the pond, modifying the weir, removing the fish, backfilling and contouring the bank of the pond, establishing vegetation within the riparian zone, and stocking the pond with desirable fish. Monitoring is conducted at the K-1007-P1 Pond to ensure that the ecological enhancement measures have been implemented as intended. The ecological information obtained is used to evaluate whether modifications are needed to attain the desired end state—i.e., a heavily vegetated, clear water pond dominated by sunfish with significantly diminished, or at least downwardly trending, polychlorinated biphenyls levels (DOE 2016a).

Wetlands. The U.S. Army Corps of Engineers (USACE) defines wetlands as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987). Wetlands usually include swamps, marshes, bogs, and similar areas. In identifying a wetland, three characteristics

should be met. First is the presence of hydrophytic vegetation that has morphological or physiological adaptations to grow, compete, or persist in anaerobic soil conditions. Second, hydric soils are present and possess characteristics that are associated with reducing soil conditions. Third, the area is influenced by wetland hydrology, meaning the area is inundated or saturated to the surface at some time during the growing season of the prevalent vegetation (Environmental Laboratory 1987; USACE 2012).



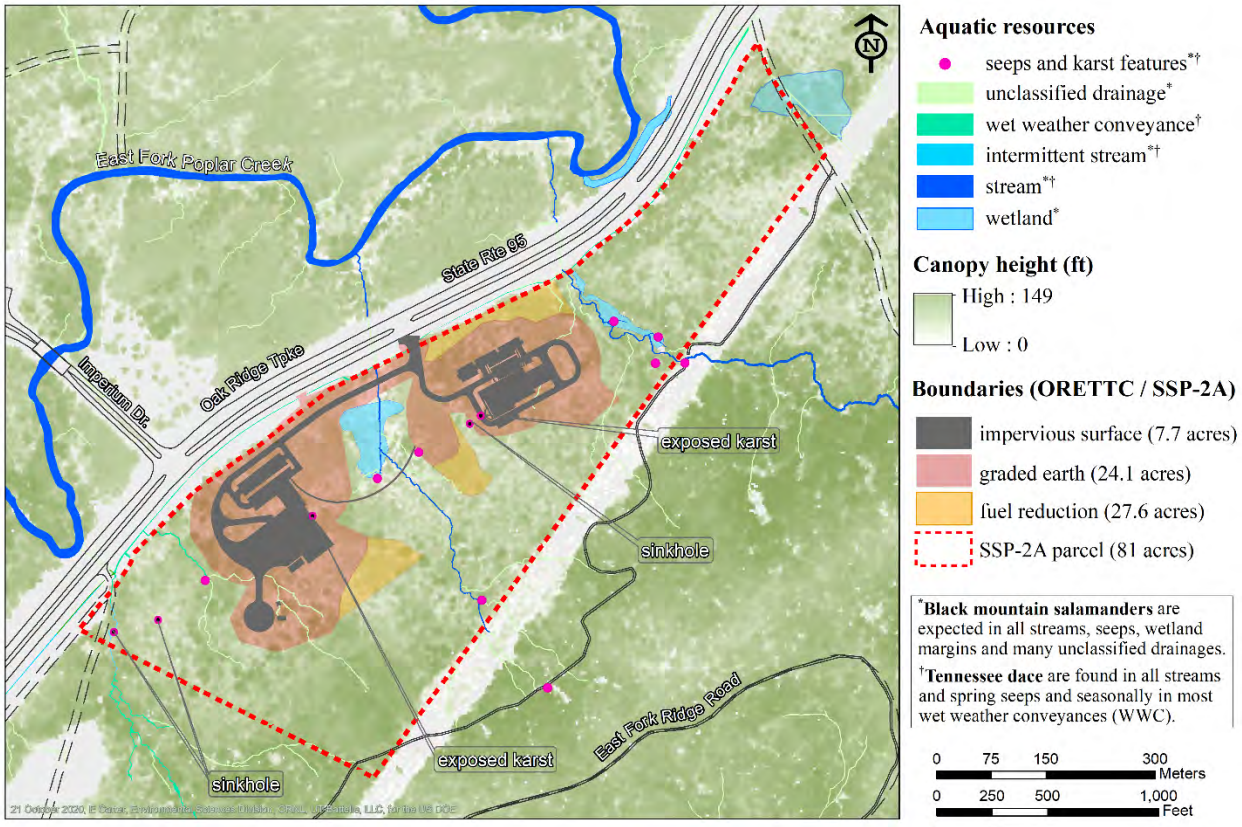
Source: CNS 2020a.

Figure 3-10. Surface Water Features near the ORETTC Proposed Site

About 600 acres of wetlands have been identified on the ORR; most are classified as forested palustrine, scrub/shrub, and emergent wetlands. Wetlands occur across the ORR at low elevations, primarily in riparian zones of headwater streams and receiving streams as well as in the Clinch River embayment (DOE 2018). These wetlands occur in association with springs and seeps along stream bottomlands, in areas of seasonally high groundwater tables and surface water levels on the alluvial islands and floodplains of perennial streams (Bear Creek, East Fork Poplar Creek, Poplar Creek, and Clinch River), and in and adjacent to areas of human disturbance (e.g., utility line rights-of-ways and channelized streams) (DOE 2016b). Recent preliminary surveys identified wetlands within the ORETTC site footprint associated with stream riparian areas (ORNL 2020). Wetlands have been identified adjacent to the streams within the ORETTC site footprint (Figure

3-11). An approximately 0.5-acre wetland and several seeps occur within the riparian zone of the central stream. Under the current site design, the wetland does not overlap with the proposed site buildings or parking lot. The proposed SNRAF stormwater detention pond would be sited west of the stream at sufficient distance to avoid wetlands. Outside of the parcel boundary, the nearest wetlands are associated with the riparian area along the East Fork Poplar Creek. The ETTP Alternative site contains wetlands and marsh areas, predominantly in the southeastern portion (CNS 2020c).

Floodplains. Floodplains are defined by EO 11988, Floodplain Management, as "the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, including at a minimum, the area subject to a 1 percent or greater chance of flooding in any given year" (that area inundated by a hundred-year flood). EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency (FEMA) do not identify any floodplains at the ORETTC proposed site. The site footprint at the proposed site is within an area identified as minimal flood hazard (FEMA 2020). With regard to the ETTP Alternative site, much of the area is within the 500-year floodplain, particularly in areas in the southern portion of the parcel (CNS 2020c).



Source: ORNL 2020.

Figure 3-11. Surface Water Features within the ORETTC Proposed Site Footprint

3.6.2 Proposed Action Impacts

Groundwater. No impacts to groundwater are anticipated from construction activities or normal facility operations. Groundwater from the site would not be used as a water source. Potential impacts to groundwater quality are not expected because no fuels or notable quantities of hazardous materials would be utilized at the ORETTC.

Surface Water. The perennial stream located within the central portion of the parcel is within the proposed construction and operational footprint for the ORETTC facility. As such, this stream would have the highest potential for impacts during construction and operations. However, a 100-foot riparian buffer would be maintained around all of the streams within the construction footprint to reduce the potential for impacts. It should be noted that the central stream would be crossed in two locations to allow pedestrians and vehicles to cross. Bottomless culvert arches (or similar bottomless bridge) would be designed in a manner that would maintain the existing stream bottom contours, and therefore the flow would not be altered or impeded. Clearing of vegetation within the stream buffer-zone at these crossings would occur. Disturbance in the stream riparian buffers would be limited to approximately 0.70 acres for the road corridor and the pedestrian crossing). By limiting the road corridor to 36 feet wide and the pedestrian corridor to 10 feet wide across the 100-foot riparian buffers on either side of the stream (ORNL 2020), only approximately 0.05 acres of wetlands would be impacted.

The northern and southern streams and their associated springs and wetlands are outside of the construction footprint, and therefore would not be directly impacted by construction. During construction, soil erosion and sedimentation would increase due to increased soil exposure. However, the implementation of erosion prevention and sediment control measures such as silt fence, filter sock, and temporary slope breakers, would reduce impacts to adjacent surface waters. Installing and maintaining erosion controls around the perimeter of the construction footprint especially along sloped areas would help mitigate the potential for sediment transport into the streams. Additionally, the installation of temporary slope breakers terminating in sumps would help to trap sediment, and reduce water velocity prior to drainage into stream channels, thereby reducing erosion potential from storm events within receiving streams. The potential for adverse impacts to surface water would exist until disturbed areas are stabilized and revegetation is established.

Prior to the start of construction, it would be necessary to obtain a construction storm water National Pollutant Discharge Elimination System (NPDES) permit for discharges of stormwater associated with construction activities, and an Aquatic Resource Alteration Permit (ARAP) from Tennessee Department of Environment and Conservation (TDEC) for work within or near surface waters. As part of the NPDES permit, the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) would be required to help minimize any pollution that might leave the site by stormwater. The SWPPP would contain a detailed site plan and schematics for the installation of temporary and permanent stormwater and erosion control devices to effectively manage the site during construction and facility operation.

Stormwater ordinances within the City of Oak Ridge may require stormwater management (CNS 2020a, CNS 2020b). Stormwater runoff from developed areas on site must be managed at pre-construction levels, which requires that the first inch of rainfall from any precipitation event

preceded with 72 or more hours of no rainfall be retained, and not discharged to surface waters (CNS 2020a). To meet this requirement, the construction of a permanent stormwater detention pond would be required for the ORETTC.

In addition, as part of the proposed ORETTC operation, the Live Burn Fire Tower could utilize large volumes of water to conduct firefighting training. A common way of managing the runoff from the fire training facilities is through detention ponds. It is estimated that a pond with a volume of 18,000 cubic feet would be required on-site to manage the runoff from the fire training facilities. No foam or chemical agents would be used for firefighting training.

To provide both stormwater management and management of runoff from fire training, NNSA proposes to construct two detention ponds (*see* Figure 2-2- for locations of ponds). The stormwater detention pond would have a volume of approximately 31,500 cubic feet, and the fire training runoff pond would have a volume of approximately 18,000 cubic feet. Each pond would be less than one acre-foot (43,560 cubic feet). The area the ponds would cover would be less than approximately one acre in order to each drain completely every three days (CNS 2020c). These detention ponds would manage runoff at the acceptable rates and prevent the first inch of precipitation from being discharged into surface waters (CNS 2020a). If required, discharge from facility operations to surface water would be in accordance with limitations established under the applicable TDEC NPDES permit. As part of this permit, information concerning outfall location, discharge date, flow rate, sources of pollution and treatment technologies, production of the effluent, effluent characteristics, and an engineering report on the wastewater treatment would be required (CNS 2020a).

Approximately 250,000 gallons of water from the ORR water system would be used for fire-training annually. The volume of water entering the East Fork Poplar Creek (EFPC) would be reduced by evaporation and seepage, by about 50 percent. Water discharges at ORR are tested for residual chlorine levels, bacterial constituents, and disinfectant by-products; sample results in 2018 showed that all constituents were within acceptable limits. For the ORETTC project, significant impacts are not expected to EFPC from fire-training water, as the limits (including chlorine) established under the NPDES permit have been protective of water quality along the EFPC in other areas, specifically from Y-12 located at the headwaters of the EFPC. The TDEC NPDES permit action level is 1.2 g/day total residual oxidant (TRO) at any outfall. At ORR, if TRO is found above detection (>0.05 mg/L), steps are taken to improve de-chlorination (DOE 2019).

Wetlands. Preliminary surveys identified wetlands within the ORETTC site footprint in association with stream riparian areas. Additionally, wetlands are associated with the riparian area adjacent to the East Fork Poplar Creek, located about 200 feet north of the site boundary. Recently, an approximately 0.5-acre wetland and several seeps were delineated within the riparian zone of the central stream, in vicinity to the eastern side of the proposed parking lot for the SRNAF. However, under current site design, this wetland does not overlap the SRNAF building or its adjacent parking lot. The proposed SNRAF stormwater detention area would be sited west of the stream at sufficient distance to avoid wetlands. Additionally, as noted on Figure 3-2, the land that would be transferred to the RCIDB for the ERTF would be located outside of 100-foot riparian buffer that would be maintained around the perennial stream located within the central portion of

the parcel. Consequently, none of the RCIDB actions associated with the ERTF would have the potential to impact wetlands.

On the northern and central portions of the ORETTC site footprint, the current site design limits the road crossing of the stream riparian zone to 36 feet wide and the pedestrian corridor to 10 feet wide (ORNL 2020). There are no wetlands identified within the proposed road corridor; however, the pedestrian crossing as currently routed would cross through wetland. Disturbance in the stream riparian buffers would be limited to approximately 0.70 acres for the road corridor and the pedestrian crossing. Approximately 0.05 acres of wetlands would be impacted.

Spills, increased sedimentation, and stormwater runoff could potentially impact wetlands associated with on-site and off-site stream riparian areas. However, with the implementation of stream and wetland buffer zones, spill prevention and response plans, NPDES permit requirements, and City of Oak Ridge stormwater ordinances, impacts to on-site and off-site wetlands near East Fork Poplar Creek would be minimal. Appendix B of this EA contains a Wetlands Assessment for the project. During the permitting process, NNSA would work with USACE and TDEC to identify and develop expansion and/or creation of wetland acreage in areas near the ORETTC.

3.6.3 ETTP Alternative Impacts

Groundwater. No impacts to groundwater are anticipated from construction activities or normal facility operations. Groundwater from the site would not be used as a water source. Potential impacts to groundwater quality are not expected because no fuels or notable quantities of hazardous materials would be utilized at the ORETTC.

Surface Water, Wetlands, and Floodplains. The acreage at the ETTP is large enough that the ORETTC could be sited to avoid any direct impacts to surface water. Depending upon the specific siting location and facility configuration at the ETTP Alternative site, floodplains and wetlands could be impacted. If the ETTP Alternative site were utilized for the ORETTC, DOE would complete any required environmental analysis, permits, or consultations, if appropriate, to implement that action.

3.6.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to water resources. Ongoing and planned reindustrialization and cleanup activities would continue at the ORR. Potential impacts to groundwater and surface waters including wetlands would be addressed under approved NEPA decisions and other applicable regulatory documents.

3.7 Geology and Soils

3.7.1 Affected Environment

Geology. The ORR is located in the Valley and Ridge Physiographic Province, which is characterized by a series of parallel narrow, elongated ridges and valleys that follow a northeast-to-southwest trend The Valley and Ridge Physiographic Province has developed on thick, folded

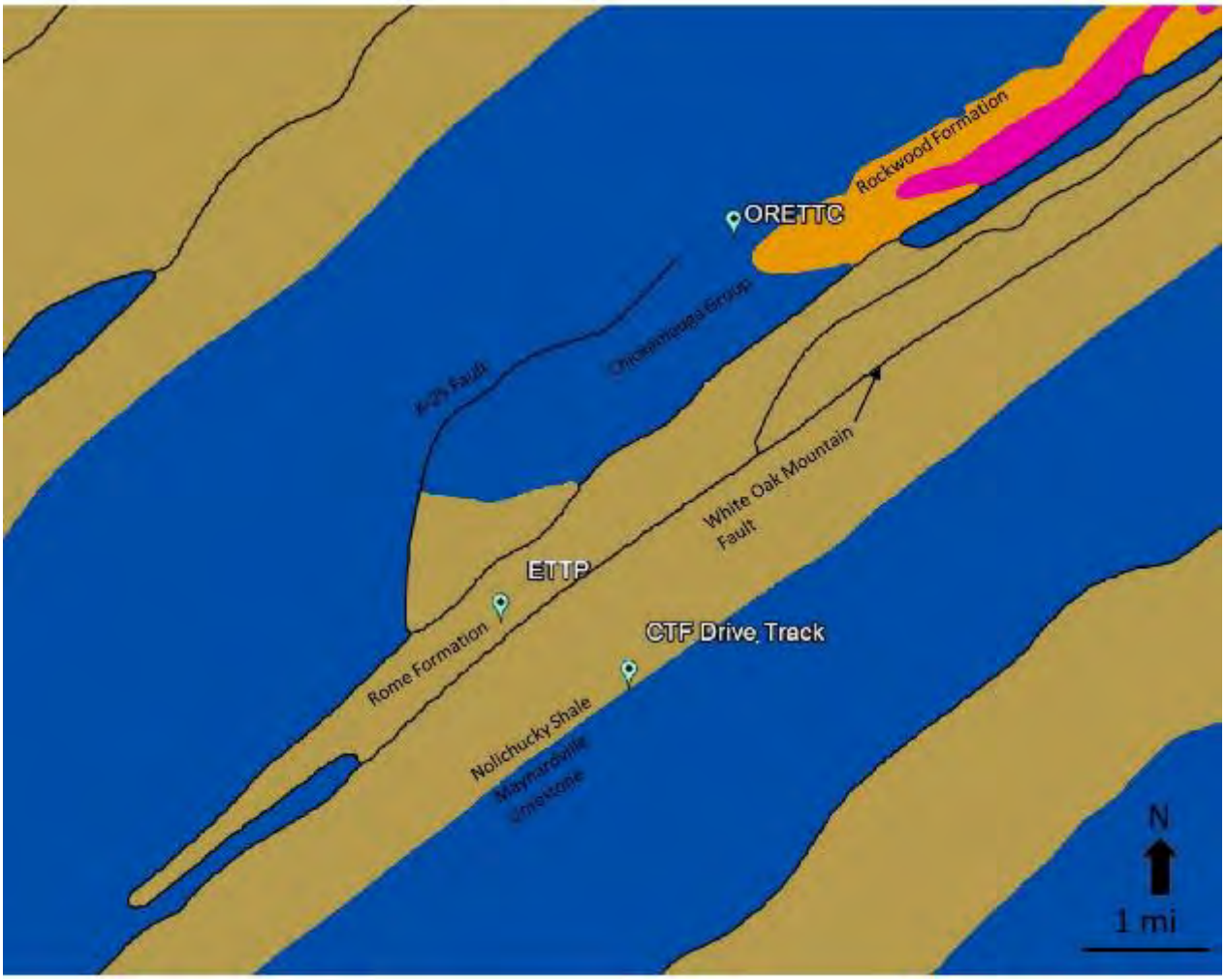
beds of sedimentary rock deposited during the Paleozoic era. The long axes of the folded beds control the shapes and orientations of a series of long, narrow parallel ridges and intervening valleys (ORNL 2006).

The geology of the study area is complex as a result of extensive thrust faults and folds. As shown in Figure 3-12, the ORETTC proposed site is underlain by bedrock of the Chickamauga Group, which is primarily a limestone with layers of siltstone. Immediately adjacent to the proposed site are rocks of the Rockwood Formation (southwest of the ORETTC site) Clastic bedrock of the older Rome Formation has been placed over the calcareous rocks of the Chickamauga Group and the younger clastic rocks of the Rockwood Formation by the White Oak Mountain thrust fault, which trends generally southwest to northeast in the vicinity of SR 58 (DOE 2016b).

Although major thrust faults are numerous in the vicinity of the study area, these faults are associated with mountain building episodes that ended more than 200 million years ago. These faults are no longer active, but stress stored up at depth in these rocks is periodically released as minor earthquakes. Since 1973, 139 earthquakes have been recorded within 62 miles of the proposed site with the highest magnitude of 4.7 (USGS 2020a). The U.S. Geological Survey (USGS) Earthquake Hazards Program's 2018 Long-term Model (USGS 2018) for the Conterminous United States shows earthquake ground motions for various probability levels across the United States.

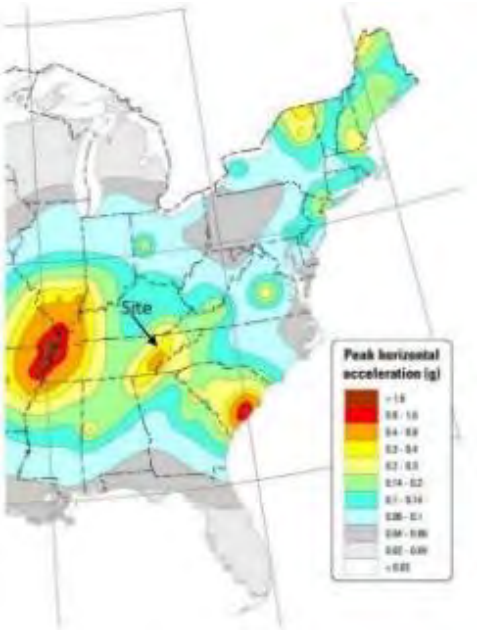
The USGS rates ground motions using peak ground acceleration, which is the maximum acceleration experienced during the course of an earthquake and is measured in units of acceleration due to gravity ("g"). The seismic map for 2018 indicates that the study area is located in an area with a moderate seismic hazard class rating: 0.34g peak horizontal ground acceleration with a 2 percent probability of exceedance in 50 years; and 0.10g peak horizontal ground acceleration with a 10 percent probability of exceedance in 50 years (*see* Figures 3-13 and 3-14).

An earthquake generating 0.3g would produce very strong perceived shaking. Damage would be slight in specially designed structures. An earthquake generating 0.10g would be perceived by all, with minimal damage to well-built ordinary structures (USGS 2018, NNSA 2011, NNSA 2020).



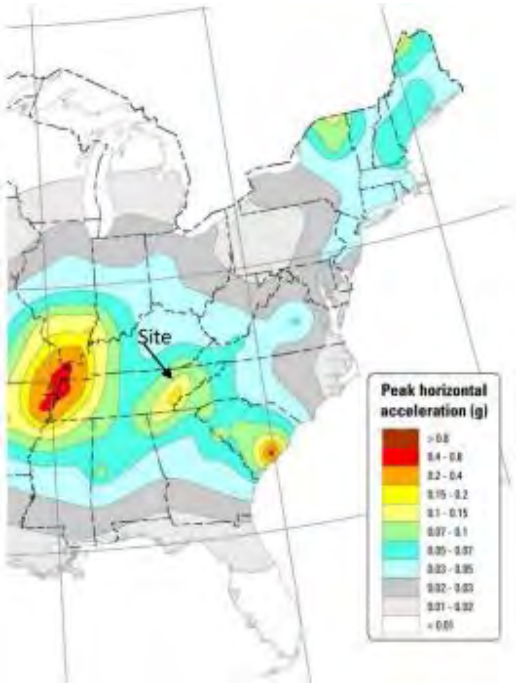
Source: USGS 2020b.

Figure 3-12. Geologic Map in the Vicinity of the ORETTC Proposed Site



Source: USGS 2018.

Figure 3-13. 2018 National Seismic Hazard Model for the conterminous United States Peak horizontal acceleration with a 2% probability of exceedance in 50 years



Source: USGS 2018.

Figure 3-14. 2018 National Seismic Hazard Model for the conterminous United States Peak horizontal acceleration with a 10% probability of exceedance in 50 years

Pre-construction topographic maps and historical investigations indicate that karst conditions, such as enclosed drainage basins and sinkholes, are present in both the Knox Group and Chickamauga Group formations in the vicinity of the project area. Because the study area is underlain by Chickamauga Group rocks, the possibility exists for karst conditions to be encountered. Small cavities have been reported in the drilling logs for several of the bedrock wells located near the ETTP. These cavities have ranged in width from 0.3 to 6.5 ft, and have generally been mud-filled. Bedrock conditions in the Chickamauga Group underneath the site are unknown. During recent surveys, karst outcrops and a small unplugged sinkhole were identified near the southeast corner of the planned parking area for the ERTF (ORNL 2020).

Soils. The soil types determined in the study area are based on the 1942 Roane County Soil Survey prepared by the U.S. Department of Agriculture (USDA 1942). Although the Roane County Soil Survey was updated in 2009, the DOE property was not mapped during this effort (DOE 2016b); thus, the 1942 survey is the only source for the study area soil types. The ORETTC site is forested and undeveloped. The 1942 soil survey indicates that the ORETTC proposed site is within the Armuchee silt loam, which is described as well-drained with weathered bedrock encountered between 20 to 40 inches.

The ORETTC site and vicinity were investigated as part of the East Fork Ridge/White Wing (Parcel 4a) investigations during an Environmental Baseline Survey Report completed in 2013. The study identified no evidence of past activities involving hazardous substances prior to federal land acquisition, and recommended no-further-investigation at the site. Prior to the Environmental Baseline Study, a recommendation of no-further-investigation of soils was also determined during footprint reduction studies in 1997 (DOE 2013).

Based on remedial actions completed and sampling results, the soils at the ETTP Alternative site have been approved for use under an industrialized use risk scenario (DOE 2016a).

3.7.2 Proposed Action Impacts

Construction activities would cause minor impacts to the existing geologic and soil conditions at the site. The near surface geologic conditions and existing soil column would be disturbed by construction, especially within the facility footprint. However, no viable geologic or soil resources would be lost from construction activities. Tree-clearing, grading, excavation, and other site development activities associated with the proposed action would occur within an undisturbed 27-acre parcel. Tree clearing and grading would temporarily disturb soils, and site contours would be permanently changed from site grading to support building foundations. Additionally, soils and potentially shallow bedrock would be excavated to accommodate the site's stormwater and fire training runoff detention ponds. The site soils contain silt and clay, and are moderately susceptible to wind erosion. Because of soil disturbance and the presence of gentle slopes (5 to 12 percent), the potential for increased soil erosion due to stormwater runoff and wind would increase.

In general, potential impacts from erosion would be minimized through the development and implementation of a SWPPP in accordance with the state of Tennessee, Division of Water Resources; implementation of erosion and sediment control measures during construction, and the implementation of a revegetation plan for areas disturbed by construction. Although the site soils are not classified as prime farmland, site topsoil could be stripped and conserved prior to grading

activities, and re-applied post-construction to facilitate revegetation. Soils in areas used to stage equipment and materials have the potential to be compacted; such areas could be mechanically de-compacted prior to the revegetation phase of the project to facilitate re-growth. With implementation of the above measures, impacts to geology and soils during construction would be minimized.

Hazards posed by geological conditions are expected to be minor. The earthquake risk near the site is considered moderate due to the presence of historic thrust faults (USGS 2018); however, there are no quaternary faults (i.e., faults less than 1.6 million years old) near the site. To minimize the potential hazards associated with earthquakes, the new facilities would be constructed in accordance with current International Building Code guidelines for facilities in seismic zones, which would minimize life-threatening structural damage during an earthquake. Due to the clay content and shallow depth to bedrock the subsurface conditions are not susceptible to liquefaction from a seismic event. Other potential hazards such as subsidence from karst and landslides are low risk. Landslide risk is low because slopes are gentle and there is a low-incidence rate.

A sinkhole was identified near the southeastern corner of the parking lot for the ERTF (ORNL 2020). Stormwater control measures would be implemented to protect this feature from surface water runoff or sediment transport during construction. If other void spaces are discovered within the operational footprint, further development of the sinkhole may be mitigated by backfilling with grout or impermeable plugs. Based on available survey data, it does not appear that sinkholes and void spaces are prevalent across the site.

Once construction is complete, areas used for laydown would be restored to pre-construction conditions. Meanwhile, open areas around the facility building would be cleaned up, restored, and revegetated. Although erosion from storm water runoff and wind action would occur occasionally during operation, it is anticipated to be minimal.

The ORETTC would be constructed in accordance with all applicable seismic standards, as appropriate, to minimize damage in the event of an earthquake. Given the absence of hazardous and radioactive material at the ORETTC (with the exception of sealed sources), and minimal hazardous material associated with cleaning supplies and spent training materials, NNSA does not expect that seismic risks for the ORETTC would be notably different than other non-nuclear, nonhazardous facilities in the area. Based on a recently completed study of potential impacts from earthquakes at Y-12, NNSA notes that earthquakes in the range of 6.0 magnitude are possible in the region (NNSA 2020).

3.7.3 ETTP Alternative Impacts

Potentially affected soils at ETTP are generally stable and acceptable for standard construction requirements (DOE 2016a). Constructing and operating the ORETTC at ETTP would have similar impacts to geology and soils as the Proposed Action. The ORETTC would be constructed in accordance with all applicable seismic standards, as appropriate, to minimize damage in the event of an earthquake. Given the absence of hazardous and radioactive material at the ORETTC (with the exception of sealed sources), and minimal hazardous material associated with cleaning supplies and spent training materials, NNSA does not expect that seismic risks for the ORETTC would be notably different than other non-nuclear, nonhazardous facilities in the area. Based on a recently

completed study of potential impacts from earthquakes at Y-12, NNSA notes that earthquakes in the range of 6.0 magnitude are possible in the region (NNSA 2020).

3.7.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to geology and soils.

3.8 Biological Resources

3.8.1 Affected Environment

This section describes the biological resources on the ORR in Roane County and is intended to provide a baseline characterization of the ecology prior to any disturbances associated with construction or operation of the ORETTC.

Vegetation. ORR is situated in the Great Valley of East Tennessee between the Cumberland and Great Smoky Mountains (DOE 2018). At approximately 33,000 acres, ORR is the largest contiguous and protected land ownership in the southern Valley and Ridge Physiographic Province of East Tennessee. ORR contains approximately 24,000 acres of forestland. ORR's natural resources are managed for DOE by the ORNL Natural Resources Management Program.

More than 1,100 vascular plant species have been identified at the ORR (Mann et al. 1996). Of the 168 non-native plant species on ORR, 54 are considered severe or significant threats to natural areas or the ORR mission. The Invasive Plant Management Plan for the ORR addresses the impacts of invasive plants on facility operations and natural areas (ORNL 2017).

Habitat. The ORETTC site is part of the heavily forested SSP-2 area that was identified by the Nature Conservancy in 1996 as very high significance with relatively intact natural communities. Forest comprises approximately 94.2 percent (76.46 acres) of the area of the proposed SSP-2A (81 acres) and right-of-way comprises 5.8 percent (4.67 acres). However, none of the right-of-way is within the ORETTC site. The ORR is mostly contiguous native eastern deciduous oak-hickory (*Quercus-Carya* spp.) hardwood forest. Other forest cover types include hemlock (*Thuja canadensis*), white pine (*Pinus strobus*), and bottomland hardwood forests. Forty-one tree species were identified in 2015. The ORETTC site is not within a designated natural area classified primarily on the basis of the presence of listed species. However, a tributary that crosses the ORETTC site is designated as an aquatic natural area (ORNL 2015).

The ORETTC site contains forest stands that are largely younger, second growth, as characterized by dominant species considered to be pioneering types such as yellow poplar (*Liriodendron tulipifera*), eastern redcedar (*Juniperus virginiana*), loblolly pine (*Pinus taeda*), Virginia pine (*P. virginiana*), and ash (*Fraxinus* spp.). Old-growth characteristics such as large tree size, multiple layers in the canopy, diversity of species, and diversity of ecosystem function occur in areas adjacent to streams, seeps, and smaller wetlands. The site is adjacent to interior forest habitat based on the presence of relatively large contiguous tracts of forest. As habitat in the surrounding Knoxville Metropolitan Area continues to be lost to fragmentation caused by clearing for agriculture, industry, commercial and residential development, roads, and utility corridors, the

ORR forests represent an increasingly scarce resource. The ORR interior forest habitat is an important component of biologically diverse systems, offering habitat critical to the survival of neotropical migratory bird species (ORNL 2015). Restoring and maintaining native grass communities along road and utility corridors, fallow fields, remediation sites, and facility buffer zones provides habitat for migratory birds and other wildlife species (ORNL 2018). The Memorandum of Understanding between the U.S. Fish and Wildlife Service (USFWS) and DOE demonstrates DOE's commitment to integrate migratory bird conservation principles, measures, and practices into agency activities (78 FR 68041).

Wildlife. The eastern deciduous hardwood forest on ORR provides habitat for numerous wildlife species. The diversity of wildlife species ranges from common species found in urban and suburban environments to more specialized species such as interior forest bird species. The ORR hosts more than 70 species of fish; about 71 species of reptiles and amphibians (68 species confirmed); 213 species of migratory, transient, and resident birds; and 49 species of mammals, as well as many invertebrate species (NERP 2020). The USFWS Environmental Conservation Online System indicates that there are 18 species of Birds of Conservation Concern, plus seven USFWS Birds of Management Concern under the *Migratory Bird Treaty Act* (MBTA) with potential to occur in SSP-2A. In addition, the Bald Eagle may also be present and is protected under both the MBTA and the *Bald and Golden Eagle Protection Act* (USFWS 2020a).

The overall goals of wildlife management on the ORR are directed toward preserving populations and habitat, maintaining and enhancing biodiversity, integrating multiple use objectives, and minimizing wildlife damage to property and public safety (ORNL 2007). The SSP-2A parcel intersects a known wildlife corridor in East Tennessee, which is the subject of ongoing research in the ORNL Environmental Sciences Division. Featured species management includes installation of nest boxes for wood ducks (*Aix sponsa*), salamander inventories, forest management practices to enhance habitat for woodland bat species, and maintenance of habitat for forest-area-sensitive neotropical birds. Game-species management is conducted for public recreation and public-health-and-safety reasons. Active hunting programs are conducted for white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and Canada goose (*Branta canadensis*). The SSP-2A area has historically had the highest deer harvest numbers on the ORR. Nuisance wildlife species include raccoon (*Procyon lotor*), skunk (Mephitis mephitis), opossum (Didelphis virginiana), and woodchuck (*Marmota monax*).

Threatened, Endangered, or Sensitive Species. The ORNL Natural Resources Program compiled a list of endangered, threatened, rare, or otherwise sensitive focal animal taxa with potential to occur within the SSP-2A parcel, which includes the ORETTC proposed site. The list was compiled using the ORNL Natural Resources database for verified spatial records of sensitive resources within the vicinity of the review area, sensitive animal taxa with reasonable potential to occur within the SSP-2A parcel based on occurrence elsewhere on the ORR, rare and sensitive resources known to occur within the Tennessee counties of Anderson and Roane as identified through the TDEC online Rare Species database (http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:0), and resources identified by the USFWS Information for Planning and Consultation tool (IPaC – https://ecos.fws.gov/ipac/, using the SSP-2A parcel as the input area). These taxa were considered contemporary records if they were documented after 1995. All others were considered historical records unless later survey

confirmed their presence within the SSP-2A parcel. A list of habitat parameters for each of the potential sensitive resources was compiled through the same sources. Table 3-8 provides the list of animal species with potential to occur within the SSP-2A parcel, with indication of historical and contemporary records and an assessment of whether habitat for that species is present within the SSP-2A parcel.

Federally listed species are protected under the *Endangered Species Act of 1973* (16 U.S.C. 1531-1534). Species listed in the State of Tennessee are protected under the *Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974* (TCA § 70-8-101 – 112) and the *Rare Plant Protection and Conservation Act of 1985* (TCA §§70-8-301 – 314).

Of particular concern is the potential presence of forest-dwelling bats that may inhibit development during significant portions of the year. Two of the federally listed bat species, Indiana bat (endangered) and northern long-eared bat (threatened) roost in trees. The other federally listed bat species (gray bat – endangered) may use the area as foraging habitat. Additionally, two state listed (threatened) bat species, little brown bat and tricolored bat, may roost in trees to some extent and forage throughout the area. Both species are under federal review for listing. Any trees, either dead or alive, with exfoliating bark, cracks or crevices can provide potential roosting habitat. Biological surveys were conducted in the SSP-2A parcel from 27 June–7 July 2020. The preliminary results indicate that 10 bat species (Table 3-9) were identified from five acoustic bat detectors within the SSP-2A parcel (ORNL 2020). It is important to note that the vast majority of the SSP-2A site does not have suitable bat foraging habitat due to cluttered mid-story and under-story vegetation.

The USFWS has established a window of April 1 through November 14 when potential roost trees for listed species may not be cut nor surrounding habitat disturbed. This window covers the time period from when bats are emerging from winter hibernaculum (caves), and through the tree roosting/maternity season and "swarming" season when bats mate and get ready to return to winter roosts. Another consideration for avoiding potential impacts is whether the area is within a distance specified by the USFWS from any caves used for hibernation by the listed species. The USFWS and Tennessee Ecological Services Field Office have developed a conservation strategy document to formalize goals and priorities regarding the conservation and recovery of forest-dwelling bats in Tennessee (USFWS 2017).

Aquatic resources in the SSP-2A parcel include perennial streams, perennial – ephemeral streams, wet weather conveyance (potential streams that will require hydrologic determination), and seeps/springs (see Section 3.6). All streams contain contemporary observations of the state listed species In Need of Management Tennessee dace (*Chrosomus tennesseensis*), which represents an ORNL Focal Species for management and ongoing research. The streams and seeps within the SSP-2A parcel support the listed species In Need of Management, black mountain salamander (*Desmognathus welteri*). This represents the only known populations of black mountain salamander on the ORR, and the only known record for Roane County, Tennessee (ORNL 2020). The ORNL Natural Resources Program also expects that the wetlands within the SSP-2A parcel support the state-listed species In Need of Management, four-toed salamander (*Hemidactylium scutatum* – also an ORNL focal species), based on ongoing habitat-based survey. As with several potential state-listed (and one federal-listed) plants, this species is not readily detectable during the time period that was allotted for field survey of the SSP-2A parcel. Importantly, the Tennessee

dace and both state-listed salamanders rely on ephemeral (in addition to perennial) aquatic resources as core habitat during important life history events.

Federally listed plant species are considered unlikely within the SSP-2A parcel. Several seeps and springs are suitable for white fringeless orchid (*Platanthera integrilabia*), which is known from wetlands and stream margins adjacent to the ORR. However, no specimens are known from the ORR. Some state listed species are expected within the SSP-2A parcel, particularly true of the springs and smaller seep wetlands that were recently identified within the SSP-2A parcel and ORETTC site. The ORNL Natural Resources Program plant surveys have been completed (ORNL 2020). Table 3-10 provides the list of plant species and their expected potential to occur within the SSP-2A parcel based on recent field-based inventory and assessment of habitat suitability.

With regard to biological resources at the ETTP site, the potentially affected areas are primarily industrialized, fragmented, and disturbed; no rare, threatened, and endangered plant and animal species are known to occur (DOE 2016a).

Table 3-8. Threatened, Endangered, or Sensitive Animal Species on SSP-2

Scientific name	Common name	Status			Oak Ridge Reservation			SSP-2A			
		Federal	State	PIF	Historical	Expected	Contemporary	Historical	Expected	Contemporary	Habitat
FISH											
Erimonax monachus	Spotfin chub	T	T		**yes, CH**	**unk**	no	no	no	**unk**	yes
Erimystax cahni	Slender chub	T	T		**no**	**no**	no	no	no	no	no
Hemitremia flammea	Flame chub		NM		yes	**unk**	no	yes	**unk**	**unk**	yes
Noturus flavipinnis	Yellowfin Madtom	T	T		no	no	no	no	no	no	no
Phoxinus tennesseensis	Tennessee dace		NM		yes	yes	yes	yes	yes	yes	yes
AMPHIBIANS											
Desmognathus welteri	Black Mountain salamander		NM		no	yes	yes	no	yes	yes	yes
Hemidactylium scutatum	Four-toed salamander		NM		yes	yes	yes	no	yes	**unk**	yes
REPTILES											
Pituophis melanoleucus	Northern pinesnake		T		yes	**unk**	no	no	**unk**	no	**unk**
Ophisaurus attenuatus	Slender glass lizard		NM		yes	**unk**	no	no	**unk**	no	**unk**
BIRDS											
Anhinga	Anhinga		NM		yes	yes	yes	no	no	no	no
Egretta caerulea	Little blue heron		NM		yes	yes	yes	no	no	no	no
Ixobrychus exilis	Least bittern	BCC	NM		yes	yes	yes	no	no	no	no
Nycticorax	Black-crowned Night-heron		NM		yes	yes	yes	no	**unk**	**unk**	**unk**
Haliaeetus leucocephalus	Bald eagle	BCC,MC, Focal	NM		yes	yes	yes	no	no	no	no
Falco peregrinus	Peregrine falcon	BCC,MC		RC,MA	yes	yes	yes	no	no	no	no
Falco sparverius	American kestrel	BCC,MC			yes	yes	yes	no	yes	no	no
Porzana carolina	Sora	MC			yes	yes	yes	no	no	no	no
Scolopax minor	American woodcock	MC,Focal		YWL,RC	yes	yes	yes	no	**unk**	no	no
Aegolius acadicus	Northern saw-whet owl	MC			yes	yes	yes	no	**unk**	no	yes
Melanerpes erythrocephalus	Red-headed woodpecker	BCC,MC		YWL	yes	yes	yes	no	**unk**	**unk**	yes

Sphyrapicus varius	Yellow-bellied sapsucker	MC			yes	yes	yes	no	yes	yes	yes
Coccyzus americanus	Yellow-billed Cuckoo			CBSD,RC,IM	yes	yes	yes	no	yes	yes	**unk**
Contopus cooperi	Olive-sided flycatcher	BCC,MC		YWL	yes	yes	yes	no	no	no	no
Empidonax trailii	Willow flycatcher	MC			yes	yes	yes	no	no	no	no
Sitta pusilla	Brown-headed nuthatch	BCC,MC			yes	yes	yes	no	no	**unk**	yes
Hylocichla mustelina	Wood thrush	BCC,MC, Focal	NM	YWL,RC,MA	yes	yes	yes	no	yes	yes	yes
Lanius ludovicianus	Loggerhead shrike	BCC,MC	NM	CBSD,FS	yes	yes	yes	no	no	no	no
Vermivora chrysoptera	Golden-winged warbler	BCC,MC, Focal	T	CBSD,RWL	yes	yes	yes	no	no	no	no
Vermivora pinus	Blue-winged warbler	BCC,MC			yes	yes	yes	no	yes	yes	yes
Setophaga cerulea	Cerulean warbler	BCC,MC, Focal	NM	YWL,RC,IM	yes	yes	yes	no	no	no	**unk**
Helmitheros vermivorus	Worm-eating warbler	BCC,MC			yes	yes	yes	no	**unk**	**unk**	yes
Limnothlypis swainsonii	Swainson's warbler	BCC,MC	NM	RC,MA	yes	yes	yes	no	no	no	no
Protonotaria citrea	Prothonotary warbler	BCC,MC		YWL,RC,MA	yes	yes	yes	no	no	no	no
Geothlypis formosus	Kentucky warbler	BCC,MC		YWL,RC,MA	yes	yes	yes	no	yes	yes	yes
Parkesia motacilla	Louisiana waterthrush	MC			yes	yes	yes	no	no	no	no
Ammodramus savannarum	Grasshopper sparrow	MC,Focal		CBSD,RC,IM	yes	yes	yes	no	no	no	no
Ammodramus henslowii	Henslow's sparrow	BCC,MC, Focal	T	IM,RC,YWL	yes	yes	yes	no	no	no	no
Dolichonyx oryzivorus	Bobolink	MC		YWL,RC,MA	yes	yes	yes	no	no	no	no
Dendroica discolor	Prairie Warbler	BCC		YWL,RC,M	yes	yes	yes	no	yes	yes	yes
Icteria virens	Yellow-breasted Chat			RC,MA	yes	yes	yes	no	yes	yes	yes
Pipilo erythrophthalmus	Eastern Towhee			RC,MA	yes	yes	yes	no	yes	yes	yes
Zenaida macroura	Mourning Dove	MC			yes	yes	yes	no	yes	yes	yes
Contopus virens	Eastern-wood Pewee			RC,MA	yes	yes	yes	no	yes	yes	yes
Empidonax virescens	Acadian Flycatcher			RC,MA	yes	yes	yes	no	yes	yes	yes
MAMMALS											
Sorex dispar	Long-tailed Shrew		NM		yes	yes	yes	no	yes	yes	yes

Synaptomys cooperi	Southern bog lemming		N	yes	**unk**	no	no	**unlikely**	no	yes
Corynorhinus rafinesquii	Rafenisque's big-eared bat		N	yes	yes	yes	no	yes	no	yes
Myotis grisescens	Gray bat	E	E	yes	yes	yes	no	yes	yes	yes
Myotis leibii	Eastern small-footed bat		N	yes	yes	yes	no	yes	no	yes
Myotis lucifugus	Little brown bat	R	T	yes	yes	yes	no	yes	yes	yes
Myotis septentrionalis	Northern long-eared bat	T	T	yes	yes	yes	no	yes	no	yes
Myotis sodalis	Indiana bat	E	E	yes	yes	yes	no	yes	no	yes
Perimyotis subflavus	Tri-colored bat	R	T	yes	yes	yes	no	yes	yes	yes
CLAMS										
Lampsilis virescens	Alabama Lampmussel	E	E	no	no	no	no	no	no	no
Hemistena lata	Cracking Pearlymussel	E	E	no	no	no	no	no	no	no
Dromus dromas	Dromedary Pearlymussel	E	E	yes	no	no	no	no	no	no
Cyprogenia stegaria	Fanshell	E	E	yes	no	no	no	no	no	no
Fusconaia cuneolus	Finerayed Pigtoe	E	E	yes	no	no	no	no	no	no
Plethobasus cooperianus	Orangefoot Pimpleback	E	E	yes	no	no	no	no	no	no
Lampsilis abrupta	Pink Mucket	E	E	yes	no	no	no	no	no	no
Obovaria retusa	Ring Pink	E	E	no	no	no	no	no	no	no
Pleurobema plenum	Rough Pigtoe	E	E	no	no	no	no	no	no	no
Quadrula cylindrica	Rough Rabbitsfoot	E	E	yes	no	no	no	no	no	no
Plethobasus cyphyus	Sheepnose Mussel	E	E	yes	no	no	no	no	no	no
Fusconaia cor	Shiny Pigtoe	E	E	yes	no	no	no	no	no	no
Cumberlandia monodonta	Spectaclecase	E	E	yes	no	no	no	no	no	no
Plethobasus cicatricosus	White Wartyback	E	E	no	no	no	no	no	no	no
SNAILS										
Athearnia anthonyi	Anthony's riversnail	E	E	no	no	no	no	no	no	no
Io fluvialis	Spiny riversnail	UR		yes	no	**unk**	no	**unlikely**	no	**unlikely**

Federal listing status codes:
- FE – Federally listed endangered species
- FT – Federally listed threatened species
- UR – Currently Under Review for federal listing
- CH – Critical Habitat present
- BCC - Birds of Conservation Concern
- MC- Birds of Management Concern
- Focal – Under MC = need additional investment of resources to address conservation or management issues.

Source: ORNL 2020.

State-listing status codes:
- NM – In Need of Management
- SC – Of Special Concern
- T – Threatened
- E – Endangered

Partners in Flight status codes – Bird Conservation Region (BCR) 28:
- RC = Regional Concern, according to the Bird Conservation Regions
- MA = Management Attention needed
- IM = Immediate Management Attention Needed
- YWL = Yellow Watch List
- RWL = Red Watch List

Table 3-9. Acoustic Detection for Bats on SSP-2A

Scientific Name	Common name
Eptesicus fuscus	Big brown bat
Lasiurus borealis	Eastern red bat
Lasiurus cinereus	Hoary bat
Lasionycteris noctivagans	Silver-haired bat
Lasiurus seminolus	Seminole bat
Myotis grisescens	Gray bat
Myotis lucifugus	Little brown bat
Nycteceius humeralis	Evening bat
Perimyotis subflavus	Tricolored bat
Tadarida brisiliensis	Mexican free-tailed bat

Source: ORNL 2020.

Table 3-10. Threatened, Endangered, or Sensitive Plant Species on SSP-2A

Scientific name	Common Name	Federal	State	Expected within SSP-2A
Spiraea virginiana	Virginia spiraea	T		Unlikely
Platanthera integrilabia	White fringeless orchid	T		Possible
Aureolaria patula	Spreading false foxglove		S	Unknown
Berberis canadensis	American barberry		S	Unlikely
Bolboschoenus fluviatilis	River bulrush		S	Unlikely
Delphinium exaltatum	Tall larkspur		E	Unlikely
Diervilla lonicera	Northern bush honeysuckle		T	Unlikely
Draba ramosissima	Branching Whitlow-grass		S	no
Elodea nuttallii	Nuttall's waterweed		S	no
Eupatorium godfreyanum	Godfrey's thoroughwort		S	Unlikely
Fothergilla major	Mountain witch-alder		T	Possible
Helianthus occidentalis	Naked-stem sunflower		S	Unlikely
Juglans cinerea	Butternut		T	no
Juncus brachycephalus	Small-headed rush		S	Unlikely
Liparis loeselii	Fen orchid		T	Unlikely
Panax quinquefolius	American ginseng		S	Likely
Platanthera flava var. *herbiola*	Tubercled rein-orchid		T	Possible
Spiranthes lucida	Shining Ladies'-tresses		T	Unlikely
Thuja occidentalis	Northern white cedar		S	no

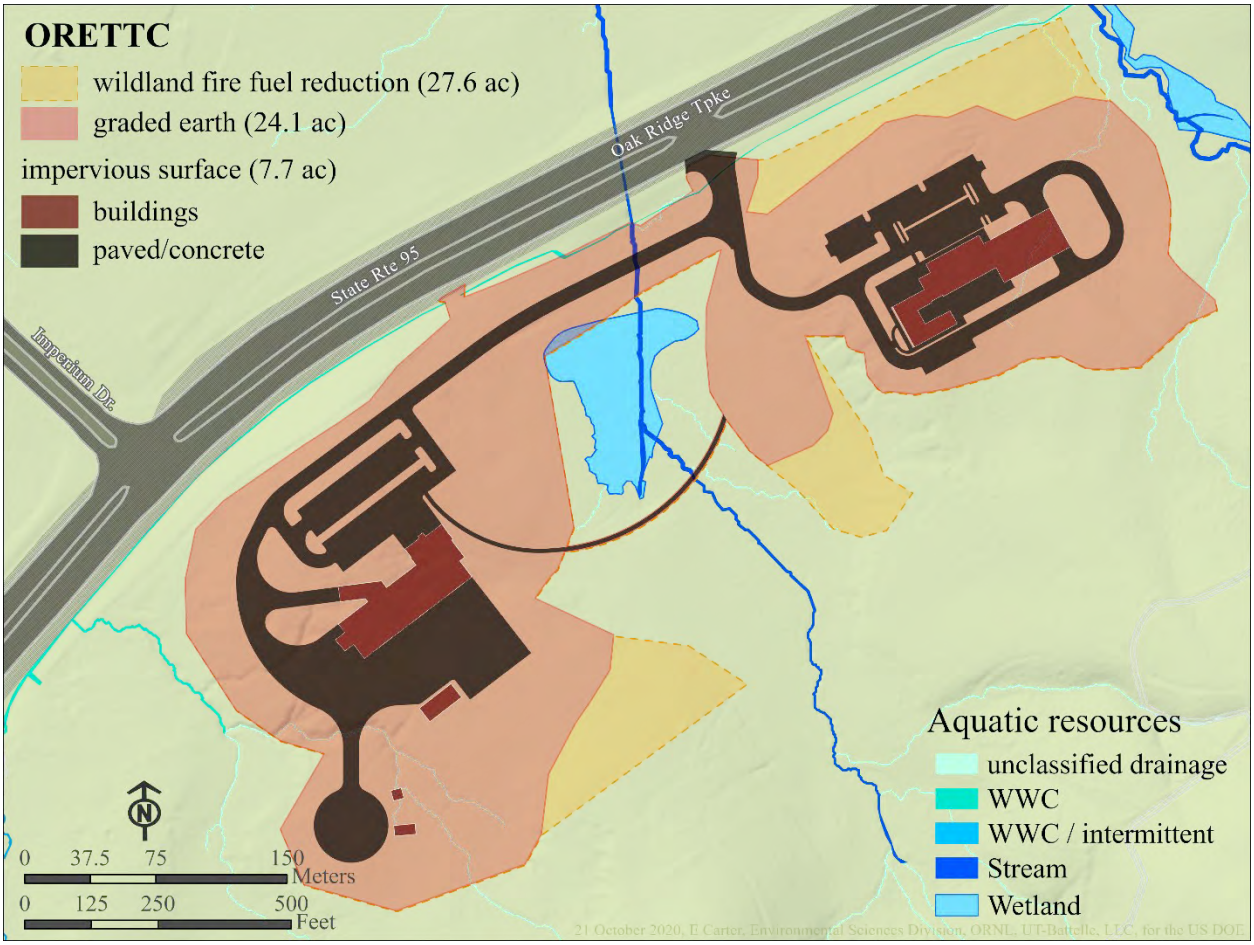
Source: ORNL 2020.

3.8.2 Proposed Action Impacts

Based on avoidance of impacts, where the sensitive species are located, to streams and springs/seeps, and minimization of wetland impacts to the greatest extent practicable, the Proposed Action would not reduce the distribution or viability of species or habitats of concern, including the taking of a listed species. Figure 3-15 shows the ORETTC facilities in relation to aquatic resources at the proposed site. Based on this spatial analysis, the footprint of the ORETTC facilities would not impact any wetlands/springs/seeps.[16] The stream through the ORETTC site would be crossed twice by the road and pedestrian walkway (sidewalk) that connect the two training facilities. Use of bottomless culvert arches (for example, as shown in the image to the

[16] For this EA, NNSA considered any wetlands outside the 100-foot buffer as being within the footprint of the ORETTC facilities and as an area that could be potentially disturbed. This is a conservative assumption to ensure all possible impacts of the proposed project are identified in case of additional land clearing or vegetation removal.

right) or similarly a bottomless bridge would span the stream crossings, thereby avoiding stream impacts, and allow the stream to flow freely. The use of bottomless stream crossings would be consistent with recommendations in the ORR Forest Management Plan (ORNL 2015), Tennessee Division of Forestry Best Management Practices (TDA 2003), and Tennessee Erosion and Sediment Control Handbook (TDEC 2012). Limiting the road corridor to 36 feet wide and the pedestrian corridor to 10 feet wide across the 100-foot riparian buffers on either side of the stream (ORNL 2020) would minimize impacts to potential wetlands in the riparian buffers to approximately 0.05 acres. Use of best management practices such as biodegradable sediment control barriers to protect the stream from erosion would further reduce potential wetland impacts.



Note: Grading plans for the ORETTC estimate that approximately 24.1 acres of land could be disturbed.
Source: ORNL 2020.

Figure 3-15. Potential Aquatic Resources within the ORETTC Site

Construction of the ORETTC would disturb approximately 24.1 acres, or approximately 0.06 percent of the total land at ORR. Of this 24.1 acres, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road. The other 16.4

acres would be temporarily disturbed (i.e., surfaces would remain pervious) to grade the land and provide greenspace around the ORETTC to enhance the campus-feel. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. Construction activities would be completed in 1.5 years. Pre-construction surveys would be conducted for sensitive resources in the ORETTC site to provide data on resources that might be impacted by the project. Surveys would include inventory and mapping of rare and sensitive natural communities, aquatic resources, and federally listed bat maternity roosts; delineation of aquatic resources and performance of hydrological determinations; inventory and mapping of rare and sensitive plant species; surveys for rare and sensitive animal species; and review of forest and timber resources. As part of the sensitive resource surveys, the ORNL Natural Resources Program team would consult with the USFWS and TDEC regarding federally listed species (particularly bats), wetlands, streams, and state-listed species to ensure compliance with federal and state laws regarding protected species.

Vegetation and Habitat. Site development for construction of the ORETTC would involve clearing of approximately 24.1 acres of undisturbed forest vegetation. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. Much of the site is largely younger, second growth, as characterized by dominant species considered to be pioneering types. Field data from the ORNL Natural Resources Program report (*see* Appendix A) indicate that the mid-story and under-story vegetation are cluttered. The vast majority of the project site does not have suitable bat foraging habitat due to cluttered mid-story and under-story vegetation. The ORR Forest Management Plan (ORNL 2015) designates the proposed site as conifer (pine) forest type. A 100-foot buffer would remain undisturbed along the stream that passes through the site, except for the corridors that cross the stream for the road and pedestrian walkway (sidewalk) that connect the two training facilities. The vegetation clearance area for construction of the ORETTC would be approximately 0.06 percent of the total forest land at ORR.

Wildlife. Site development for construction of the ORETTC could cause direct impacts through mortality or injury to wildlife (e.g., construction equipment striking ground-dwelling small mammals) during operation of construction equipment and indirect impacts through loss of wildlife habitat. Wildlife species considered in the overall goals of wildlife management on the ORR (ORNL 2007) that likely occur in the ORETTC site are common in the ORR. In response to the ORETTC development, some species could relocate to similar habitats located immediately adjacent to the disturbed site. Potential effects on the wildlife corridor from development of the ORETTC include temporary disturbance to wildlife movement and activity patterns during construction, long-term disturbance owing to increased traffic and sustained human presence, and direct intersection/obstruction of the least cost path that passes through the SSP-2A parcel. The ORETTC site is a small fraction of the wildlife corridor through East Tennessee. The loss of wildlife habitat for construction of the ORETTC would be approximately 0.06 percent of the total forest land at ORR. Development of the ORETTC would reduce the available area for deer hunting by approximately 24.1 acres. Based on an average harvest of 400 deer on ORR and 10,000 acres available for deer hunting, the anticipated reduction in the annual deer harvest from reducing the available area for deer hunting by approximately 24.1 acres would be one deer. Management options to compensate for the potential decrease in deer harvest as a result of the ORETTC development could include increased hunting of inaccessible parcels by badged employees (ORNL 2007).

Threatened, Endangered, or Sensitive Species. The ORETTC site is not included in the Conservation Focus Areas as a key region for forest-dwelling bat conservation and recovery in Tennessee (USFWS 2017). Therefore, complete avoidance of impacts to caves and other potential hibernacula is not required and conservation measures used to offset habitat loss would generally be appropriate for development projects in Tennessee. According to the maps presented in the Conservation Strategy for Forest-dwelling Bats in Tennessee (USFWS 2017), there are no known Indiana bat, northern long-eared bat, or forest dwelling bat sites within 20 miles of the ORETTC site. Based on field observations and acoustic surveys at cave entrances, ORNL Natural Resources Program indicated that several caves on the ORR probably contain hibernating Indiana bats. There are no known caves in the ORETTC site. However, there are caves which could serve as hibernacula within 10 miles of the ORETTC site (ORNL 2020). Based on section 7 technical assistance and a summary of Indiana bat ecology, the USFWS considers that a loss of no more than 10 acres or less than 10 percent of the available habitat in any given forest stand during the inactive season is unlikely to lead to detectable adverse effects on Indiana bats.[17] The conservation strategy developed by the USFWS and Tennessee Ecological Services Field Office includes recovery actions that best reflect the specific opportunities and needs of forest-dwelling bats in Tennessee.

Provided that sufficient roosting, foraging, and travel habitat is maintained within a colony's traditional home range (radio-telemetry studies have document foraging up to 10 miles from a hibernaculum), it is unlikely that detectable adverse effects would occur as a result of removal or loss of habitat during the inactive season. As Indiana bat maternity areas contain multiple primary roost trees, it is extremely unlikely that loss of 10 acres or 10 percent of a forested stand (whichever is smaller) would eliminate all primary roost trees within a traditional home range of an Indiana bat maternity colony. Similarly, loss of this magnitude is not likely to noticeably degrade the quality of a roosting or foraging area or render a travel corridor unsuitable. For these reasons, USFWS believes it is extremely unlikely that loss of 10 acres or 10 percent (whichever is smaller) of a forest stand would lead to detectable adverse effects on forest dwelling bats. The loss of bat habitat due to construction of the ORETTC would be approximately 0.06 percent of the total forest land at ORR. No tree removal would be conducted until a final assessment is agreed upon with the USFWS and TDEC. Therefore, effects on bats listed in Table 3-9 from implementation of the Proposed Action would not be measurably different when compared to existing conditions.

NNSA evaluated the potentially affected rare, threatened, or endangered plant species for measures to avoid potential impacts. During this EA process, NNSA conducted informal consultation with the USFWS, Tennessee Ecological Services Field Office, regarding potential impacts to threatened, endangered, or sensitive species, particularly the Indiana bat (endangered), northern long-eared bat (threatened), and gray bat (endangered) (*see* Appendix A). As a result of that consultation, the USFWS concluded that NNSA has adequately addressed potential direct, indirect, and cumulative effects to federally listed species and their habitats. The USFWS concurred with the determination that the project is not likely to adversely affect federally listed bats (USFWS 2020b). Because of the documented presence of the Indiana bat and northern long-eared bat in the general vicinity of the proposed project area, the USFWS has recommended that NNSA only necessarily remove suitable bat roosting trees between November 15 and March 31.

[17] https://www.fws.gov/midwest/endangered/section7/s7process/mammals/inba/INBAEcologySummary.html

In addition, as a proactive measure for improvement of bat habitat and as a possible educational tool, the USFWS has suggested that NNSA consider the installation of several artificial bat roosting structures (e.g., rocket box and/or "Brandenbark" poles) at the project site. NNSA intends to implement these recommendations/suggestions for protection of state and federal listed species.

Site development for construction of the ORETTC would not impact federally listed bird species. Of the listed bird species with potential to occur on the SSP-2A parcel, none are associated with aquatic habitats, three (Loggerhead Shrike, American Kestrel, and Henslow's Sparrow) are associated with grassland habitats, and the remaining 11 species (e.g., Wood Thrush, Golden-winged Warbler, and Cerulean Warbler) are associated with forested habitats. No impacts to grassland species would occur because the proposed site does not contain grassland habitats. Potential impacts to forest habitat birds would be negligible because the loss of forest habitat due to construction of the ORETTC would be approximately 0.06 percent of the total land at ORR.

Based on preliminary field data from the ORNL Natural Resources Program report (ORNL 2020), the stream that intersects the ORETTC site is perennial and contains many fish, including the state-listed Tennessee dace. In addition, the only known Roane County population of state-listed black mountain salamander occurs in the stream and the expected area of occupancy of state-listed flame chub on the ORR encompasses streams within the SSP-2A parcel. The state-listed four-toed salamander and ORNL focal species for research and management, mud salamander (*Pseudotriton montanus*) are expected to be present in the ephemeral streams, seeps, or wetlands on the SSP-2A parcel. As previously stated, potential impacts to aquatic resources would be minimized to the greatest extent practicable. Potential impacts to wetlands in the riparian buffer would be approximately 0.05 acres, and use of best management practices to protect the stream from erosion would further reduce potential wetland impacts (*see* Appendix B). The project would not impact the listed reptile species, clam species, or the listed snail species because there is no suitable habitat on the SSP-2A parcel.

The potential for impacts to the listed flowering plants would be negligible because the expected occurrence on SSP-2A is unlikely for most of the species listed in Table 3-10. In addition, pre-construction surveys would be conducted to identify resources that might be impacted by the project. These surveys would be conducted before stream crossings are sited and in close coordination with the ORNL Natural Resources Program. Any occurrence of the listed plant species would be identified for avoidance or mitigation to relocate the plant(s) offsite to an adjacent undisturbed area.

Use of the ORETTC for emergency response training would have minor effects on biological resources. The ORETTC site would be landscaped in a campus-like setting (CNS 2020a). Most of the training would be conducted indoors and have no effect on biological resources. Outdoor activities would be conducted in facilities specifically designed for firefighting training. Wildlife occurrence on the site would primarily be common species adapted to live in developed areas with intermittent human disturbance.

3.8.3 ETTP Alternative Impacts

Because much of the Powerhouse Area/S-50 at ETTP has been previously disturbed, there are no notable vegetation and habitats in the potentially affected area. No state or federally listed

threatened and endangered species have been identified as occurring in the project area (DOE 2016a). Because the site is primarily industrialized, fragmented, and disturbed, and no rare, threatened, and endangered plant and animal species are known to occur, adverse impacts to biological resources are not expected.

3.8.4 No-Action Alternative Impacts

The No-Action Alternative would result in no additional effects on biological resources. Under the No-Action Alternative, the ORETTC would not be constructed. Biological resources would remain unchanged when compared to existing conditions.

3.9 Cultural Resources

3.9.1 Affected Environment

Definition of the Resource. Cultural resources are physical manifestations of culture, specifically archaeological sites, architectural properties, ethnographic resources, and other historical resources relating to human activities, society, and cultural institutions that define communities and link them to their surroundings. They include expressions of human culture and history in the physical environment, such as prehistoric and historic archaeological sites, buildings, structures, objects, and districts. The National Register of Historic Places (NRHP) is a listing maintained by the Federal Government of prehistoric, historic, and ethnographic buildings, structures, sites, districts, and objects that are considered significant at a national, state, or local level. Cultural resources listed on the NRHP, or determined eligible for listing, have been documented and evaluated according to uniform standards, found in 36 CFR 60.4, and, regardless of age, are called *historic properties*.

Regulatory Setting. Several federal laws, regulations, and Executive Orders (EOs) address cultural resources and federal responsibilities regarding them and are applicable to the ORR. Foremost among these statutory provisions, and most relevant to the current analysis, is the *National Historic Preservation Act* (NHPA) (54 U.S.C. 300101 et seq.). Section 106 of the NHPA and its implementing regulations at 36 CFR Part 800 require federal agencies to take into account the effects of their undertakings on historic properties and to consult to find ways to avoid, minimize, or mitigate any adverse effects. As part of the Section 106 process, agencies are required to consult with the State Historic Preservation Officer (SHPO) on their determinations and decisions. The Tennessee Historical Commission (THC) serves as the SHPO.

Cultural Resource Management at the ORR. The *Cultural Resource Management Plan, DOE Oak Ridge Reservation, Anderson and Roane Counties* (DOE 2001) addresses DOE compliance with cultural resource statutes, ensures that cultural resources are addressed early in the planning process of undertakings, and ensures needed protection is provided or appropriate documentation is prepared before an undertaking is initiated. Two site-wide Programmatic Agreements (PAs) among the DOE, SHPO, and the President's Advisory Council on Historic Preservation were executed for the ORNL and Y-12 (DOE 2019). In addition, to better fulfill the requirements of the NHPA, DOE developed a historic preservation plan (HPP) for each site. These HPPs ensure compliance with Section 106 of the NHPA and provides for more efficient and effective review of DOE undertakings having the potential to impact historic properties. The PAs and HPPs provide

for the systematic management of all archeological and historic resources at the sites under these documents. The Cultural Resource Management program ensures compliance with all applicable state and federal requirements.

Cultural Resources at the ORR. ORR had 168 facilities that were eligible for inclusion on the NRHP. The reservation contains more than 45 known prehistoric sites (primarily burial mounds and archaeological evidence of former structures), more than 250 historic pre-World War II structures, 32 cemeteries, and several historically significant structures from the Manhattan Project era. The Manhattan Project National Historical Park includes facilities located on ORR including the X-10 Graphite Reactor, Buildings 9731 and 9204-3 at Y-12 and the K-25 Building Site at the ETTP. Seven historic ORR properties are currently listed individually in the NRHP (DOE 2019):

- Freels Bend Cabin
- Graphite Reactor
- New Bethel Baptist Church and Cemetery
- Oak Ridge Turnpike checking Station
- George Jones Memorial Baptist Church and Cemetery
- Bear Creek (Scarboro) Road Checking Station
- Bethel Valley Road Checking Station

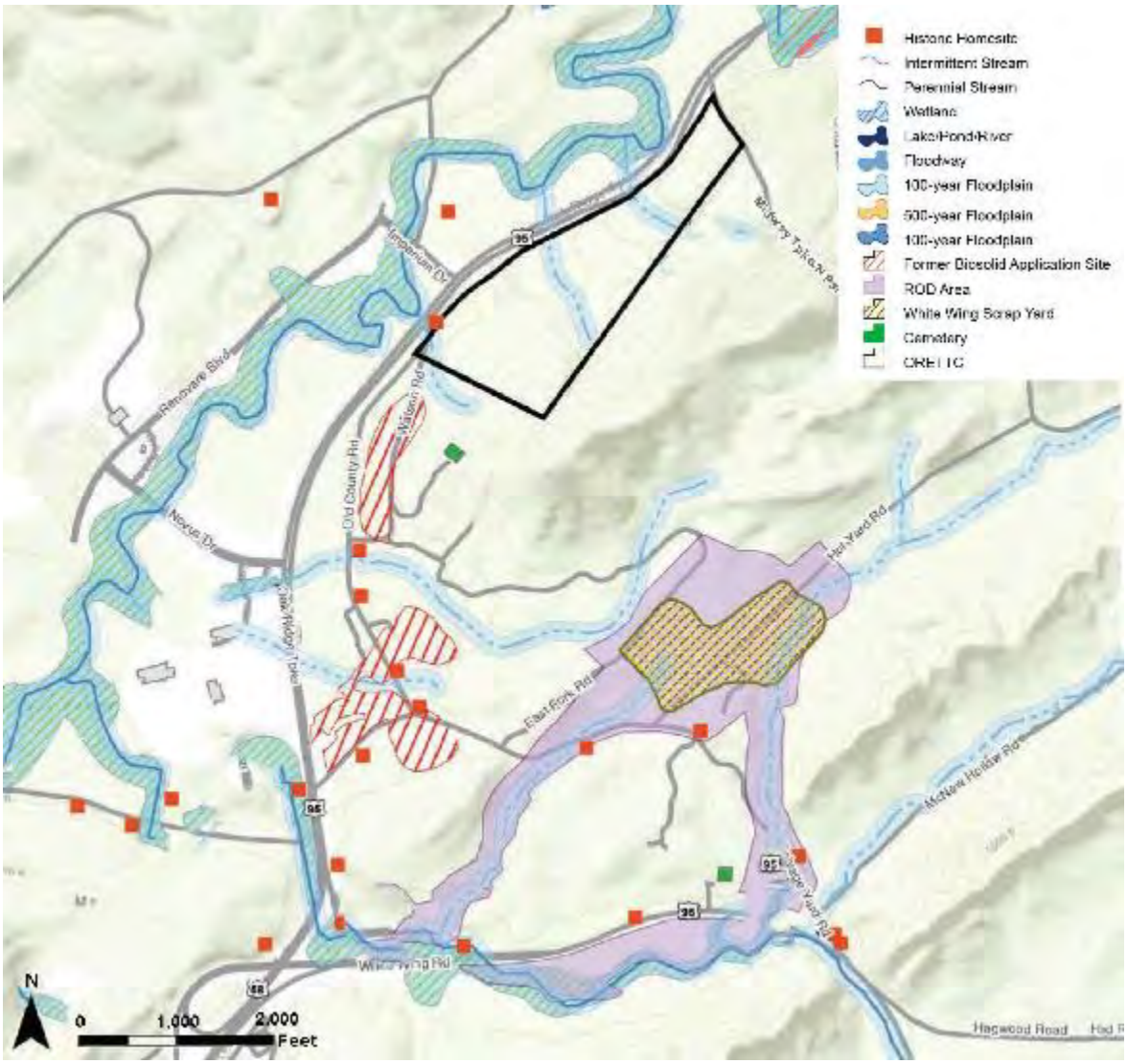
Although not included on the NRHP, an area known as the Wheat Community African Burial Grounds was dedicated and a memorial was erected in 2000 (DOE 2019).

Cultural Resources in the Proposed Area. The proposed ORETTC would be sited on previously undisturbed property located approximately 5 miles west of Y-12 adjacent to the Oak Ridge Turnpike/SR 95. The SSP-2 is thought to contain portions of five historical acquisition parcels and a number of identified historical dwellings. These sites are expected to be generally small remnants of the aforementioned pre-Manhattan Project-era homesteads. Only one, a historic homesite, is thought to be located on the ORETTC site. That historical dwelling is thought to be located in the southwest corner of the ORETTC proposed site, near the intersection of Old County Road and the Oak Ridge Turnpike in an area unlikely to be developed further in the near future (Figure 3-16) (CNS 2020a).

In addition, as shown on Figure 3-16, two cemeteries are located on the SSP-2, but are not located within the 81-acre ORETTC proposed site. The Smith/Gallaher Cemetery, also known as the Alexander Smith Cemetery, is approximately 1,000 ft. from the southwest border of the ORETTC site. It is fenced and contains at least 37 graves (CNS 2020a). The other cemetery is approximately one mile southwest of the ORETTC site. An archeological survey was conducted for the ORETTC site in July 2020. The preliminary results of that survey did not identify any cultural resources within the footprint of proposed ORETTC facilities and did not find any remains of the one homesite that was thought to be located in the southwest corner of the ORETTC proposed site[18]

[18] A closer ground examination undertaken during a June 2020 forest assessment survey was unable to recover any evidence of artifacts associated with the homesite or any associated outbuildings. Coordinates determined from the 1942 vintage USGS Bethel Valley, Tennessee topographic quadrangle map placed the foundation's position inside the SR95 right-of-way area (as determined from relocated concrete monuments) which was cleared during 2009-

(CNS 2020c). The Tennessee SHPO would be consulted regarding the recommendations outlined in the archeological survey for the proposed ORETTC.



Source: Modified from CNS 2020a.

Figure 3-16. Existing Cultural Resources on or Near the ORETTC Proposed Site

3.9.2 Proposed Action Impacts

Most of the construction-related activities and ground disturbance conducted for construction of the ORETTC and related utilities and facilities would occur on undisturbed lands. Construction activities would not disturb or affect the two cemeteries, neither of which are located within the 81-acre ORETTC proposed site. Best management practices would be utilized during construction

2010 highway widening. There also appears to have been a water main installed within the right-of-way at that time in proximity to the homesite (marker and valve located 116 feet from the homesite). Either or both of these actions appear to have obliterated the site, just outside the SSP-2A area (CNS 2020c).

to control drainage and erosion patterns, thereby limiting the potential for erosion impacts to archaeological resources in the vicinity. Unanticipated discoveries of archaeological materials during construction would be evaluated and, if needed, mitigated in accordance with the HPP.

Operational activities are not expected to have an impact on cultural resources because such activities would occur inside newly-constructed buildings, well away from historic homesites and the two cemeteries.

3.9.3 ETTP Alternative Impacts

Because much of the Powerhouse Area/S-50 on ETTP has been previously disturbed, cultural resources are not likely to exist. However, during construction, any unanticipated discoveries of cultural/archaeological materials would be evaluated and, if needed, mitigated in accordance with the HPP. Operational activities are not expected to have an impact on cultural resources.

3.9.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to cultural resources under this alternative.

3.10 Socioeconomic Resources and Environmental Justice

This section discusses the existing socioeconomic and environmental justice conditions within the ORETTC ROI and the impacts associated with the Proposed Action and No-Action Alternative.

3.10.1 Affected Environment

Socioeconomic Resources. Socioeconomics considers the attributes of human social and economic interactions associated with the proposed DOE actions to construct and operate the ORETTC and the impacts that such action may have on the ROI. The ROI is a four-county area in Tennessee comprised of Anderson, Knox, Loudon, and Roane counties where a majority of the ORR workforce resides. Figure 3-17 shows the location of the proposed ORETTC and surrounding counties. Socioeconomic areas of discussion include the regional and local economy, local demographics, local housing, and community services. Socioeconomic impacts may be defined as the environmental consequences of a proposed action in terms of potential demographic and economic changes.

From 2010 through 2019, the labor force in the ROI increased 5.5 percent to 330,508 persons. During the same time period, employment in the ROI increased by 11 percent to 320,374 persons, and the number of unemployed decreased by 54.3 percent, reflecting economic recovery after the recession of 2008–2010. Over that same period, the unemployment rate declined from 8.5 percent to 3.7 percent. Tennessee experienced similar trends in unemployment rates, decreasing from 9.7 percent to 3.4 percent in 2019 (BLS 2019). Table 3-11 presents the employment profile in the ROI and Tennessee for 2010 and 2019.

Roane County, where the proposed ORETTC would be located had a per capita personal income of $40,980 and ranked 24th in the state in 2018. In 2008, the per capita was $31,415. The 2018

per capita income reflected an increase of 4.4 percent from 2017 (BEA 2018a). The median income for households in Roane County was $50,003 in 2018 (USCB 2018a). Roane County had a total of 735 business establishments in 2018, with a combined annual payroll of approximately $291 million (USCB 2019).

Figure 3-17. Locaton of Proposed ORETTC and Region of Influence

Table 3-11. ROI Employment Profile

Area	Labor Force		Employed		Unemployed		Percent Unemployed	
	2010	2019	2010	2019	2010	2019	2010	2019
Anderson	34,926	34,949	31,675	33,708	3,251	1,241	9.3%	3.6%
Knox	229,800	246,227	212,757	239,090	17,043	7,137	7.4%	2.9%
Loudon	22,352	23,696	20,280	22,895	2,072	801	9.3%	3.4%
Roane	24,323	23,617	22,089	22,662	2,234	955	9.2%	4.0%
ROI	313,411	330,508	288,811	320,374	26,610	12,153	8.5%	3.7%
Tennessee	3,090,795	3,344,849	2,792,063	3,231,501	298,732	113,348	9.7%	3.4%

Source: BLS 2019.

Major employment sectors in the ROI and Tennessee are presented in Figure 3-18. In Roane County, professional, scientific, and technical services accounted for approximately 26.1 percent of the total employment in the county. Government and government enterprises accounted for approximately 15.6 percent followed by health care and social assistance with 8.7 percent of total employment (BEA 2018a). In Tennessee, government enterprises were the largest employer, accounting for approximately 11 percent of total employment, followed by health care and social assistance accounting for 10.5 percent and retail trade accounting for approximately 10.2 percent of total employment (BEA 2018b).

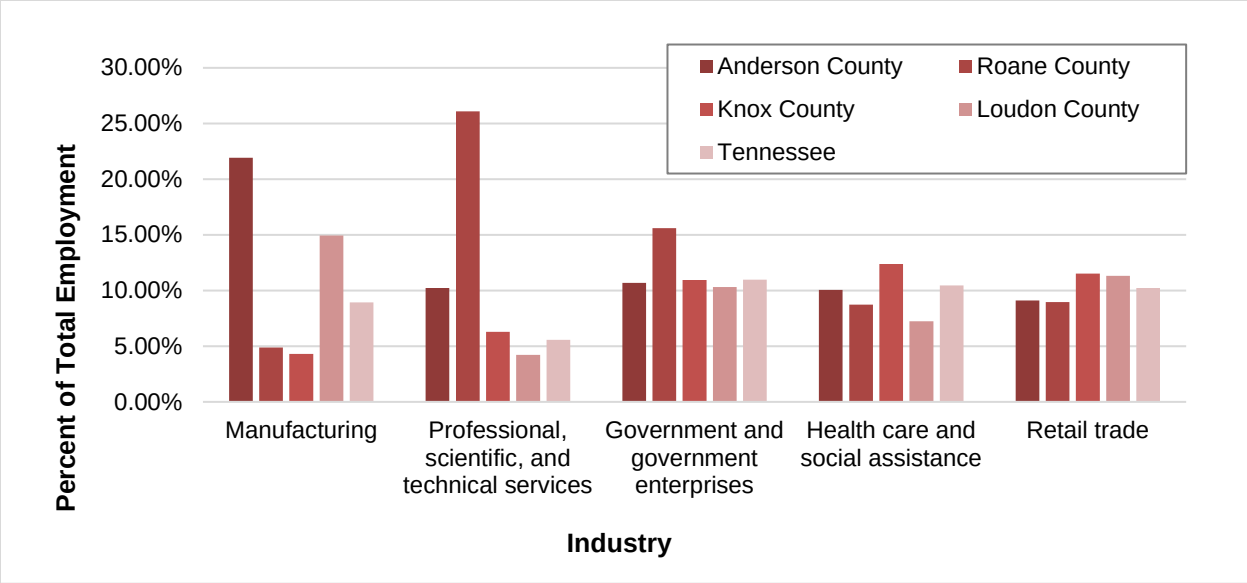


Figure 3-18. Major Employment Sector Distribution

In 2018, the population in the ROI was estimated to be 636,467 (USCB 2018b). From 2010 to 2018, the total population in the ROI increased 4.3 percent, which was lower than the growth rate in Tennessee (USCB 2018b). Between 2019 and 2030, the population of the ROI is projected to steadily increase. In 2030 the population in the ROI is projected to be 706,193 (Boyd Center 2019). Table 3-12 presents the historic and projected population of the ROI and Tennessee.

Table 3-12. County and State Historic and Projected Population

Area	2010	2015	2018	2020	2025	2030
Anderson	75,129	75,430	75,775	77,151	78,500	79,454
Knox	432,226	444,348	456,185	473,996	494,503	513,318
Loudon	48,556	50,229	51,610	54,454	57,606	60,311
Roane	54,181	53,162	52,897	53,285	53,386	53,111
ROI	610,092	623,169	636,467	658,886	683,995	706,193
Tennessee	6,346,105	6,499,615	6,651,089	6,886,369	7,153,758	7,393,069

Source: USCB 2010, 2015, 2018b, Boyd Center 2019.

As of 2018, the ROI had 254,979 housing units of which 10.7 percent were vacant. Of the estimated 30,656 vacant units, 5,749 were estimated to be vacant rental units, or two percent of the housing stock. A majority of vacant rental units are for seasonal, recreational, or occasional use (USCB 2018c). Temporary housing is available in the form of daily, weekly, and monthly rentals in motels, hotels, and campgrounds, and recreational vehicle parks. The demand for temporary housing in the Project area is generally greatest during the summer months when tourism is at its highest.

Community services within the ROI include public schools, hospitals, and public safety. There are seven school districts with 151 schools serving the ROI. The ROI has seven school districts

with a total of 151 schools serving a student population of 86,895 during the 2018-2019 school year (NCES 2020). There are eleven hospitals serving the ROI with the majority located in Knox County. There are 29 fire departments in the ROI made up of career and volunteer firefighters. County Sheriff's Offices provide police protection services in cooperation with municipal police departments, including the Oak Ridge Police Department, and the Tennessee Highway Patrol. In 2018, there were 1,361 total law enforcement employees including 563 officers and 798 civilians (FBI 2018).

Environmental Justice. Under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, federal agencies are responsible for identifying and addressing the possibility of disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands. Minority populations refer to persons of any race self-designated as Asian, Black, Native American, or Hispanic. Low-income populations refer to households with incomes below the federal poverty thresholds.

Environmental justice concerns the environmental impacts that proposed actions may have on minority and low-income populations, and whether such impacts are disproportionate to those on the population as a whole in the potentially affected area. The threshold used for identifying minority populations surrounding specific sites was developed consistent with CEQ guidance (CEQ 1997, Section 1-1) for identifying minority populations using either the 50 percent threshold or another percentage deemed "meaningfully greater" than the percentage of minority individuals in the general population. CEQ guidance does not provide a numerical definition of the term "meaningfully greater." CEQ guidance was supplemented using the *Community Guide to Environmental Justice and NEPA Methods* (EJ IWG 2019) and provides guidance using "meaningfully greater" analysis.

For this analysis, meaningfully greater is defined as 20 percentage points above the population percentage in the general population. The significance thresholds for environmental justice concerns were established at the county level. Areas are assumed to contain disproportionately high percentages of minority populations if the percentage of minority persons in the area significantly exceeds the county average or if the percentage of minority population exceeds 50 percent of the population. The lower threshold is used to identify areas with meaningfully greater minority populations surrounding the project area. Meaningfully greater low-income populations are identified using the same methodology described above for identification of minority populations. The area of concern for this analysis are the census tracts in the 4-county ROI (Anderson, Knox, Loudon and Roane counties). Table 3-13 presents the county thresholds used for the analysis.

Table 3-13. Thresholds for Identification of Minority and Low-Income Communities within the 4-County ROI (percentage)

County	Minority Population	Low-Income Population
Anderson	30.7%	41.6%
Knox	27.4%	39.0%
Loudon	32.0%	40.0%
Roane	27.1%	38.4%

The analysis used estimates from the U.S. Census Bureau's 2013-2018 American Community Survey 5-Year estimates ((https://data.census.gov/cedsci/) to identify minority and low-income populations for the census tracts within the 4-county ROI (USCB 2018b, 2018d). There are 151 census tracts in the 4-county ROI. Of the 151 census tracts, 27 exceed the thresholds for minority and/or low-income populations. Census tracts that exceed minority and/or low-income thresholds are predominantly located in the Knoxville area, approximately 28 miles from the proposed ORETTC. There are three census tracts immediately surrounding the proposed ORETTC (9801, 301, and 309). The proposed ORETTC is located in Census Tract 9801. None of these tracts exceed the thresholds for minority and/or low-income populations. Table 3-14 lists minority and low-income data for census tracts immediately surrounding the proposed ORETTC and for tracts that exceed county thresholds for minority and low-income populations in the 4-county ROI.

Table 3-14. Minority and Low-Income Populations, 2018

Area	% Minority	% Below Poverty
Census Tract 9801, Roane County, Tennessee[a]	0%	0%
Census Tract 301, Roane County, Tennessee[a]	17.5%	3%
Census Tract 202.01, Anderson County, Tennessee[a]	17.9%	4.1%
Census Tract 201, Anderson County, Tennessee	32.8%	21.8%
Census Tract 205, Anderson County, Tennessee	33.4%	28.2%
Census Tract 9.02, Knox County, Tennessee	16.3%	66.4%
Census Tract 69, Knox County, Tennessee	20.5%	65.6%
Census Tract 27, Knox County, Tennessee	23.0%	39.1%
Census Tract 31, Knox County, Tennessee	28.8%	19.2%
Census Tract 17, Knox County, Tennessee	29.2%	20.3%
Census Tract 9.01, Knox County, Tennessee	29.7%	-
Census Tract 38.01, Knox County, Tennessee	29.8%	27.5%
Census Tract 46.15, Knox County, Tennessee	30.0%	28.6%
Census Tract 39.01, Knox County, Tennessee	31.0%	18.8%
Census Tract 40, Knox County, Tennessee	31.1%	22.1%
Census Tract 24, Knox County, Tennessee	32.0%	37.9%
Census Tract 8, Knox County, Tennessee	32.5%	55.5%
Census Tract 30, Knox County, Tennessee	34.5%	22.2%
Census Tract 33, Knox County, Tennessee	36.2%	4.4%
Census Tract 29, Knox County, Tennessee	36.5%	52.3%
Census Tract 26, Knox County, Tennessee	43.7%	41.2%

Area	% Minority	% Below Poverty
Census Tract 14, Knox County, Tennessee	47.1%	63.4%
Census Tract 28, Knox County, Tennessee	59.8%	46.1%
Census Tract 32, Knox County, Tennessee	64.6%	30.4%
Census Tract 67, Knox County, Tennessee	65.7%	33.2%
Census Tract 70, Knox County, Tennessee	65.9%	47.3%
Census Tract 68, Knox County, Tennessee	70.3%	59.8%
Census Tract 21, Knox County, Tennessee	72.9%	36.6
Census Tract 19, Knox County, Tennessee	74.9%	38.6
Census Tract 20, Knox County, Tennessee	82.8%	43.9

Source: USCB 2018b, USCB 2018d.
Note: Gray shading identifies tracts that exceed minority and/or low-income thresholds.
[a] Census tract immediately surrounding the proposed ORETTC.
https://data.census.gov/cedsci/table?text=DP05&tid=ACSDP5Y2018.DP05&hidePreview=true&vintage=2018&layer=VT_2018_050_00_PY_D1&cid=DP05_0001E&g=0500000US47001.140000,47105.140000,47093.140000,47145.140000
https://data.census.gov/cedsci/table?q=S1701%3A%20POVERTY%20STATUS%20IN%20THE%20PAST%2012%20MONTHS&tid=ACSST5Y2018.S1701&hidePreview=true&vintage=2018&layer=VT_2018_050_00_PY_D1&cid=DP05_0001E&g=0500000US47145.140000,47001.140000,47093.140000,47105.140000

3.10.2 Proposed Action Impacts

Socioeconomic Resources. It is anticipated that construction of the ORETTC would take approximately 1.5 years. In terms of employment and income, NNSA estimated that there would be 75 peak workers with a total of 125 workers needed for construction (CNS 2020c). It is anticipated that some portion of construction materials would be purchased locally. Payroll and materials expenditures would have a positive impact on the local economies. Estimated direct construction jobs may result in additional indirect jobs providing increased local revenue. Most construction materials and temporary construction workers would most likely be drawn from the local community. As a result, permanent increases in population would not occur and housing and community services would not be permanently impacted. Because the peak construction workforce (75 persons) would be negligible compared to the projected population in the ROI, socioeconomic impacts during construction, although beneficial, are expected to be negligible. The increase in economic activity would be temporary and would subside when construction is completed.

Future operations would have a positive impact on regional economics. Operation of the ORETTC would require 20 permanent workers. In addition, operation of the ORETTC could bring in a daily average of 250 personnel to train at the new facility. While some of the personnel would be local personnel residing in the area, most would be non-local personnel traveling to the area for training. It is anticipated that non-local personnel would contribute to the local economy through the purchase of housing, food, gasoline, entertainment, and luxury items. The dollar amount would be dependent on the number of non-local personnel at any given time and the duration of the non-local personnel's residence in the ROI. In terms of other operational impacts:

- Population. Based on the estimated number of new direct jobs and the assumption that workers in the existing labor force in the ROI would fill all direct and indirect jobs, impacts to population would be negligible.

- Housing. Based on the estimated number of jobs and the assumption that workers in the existing labor force in the ROI would fill all direct and indirect jobs, there would be no need for additional housing. Localized impacts on tourism in the ROI could result due to a decrease in available accommodations from the influx of non-local personnel. Local personnel would not require temporary housing and, thus, would have neither adverse nor beneficial impacts on temporary housing. The influx of non-local personnel for training at the ORETTC could result in displacement of tourists or others from individual hotels or other temporary housing. However, if there was a need for temporary housing, the current market would be able to meet that need.

- Community Services. Based on the number of estimated jobs created and the assumption that all direct and indirect jobs would be filled by workers from the ROI existing labor force, no impact to public schools, law enforcement, or firefighting capabilities is anticipated.

Environmental Justice. Environmental impacts from most projects tend to be highly concentrated at the actual project site and tend to decrease as distance from the project site is increased. There are 27 census tracts that meet the definition of minority and/or low-income populations. None of the three census tracts immediately surrounding the ORETTC proposed site contained minority or low-income populations that exceeded the county threshold in Roane County. During construction and operation related activities, it is anticipated that environmental, health, and occupational safety impacts would be minimal, temporary, and confined to the ORETTC proposed site (*see* Section 3.11). Therefore, there would be no disproportionately high and adverse environmental or economic effects on minority or low-income populations.

3.10.3 ETTP Alternative Impacts

Although the ETTP Alternative site would require less land clearing activities than the proposed site, the overall construction workforce was estimated to be the same, as facility construction is the major factor in determining the peak workforce and duration of construction. Once operational, the workforce would be the same as at the proposed site. Consequently, the socioeconomic impacts and environmental justice impacts at ETTP would be the same as the Proposed Action.

3.10.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no socioeconomic or Environmental Justice impacts.

3.11 Health and Safety, Accidents, and Intentional Destructive Acts

3.11.1 Affected Environment

The proposed ORETTC would not utilize releasable quantities of radiological materials, nor any large quantities of hazardous materials. Consequently, no potential impacts related to health, safety, and accidents are expected to occur offsite. As a result, the discussion in this section focuses on onsite ORETTC workers and personnel who would attend training at the facilities. The potentially affected workforce at the ORETTC is estimated to be 20 personnel. In addition, a daily average of 250 personnel are assumed for training purposes. Thus, for purposes of this human health, safety, and accident analysis, a total of 270 personnel could be potentially affected by activities at the ORETTC.

3.11.2 Proposed Action Impacts

Human Health Impacts During Construction and Normal Operations. Potential impacts to workers were evaluated using Bureau of Labor Statistics (BLS) occupational injury/illness and fatality rates. NNSA values are historically lower than BLS values due to the increased focus on safety fostered by integrated safety management, and the voluntary protection program. The potential risk of occupational injuries/illnesses and fatalities to workers constructing the proposed ORETTC would be bounded by injury/illness and fatality rates for general industrial construction. Table 3-15 lists the potential estimates of injuries/illnesses and fatalities estimated for the peak year of construction and the total 18-month construction period. Over the full construction period, approximately one day of lost work from illness/injury and less than one fatality would be expected.

Table 3-15. Occupational Injury/Illness and Fatality Estimates for ORETTC Construction

Injury, Illness, and Fatality Categories	Results
Peak Construction	
Peak construction workforce (persons)	75
Lost days due to injury/illness	0.8
Number of fatalities	0.008
Total Construction (1.5 years)	
Total construction worker-years	125
Lost days due to injury/illness	1.2
Number of fatalities	0.01

Sources: CNS 2020c, BLS 2020.

Occupational impacts during operations would involve approximately 270 personnel. The potential risk of occupational injuries/illnesses and fatalities to workers during operations would be expected to be similar to the general injury and fatality rates for all industries. Table 3-16 presents the potential estimates of injuries/illnesses and fatalities for the average year of operations at the ORETTC. In an average year, 2.2 days of lost work from illness/injury and less than one fatality would be expected.

Table 3-16. Occupational Injury/Illness and Fatality Estimates for ORETTC Operations

Injury, Illness, and Fatality Categories	Results
Operational workforce (persons)	270
Lost days due to injury/illness	2.2
Number of fatalities	0.005

Sources: CNS 2020c, BLS 2020.

Accidents. A wide-range of activities would be conducted at the ORETTC, including classroom desktop training, virtual simulations, and live firefighting drills/training. These latter activities have the potential to cause impacts (injury and death) to instructors and students alike, as discussed below.

Firefighting Drills/Training. During the period from 2001 to 2013, the United States Fire Administration (USFA) reported that approximately 11 percent (141 out of 1,305) of the line-of-duty deaths were training-related. The leading cause of training-related deaths was heart attacks (50 percent) followed by traumatic injury (31 percent). The remaining 19 percent were other types of cardiovascular disease and other diverse circumstances. During 2001 to 2013, 77 training-related fatalities (approximately 6 per year) were investigated by the National Institute for Occupational Safety and Health (NIOSH) through the Fire Fighter Fatality Investigation and Prevention Program. Of these fatalities, 62 (80 percent) were cardiac-related and 11 (14 percent) were trauma-related. These investigations included 38 deaths due to physical fitness activities, 23 deaths due to apparatus/equipment drills, 10 deaths due to live-burn exercises, and 5 deaths due to other training associated circumstances. In 2018, there were an estimated 1,115,000 firefighters in the U.S. (career: 370,000; volunteer: 745,000), virtually all of whom participate in live firefighting training/drills. In 2018, nine firefighters died while participating in training activities. This equates to a fatality rate of 0.0008 percent (USFA 2019, USFA 2020). Applying that fatality rate to the average daily population (workers and trainees) that would be at the ORETTC (270 personnel), approximately 0.002 fatalities could be expected to occur annually at the ORETTC specifically from firefighting drills/training. Statistically, one death would be expected to occur for every 500 years of operation at the ORETTC.

To minimize the potential for injuries/deaths associated with training exercises, NNSA would consider implementing the following mitigation measures:

- Establish easy-to-understand, written standard operating procedures for all training activities and ensure they are implemented and enforced.
- Ensure that a sufficient number of qualified instructors are available to conduct the specific training and maintain optimal student-to-instructor ratios.
- Ensure that participants are screened to determine physical capacity and fitness to participate in the training.
- Designate a qualified individual to act as safety officer for all training activities.
- Ensure that all new training curricula undergo comprehensive safety review by management personnel prior to implementation.
- Ensure that the training environment and facilities are safe.
- Ensure that adequate time is allotted to safely carry out the training exercise.

- Ensure that all equipment, including personal protective equipment (PPE), is approved and in good working order.
- Provide pre-training safety briefings, including a facility walk-through, for all participants.
- Ensure that sufficient numbers of fire suppression apparatus and equipment are readily available for live-burn training evolutions.
- Monitor participants' physical stress and watch for signs of overexertion.
- Ensure training participants wear the appropriate PPE at all times.

Intentional Destructive Acts. NNSA is required to consider intentional destructive acts, such as sabotage and terrorism, in the NEPA documents it prepares. As at any location, the possibility exists for random acts of violence and vandalism. The risk of terrorist acts at the proposed ORETTC is considered minimal given that limited sealed sources and no notable quantities of hazardous materials would be used or stored at the facility. Firearms would not be stored or handled on site. It is also anticipated that security measures (e.g., gates and fences) typical of small industrial parks and other commercial developments would be implemented and serve as an impediment to assault by trucks or other vehicles. No act of sabotage or terrorism has occurred on DOE property at the nearby ETTP during some two decades of cleanup activity (DOE 2016b).

3.11.3 ETTP Alternative Impacts

The human health impacts are generally a function of the workforce requirements. For a facility with no radiological materials and no notable hazardous materials, potential impacts associated with accidents and intentional destructive acts are generally independent of the facility location. Consequently, the potential human health impacts at ETTP would be the same as the Proposed Action.

3.11.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to human health.

3.12 Waste Management

3.12.1 Affected Environment

As discussed in Section 3.2, the ORETTC proposed site is a greenfield site which has never had any hazardous substance stored on it for one year or more, has not been known to have any hazardous substance released/spilled on it, or been used to dispose of any hazardous substance. No wastes are currently generated on the site. Because the ORETTC would generate nonhazardous wastes and minimal quantities of hazardous waste (i.e., less than 100 pounds of hazardous waste associated with cleaning supplies and spent training materials would be generated annually), the discussion in this section is limited to the management of nonhazardous wastes.

The regulations for control of nonhazardous solid waste are also promulgated by TDEC and are found in TCA Chap. 0400-11-01, Solid Waste Processing and Disposal. They regulate all aspects of storage, collection, transportation, and disposal of solid waste, including the regulation of composting facilities. The nearest DOE landfills are the ORR Industrial Waste Landfill V and the

ORR Construction Landfill VII and the Y-12 Recycle Program on the ORR in Anderson County operated by UCOR, LLC and CNS, LLC, respectively. Landfill V started operating in 1994 and encompasses 25.9 acres, and Landfill VII started operating in 2001 and encompasses 30.4 acres. Annually, approximately 40,000 cubic yards of solid waste are disposed at the ORR landfills. The landfills V and VII each has a remaining life expectancy of approximately 2 million cubic yards. The following waste types are accepted at Landfill V: sanitary industrial waste (including office/cafeteria waste, equipment, construction/demolition debris). Landfill VII accepts construction/demolition debris (DOE 2017). The Y-12 Recycling Program compliantly recycles a wide variety of materials such as ballasts, batteries, circuit boards/electronic equipment, clean consumer plastics #1 and #2, corrugated cardboard, lamps, paper, toner cartridges, scrap metal, and wood/pallets (DOE 2019).

3.12.2 Proposed Action Impacts

The analysis focused on how and to what degree the Proposed Action would affect nonhazardous waste generation and management. The analysis focuses on whether implementation of the Proposed Action would result in the generation of nonhazardous waste types or quantities that could not be accommodated by the current management system or landfill. It is not anticipated that land clearing and grading activities would generate a need for disposal of soil or woody waste. This assumes that excavated soils would be used as fill during construction and woody wastes would be sent off for recycling by the wood or wood pulp or mulch industry or would be chipped and reused as mulch on-site. Therefore, these materials would not be expected to impact solid waste resources. Construction activities associated with the Proposed Action would result in the generation of minimal quantities of nonhazardous waste from construction of the facilities, in wood forms or concreted/asphalt rubble. These materials would be sent off for recycling if possible.

During operations, municipal solid waste— generally paper waste— would be generated. NNSA estimates that approximately 100 tons of nonhazardous solid waste would be generated annually. As discussed previously, the ORR Landfills in Anderson County receives approximately 40,000 cubic yards of solid waste for disposal each year. Based on the estimated quantity of nonhazardous solid waste associated with the Proposed Action, no adverse impacts are expected as sufficient landfill capacity exists to accommodate the additional nonhazardous solid waste generated from construction and operational and activities of the ORETTC.

As discussed previously, the Y-12 Recycling Program compliantly recycles a wide variety of materials and would be utilized to recycle the anticipated routinely generated paper, clean consumer plastics #1 and #2, corrugated cardboard, and toner cartridges as well as the occasionally generated materials such as ballasts, batteries, broken furniture, circuit boards/electronic equipment, glass, lamps, scrap metal, and wood/pallets.

Any hazardous waste associated with cleaning supplies and spent training materials would be disposed of at offsite licensed facilities.

3.12.3 ETTP Alternative Impacts

The waste management impacts at ETTP would be the same as the Proposed Action.

3.12.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to waste management.

3.13 Transportation

3.13.1 Affected Environment

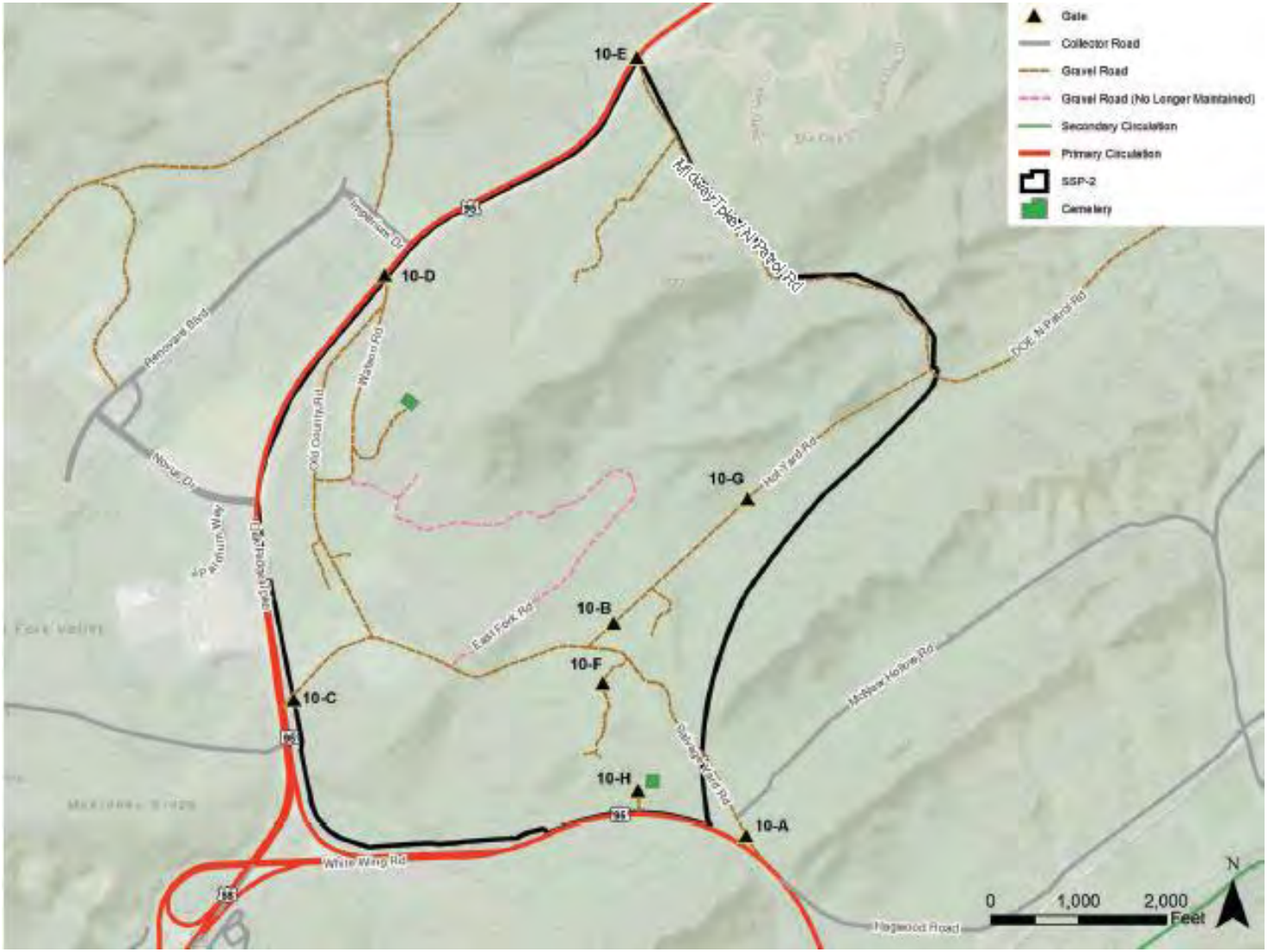
The City of Oak Ridge is framed by several principal interior roads, which include the Oak Ridge Turnpike (SR 95) located on the west side of the town. SR 9 runs along the east side of Oak Ridge while SR 61/62 cuts through the center of town. The downtown area is comprised mostly of major and minor collector roads with traffic speeds between 25 and 35 miles per hour (mph). As shown on Figure 3-19, the alternative sites are located near the interchange of SR 58 and SR 95. To the north and west of the site is the Oak Ridge Turnpike, a 4-lane divided highway with a speed limit of 55 mph. To the south is White Wing Road, a two-lane highway with a speed limit of 50 mph. On the eastern edge of the ORETTC proposed site is a narrow paved road, Midway Turnpike/North Patrol Road. The ORETTC proposed site is easily accessible from the City of Oak Ridge via the Oak Ridge Turnpike. The ETTP is readily accessible from the Oak Ridge Turnpike.

Average daily traffic counts for SR 95, SR 58, and Bear Creek Road are shown in Table 3-17. The data in that table shows that SR 95, SR 58, and Bear Creek Road have handled more traffic in the past than in 2017.

Table 3-17. Average Daily Traffic Counts of Area Roads

Year	SR 95	SR 85	Bear Creek Road
2017	5,066	11,806	398
2016	5,043	11,531	436
2015	5,496	11,016	432
2014	5,326	10,793	427
2013	5,451	10,373	509
2012	6,618	10,563	461
2011	6,388	11,437	570
2010	6,867	11,592	534
2009	5,810	11,289	518
2008	6,666	12,604	503

Source: CNS 2020a.



Source: CNS 2020a.

Figure 3-19. Transportation Network in the Vicinity of the Alternative Sites

The ORETTC proposed site includes a short section of Midway Turnpike/North Patrol Road on the northeast side of the site. This narrow paved road is accessed via Gate 10-E, a single-arm manual swing gate. In addition, a short portion of Old County Road and Gate 10-D are located on the southwest portion of the ORETTC site. Gate 10-D is a similar swing gate. Old County Road is among a number of gravel roads on the site that predate the Manhattan Project-era development of Oak Ridge (*see* Figure 3-20). Several single-arm swing gates prevent access. Most of these gravel roads are currently kept as fire roads; however, some of the roads reaching the higher elevations are no longer maintained. Should any of these roads be utilized for the ORETTC, they would need to be redeveloped. Due to location and topography, it is unlikely either of these roads would be used in the near future for the ORETTC. No other existing roads exist on the ORETTC proposed site.

Source: CNS 2020a.

Figure 3-20. Typical Gravel Road in Vicinity of the ORETTC Proposed Site

3.13.2 Proposed Action Impacts

Offsite Circulation. As depicted in Figure 3-19, the ORETTC would be located along the Oak Ridge Turnpike, a 4-lane divided highway with a speed limit of 55 mph. The SR 95-SR 58 interchange is located 1.5 miles west. A single access point is proposed for the ORETTC along Oak Ridge Turnpike/SR 95 (*see* Figure 3-21). The entrance (10-E) would be located

approximately 1,200 feet east of Imperium Drive at the next median cut. However, this location can only be accessed by northbound/eastbound traffic on the Oak Ridge Turnpike. The access point is located in close proximity to existing breaks in the divided highway as well as other roads (i.e., 10-E is near the residential access road to the northeast). For safety and traffic flow, it is recommended that access ways to the ORETTC be relocated to align with existing crossings to allow for traffic from both directions.

Source: CNS 2020a.

Figure 3-21. Diagram of Recommended Access Points Relative to Gate 10-E

The access road to the ORETTC would require a new left-turn lane in the existing median and right turn lane. The existing breaks in the median on Oak Ridge Turnpike are paved. For the ORETTC proposed site, Novus Drive or Imperium Drive may provide the most cost-effective entrance/egress points. Existing gravel roads could be improved and utilized should they align with site development. Culverts would be required where roads cross streams on the ORETTC proposed site. Driveway permits would be obtained from TDOT. Depending on the proposed construction of the new access road and the characteristics of SR 95, a traffic control plan may need to be included in the application.

Average daily traffic counts for SR 95, SR 58, and Bear Creek Road are shown in Table 3-17. The data in that table show that SR 95, SR 58, and Bear Creek Road have handled more traffic in the past than current traffic. This, along with the existing road condition, suggests that no significant modifications would be required to support the ORETTC construction and operation. During peak construction, the addition of 75 vehicles to daily traffic counts for SR 95 and SR 58 would result in a 0.6-1.5 percent increase in traffic counts. During operations, the addition of up to 270 vehicles on SR 95 and SR 58 would result in a 2.5-5.3 percent increase in traffic counts; overall traffic

counts would be well within historic traffic counts for those roads. Because of the high speed limit, a turn lane from the Oak Ridge Turnpike would be recommended into the ORETTC.

Onsite Circulation. As shown on Figure 2-2, with regard to onsite circulation, a primary road paralleling the Oak Ridge Turnpike would connect the facilities. The circulation plan would accommodate emergency and heavy vehicles. All proposed ORETTC roads are anticipated to allow for two-way traffic. The lanes would be 12-foot paved with curb and gutter. The primary road on the ORETTC site would parallel SR 95 and provide access to the facilities. Continuing west on the access road, a second road would travel south to the Live Burn Fire Tower and rubble pit. Emergency vehicles would be able to access these training facilities via a circular paved area wide enough to accommodate a ladder fire truck.

The access road from the Oak Ridge Turnpike would allow for direct access for construction. Onsite roads would allow emergency vehicles to access the Live Burn Fire Tower and rubble pit without driving through parking lots and passenger vehicle traffic. The ORETTC access road would have an electric roll gate, which could be left open during business hours and would accommodate two-way traffic.

Parking. Each building would have its own parking lot. The total parking area would total more than 63,000 square feet, allowing for approximately 300 vehicles. Parking areas would have no more than 20 contiguous parking spaces without an intervening landscape island. Eighty percent of all islands would have at least one tree planted (CNS 2020a).

Pedestrians. Due to the proximity of the primary facilities, sidewalks have been included in the plan to enhance walkability and synergy between facilities. A 100-foot riparian buffer along the stream between the facilities would also serve as green space. In addition, lawns and landscaping around each facility would establish a sense of place in line with the importance of the building. Green spaces should be preserved for staff and student gathering and quality of life.

3.13.3 ETTP Alternative Impacts

The ETTP Alternative site is located approximately three miles west of the ORETTC proposed site. The existing transportation network would be used to provide service to the ORETTC at ETTP and potential impacts would be the same as the Proposed Action.

3.13.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to transportation.

3.14 Site Infrastructure

3.14.1 Affected Environment

Site infrastructure includes those basic resources and services required to support the construction and operation of the ORETTC facilities. For the purposes of this EA, infrastructure is defined as

electricity, domestic water (potable and fire), natural gas, wastewater, stormwater, and communications.

The proposed ORETTC development site is a greenfield site with no known utility service. The following section outlines the availability of utilities and anticipated service size that would support the ORETTC. Projected utility usage is discussed in Section 3.14.2. Table 3-18 identifies the utility providers and type/size of infrastructure required at the ORETTC site.

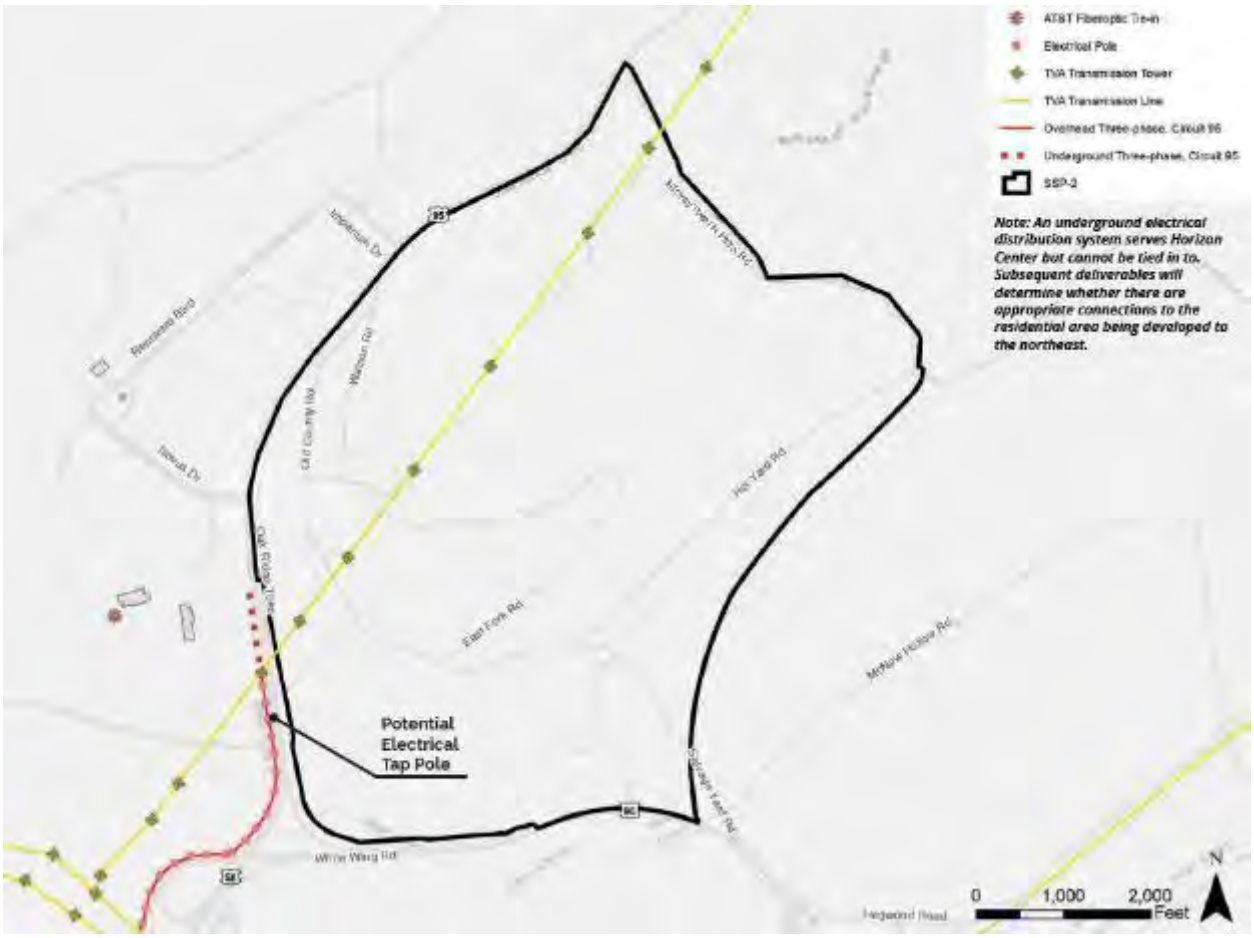
Table 3-18. ORETTC Infrastructure Requirements

Utility	Provider	Anticipated Service Size	Notes
Electrical	City of Oak Ridge	13.2 kV distribution line	1,000 kVA (capacity)
Water (Potable)	City of Oak Ridge	2-inch line	17,000 gpd (estimated usage)
Water (Fire)	City of Oak Ridge	8-inch lines (2)	6 hydrants with minimum of 1,000 gpm @ 20psi
Natural Gas	Oak Ridge Utility District (ORUD)	4-inch line	1,814,000 BTU (estimated usage campus-wide)
Wastewater	City of Oak Ridge	2-inch line	1,758 gph (estimated peak demand)
Communications	AT&T	Fiber Optic	speeds up to 100 Gbps

Notes: BTU = British thermal unit; Gbps = gigabits per second; gpd = gallons per day; gph = gallons per hour; gpm = gallons per minute; kV = kilovolt; kVA = kilovolt-ampere; psi = pound per square inch.
Source: CNS 2020a, DOE 2016b.

Electricity. The TVA generates electric power for the region. Most residences and businesses receive their power through distribution companies that purchase wholesale power from TVA. The City of Oak Ridge operates its own electric utility, providing electricity to about 15,000 metered customers. Peak system demand in the city is approximately 120 megavolt-amperes (MVA), while the system's base capacity is just over 200 MVA. There are overhead 13.2 kilovolt (kV) distribution lines owned by the City of Oak Ridge both southwest of the Horizon Center and northeast of the ORETTC site. The line to the southwest has more capacity than that to the northeast (CNS 2020a, DOE 2016b). The City of Oak Ridge would provide electricity to the ORETTC. The existing electrical and communications infrastructure is shown in Figure 3-22.

Communications. AT&T has underground fiber optic service to Horizon Center and an existing underground handhole of fiber optic located at the corner of the Oak Ridge Turnpike and Midway Turnpike/North Patrol Road (*see* Figure 3-23). Broadband service would be available ranging from 10 megabits per second to 100 gigabits per second. Fiber optic conductors would share the same trench with electric utility (CNS 2020a).



Source: CNS 2020a.

Figure 3-22. Existing Electrical and Communications Infrastructure

Water and Fire. Water supply for the Oak Ridge area is obtained from the Clinch River. DOE transferred ownership of its water treatment plant to the City of Oak Ridge effective May 1, 2000. This plant is located on Pine Ridge near the Y-12 Complex. The plant produces about 12 million gallons per day and has the capacity to produce up to 28 million gallons per day. A 16-inch ductile iron pipe water main runs along Oak Ridge Turnpike. South of Novus Drive, the water main reduces to 12- inch pipe. The main is located on the western edge of SSP-2 and can be tapped into to provide water for the site. From the SR 95/SR 58 interchange north to Novus Drive, the water main is on the west side of the road. After Novus Drive the 16-inch main crosses to the southeast side of Oak Ridge Turnpike, onto SSP-2 (CNS 2020a, DOE 2016b). The existing water infrastructure is shown in Figure 3-23.

Source: CNS 2020a.

Figure 3-23. Existing Water Infrastructure

Natural Gas. The Oak Ridge Utility District (ORUD) provides natural gas service. There are 4- and 8-inch lines that serve Horizon Center and the developing residential area to the northeast. ORUD would extend its 4-inch gas line at Imperium Drive and Oak Ridge Turnpike across the highway to serve the ORETTC. This would be the shortest distance to existing gas lines (CNS 2020a, DOE 2016b). The existing natural gas infrastructure is shown in Figure 3-24.

Source: CNS 2020a.

Figure 3-24. Existing Natural Gas Infrastructure

Source: CNS 2020a.

Figure 3-25. Existing Wastewater Infrastructure

Wastewater. Wastewater collection in the city is maintained by the City of Oak Ridge. There is a 12-inch polyvinyl chloride main sewer line running near the western edge of SSP-2, across Oak Ridge Turnpike and within Horizon Center. A grinder pump station can be purchased for each building, and a 2-inch sewer line can be run from the site to the pump station along Imperium Drive. The sewer line would need to run under Oak Ridge Turnpike/SR 95 in order to connect to the existing pump station (CNS 2020a). The existing wastewater infrastructure is shown in Figure 3-25.

Stormwater. Stormwater flow is all surface flow on the site. There are no manmade stormwater structures on site, although there are two intermittent streams, which flow north to East Fork Poplar Creek. A 100-foot buffer from either side of the streams would be maintained (CNS 2020a).

3.14.2 Proposed Action Impacts

Electricity. To service the ORETTC, a new overhead 13.2 kV distribution line would be installed and tied-in to an existing utility pole at the northeast corner of the Oak Ridge Turnpike and Southwood Lane. The overhead line would be approximately 2,872 feet in length and require 11 utility wood poles installed along the east side of Oak Ridge Turnpike. Electricity for the ORETTC

would go underground at the Oak Ridge Turnpike/Imperium Drive intersection to the proposed ORETTC facilities. The TVA electrical system has sufficient capacity for the proposed ORETTC, which is expected to use approximately 1,800,000 kilowatt-hours annually (CNS 2020c).

Site lighting would be provided on the exterior of each building, the parking lots, the Live Burn Fire Tower, and the rubble pit. Wall-mounted light fixtures would be installed on the exterior of the buildings. Light poles with pole-mounted light fixtures would be installed within the ORETTC to provide sufficient lighting in the exterior area.

Water and Fire. The ORETTC would require 1,100,000 gallons per year during construction. A 2-inch water line would be tapped at the water main on the eastern side of the northern access gate to service the ORETTC. Once operational, the water demand for the ORETTC would ultimately be determined by the number of water fixture units within each building as design progresses according to the 2018 International Plumbing Code. However, generally the system can be sized by looking at the wastewater demand flows. City of Oak Ridge Standard Construction Requirements regulates a flow of 25 gallons per day per person per 8-hour shift within institutional and office use buildings. The ORETTC would be manned during normal business hours by a staff of approximately 20 people and would have the capability to staff and operate if needed by a customer over a 24-hour period. On average, approximately 250 people would be trained at the ORETTC daily, and the annual demand of potable water is estimated to be approximately 2,362,500 gallons per year.

Fire protection at the ORETTC proposed site would be based around the City of Oak Ridge requirement that a minimum 6-inch line can provide 1,000 gallons per minute (gpm) at 20 pounds per square inch (psi). Sites in Horizon Center use hydrants for fire water supply, and hydrant tests indicate the water main is provides an average of 1,800 gpm at 20 psi (CNS 2020b).

Each building would require a minimum of two fire hydrants at opposing sides of the building, as per City of Oak Ridge Standards of Construction. The Live Burn Fire Tower would require two hydrants within 200 feet. City of Oak Ridge Standards of Construction require a fire department connection at each building as well. The maintenance building would utilize a fire hydrant from the ORETTC. The ERTF and SNRAF would each require approximately 850 gpm of sprinkler flow. An 8-inch line would be tapped at Imperium Drive to run to the Live Burn Fire Tower location, and an additional 8-inch line would be tapped on the eastern side of the northern access gate to serve as fire protection for the primary training buildings.

Natural Gas. Natural gas would be used for building heating. For planning purposes, the following assumptions were used: ERTF: 800,000 British thermal units (BTU); SNRAF: 800,000 BTU; maintenance building: 134,000 BTU; and Live Burn Fire Tower: 80,000 BTU. Approximately 1,920,000 cubic feet of natural gas would be required annually at the ORETTC. The ORUD has sufficient supply capacity to support the natural gas demands of the proposed ORETTC (CNS 2020c).

Wastewater. Wastewater collection would be serviced by the City of Oak Ridge. There is a 12-inch polyvinyl chloride force main sewer line running near the western edge of SSP-2, across Oak Ridge Turnpike and within Horizon Center. A grinder pump station could be purchased for each

building, and a 2-inch sewer line could be run from the site to the pump station along Imperium Drive. The sewer line would need to run under Oak Ridge Turnpike in order to connect to the existing pump station.

City of Oak Ridge Standard Construction Requirements specifies a wastewater demand of 25 gallons per day per employee per 8-hour shift. Using the same calculations used to determine water demand, the peak hour demand for wastewater at the site would be approximately 1,758 gallons per hour. Per City of Oak Ridge personnel, the existing pump station has adequate capacity to handle the peak flows of the ORETTC (CNS 2020b).

Stormwater. Any development or construction activities that disturb more than 1 acre would be required to comply with TDEC General NPDES Permit for Discharges of Stormwater Associated with Construction Activities. This includes the development and implementation of a SWPPP to help minimize any pollution that might leave the site by stormwater.

The Oak Ridge Stormwater Management Ordinance provides design requirements to follow for stormwater control. An area approximately equal to 5 percent of the total impervious surface area created for the ORETTC would need to be allocated for stormwater ponds, to be used for stormwater management. Stormwater ordinances within City of Oak Ridge require two separate types of stormwater management, runoff and rainfall mitigation. All stormwater runoff from developed areas on site must be managed. The site contains three historical drainage basins that could potentially need to be managed, with post-construction stormwater runoff being managed at pre-construction levels. The site additionally must manage the first inch of rainfall from any precipitation event preceded with 72 or more hours of no rainfall. The water may not be discharged to surface waters and must be 100 percent managed. The first inch of rainfall across the current planned development equates to a volume of 18,150 cubic feet of water that must be retained.

The City of Oak Ridge requires management of 1-, 2-, 5-, 10-, and 25-year Type II 24-hour storms. The allowable runoff rates are shown in Table 3-19. The two proposed ponds would contain enough volume to manage the stormwater runoff from the site and any firefighting water runoff (CNS 2020c).

Table 3-19. Acceptable Stormwater Runoff Discharge Rates

Return Period	Runoff Rate (cubic feet per second)
1-year	24.7
2-year	29.6
5-year	35.2
10-year	40.5
25-year	47.3

Source: CNS 2020a.

Live Burn Fire Tower. The Live Burn Fire Tower would utilize large volumes of water to conduct firefighting training at the ORETTC. According to the manufacturers of similar live burn buildings, average training operations with the burn building would likely utilize about 250,000 gallons of water per year for firefighting training. A common way of managing the runoff from the fire training facilities is through ponds.

Communications. Fiber optic service would share the same trench with electric utility to Horizon Center and an existing underground handhole located at the corner of the Oak Ridge Turnpike and Midway Turnpike/North Patrol Road. Available broadband service would adequately support the ORETTC requirements (CNS 2020b).

3.14.3 ETTP Alternative Impacts

The ETTP has an existing utility infrastructure with adequate capacity to support the ORETTC. Electricity would be purchased from the City of Oak Ridge, and natural gas would be purchased from the ORUD. Telecommunication services could be provided from the fiber-optic system that serves the ETTP. Existing water and sewer lines currently exist along SR 58. Minor upgrades and modifications would be needed and some existing utilities would need to be relocated.

3.14.4 No-Action Alternative Impacts

Under the No-Action Alternative, no new facilities would be constructed. There would be no impacts to infrastructure.

4 CUMULATIVE IMPACTS

This chapter presents an analysis of the potential cumulative impacts resulting from the Proposed Action evaluated in this EA. CEQ regulations at 40 CFR 1508.7 define cumulative impacts as "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

4.1 Evaluation of Past, Present, and Reasonably Foreseeable Future Actions

Construction of the ORETTC would occur over a 1.5 year period, from November 2020 until approximately early 2022. The ORETTC is expected to operate for 50 years. Consequently, cumulative impacts associated with operations could occur until approximately the year 2072. The cumulative analysis in this EA focuses on actions and impacts that could occur over the next 10 years (2020-2030), as forecasts beyond that time period become more speculative and less meaningful. Past operations, and continued operations of existing facilities within the ORETTC Project area are included in the affected environment section and thus, are already considered in this EA. Consequently, this cumulative analysis focuses on reasonably foreseeable actions.

NNSA identified three such actions: (1) construction and operation of the General Aviation Airport at the East Tennessee Technology Park; (2) construction and operation of a Drive Track at the DOE CTF, which is a separate training facility that would accommodate wet-driving conditions, and (3) the proposal to increase the allowable land uses in the Horizon Center (Parcel ED-1) to include hotels, a recreational vehicle park, a motorsports park, a vehicle test facility, residential development, and an amphitheater.

4.2 Potential Cumulative Impacts

Table 4-1 presents the cumulative impact analysis of the ORETTC (at either the proposed site or the ETTP), the General Aviation Airport, the Drive Track, and proposed land use changes to the Horizon Center Parcel ED-1.

Table 4-1. Potential Cumulative Impacts by Activity

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Land Resources	Approximately 24.1 acres could be disturbed during construction, which is less than one percent of land at ORR. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. Up to 24 acres would be transferred to the RCIDB for construction of the ERTF.	The amount of land disturbance during construction could be of similar magnitude as the disturbance at the proposed site. Once operational at the ETTP Alternative site, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road.	Approximately 132 acres of property needed for the development of the airport would be cleared and graded. There would not be any adverse land use compatibility impacts.	Just like the ORETTC site, the land use for the CTF, where the Drive Track would be sited, is classified as public use. Up to 3.5 acres could be disturbed, which is less than one percent of land at ORR. Drive Track operations would be consistent with current land uses in the area.	Potential development of an additional 58 acres. Potential land use impacts would remain within the scope of those analyzed under previous NEPA documentation. Allowing mixed use on Parcel ED-1 and/or improving connectivity between Development Areas 5, 6, and 7 would not result in adverse land use-related impacts. Parcel ED-1 is already zoned for industrial use. Allowing a mixed-use zoning would not result in adverse impacts to surrounding land uses and may prove beneficial from a potential reduction in industrial use over less intrusive types of land uses.
Visual Resources	No appreciable visual resource impacts are expected, as the ORETTC proposed site is largely wooded and would only be visible from traffic on the Oak Ridge Turnpike.	The ORETTC facilities would be visible from the Oak Ridge Turnpike, and would be in character with the mix of industrial use and open space at ETTP.	The visual character of the area would change from a mix of industrial use and open space with the development of the airport and associated roads.	Because of the location within the CTF, no notable visual impacts would be expected.	Parcel ED-1 is already planned for industrial/business park development; consequently, there would be no unexpected impacts to the visual character of the land.
Air Quality	Minor, short-term effects would be due to generating airborne dust and other pollutants during construction. The area is in attainment for all NAAQS and emissions from the Proposed Action would be below *de minimis* thresholds.	The maximum annual air emissions during construction could be reduced by approximately 33 percent compared to the Proposed Action if less land clearing is required. Operational emissions would be the same as the Proposed Action.	There would not be a substantial increase in air emissions and no adverse impacts would occur. Temporary particulate emissions during airport and road construction activities would be the greatest contributor.	Minor, short-term effects would be due to generating airborne dust and other pollutants during construction. The area is in attainment for all NAAQS.	Potential impacts from vehicle emissions associated with employees of businesses and visitors to the area would be intermittent and would not be associated with quantities that would result in non-attainment of NAAQS.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Noise	There are no sensitive noise receptors in the vicinity of the proposed site and there would be no notable noise sources associated with ORETTC construction and operation.	There are no sensitive noise receptors in the vicinity of the ETTP site and there would be no notable noise sources associated with ORETTC construction and operation.	Construction noise would generate localized temporary increases in noise levels at and near the construction site. The noise would be generated in an industrial area and should not exceed any thresholds that could result in adverse impacts. Aircraft noise levels would remain below 65 dB DNL at all noise- sensitive locations.	There are no sensitive noise receptors in the vicinity of the Drive Track and noise impacts would not be expected beyond the ORNL site boundary.	The largest potential noise contributor would be the proposed operation of a motorsports park. However, noise levels are not expected to conflict with surrounding land uses. Average background noise levels at nearby residential areas would be expected to be between 45 and 50 dBA. The highest noise level anticipated, based on modeling results, would be under 50 dBA for a 103 dBA noise level restriction 50 ft from the racetrack. While noise from racing events may be noticeable for nearby residential areas, the noise would not be expected to interfere with daily activities.
Water Resources	Construction of the ORETTC would not impact surface water or groundwater resources. No water quality impacts are expected from operations as stormwater and fire-training runoff water would be managed under NPDES permits, as required. Disturbance in the stream riparian buffers would be limited to approximately 0.70 acres. Approximately 0.05 acres of wetlands could be impacted.	Construction of the ORETTC would not impact surface water or groundwater resources. No water quality impacts are expected from operations as stormwater and fire-training runoff water would be managed under NPDES permits, as required. At ETTP, there could be wetland and floodplain impacts depending upon the specific location of the ORETTC and the facility layout.	Construction activities for the airport would directly and indirectly impact five streams and approximately 6 acres of wetlands. Three streams and approximately 1.41 acres of wetlands could be impacted.	Surveys of the proposed site would be performed to identify any surface water resources and support evaluations of impacts to water resources. At least a portion of the Drive Track would be sprinklered to accommodate training in wet driving conditions. At this time, there is not enough known about the Drive Track to estimate water usage. Runoff from a 130,000-foot Drive Track would need to be collected and either reused or held and released at a rate not to exceed the pre-development runoff rate.	Impacts associated with development activities (e.g., ground disturbance) would be within the scope of those identified in previous NEPA documentation. Surface water resources on and near Development Areas 5, 6, and 7 could be affected by the alteration of local hydrology, soil erosion, runoff, and sedimentation during construction activities, and contaminated stormwater runoff from operations. Prior to construction, an Erosion and Stormwater Management Plan (per guidance from the City of Oak Ridge's Zoning Ordinance) for the proposed action would be required.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Geology and Soils	Construction activities would cause some minor impacts to the existing geologic and soil conditions; however, no viable geologic or soil resources would be lost as a result of construction activities. Excavated soils would be used to improve storm water drainage on site.	Constructing and operating the ORETTC at ETTP would have similar impacts to geology and soils as the Proposed Action.	Adverse impacts on site geology are not expected. Affected soils are generally stable and acceptable for standard construction requirements. Erosion prevention and sedimentation control measures would be implemented to minimize the potential for soil erosion.	Minor, temporary soil disturbance during construction; however, no viable geologic or soil resources are expected to be lost as a result of construction activities, although pre-construction surveys would confirm this conclusion.	Potential impacts associated with development activities (e.g., ground disturbance, erosion, etc.) are within the scope of analysis conducted in previous NEPA documentation, and would not be significant.
Biological Resources	Construction of ORETTC would have minor short- and long-term adverse effects on biological resources. Potential impacts on biological resources include loss of habitat and wildlife disturbance. Given the small land disturbance, the ORETTC would not reduce the distribution or viability of species or habitats of concern.	There are no notable vegetation and habitats in the potentially affected area. No rare, threatened, and endangered plant and animal species are known to occur at the ETTP site, and adverse impacts to biological resources are not expected.	Vegetation and habitats in affected areas would be permanently changed to an urban/industrial cover type. Some wildlife would be destroyed and displaced from the airport development. No state or federally listed threatened and endangered species have been identified as occurring in the project area. The potential for wildlife-aircraft strikes could be minimized with the implementation of a wildlife hazard management plan.	Potential impacts on biological resources include loss of habitat and wildlife disturbance. Given the small land disturbance, the ORETTC would not be expected to reduce the distribution or viability of species or habitats of concern. Biological surveys would be conducted, as appropriate, to identify any biological resources and support evaluations of impacts to biological resources.	Impacts to terrestrial ecosystems would include: (1) temporary and permanent disturbance, degradation, and/or loss of habitat from land-clearing activities; (2) habitat fragmentation; (3) disturbance or displacement of wildlife due to an increase in noise and human activity associated with construction; (4) potential collisions between wildlife and motor vehicles during construction; and (5) increased noise impacts from the proposed Motorsports Park/Vehicle Test Facility. Because no USFWS federally listed species or designated critical habitats occur within the proposed action area, no impacts to federally listed species would result from implementation of the proposed action.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Cultural Resources	Construction-related activities and ground disturbance would be small and no cemeteries or known prehistoric sites would be affected. No historic properties eligible or potentially eligible for listing in the NRHP would be affected.	Because much of the Powerhouse Area/S-50 on ETTP has been previously disturbed, cultural resources are not likely to exist. Operational activities are not expected to have an impact on cultural resources.	No cemeteries or known prehistoric sites would be affected. No historic properties eligible or potentially eligible for listing in the NRHP would be affected. Four sites considered to be contributing properties to the potentially NRHP-eligible Wheat Community Historic District could be adversely affected from airport construction. No direct impacts on the proposed K-25 building footprint facilities stipulated as part of the final MOA or adverse impact on the creation of the Manhattan Project National Historic Park.	Construction-related activities and ground disturbance would be small. Cultural resource surveys would be conducted, as appropriate, to identify any cultural resources and support evaluations of impacts to cultural resources.	There are no archaeological sites or historic resources that would be affected by development activities.
Socioeconomics	Because the peak construction workforce (75 persons) and operational/training workforce (270 persons) would be negligible compared to the projected population in the ROI, socioeconomic impacts, although beneficial, are expected to be negligible.	Impacts would be the same as the Proposed Action.	Minor positive employment and income impacts are possible. There would be no impact on population. Positive fiscal impacts include revenue from property and sales taxes.	The peak construction workforce and operational workforce would be less than ORETTC, and negligible compared to the projected population in the ROI. As such, socioeconomic impacts, although beneficial, are expected to be negligible.	Potential impacts associated with proposed development activities and operations are within the scope of analysis conducted in previous NEPA documentation. Socioeconomic impacts identified under previous NEPA documentation were beneficial and associated with job creation associated with development, as well as spending and job creation associated with new businesses entering the park.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Environmental Justice	No environmental justice populations were identified within the census tracts where ORETTC would be located. During construction and operation, no disproportionately high and adverse environmental or economic effects on minority or low-income populations are expected.	Impacts would be the same as the Proposed Action.	No disproportionate adverse health or environmental impacts would occur to any low-income or minority population	No environmental justice populations are expected within the census tracts where the Drive Track would be located. During construction and operation, no disproportionately high and adverse environmental or economic effects on minority or low-income populations are expected.	As discussed in the 1996 and 2003 NEPA documents, there would be no environmental justice impacts associated with industrial development and use of Parcel ED-1; this would hold true as well for a mixed-use land use.
Human Health	No offsite impacts are expected. During ORETTC construction and operation, 1-2 days of lost work from illness/injury and less than one fatality would be expected. There would be no radiological or hazardous chemical human health impacts associated with ORETTC operations.	Impacts would be the same as the Proposed Action.	No impacts expected other than normal safety concerns associated with construction and aircraft operations.	No offsite impacts are expected. There would be no radiological or hazardous chemical human health impacts associated with Drive Track operations.	Patrons participating in inherently risky activities such as operating vehicles at high speed on a racetrack would be expected to be notified of the risks by the operator and would be expected to participate at their own risk via waiver or other such participatory agreement. No otherwise unique health and/or safety risks would be anticipated.
Facility Accidents	Approximately 0.002 fatalities could be expected to occur annually at the ORETTC specifically from accidents related to firefighting drills/training. Statistically, one death would be expected to occur for every 500 years of operation at the ORETTC.	Impacts would be the same as the Proposed Action.	Based on statistical analysis and the estimated number of aircraft operations, there could be a non-fatal aircraft accident occurring once every 5 months, with a fatal accident occurring once every 2 years. A wildlife strike could occur approximately once every 2.9 years, with a damaging strike occurring once every 10.1 years.	Drive Track operations are inherently dangerous and trainees could be adversely impacted by accidents. No offsite impacts would occur.	Patrons participating in inherently risky activities such as operating vehicles at high speed on a racetrack would be expected to be notified of the risks by the operator and would be expected to participate at their own risk via waiver or other such participatory agreement. No otherwise unique health and/or safety risks would be anticipated.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Intentional Destructive Acts	The likelihood of sabotage and terrorism is extremely low. However, it is possible but highly unlikely that random acts of vandalism could occur. A variety of measures to control access and maintain security would be used.	Impacts would be the same as the Proposed Action.	The likelihood of sabotage and terrorism is extremely low. However, it is possible but highly unlikely that random acts of vandalism could occur. A variety of measures to control access and maintain security would be used.	The likelihood of sabotage and terrorism is extremely low. However, it is possible but highly unlikely that random acts of vandalism could occur. A variety of measures to control access and maintain security would be used.	Because Parcel ED-1 is essentially public property and has no DOE-related facilities, the risk of terrorist acts is minimal. It is also anticipated that security measures (e.g., gates and fences) typical of small industrial parks and other commercial developments would be implemented and serve as an impediment to assault by trucks or other vehicles.
Waste Management	Solid non-hazardous waste would be recycled or transported to an appropriate ORR landfill for disposal. Less than 100 pounds of hazardous waste associated with cleaning supplies and spent training materials would be generated annually, which is less than 0.01 percent of the hazardous waste generate at ORR.	Impacts would be the same as the Proposed Action.	Solid non-hazardous waste would be recycled or transported to an appropriate ORR landfill for disposal. Minor quantities of hazardous waste may be generated from airport operations. These wastes would be transported to existing licensed and/or permitted treatment, storage, and disposal facilities.	Solid non-hazardous waste would be recycled or transported to an appropriate ORR landfill for disposal. No hazardous waste would be generated from operations.	Hazardous material such as petroleum, oils, and lubricants (POLs) would be utilized during both development activities and facility operations. Wastes associated with industrial and mixed-use activities would generally be associated with disposal of POLs (which are not generally considered hazardous wastes in Tennessee), paint-related wastes, and municipal solid wastes. Overall, potential impacts associated with development activities and operations are within the scope of analysis conducted in previous NEPA documentation.

Resource Area	ORETTC (at Proposed Site)	ORETTC (at ETTP Site)	General Aviation Airport	Drive Track	Parcel ED-1
Transportation	Temporary increases in traffic associated with construction activities would not be notably different when compared to existing activities in the ROI.	Impacts would be the same as the Proposed Action.	The existing Haul Road and Blair Road would be impacted, but re-route options could improve existing conditions on the affected roadways.	Temporary increases in traffic associated with construction activities would not be notably different compared to existing activities in the ROI.	Impacts and associated mitigations/management requirements would be similar to those analyzed previously, with potential benefits associated with minimization of large trucks associated with industrial activities entering/leaving the area. It is also likely that there would be improved traffic management with implementation of traffic control mechanisms such as traffic lights and turn lanes.
Infrastructure	Construction of the ORETTC would have minimal impacts on infrastructure capacity. The capacity of the existing infrastructure in the region would be adequate to support the ORETTC.	Construction of the ORETTC would have minimal impacts on infrastructure capacity. The capacity of the existing infrastructure in the region would be adequate to support the ORETTC.	Existing utilities have adequate capacity to support the proposed airport, but minor upgrades and modifications would be needed and some existing utilities may need to be relocated.	Construction of the Drive Track would have minimal impacts on infrastructure capacity. The capacity of the existing infrastructure in the region would be adequate to support the Drive Track (CNS 2020a).	Since 1996, there have been significant improvements in Parcel ED-1 infrastructure, as described in the 2013 Mitigation Action Plan. Continued development and utilization of infrastructure at Parcel ED-1 under the proposed action and Alternative 1 would be similar in scope to that analyzed in previous NEPA documentation. Design and construction of stormwater systems would be conducted in accordance with state and local requirements for proper management of stormwater.

Source: CNS 2020c, DOE 2016b, DOE 2020b.

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APPENDIX A

USFWS Consultation

ORNL/TM-2020/1743

Sensitive Resources Assessment and Forest Analysis for the SSP-2A Parcel and Proposed Oak Ridge Enhanced Technology and Training Center (ORETTC), Oak Ridge, Tennessee

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September 2020

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

ORNL/TM-2020/1743

Natural Resources Management Program

SENSITIVE RESOURCES ASSESSMENT AND FOREST ANALYSIS FOR THE SSP-2A PARCEL AND PROPOSED OAK RIDGE ENHANCED TECHNOLOGY AND TRAINING CENTER (ORETTC), OAK RIDGE, TENNESSEE

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Prepared for
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for the
US DEPARTMENT OF ENERGY
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CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

ACOE	United States Army Corps of Engineers
BCC	U.S. Fish and Wildlife Service Bird of Conservation Concern
BMC	U.S. Fish and Wildlife Service Bird of Management Concern
CFR	Code of Federal Regulations
DOE	US Department of Energy
EAB	emerald ash borer
ECBI	Eastern Band of Cherokee Indians
EO	Executive Order
ERTF	Emergency Response Training Facility
ESA	Endangered Species Act
ETTP	East Tennessee Technology Park
ETW	Exceptional Tennessee Waters
FIS	Fire Intensity Scale
GA	General Agreement
HD	Hydrologic Determination
NERP	National Environmental Research Park
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NRMP	Natural Resources Management Program
ORETTC	Oak Ridge Enhanced Technology and Training Center
ORNERP	Oak Ridge National Environmental Research Park
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
ORWMA	Oak Ridge Wildlife Management Area
PIF	Partners in Flight
SNRAF	Simulated Nuclear and Radiological Activities Facility
SNS	Spallation Neutron Source
SWRA	Southern Wildfire Risk Assessment
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
TRAM	Tennessee Rapid Assessment Method
TVA	Tennessee Valley Authority
VES	visual encounter survey
TWRA	Tennessee Wildlife Resources Agency
USC	United States Code
USFWS	US Fish and Wildlife Service
WWC	Wet Weather Conveyance
Y-12	Y-12 National Security Complex

1. INTRODUCTION

1.1 OVERVIEW AND GOALS

This report summarizes current knowledge of natural and cultural resources associated with potential land use changes within an 81-acre (32.8-hectare) parcel, termed SSP-2A, on the US Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee (Figure 1). A primary goal for the work presented here was to evaluate potential impacts to sensitive resources within the SSP-2A parcel that might result from land disturbance and construction of the Oak Ridge Enhanced Technology and Training Center (ORETTC). In addition to on-the-ground surveys of the ORETTC footprint and SSP-2A parcel during summer 2020 (Figure 1), this report leverages historical (pre-1995) and contemporary (1995–present) data from additional sources such as the Tennessee Department of Environment and Conservation (TDEC). The individuals who obtained and compiled the data that are presented here are familiar with and routinely assess, manage, and research sensitive resources on the ORR. This report should facilitate more environmentally sound decisions during planning and development of the ORETTC, provide a foundation for further assessment of sensitive and cultural resources associated with the broader SSP-2A parcel (should additional actions take place), and help project managers address regulatory guidance and DOE policy on sustainable development. Those who reference this report must consider that the timing of surveys does not permit complete delineation of resources. Data deficiencies are indicated where possible. Additional surveys may be required to account for seasonal patterns of various threatened and endangered species (e.g., bats), and additional assessment will be required if activities extend beyond the ORETTC site (Figure 2).

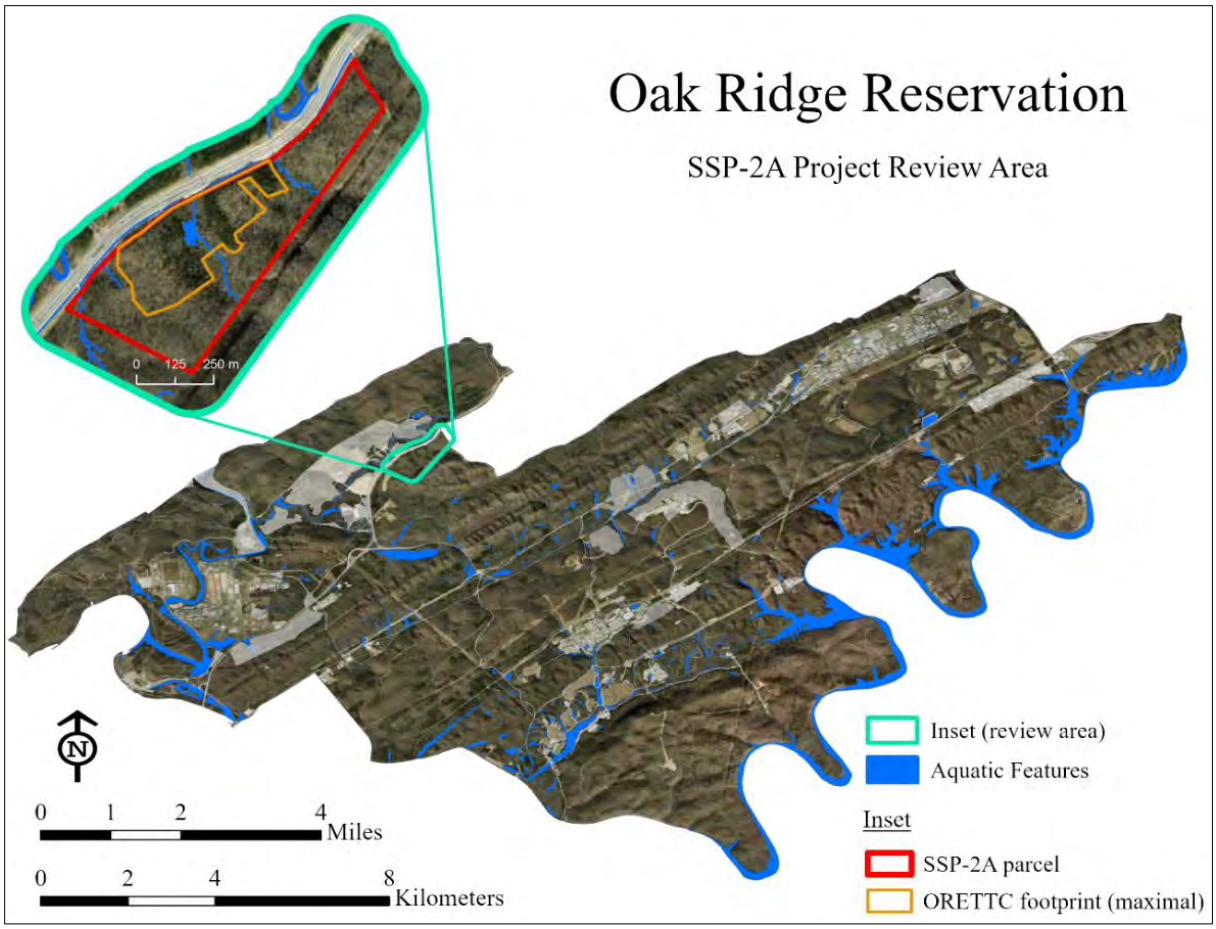

Figure 1. Review areas on the DOE Oak Ridge Reservation.

1.2 OAK RIDGE ENHANCED TECHNOLOGY AND TRAINING CENTER

The DOE National Nuclear Security Administration (NNSA) has the primary responsibility to promote the safety, security, and effectiveness of the US nuclear weapons stockpile. The administration works to reduce the global danger from weapons of mass destruction and responds to nuclear and radiological emergencies globally. NNSA oversees the National Security Enterprise, made up of six production sites and three laboratories across the country. The Y-12 National Security Complex is a critical production site, spanning 811 acres (329 ha).

NNSA has a need for highly specialized industrial training facilities and equipment with national-level emergency response experts, who will train first responders and other experts in nuclear operations, safeguards, and emergency response to support the National Security Enterprise. Currently, such training occurs at Y-12, at sites across the National Security Enterprise, and at non-NNSA facilities around the country. The absence of a centralized training facility reduces the effectiveness and efficiency of training. To reduce these limitations, NNSA proposed a new facility, the Oak Ridge Enhanced Technology and Training Center (ORETTC). The ORETTC would be a state-of-the-art training center that contains highly specialized industrial training facilities and equipment (Figure 2).

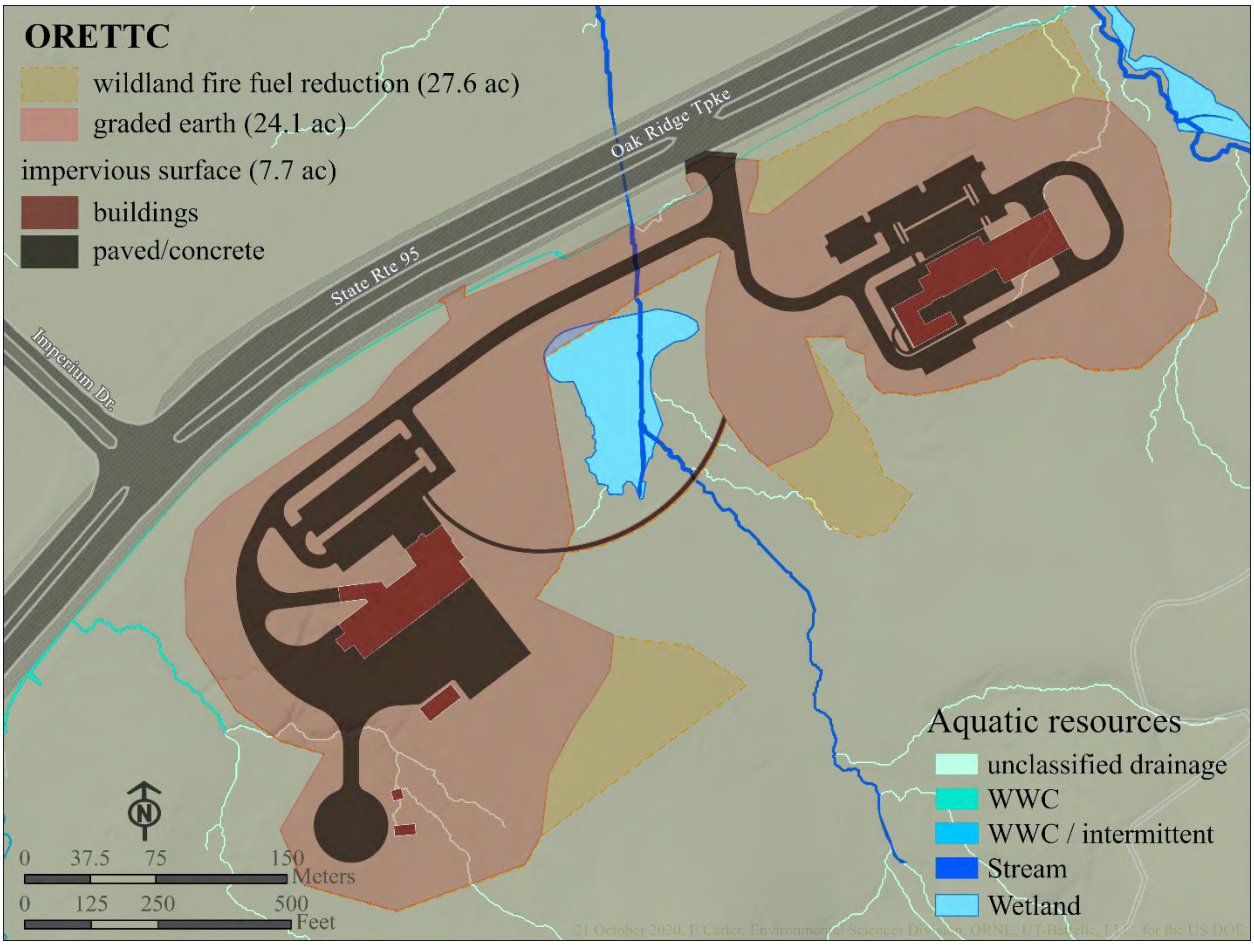

Figure 2. Oak Ridge Enhanced Technology and Training Center (ORETTC) facility conceptual design and proximate affected area(s).

The ORETTC would be located within a portion of an 81-acre (32.8-ha) parcel on the DOE ORR. The ORETTC would consist of (1) a Simulated Nuclear and Radiological Activities Facility (SNRAF) and Technical Rescue Training Area, with a Live Burn Fire Tower and Rubble Pit to be developed by NNSA; (2) an Emergency Response Training Facility (ERTF), which would be funded by the state of Tennessee and developed by the Roane County Industrial Development Board; (3) a maintenance building; and (4) utilities, roads, detention ponds, and supporting infrastructure. The primary ORETTC conceptual design includes 24.1 acres (9.8 ha) of graded earth that includes approximately 7.7 acres (3.1 ha) of impervious surfaces (Figures 2–3). Additional forest thinning—as required for wildland fire fuel reduction—will yield a maximum affected area (in terms of direct impact) equal to 27.6 acres (11.2 ha). The ORETTC would affect forested natural areas of the DOE ORR and Oak Ridge National Environmental Research Park (ORNERP) (Figures 2–3). Total manicured area and human influence into natural areas beyond the facility are not well-defined at this time; although, grading plans include 24.1 acres (9.8 ha) of disturbed earth to maintain a campus environment.

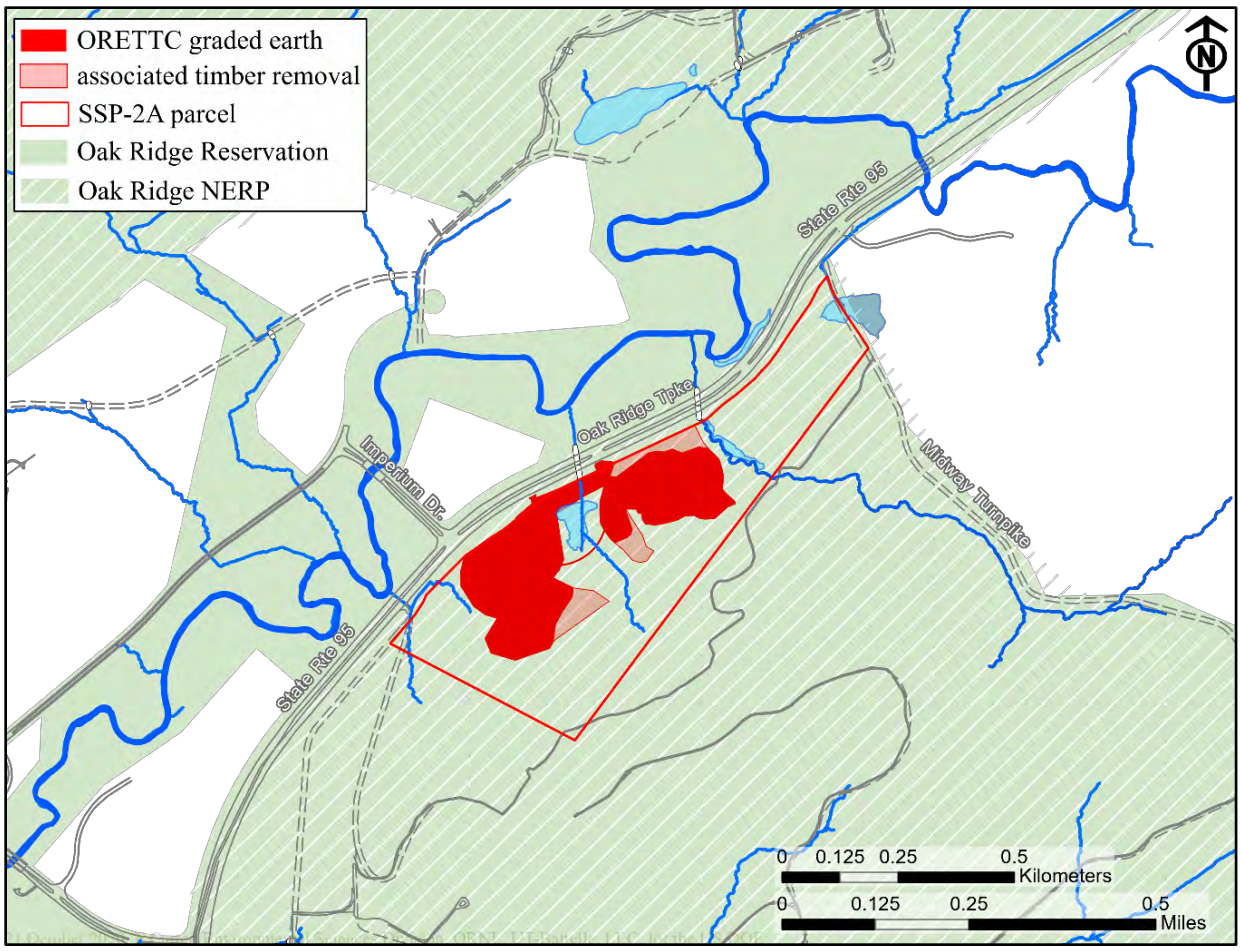

Figure 3. Location of the review areas, including ORETTC-associated timber removal, relative to major DOE boundaries. Total forest area impacted by the ORETTC project would comprise approximately 27.6 acres (11.2 ha). This would include ~3.5 acres (~1.4 ha) of additional forest thinning beyond the 24.1 acres (9.8 ha) of graded earth proposed in grading plans for the facility.

1.3 THE OAK RIDGE RESERVATION

The ORR is a 32,866-acre (13,301-ha) tract of DOE-owned land in Anderson and Roane counties in eastern Tennessee. The land on the ORR is used for multiple purposes to support DOE's mission goals and objectives. These include developed sites to support safety, security, and emergency planning; research, development, and education in energy sciences; environmental cleanup and remediation; environmental regulatory monitoring; protection of cultural and historic resources; and natural resources preservation. In addition to diverse and complex natural features that have provided a critical foundation to support DOE's environmental research mission, the ORR currently contains three facilities tied to primary DOE missions: NNSA's Y-12 National Security Complex, Oak Ridge National Laboratory (ORNL), and the East Tennessee Technology Park (ETTP).

The land that now makes up the ORR was originally acquired by the US government as a security buffer for military activities in 1941–1942. At that time, 49% of the area was composed of forest. Designation of 20,000 acres (8094 ha) of the ORR by DOE in 1980 as the ORNERP signified DOE's commitment to environmental stewardship (Figure 4). On 30 November 1984, the ORR was designated a state Wildlife Management Area [Oak Ridge WMA (ORWMA)] through a series of cooperative agreements between DOE and the Tennessee Wildlife Resources Agency (TWRA). Subsequent designation of the ORR as an

International Biosphere Reserve in 1989 marked the ORR as an important natural feature from local to international scales (Dale and Parr 1998). By 1994, ~20% of the ORR was largely transitional natural area, and ~70% was forested (Washington-Allen et al. 1995). The ~43% increase in forest cover since 1942 included many blocks of interior forest (oak-hickory, pine-hardwood, or pine) that exceeded 100 acres (40 ha) in contiguously forested area (Figure 4) (Parr and Hughes 2006).

At the western edge of the Ridge and Valley as it transitions to the Interior Plateau, the ORR contains a variety of freshwater aquatic features (palustrine wetland and riverine environments) that span seven geologic units from Ordovician to Cambrian age (Weary and Doctor 2014, Carter et al. 2020a). The highly heterogeneous landscape supports a greater number of fish and wildlife species by area than the proximate Great Smoky Mountains (Mann et al. 1996). The ORR's contiguous natural areas also offer a reprieve for migrating wildlife and game species in an otherwise challenging eastern Tennessee landscape (Carter et al. 2020a, Kwarta et al. in prep), which highlights its importance to natural and economic processes well beyond its borders. As of 2020, the value of this biodiversity center has only increased as land use changes continue to fragment eastern Tennessee (Belote et al. 2016, McKinley et al. 2019) and the ORR itself (Figure 4).

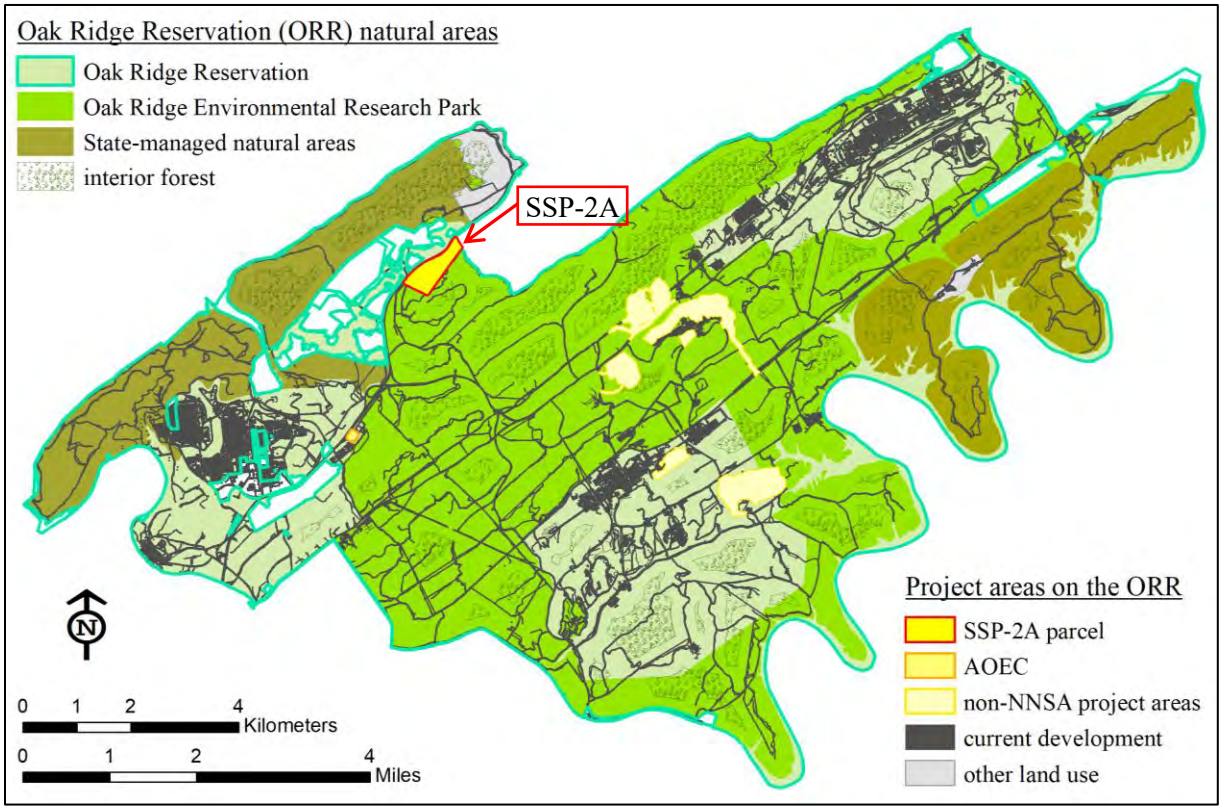

Figure 4. Boundaries and project development areas on the Oak Ridge Reservation and Oak Ridge National Environmental Research Park.

2. BASIS FOR SENSITIVE RESOURCES ASSESSMENT

While activities on the ORR are influenced by national priorities in energy, nuclear security, and scientific discovery that often call for facility improvements and expansions and new facilities, DOE works with the TWRA, TDEC, US Fish and Wildlife Service (USFWS), US Department of Agriculture, and other agencies and organizations to serve as an effective steward of the ORR's natural and cultural

resources. Project managers must ensure actions conform to environmental regulations, agreements, and policies at the federal, state, and institutional levels. These include, e.g., the US Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Tennessee Rare Plant Protection and Conservation Act of 1985, Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974, several federal and state regulations regarding aquatic resource protection, and site-specific policy as outlined in various Oak Ridge Reservation land use and management plans developed by ORNL and TWRA for DOE (e.g., DOE 2012; Parr et al. 2012, Parr et al. 2015, Carter et al. 2020a). Minimally, wetland delineations (USACE 1987), stream evaluations (TDEC 2019), and hydrologic determinations (TDEC 2020a) are required for all wetlands, streams, and currently unclassified channels and wet weather conveyances (WWCs), respectively. Additional TDEC-prescribed assessments might be required before projects can proceed for many Exceptional Tennessee Waters (ETW) on the ORR (TDEC 2015). Likewise, forest-dwelling bats, migratory birds, and other federal- and state-listed species require detailed assessment and potential consultation with USFWS, TDEC, and/or TWRA.

The goals of various environmental and natural resource agreements between DOE and TWRA, TDEC, USFWS, EPA, and on-site contractors are to promote healthy and diverse ecosystems and game populations through the application of science and adaptive natural resources management (for details on natural resource-related agreements, see Carter et al. 2020a). Consistent with the government's programmatic use of lands, the ORR Natural Resources Management Program (NRMP) coordinates and implements these management activities on the ORR, ORNERP, and ORWMA, alongside appointed TWRA law enforcement and wildlife managers. Forest-dwelling bats and aquatic resources (biotic and abiotic) represent major focal areas for research, management, and science education activities that are carried out by UT-Battelle, LLC and TWRA on behalf of DOE. Several additional resources, notably ORNL's Focal Species for Research and Management, receive considerable funding from DOE, and several multi-institutional programs rely on the long-term health and security of focal species populations and their habitats. These and other natural resources on the ORR are thus subject to various special consideration under federal, state, and institutional regulation and policy (e.g., TDEC-classified ETW, long-term research and monitoring programs, compliance sampling, science education, and site-specific policy on biodiversity and sustainable development; for details, see Carter et al. 2020a), many of which influence directly such requirements as compensatory mitigation (Table 1).

Although the ORR does not carry the same protection status as a national park, its status as a National Environmental Research Park and International Biosphere Reserve increases the scope of environmental and cultural impacts that must be considered (Dale and Parr 1998). For instance, per 40 CFR 1508.14, potential impacts to research and science education on the ORNERP and ORR, and impacts to hunting opportunities on the ORWMA, must be considered when other aspects of the human environment are affected (as defined at 40 CFR 1508.18). Impacts to resources on the ORR that result from federal actions are defined in terms of direct effects (direct loss or alteration) owing to project-specific actions, any indirect effects on biotic, abiotic, and cultural components that might be associated with those actions, and any cumulative effects on those resources, now or in the foreseeable future, regardless of who carries out additional actions (40 CFR 1508.7–8). Thus, sensitive resources assessments that are carried out by those who conduct natural resources management on the ORR and who contribute directly to the development of the ORR's site-specific policy on natural resources and land-use planning help to ensure full and proper consideration of impacts during such process as a National Environmental Policy Act (NEPA) review.

Table 1. Key state and federal regulations related to natural resources. For details on additional state and federal policy, DOE Orders, and ORR-specific policy and Best Management Practices, see Carter et al. 2020a.

Resource/Action	Regulations	Citation
	Aquatic resources	
Actions that involve potential impacts to, or take place within, wetlands: 10 CFR 1022	Incorporate wetland protection considerations into its planning, regulatory, and decision-making processes, and, to the extent practicable, minimize the destruction, loss, or degradation of wetlands; and preserve and enhance the natural and beneficial values of wetlands.	10 *CFR* 1022.3(a)(7) and (8)
	Undertake a careful evaluation of the potential effects of any proposed wetland action. Avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction of and occupancy and modification of wetlands. Avoid direct and indirect development in a wetland wherever there is a practicable alternative. Identify, evaluate, and, as appropriate, implement alternative actions that may avoid or mitigate adverse wetland impacts.	10 *CFR* 1022.3(b), (c), (d)
	Alternatives. Consider alternatives to the proposed action that avoid adverse impacts and incompatible development in a wetland area, including alternate sites, alternate actions, and no action. DOE shall evaluate measures that mitigate the adverse effects of actions in a wetland including, but not limited to, minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically sensitive areas.	10 *CFR* 1022.13(a)(3)
	If no practicable alternative to locating or conducting the action in the wetland is available, then before taking action, design or modify the action in order to minimize potential harm to or within the wetland, consistent with the policies set forth in Executive Order 11990.	10 *CFR* 1022.14(a)
Activity that would cause loss of a wetland, or that reduces wetland value: TDEC 0400-40-07-.03	If an applicant proposes an activity that would result in appreciable permanent loss of resource value of wetlands, the applicant must provide mitigation, which results in no overall net loss of resource value. Compensatory measures must be at a ratio of 2:1 for restoration, 4:1 for creation and enhancement, and 10:1 for preservation, or at a best professional judgment ratio agreed to by the state. For any mitigation involving the enhancement or preservation of existing wetlands, to the extent practicable, the applicant shall complete the mitigation before any impact occurs to the existing state waters. For any mitigation involving restoration or creation of a wetland, to the extent practicable, the mitigation shall occur either before or simultaneously with impacts to the existing state waters. Mitigation actions for impacts to wetlands are prioritized as listed in TDEC 0400-40-07-.04 (7)(b)(1)(i)–(viii).	TDEC 0400-40-07-.04 (7)(b)
Activity that would result in an appreciable permanent loss of resource value of a state water, other than wetlands: TDEC 0400-40-07-.03	Must provide mitigation that results in no overall net loss of resource values for any activity that would result in appreciable permanent loss of resource value of a state water. Mitigation measures include, but are not limited to, restoration of degraded stream reaches and/or riparian zones; new (relocated) stream channels; removal of pollutants from and hydrologic buffering of stormwater runoff; and other measures, which have a reasonable likelihood of increasing the resource value of a state water. Mitigation measures or actions should be prioritized in the following order: restoration, enhancement, re-creation, and protection.	TDEC 0400-40-07-.04(7)(a)

Table 1. (continued).

Resource/Action	Regulations	Citation
	Plant and Animal resources	
Action that is likely to jeopardize fish, wildlife, or plant species or adversely modify Critical Habitat: 50 *CFR* 17.11–17.12	Actions that jeopardize the existence of a listed species or result in the destruction or adverse modification of critical habitat must be avoided or reasonable and prudent mitigation measures taken.	16 *USC* 1531 et seq., Sect. 7(a)(2)
Action that impacts rare plant species, which include but are not limited to federally listed species: TDEC 0400-06-02-.04	May not knowingly uproot, dig, take, remove, damage, destroy, possess, or otherwise disturb for any purposes any endangered species.	*TCA* 70-8-309(a) 16 *USC* 1531 et seq. TDEC 0400-06-02-.04
Action that impacts Tennessee nongame species, including wildlife species which are "in need of management": *TCA* 70-8-101, *TCA* 70-8-103, TWRA Proclamations 00-14 and 00-15	May not take (i.e., harass, hunt, capture, kill or attempt to kill), possess, transport, export, or process wildlife species. May not knowingly destroy the habitat of such species. Certain exceptions may be allowed for reasons such as education, science, etc., or where necessary to alleviate property damage or protect human health or safety. Upon good cause shown and where necessary to protect human health or safety, endangered or threatened species or "in need of management" species may be removed, captured, or destroyed.	*TCA* 70-8-104(b) and (c) *TCA* 70-8-106(e)
Action that is likely to impact migratory birds: 50 *CFR* 10.13, EO 13186	Unlawful killing, possession, and sale of migratory bird species, as defined in 50 *CFR* 10.13, native to the United States or its territories is prohibited. Executive Order (EO) 13186 requires DOE to avoid or minimize the adverse impact of their actions on migratory birds and ensure that environmental analyses under the NEPA evaluate the effects of proposed federal actions on such species.	16 *USC* 703-711 EO 13186 January 10, 2001 (66 FR 3853)

3. METHODS

3.1 OVERVIEW

In addition to on-the-ground surveys by ORNL NRMP and Aquatic Ecology Group staff who routinely assess and are familiar with sensitive resources on the ORR, this report makes use of both historical (pre-1995) and contemporary (1995–present) data, as obtained from (1) previous reports and observations by NRMP, (2) reports made available to the ORR NRMP by researchers and contractors on the ORR, and (3) the TDEC's Natural Heritage Inventory Program. Historical observations (pre-1995) are especially relevant to quantify rare species, which are inherently difficult to detect. Thus, historical observations were presumed valid unless subsequent targeted surveys (1) failed to detect those resources, (2) other resources that are critical to the persistence of those resources were no longer present or adequate to support viable populations within the SSP-2A parcel or ORETTC project area, and (3) there was reasonable evidence that connectivity was impeded between the SSP-2A parcel or ORETTC project area and populations of sensitive taxa elsewhere on the ORR.

3.2 FOREST INVENTORY AND ANALYSIS

Forest conditions were assessed based on a previous forest inventory and supplemented with ground observation during summer 2020. A forest inventory for the Forest Management Compartments that contain the SSP-2A and ORETTC review areas was concluded in September 2011 (B. Johnston 2019, unpublished report to the ORNL NRMP).

A timber assessment was conducted according to ORR Wildland Fire and Forestry to aid in characterizing the forest and evaluate timber locations, timber quality, and ease of equipment access. Assessment of wildfire risk and the extent of residual vegetative debris was also prepared.

All projects involving the removal of timber on the ORR must follow ORR guidance, which includes use of a designated DOE timber salvage contractor at no cost to projects. After deduction of any access improvement costs, the contractor would remit to DOE funds that represent the stumpage (agreed merchantable value of timber) sold from the project site. The timber harvest operation should be planned in advance, subsequent to a timber assessment and based on project needs. Anticipated logging traffic should be planned and coordinated with other organizations that use or will use existing roads in the area.

3.3 SENSITIVE RESOURCES SURVEYS

3.3.1 Database review and initial screening

ORNL's NRMP compiled a list of endangered, threatened, rare, or otherwise sensitive focal taxa with potential to occur within the SSP-2A parcel. NRMP first reviewed the ORNL Natural Resources database for verified spatial records of sensitive resources within the vicinity of the review area. These taxa were considered contemporary records if they were documented after 1995. All others were considered historical records unless a later survey confirmed their presence within the SSP-2A parcel. NRMP then compiled a list of additional sensitive animal taxa with reasonable potential to occur within the SSP-2A parcel based on occurrence elsewhere on the ORR, rare and sensitive resources known to occur within the Tennessee counties of Anderson and Roane as identified through the TDEC's online Rare Species database (http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:0), and resources identified by an unofficial query of the USFWS's Information for Planning and Consultation tool (IPaC – https://ecos.fws.gov/ipac/, using the SSP-2A parcel as the input area) (USFWS 2020). Habitat parameters for each of the potential sensitive resources were compiled through the same sources. These parameters were later used to guide field-based survey.

3.3.2 Aquatic resources assessment

Environmental management and protection of aquatic features on the ORR is a priority for DOE and thus a major focus of several DOE and NERP programs. Accordingly, substantial prior effort was placed on inventory and understanding the connectivity of surface and subterranean aquatic features. Thus, we first reviewed previous aquatic resource delineation efforts and reports to determine locations of known streams, wetlands, and seeps within the SSP-2A parcel (e.g., Rosensteel 1996; Baranski 2009, 2011, 2018). We then used these data alongside new quantitative hydrology models to focus current field-based mapping.

Modeling hydrology within the SSP-2A Construction Area—LiDAR data at < 1-m resolution were obtained from a winter 2015/2016 flyover (USGS 2015, Kuxhausen 2016) of the ORR. These data, in conjunction with an inventory of 3,442 seeps, active springs, sinks, and caves on the ORR by the ORNL NRMP, were used to develop several hydrologic models (for additional details, see Wade and Carter 2020). These included surface water flow to identify streams and WWCs by catchment area via the

hydrology toolset in ArcMap 10.7 (ESRI 2018) and surface porosity (owing to karst features) via a diffusion model with elevation as a cumulative barrier in R (R Core Team 2020). The extensive inventory of macropores and other karst windows were used to either add or subtract from surface water according to their depth relative to the water table at originally mapped resolutions. These models were in turn used to focus field-based surveys herein via stream, wetland, and soil saturation predictions.

Field-based aquatic feature inventory within the SSP-2A parcel—Aquatic surveys were conducted between June and September 2020. When possible, surveys for sensitive aquatic or semi-aquatic species were conducted at the best time to locate those species (for additional details, see Section 3.3.3).

Integrating field and model based delineations—Newly acquired data were used to retrain models as new data were collected. Updated maps were used to better document the extensive aquatic resources within the SSP-2A parcel, gain a clearer understanding of aquatic connectivity in this area, and understand their relation to other sensitive resources such as stream or wetland obligate flora and fauna.

Field-mapped seeps/springs and stream and wetland boundaries presented here represent aquatic features within and adjacent to the SSP-2A parcel that were mapped via a Trimble Geo 7x by an experienced hydrologic technician trained in US Army Corps of Engineers (ACOE)/TDEC wetland delineation methods (ACOE 1987; TDEC 2015, 2020). All streams and channels with stream-like features that occur within the SSP-2A parcel were assessed via TDEC Hydrologic Determinations (TDEC 2020a). Potential ETW will require additional TDEC-prescribed assessment (TDEC 2015).

3.3.3 Wildlife surveys

Visual encounter surveys (VES)/cover boards—An initial survey of the entire SSP-2A parcel took place along a transect grid, with 53 equally spaced points generated in ArcMap 10.7 (ESRI 2018). Habitat was assessed within a minimum 30-m radius of each point and within visible distance along intervening transects. Surveyors maintained an active inventory of rare and sensitive species' habitat suitability by referencing and updating the previously compiled list of potential rare and sensitive taxa (Section 3.3.1). Further surveys concentrated effort in distinct sections of sensitive habitat features. To further aid in the detection of reptiles, amphibians, and small mammals, 32 coverboards were placed strategically throughout the site and checked during each VES survey. All wildlife encountered were recorded and photographed where possible.

Bat acoustic surveys—Bats are a primary focus of the ORNL NRMP because the ORR's forests, wetlands, and caves have potential to support several state- and federal-listed bats. Of the bats on the ORR (McCracken et al. 2015), the USFWS lists the Indiana bat (*Myotis sodalis*) and gray bat (*Myotis grisescens*) as Federally Endangered and the northern long-eared bat (*Myotis septentrionalis)* as Federally Threatened under the US Endangered Species Act (USFWS 2020). Additionally, the little brown bat (*Myotis lucifugus*) and tricolored bat (*Perimyotis subflavus*) are currently Under Review for listing under the ESA (USFWS 2020). All federal-listed bats and several additional bats of the ORR carry various special protection statuses specific to the state of Tennessee.

Eleven bat acoustic monitors (Wildlife Acoustics Song Meter SM4Bat FS Ultrasonic Recorders equipped with SMM-U2 microphones) were deployed in the SSP-2A parcel during summer forest roosting and maternity season (15 May–15 August) (Table 2). Sites were selected based on likelihood of use by bats as flyways to foraging grounds, foraging for prey, and for roosting/rearing young. Two detectors were placed along the stream riparian within the ORETTC footprint. Canopy cover at these sites varied from 60–85%. Microphones were mounted on 3-m poles and directed along the likely flyway. Recording began 30 minutes before sunset and ended 30 minutes after sunrise each night. Recordings were analyzed via

Kaleidoscope Pro Analysis Software V5, with both zero-crossing and full-spectrum analysis methods, as approved by the USFWS (2017).

Table 2. Bat acoustic monitor sites.

Site ID	Monitor ID	Date deployed	Nights deployed	Site description
SSP-1	SM4-1	6-26-2020	12	Gravel road through forest
SSP-2	SM4-4	6-26-2020	12	Mature forest, 65% canopy cover, 2 dead snags, fairly open midstory, suitable roost trees
SSP-3	SM4-3	6-26-2020	12	Mature forest, 70% canopy cover, open midstory, suitable roost trees
SSP-5	SM4-7	6-27-2020	11	Mature forest, 80% canopy cover, several dead snags, suitable roost trees, open midstory
SSP-6	SM4-8	6-27-2020	11	Mature forest, 85% canopy cover, suitable roost trees, fairly open midstory
SSP-7	SM4-7	7-14-2020	6	Mature forest, 80% canopy cover, open midstory, suitable roost trees
SSP-8	SM4-8	7-14-2020	6	Mature forest, 85–90% canopy cover, snags and suitable roost trees, open midstory
SSP-9	SM4-1	7-14-2020	6	Creek through mature forest, 70% canopy cover, few roost trees, fairly open midstory
SSP-10	SM4-2	7-14-2020	6	Small creek, cluttered forest
SSP-11	SM4-3	7-15-2020	6	Creek through mature forest, 90% canopy cover, suitable roost trees, open midstory
SSP-12	SM4-7	8/10/2020	4	Mature forest, 85% canopy cover, open midstory, suitable roost trees

Avian point counts—Migratory birds represent a major management focus for both ORNL and DOE; e.g., Carter et al. (2020a) provides details related to DOE's responsibilities specific to the ORR, and the 2013 memorandum of understanding between USFWS and DOE can be found at https://www.energy.gov/sites/prod/files/2013/10/f3/Final%20DOE-FWS%20Migratory%20Bird%20MOU.pdf).

To assess occupancy by and potential importance of the site for migratory birds, we combined historical species occurrence data primarily via ongoing Partners in Flight surveys across the ORR (Partners in Flight 2020). To provide a more detailed assessment specific to SSP-2A and ORETTC, we implemented avian point counts at eight equally spaced locations within the SSP-2A parcel. All bird species seen or heard within a period of 10 minutes at each point were recorded. Each avian point count site was visited twice throughout the survey period. Additionally, we recorded all birds seen and/or heard during visual encounter surveys and at each small mammal trap location (see below), which were visited eight times between 27 July 2020 and 7 August 2020.

Small mammal trapping—To quantify small mammal abundance and diversity, 61 Sherman live traps were positioned within the primary impact area and checked daily between 27 July 2020 and 7 August 2020.

Drift fence surveys (small vertebrates and invertebrates)—We installed a drift fence array to provide a more detailed assessment of small vertebrates within the northeastern portion of the survey area close to a

perennial stream. The drift fence array consisted of ~125 ft of silt fence installed in an "x" pattern with a four-way funnel trap at its center. The trap was checked daily, and bird seed, shelter, and a water source were provided between 15 July 2020 and 15 August 2020.

Camera-trap surveys—The area that encompasses the ORETTC footprint is known to be a wildlife corridor in eastern Tennessee (Carter et al. 2020a; Kwarta et al. in prep). To assess large mammal abundance and diversity within the area, seven trail cameras were deployed within the area for ~2 weeks per camera starting 29 June 2020 and continuing until 20 August 2020.

Nocturnal Species Survey—We implemented one 2-hour-long nighttime survey to observe nocturnal fauna in the survey area on 30 July 2020.

3.3.4 Plant surveys

A field survey for vascular plants was conducted primarily from 11–13 August 2020 within the ORETTC footprint. Notable or unusual species were also recorded and photographed during all wildlife and aquatic surveys for subsequent identification. Within the ORETTC footprint, linear search transects were positioned at 25-m intervals. Notable habitats (seeps, outcrops, and special habitats identified during the initial screening) were searched thoroughly by one to two surveyors with a combined 40 years of experience in the inventory of the ORR's flora.

4. RESULTS AND DISCUSSION

4.1 FOREST ANALYSIS (Note: this analysis was based on a previous conceptual design)

4.1.1 Forest inventory

Current condition of the SSP-2A area forest—The current condition of the SSP-2A forest can most easily be determined from a relatively recent forest inventory. The area was included in a forest inventory conducted in 2015 covering Forest Management Compartment 10, which lies in the north central portion of the ORR. Fieldwork for the inventory data used in this assessment was conducted from May 28, 2015, through August 7, 2015. Data compiled from a subset of 39 of the original 440 forest inventory points that were within the SSP-2A study area were extracted to prepare the following analysis (Figure 5).

Land use—Land use categories in the proposed SSP-2A, corresponding to habitat types, include forest and right-of-way; there are no instances of developed areas, edge, and water. Forest comprises approximately 94.2% (76.46 acres) of the area of the proposed SSP-2A (81.14 acres), and right-of-way comprises 5.8% (4.67 acres). Spatial distribution of land use types is shown in Figure 6.

Basal area—Total basal area of the SSP-2A forest in 2015 was 10,352 sq. ft. Standing dead trees accounted for approximately 4.61% of the total basal area. The average live basal area of forest was 122 sq. ft per acre.

A list of species and live tree basal area statistics are provided in Table 3. Forty-one species were identified; Fraxinus (ash) was identified to genus. Trees with a diameter at breast height (dbh, 4.5 ft) greater or equal to 10.0 in. accounted for 47.5% of the total basal area. Among trees greater than or equal to 10.0 in. dbh, five species contributed greater than 5% of forest basal area, including tulip poplar (33%), eastern redcedar (15%), loblolly pine (6%), Virginia pine (5%), and ash (5%). Among sapling-size trees (dbh greater than or equal to 2.0 in. and less than 10.0 in.), species ranking based on basal area representing > 5% included four species: loblolly pine (31%), tulip poplar (15%), American beech (9%), and ash (6%). Note that in the intervening 5 years since the inventory was conducted, most of the ash

trees on the ORR have succumbed to Emerald Ash Borer (EAB) infestations; live basal area for ash will by now have been considerably reduced.

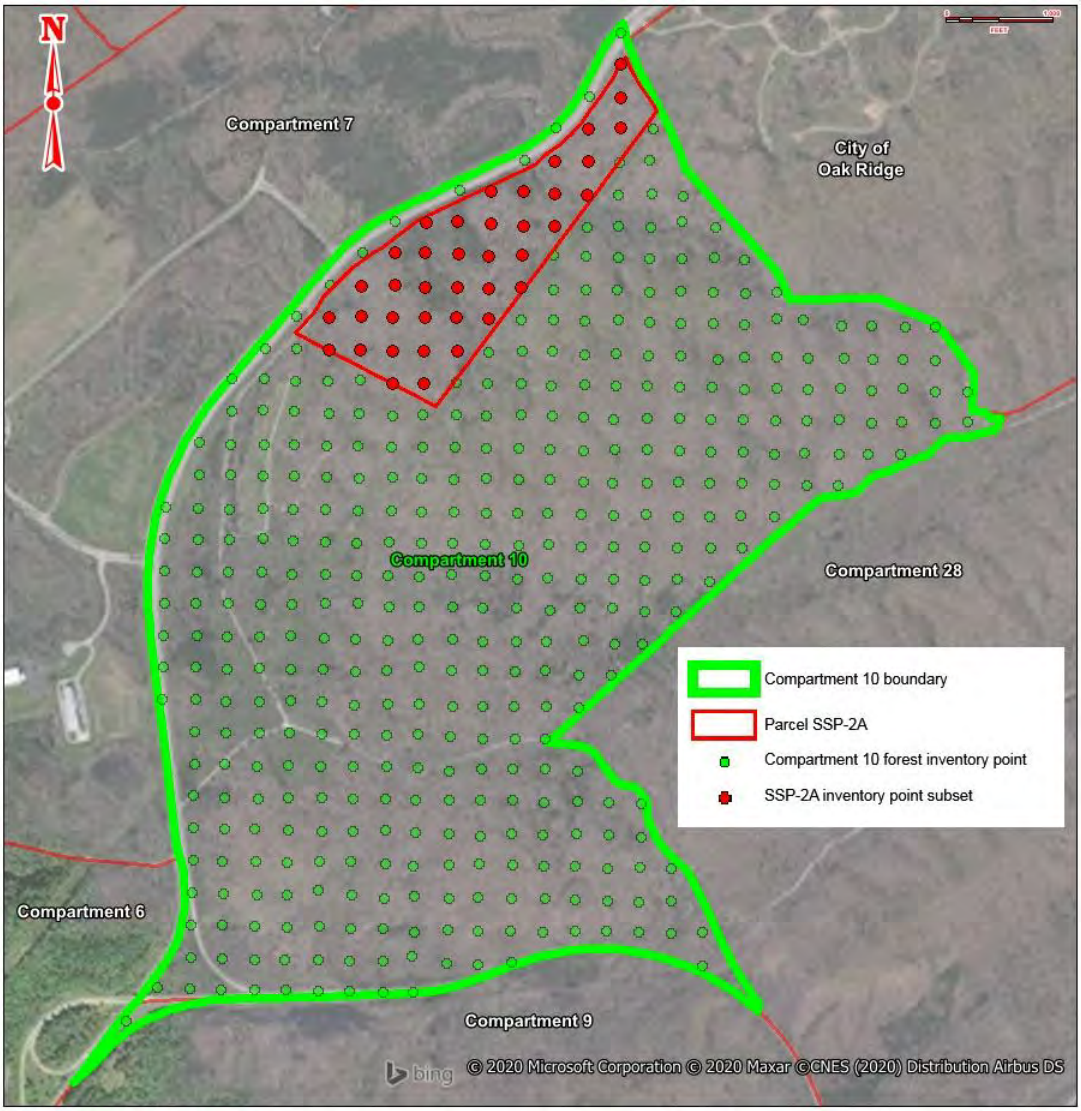

Figure 5. Forest inventory points for Compartment 10 (green) and the SSP-2A parcel (red).

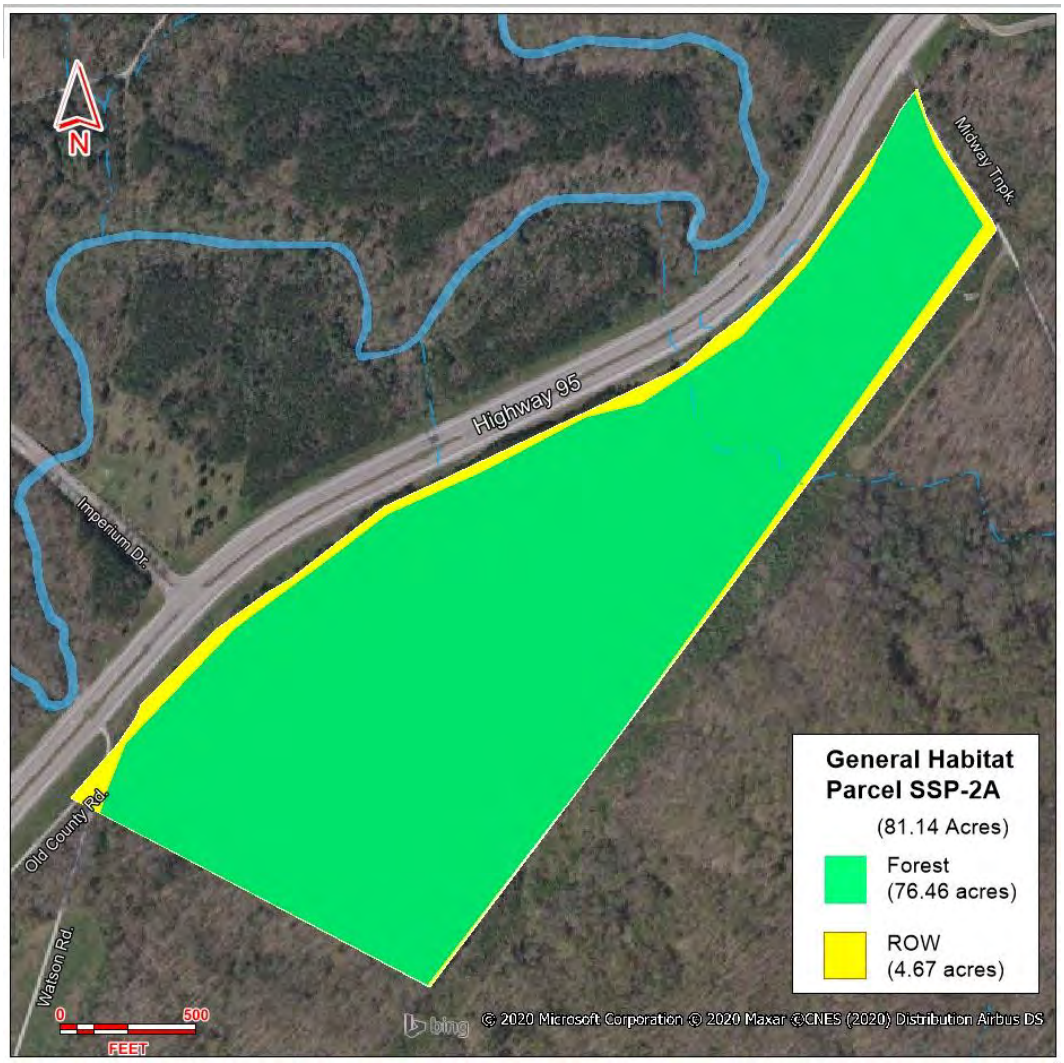

Figure 6. Land cover type within the SSP-2A parcel.

Table 3. Parcel SSP-2A species list and live tree basal area statistics.

		Basal Area (ft^2)				Basal Area (%)			
Scientific Name	Common Name	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable
Acer rubrum	red maple	196	216	412	59	4%	4%	4%	2%
Acer saccharum	sugar maple	98	59	157	39	2%	1%	2%	1%
Aesculus flava	yellow buckeye	39	20	59		1%	0%	1%	0%
Carpinus caroliniana	iron wood	0	39	39		0%	1%	0%	0%
Carya cordiformis	bitternut hickory	20	20	39	20	0%	0%	0%	1%
Carya glabra	pignut hickory	78	0	78	39	2%	0%	1%	1%
Carya ovalis	sweet pignut hickory	0	39	39		0%	1%	0%	0%
Carya pallida	pale hickory	20	0	20	20	0%	0%	0%	1%
Carya tomentosa	mockernut hickory	0	20	20		0%	0%	0%	0%
Celtis sp.	hackberry	98	20	118	59	2%	0%	1%	2%
Cercis canadense	redbud	20	118	137		0%	2%	1%	0%
Cornus florida	flowering dogwood	0	176	176		0%	3%	2%	0%
Diospyros virginiana	persimmon	0	39	39		0%	1%	0%	0%
Fagus grandifolia	American beech	157	451	608	20	3%	9%	6%	1%
Fraxinus sp.	ash	235	294	529	20	5%	6%	5%	1%
Juglans nigra	black walnut	39	39	78	20	1%	1%	1%	1%
Juniperis virginiana	eastern red cedar	686	196	882	549	15%	4%	9%	17%
Liquidambar styraciflua	sweetgum	118	118	235	78	2%	2%	2%	2%
Liriodendron tulipifera	tulip poplar	1,568	784	2,353	1,314	33%	15%	24%	41%
Magnolia acuminata	cucumber magnolia	0	78	78		0%	2%	1%	0%
Morus rubra	red mulberry	20	0	20		0%	0%	0%	0%
Nyssa sylvatica	black gum	0	20	20		0%	0%	0%	0%
Ostrya virginiana	hophornbeam	0	20	20		0%	0%	0%	0%
Oxydendrum arboreum	sourwood	0	59	59		0%	1%	1%	0%
Pinus echinata	short-leaf pine	39	0	39	39	1%	0%	0%	1%
Pinus strobus	white pine	59	0	59	39	1%	0%	1%	1%
Pinus taeda	loblolly pine	294	1,608	1,902	294	6%	31%	19%	9%
Pinus virginiana	Virginia pine	255	59	314	176	5%	1%	3%	6%
Platanus occidentalis	sycamore	39	0	39		1%	0%	0%	0%
Prunus serotina	black cherry	78	216	294	39	2%	4%	3%	1%
Quercus alba	white oak	137	78	216	137	3%	2%	2%	4%
Quercus coccinea	scarlet oak	20	0	20	20	0%	0%	0%	1%
Quercus falcata	southern red oak	20	39	59	20	0%	1%	1%	1%
Quercus montana	chestnut oak	98	0	98	39	2%	0%	1%	1%
Quercus muehlenbergii	chinquapin oak	20	175	195		0%	3%	2%	0%
Quercus rubra	northern red oak	59	39	98	59	1%	1%	1%	2%
Quercus shumardii	Shumard oak	20	0	20	20	0%	0%	0%	1%
Sassafras albidum	sassafras	0	20	20		0%	0%	0%	0%
Tilia americana	basswood	39	20	59	20	1%	0%	1%	1%
Ulmus alata	winged elm	98	59	157	39	2%	1%	2%	1%
Ulmus americana	American elm	39	59	98		1%	1%	1%	0%
		4,705	5,194	9,900	3,176	100%	100%	100%	100%

At the genus level, poplar accounted for 33% of the live basal area of trees ≥ 10.0 in. dbh (Table 4) and provided only 15% of the sapling size class basal area. Pines accounted for 14% of the live basal area of trees ≥ 10.0 in. dbh but 32% of live basal area of trees < 10 in. dbh, indicating an increasing presence is possible over time. Eastern redcedar comprised 15% of the live basal area of trees ≥ 10.0 in. dbh but 4% of live basal area of trees < 10 inches dbh, indicating a decreasing presence is likely over time. Oaks accounted for only 8% of the live basal area of trees ≥ 10.0 in. dbh and 6% of live basal area of trees < 10 in. dbh. White oaks (includes white, chinquapin, and chestnut oaks) provided 5% of the live basal area of trees ≥ 10.0 in. dbh and 5% of the sapling size class basal area. Red oaks (includes northern red, southern red, scarlet, and Shumard oaks) provided 3% of the live basal area of trees ≥ 10.0 in. dbh and 2% of the sapling size class basal area. Beech (6%), maple (6%), and ash (5%) were the only others representing greater than 5% of total basal area.

Tree number and density—Number of live trees and saplings in the SSP-2A forest in 2015 totaled 44,627, averaging 550 stems per acre of trees > 2.0 in. dbh (Table 5). There were 51.8 trees > 9.9 in. dbh

per acre on average across all forested sample points in the area, totaling 3,959 trees. There was an average of 498.2 sapling trees (< 10.0 in. dbh) per acre in this forest, totaling 38,091 saplings. For trees ≥ 10.0 in. dbh, tulip poplar (14.6) provided the greatest average number of stems per acre, followed by eastern redcedar (8.0), loblolly pine (4.9), Virginia pine (3.6), and ash (2.8). Among sapling-size trees, species ranking for average number of stems per acre included loblolly pine (97.9), beech (82.3), tulip poplar (45.0), dogwood (35.4), ash (28.9), sweetgum (27.8), and chinquapin oak (24.9).

Table 4. Parcel SSP-2A live tree basal area statistics by genus.

		Basal Area (ft^2)				Basal Area (%)			
Scientific Name	Common Name	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable
Liriodendron	tulip poplar	1,568	784	2,353	1,314	33%	15%	24%	41%
Pinus	pine	647	1,666	2,313	549	14%	32%	23%	17%
Juniperis	eastern red cedar	686	196	882	549	15%	4%	9%	17%
Quecus	oak	373	332	705	294	8%	6%	7%	9%
	white oak group	255	254	509	176	5%	5%	5%	6%
	red oak group	118	78	196	118	3%	2%	2%	4%
Fagus	beech	157	451	608	20	3%	9%	6%	1%
Acer	maple	294	274	569	98	6%	5%	6%	3%
Fraxinus	ash	235	294	529	20	5%	6%	5%	1%
Prunus	black cherry	78	216	294	39	2%	4%	3%	1%
Ulmus	elm	137	118	255	39	3%	2%	3%	1%
Liquidambar	sweetgum	118	118	235	78	2%	2%	2%	2%
Carya	hickory	118	78	196	78	3%	2%	2%	2%
Cornus	flowering dogwood	0	176	176		0%	3%	2%	0%
Cercis	redbud	20	118	137		0%	2%	1%	0%
Celtis	hackberry	98	20	118	59	2%	0%	1%	2%
Juglans	walnut	39	39	78	20	1%	1%	1%	1%
Magnolia	magnolia	0	78	78		0%	2%	1%	0%
Aesculus	buckeye	39	20	59		1%	0%	1%	0%
Oxydendrum	sourwood	0	59	59		0%	1%	1%	0%
Tilia	basswood	39	20	59	20	1%	0%	1%	1%
Carpinus	iron wood	0	39	39		0%	1%	0%	0%
Diospyros	persimmon	0	39	39		0%	1%	0%	0%
Platanus	sycamore	39	0	39		1%	0%	0%	0%
Morus	mulberry	20	0	20		0%	0%	0%	0%
Nyssa	black gum	0	20	20		0%	0%	0%	0%
Ostrya	hophornbeam	0	20	20		0%	0%	0%	0%
Sassafras	sassafras	0	20	20		0%	0%	0%	0%
		4,705	5,194	9,900	3,176	100%	100%	100%	100%

Volume of merchantable timber—Volume of merchantable timber in the SSP-2A in 2015 totaled 353,501 board feet (bf, International ¼ in. rule), averaging 4,623.3 bf per acre (Table 6). Tulip poplar (171,934 bf), eastern redcedar (45,712 bf), loblolly pine (26,309 bf), Virginia pine (17,957 bf), and white oak (16,078 bf) collectively contributed 78.5% of the merchantable timber in this area. Species rank for the number of merchantable stems (Table 5) included tulip poplar (901), eastern redcedar (480), loblolly pine (371), Virginia pine (182), and hackberry (74). Table 7 provides the merchantable volume ranking at the genus level. Tulip poplar, pine, redcedar, and oaks accounted for 87% of the marketable timber in the area. To estimate the current volume of timber, the volumes determined from the 2015 inventory may be adjusted by compounding over the five intervening growing seasons. A modest annual volume growth rate of 3% was assumed and applied to reflect an estimate of present stand volume. For example, total volume at the time of this report would approach 409,805 bf, or 5,360 bf per acre.

Table 5. Parcel SSP-2A tree density per acre.

		Total Trees				Average Trees per Acre			
Scientific Name	Common Name	Trees dbh > 10.0 inches	Saplings 2 > dbh < 10.0 inches	All tally trees (dbh > 2.0 in)	Merchantible Trees	Trees dbh > 10.0 inches	Saplings 2 > dbh < 10.0 inches	All tally trees (dbh > 2.0 inches)	Merchantible Trees
Pinus taeda	loblolly pine	371	7,489	7,860	371	4.9	97.9	102.8	4.9
Fagus grandifolia	American beech	126	6,292	6,418	15	1.6	82.3	83.9	0.2
Liriodendron tulipifera	tulip poplar	1,117	3,439	4,556	901	14.6	45.0	59.6	11.8
Cornus florida	flowering dogwood	0	2,705	2,705	0	0.0	35.4	35.4	0.0
Fraxinus sp.	ash	218	2,206	2,424	18	2.9	28.9	31.7	0.2
Liquidambar styraciflua	sweetgum	91	2,125	2,216	53	1.2	27.8	29.0	0.7
Quercus muehlenbergii	chinquapin oak	5	1,904	1,909	0	0.1	24.9	25.0	0.0
Acer rubrum	red maple	164	1,883	2,047	38	2.1	24.6	26.8	0.5
Prunus serotina	black cherry	96	1,551	1,647	38	1.3	20.3	21.5	0.5
Oxydendrum arboreum	sourwood	0	1,163	1,163	0	0.0	15.2	15.2	0.0
Ulmus americana	American elm	45	913	958	0	0.6	11.9	12.5	0.0
Cercis canadense	redbud	35	849	884	0	0.5	11.1	11.6	0.0
Carya ovalis	sweet pignut hickory	0	681	681	0	0.0	8.9	8.9	0.0
Quercus alba	white oak	58	660	718	58	0.8	8.6	9.4	0.8
Juniperis virginiana	eastern red cedar	608	605	1,213	480	8.0	7.9	15.9	6.3
Magnolia acuminata	cucumber magnolia	0	567	567	0	0.0	7.4	7.4	0.0
Ostrya virginiana	hophornbeam	0	532	532	0	0.0	7.0	7.0	0.0
Carpinus caroliniana	iron wood	0	499	499	0	0.0	6.5	6.5	0.0
Quercus falcata	southern red oak	9	332	341	9	0.1	4.3	4.5	0.1
Ulmus alata	winged elm	99	258	357	36	1.3	3.4	4.7	0.5
Acer saccharum	sugar maple	51	258	309	0	0.7	3.4	4.0	0.0
Pinus virginiana	Virginia pine	272	189	461	182	3.6	2.5	6.0	2.4
Quercus rubra	northern red oak	37	172	209	37	0.5	2.2	2.7	0.5
Diospyros virginiana	persimmon	0	170	170	0	0.0	2.2	2.2	0.0
Tilia americana	basswood	53	123	176	21	0.7	1.6	2.3	0.3
Aesculus flava	yellow buckeye	29	103	132	15	0.4	1.3	1.7	0.2
Sassafras albidum	sassafras	0	103	103	0	0.0	1.3	1.3	0.0
Juglans nigra	black walnut	29	86	115	14	0.4	1.1	1.5	0.2
Carya cordiformis	bitternut hickory	13	69	82	13	0.2	0.9	1.1	0.2
Carya tomentosa	mockernut hickory	0	64	64	0	0.0	0.8	0.8	0.0
Celtis sp.	hackberry	121	56	177	74	1.6	0.7	2.3	1.0
Nyssa sylvatica	black gum	0	45	45	0	0.0	0.6	0.6	0.0
Carya glabra	pignut hickory	79	0	79	43	1.0	0.0	1.0	0.6
Pinus strobus	white pine	44	0	44	28	0.6	0.0	0.6	0.4
Platanus occidentalis	sycamore	44	0	44	0	0.6	0.0	0.6	0.0
Quercus montana	chestnut oak	42	0	42	11	0.5	0.0	0.5	0.1
Morus rubra	red mulberry	31	0	31	0	0.4	0.0	0.4	0.0
Pinus echinata	short-leaf pine	29	0	29	29	0.4	0.0	0.4	0.4
Carya pallida	pale hickory	27	0	27	27	0.4	0.0	0.4	0.4
Quercus coccinea	scarlet oak	8	0	8	8	0.1	0.0	0.1	0.1
Quercus shumardii	Shumard oak	8	0	8	8	0.1	0.0	0.1	0.1
		3,959	38,091	42,050	2,527	51.8	498.2	550.0	33.0

Table 6. Parcel SSP-2A timber volume per acre, by species.

		Volume (bf)		Present Volume (bf)	
Scientific Name	Common Name	Compartment Total	Average per Acre	Tract Total	Average per Acre
Liriodendron tulipifera	tulip poplar	171,934	2,249	199,319	2,607
Juniperis virginiana	eastern red cedar	45,712	598	52,993	693
Pinus taeda	loblolly pine	26,309	344	30,499	399
Pinus virginiana	Virginia pine	17,957	235	20,817	272
Quercus alba	white oak	16,078	210	18,639	244
Liquidambar styraciflua	sweetgum	9,127	119	10,581	138
Quercus rubra	northern red oak	8,381	110	9,716	127
Quercus montana	chestnut oak	6,552	86	7,596	99
Acer rubrum	red maple	5,107	67	5,920	77
Pinus strobus	white pine	4,589	60	5,320	70
Pinus echinata	short-leaf pine	4,470	58	5,182	68
Prunus serotina	black cherry	4,378	57	5,075	66
Aesculus flava	yellow buckeye	4,311	56	4,998	65
Celtis sp.	hackberry	4,213	55	4,884	64
Ulmus alata	winged elm	4,013	52	4,652	61
Carya glabra	pignut hickory	3,334	44	3,865	51
Juglans nigra	black walnut	2,914	38	3,378	44
Quercus coccinea	scarlet oak	2,645	35	3,066	40
Quercus falcata	southern red oak	2,619	34	3,036	40
Fagus grandifolia	American beech	2,006	26	2,326	30
Fraxinus sp.	ash	1,954	26	2,265	30
Quercus shumardii	Shumard oak	1,578	21	1,829	24
Carya cordiformis	bitternut hickory	1,519	20	1,761	23
Tilia americana	basswood	1,440	19	1,669	22
Carya pallida	pale hickory	361	5	418	5
	Total	353,501	4,623	409,805	5,360

Table 7. Parcel SSP-2A timber volume per acre, by genus.

		Volume (bf)		Present Volume (bf)	
Scientific Name	Common Name	Compartment Total	Average per Acre	Tract Total	Average per Acre
Liriodendron	tulip poplar	171,934	2,249	199,319	2,607
Pinus	pine	53,325	697	61,818	809
Juniperis	eastern red cedar	45,712	598	52,993	693
Quecus	oak	37,853	495	43,882	574
	white oak group	22,630	296	26,234	343
	red oak group	15,223	199	17,648	231
Liquidambar	sweetgum	9,127	119	10,581	138
Carya	hickory	5,214	68	6,044	79
Acer	maple	5,107	67	5,920	77
Prunus	black cherry	4,378	57	5,075	66
Aesculus	buckeye	4,311	56	4,998	65
Celtis	hackberry	4,213	55	4,884	64
Ulmus	elm	4,013	52	4,652	61
Juglans	walnut	2,914	38	3,378	44
Fagus	beech	2,006	26	2,326	30
Fraxinus	ash	1,954	26	2,265	30
Tilia	basswood	1,440	19	1,669	22
	Total	353,501	4,623	409,805	5,360

Large diameter trees—Table 8 provides a list of the largest diameter trees of selected species and a count of all tally trees greater than 30 in. dbh, measured at sample points in the area. The tally tree with

greatest dbh in the area was a 42.7-in. yellow buckeye. There were six tally trees with dbh ≥ 30 in., of which three were tulip poplar and one was an ash, likely now dead due to EAB. The locations of trees greater than 30 in. dbh in and around the parcel are shown in Figure 7.

Table 8. Parcel SSP-2A largest diameter of selected species and number of trees over 30 in. in diameter.

Scientific name	Common Name	dbh of largest tally tree (inches)	Number of tally trees with dbh >= 30.0 inches
Acer rubrum	red maple	24.4	
Acer saccharum	sugar maple	24.8	
Aesculus flava	yellow buckeye	42.7	1
Carpinus caroliniana	iron wood	3.7	
Carya cordiformis	bitternut hickory	16.7	
Carya glabra	pignut hickory	14.4	
Carya ovalis	sweet pignut hickory	3.3	
Carya pallida	pale hickory	11.6	
Carya tomentosa	mockernut hickory	7.5	
Celtis sp.	hackberry	14.1	
Cercis canadense	redbud	10.1	
Cornus florida	flowering dogwood	6.8	
Diospyros virginiana	persimmon	9.2	
Fagus grandifolia	American beech	27.8	
Fraxinus sp.	ash	32.1	1
Juglans nigra	black walnut	15.9	
Juniperis virginiana	eastern red cedar	24.9	
Liquidambar styraciflua	sweetgum	21.8	
Liriodendron tulipifera	tulip poplar	37.7	3
Magnolia acuminata	cucumber magnolia	9.2	
Morus rubra	red mulberry	10.8	
Nyssa sylvatica	black gum	8.9	
Ostrya virginiana	hophornbeam	2.6	
Oxydendrum arboreum	sourwood	8.9	
Pinus echinata	short-leaf pine	17.7	
Pinus strobus	white pine	21.5	
Pinus taeda	loblolly pine	17.8	
Pinus virginiana	Virginia pine	18.9	
Platanus occidentalis	sycamore	21.4	
Prunus serotina	black cherry	16.8	
Quercus alba	white oak	30.9	1
Quercus coccinea	scarlet oak	20.6	
Quercus falcata	southern red oak	19.7	
Quercus montana	chestnut oak	26.9	
Quercus muehlenbergii	chinquapin oak	28.1	
Quercus rubra	northern red oak	27.9	
Quercus shumardii	Shumard oak	21.1	
Sassafras albidum	sassafras	5.9	
Tilia americana	basswood	13.2	
Ulmus alata	winged elm	20.1	
Ulmus americana	American elm	13.4	
		Total >= 30.0	6

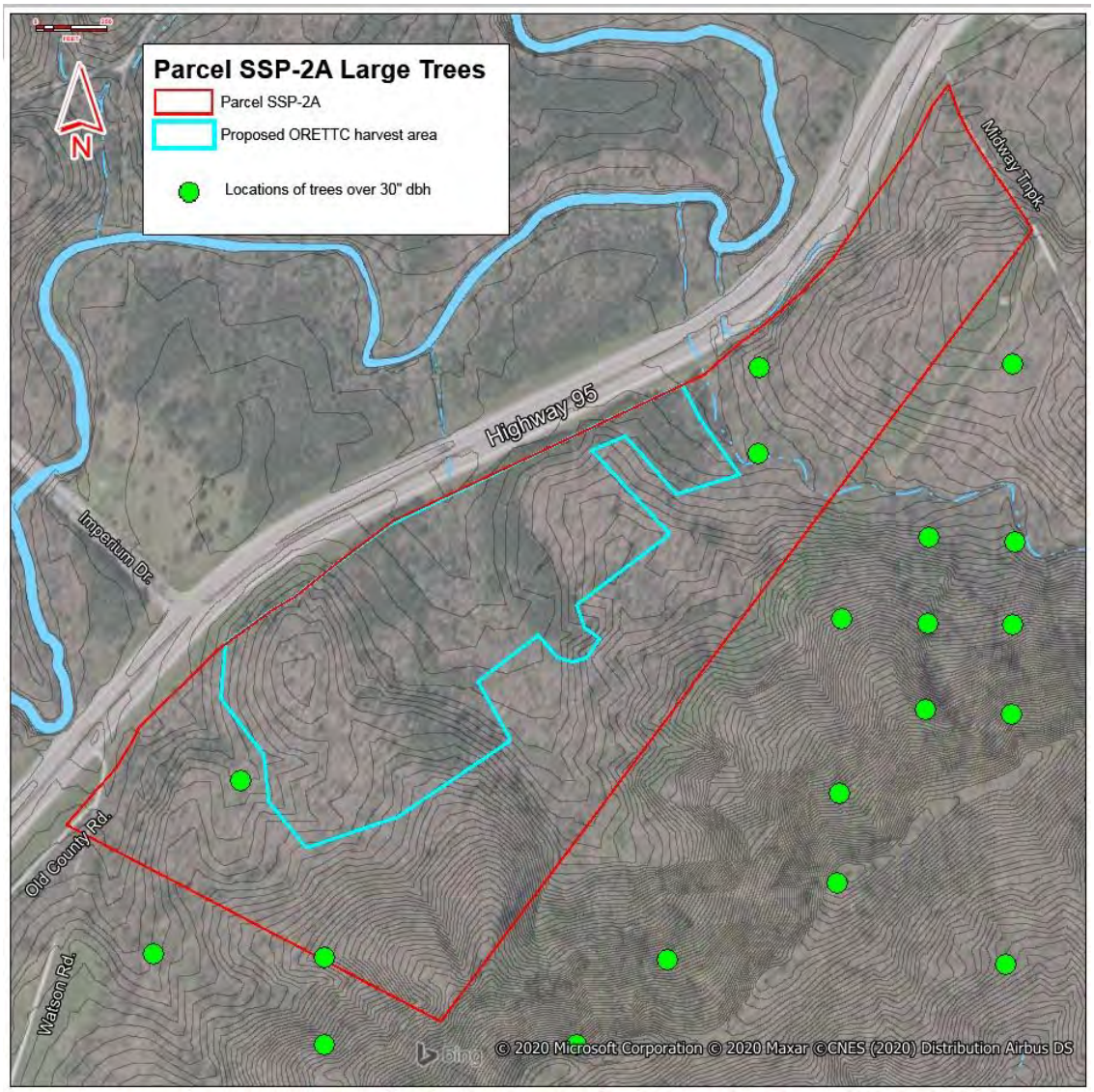

Figure 7. Large diameter trees within the SSP-2A parcel. (Note: ORETTC boundaries shown are based off a previous conceptual design. See Figures 2, 3 and 19 for latest project design and boundaries of disturbance.)

Additional observations—Due to the impact of the introduction of an invasive exotic insect, the Emerald Ash Borer (EAB), ash species (*Fraxinus*) on the site, originally representing approximately 0.8% of the live basal area but none of the merchantable volume may now be considered absent from the live component of the current SSP-2A forest.

In 2015, eight invasive plant species were recorded within the forest at 37 of the 39 inventory points. Species noted include Japanese honeysuckle (*Lonicera japonica*, at 36 points), Japanese stiltgrass (*Microstegium vimineum*, at 20 points), privet (*Ligustrum* spp. at 18 points), autumn-olive (*Elaeagnus umbellata*, at 14 points), and Amur honeysuckle (*Lonicera maackii*, at 6 points). Winged burning bush (*Euonymus alatus*), multiflora rose (*Rosa multiflora*), and fire thorn (*Pyrocantha* spp.) were observed at one point each. The extensive prevalence of invasives would appear to be a consequence of forest

fragmentation resulting from the presence of right-of-way clearing for both the TVA power line and Highway 95 and extensive pine clearing during efforts to control southern pine beetles in 1994.

4.1.2 Forest conditions within the ORETTC site

Forest condition within the ORETTC construction area—The forest within the ORETTC footprint (per the design of 7/24/2020) can be characterized by further extraction of the 2015 forest inventory data. A subset of 14 of the original inventory points that fell within the proposed ORETTC construction site was used to prepare the following analysis (Figure 8). The total area considered for this examination was 27.6 acres, composed of the 24.1-acre footprint, plus an additional 3.5 acres to remove hazard trees and dense pine that would present high-intensity wildfire fuels adjacent to the proposed facility.

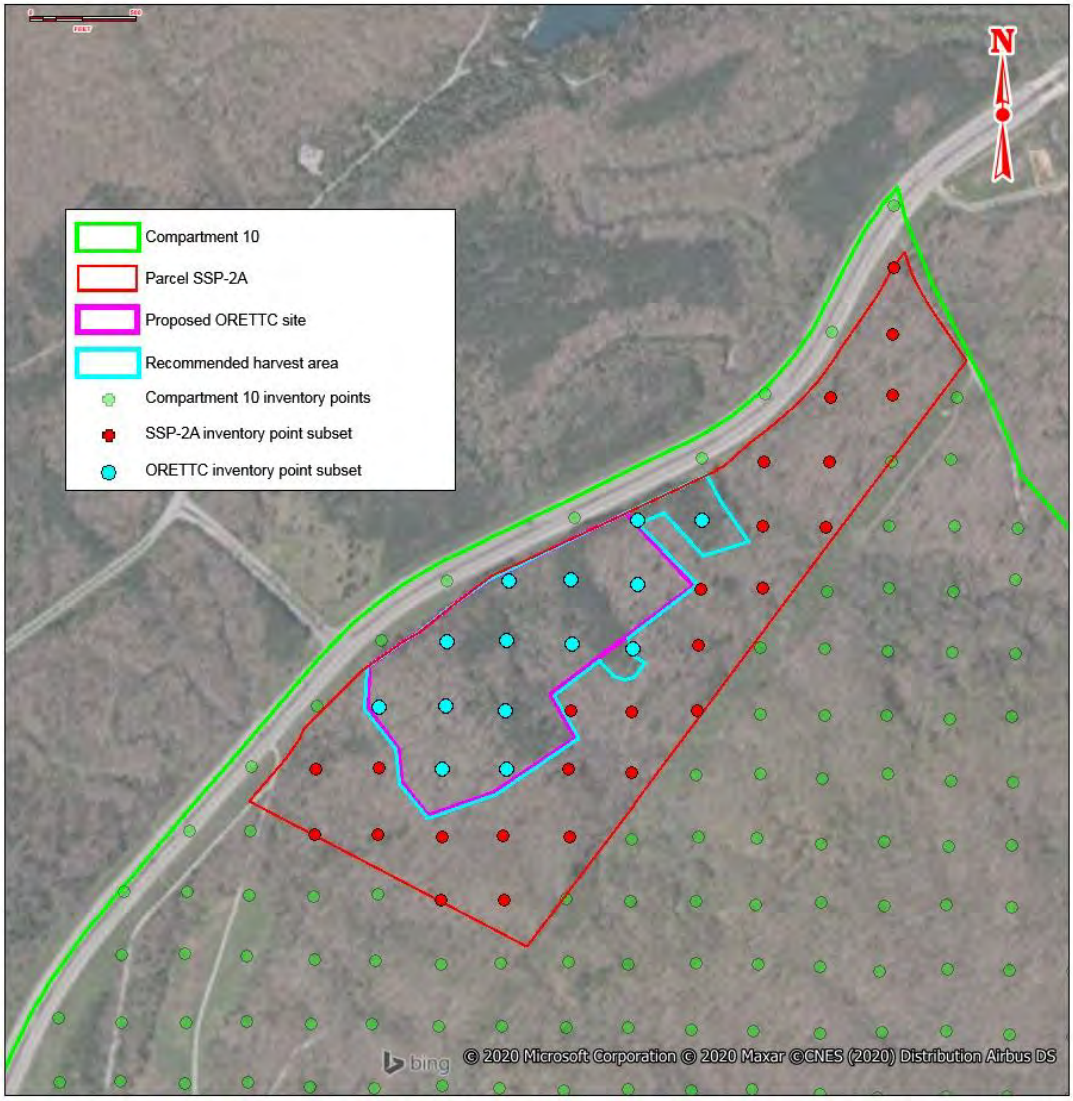

Figure 8. Subset of forest inventory points for the SSP-2A parcel, ORETTC footprint, and ORETTC timber harvest/fuel reduction area. (Note: ORETTC boundaries shown are based off a previous conceptual design. See Figures 2, 3 and 19 for latest project design and boundaries of disturbance.)

Basal area—Total basal area of the forest within the ORETTC site was 4,205 sq. ft. Standing dead trees accounted for approximately 11.8% of the total basal area (and by now would constitute a significant amount of dead and down wildfire fuels). The average live basal area of forest was 142 sq. ft per acre, a bit denser than the overall SSP-2A parcel.

A list of 22 species, with respective live tree basal area statistics, is provided in Table 9. Trees with a dbh greater or equal to 10.0 in. accounted for only 31.7% of the total basal area. Among trees greater than or equal to 10.0 in. dbh, four species contributed greater than 5% of the forest basal area, including eastern redcedar (32%), tulip poplar (21%), loblolly pine (17%), and ash (6%). Among sapling-size trees (dbh greater than or equal to 2.0 in. and less than 10.0 in.), species ranking based on basal area representing > 5% included four species: loblolly pine (59%), tulip poplar, (7%), American beech (6%), and ash (6%). Note that in the intervening 5 years since the inventory was conducted, most of the ash trees on the ORR have succumbed to EAB infestations; live basal area for ash by now will have been considerably reduced and contribute to an even higher percentage of standing dead basal area, or increased dead and down material.

Tree number and density—The number of live trees and saplings in the proposed construction area forest in 2015 totaled 21,787, averaging a considerably dense 781stems per acre (Table 10). There were 47.0 trees >9.9 in. dbh per acre on average across the area, totaling 1,311trees. There was an average of 733.9 sapling trees (< 10.0 in. dbh) per acre in this forest, totaling 20,476 saplings. For trees ≥10.0 in. dbh, eastern redcedar (11.8) provided the greatest average number of stems per acre, followed by loblolly pine (10.9) and tulip poplar (9.3). Among sapling-size trees, species ranking for average number of stems per acre included loblolly pine (268.8), beech (129.4), ash (48.1), sweetgum (45.3), sourwood (40.7), American elm (30.4), black cherry (30.1), and tulip poplar (28.3).

Volume of merchantable timber—The volume of merchantable timber in the ORETTC site in 2015 totaled 80,444 bf, averaging 2,883.3 bf per acre (Table 11). Eastern redcedar (27,815 bf), tulip poplar (24,012 bf), and loblolly pine (15,957 bf) collectively contributed 84.2% of the merchantable timber in this area. To estimate the current volume of timber, the volumes determined from the 2015 inventory may be adjusted by compounding over the five intervening growing seasons. Given the younger age of the timber, a somewhat more aggressive annual volume growth rate of 5% was assumed and applied to reflect an estimate of present stand volume. For example, the total volume at the time of this report, excluding ash mortality, would approach 100,134 bf, or 3,589 bf per acre.

Large diameter trees—No trees in excess of 30 in. dbh were tallied on the proposed ORETTC construction site during the 2015 forest inventory. The tally tree with greatest dbh in the ORETTC area was a 27.9-in. northern red oak.

Table 9. ORETTC site species list and live tree per acre statistics.

		Basal Area (ft^2)				Basal Area (%)			
Scientific Name	Common Name	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable	Trees (dbh > 10.0 inches)	Saplings (2 > dbh < 10.0 inches)	All tally trees (dbh > 2.0 inches)	Merchantable
Acer rubrum	red maple	40	60	100		3%	2%	3%	0%
Carpinus caroliniana	iron wood	0	20	20		0%	1%	1%	0%
Celtis sp.	hackberry	20	0	20		2%	0%	1%	0%
Cercis canadense	redbud	20	40	60		2%	1%	2%	0%
Cornus florida	flowering dogwood	0	20	20		0%	1%	1%	0%
Fagus grandifolia	American beech	20	159	179		2%	6%	5%	0%
Fraxinus sp.	ash	80	159	239	20	6%	6%	6%	2%
Juniperis virginiana	eastern red cedar	399	60	458	339	32%	2%	12%	39%
Liquidambar styraciflua	sweetgum	20	80	100	20	2%	3%	3%	2%
Liriodendron tulipifera	tulip poplar	259	199	458	219	21%	7%	12%	25%
Magnolia acuminata	cucumber magnolia	0	20	20		0%	1%	1%	0%
Nyssa sylvatica	black gum	0	20	20		0%	1%	1%	0%
Oxydendrum arboreum	sourwood	0	40	40		0%	1%	1%	0%
Pinus taeda	loblolly pine	219	1,594	1,814	219	17%	59%	46%	25%
Platanus occidentalis	sycamore	20	0	20		2%	0%	1%	0%
Prunus serotina	black cherry	60	60	120	20	5%	2%	3%	2%
Quercus alba	white oak	0	20	20		0%	1%	1%	0%
Quercus falcata	southern red oak	20	20	40	20	2%	1%	1%	2%
Quercus muehlenbergii	chinquapin oak	0	80	80		0%	3%	2%	0%
Quercus rubra	northern red oak	20	0	20	20	2%	0%	1%	2%
Ulmus alata	winged elm	40	20	60		3%	1%	2%	0%
Ulmus americana	American elm	20	40	60		2%	1%	2%	0%
		1,256	2,710	3,966	877	100%	100%	100%	100%
	Totals	31.7%	68.3%	100%					

Table 10. ORETTC site tree density per acre.

		Total Trees				Average Trees per Acre			
Scientific Name	Common Name	Trees dbh > 10.0 inches	Saplings 2 > dbh < 10.0 inches	All tally trees (dbh > 2.0 in)	Merchantible Trees	Trees dbh ≥ 10.0 inches	Saplings 2 > dbh < 10.0 inches	All tally trees (dbh > 2.0 inches)	Merchantible Trees
Acer rubrum	red maple	36	632	668	18	1.3	22.6	23.9	0.6
Carpinus caroliniana	iron wood	0	240	240		0.0	8.6	8.6	0.0
Celtis sp.	hackberry	26	0	26		0.9	0.0	0.9	0.0
Cercis canadense	redbud	36	335	371		1.3	12.0	13.3	0.0
Cornus florida	flowering dogwood	0	253	253		0.0	9.1	9.1	0.0
Fagus grandifolia	American beech	22	3,610	3,631		0.8	129.4	130.1	0.0
Fraxinus sp.	ash	83	1,343	1,426		3.0	48.1	51.1	0.0
Juniperis virginiana	eastern red cedar	330	142	471	287	11.8	5.1	16.9	10.3
Liquidambar styraciflua	sweetgum	8	1,262	1,270	8	0.3	45.3	45.5	0.3
Liriodendron tulipifera	tulip poplar	258	788	1,047	210	9.3	28.3	37.5	7.5
Magnolia acuminata	cucumber magnolia	0	140	140		0.0	5.0	5.0	0.0
Nyssa sylvatica	black gum	0	46	46		0.0	1.7	1.7	0.0
Oxydendrum arboreum	sourwood	0	1,136	1,136		0.0	40.7	40.7	0.0
Pinus taeda	loblolly pine	304	7,500	7,803	304	10.9	268.8	279.7	10.9
Platanus occidentalis	sycamore	37	0	37		1.3	0.0	1.3	0.0
Prunus serotina	black cherry	85	841	926	25	3.0	30.1	33.2	0.9
Quercus alba	white oak	0	282	282		0.0	10.1	10.1	0.0
Quercus falcata	southern red oak	9	282	291	9	0.3	10.1	10.4	0.3
Quercus muehlenbergii	chinquapin oak	0	694	694		0.0	24.9	24.9	0.0
Quercus rubra	northern red oak	5	0	5	5	0.2	0.0	0.2	0.2
Ulmus alata	winged elm	53	101	154		1.9	3.6	5.5	0.0
Ulmus americana	American elm	20	849	870		0.7	30.4	31.2	0.0
		1,311	20,476	21,787	866	47.0	733.9	780.9	31.0

Table 11. ORETTC site timber volume by species.

		Volume (bf)		Present Volume (bf)	
Scientific Name	Common Name	Compartment Total	Average per Acre	Tract Total*	Average per Acre
Juniperis virginiana	eastern red cedar	27,815	997	35,500	1,272
Liriodendron tulipifera	tulip poplar	24,012	861	30,646	1,098
Pinus taeda	loblolly pine	15,957	572	20,365	730
Quercus rubra	northern red oak	3,400	122	4,339	156
Liquidambar styraciflua	sweetgum	2,722	98	3,474	125
Quercus falcata	southern red oak	2,662	95	3,398	122
Fraxinus sp.	ash	1,986	71	0	0
Prunus serotina	black cherry	1,890	68	2,413	86
	Total	80,444	2,883	100,134	3,589

* Ash volumes not considered to be present following recent Emerald Ash Borer infestation.

4.1.3 Timber clearing and disposal

Timber clearing—Timber (the marketable portion of the forest) is considered a DOE Realty asset and must therefore be properly disposed. DOE currently has a timber sale agreement in place with a local wood-using business, Oak Ridge Hardwoods, LLC (RE-Timber-03-0001). This contractor has the option to harvest or otherwise recover merchantable wood from project sites and in return agrees to remit to DOE an established stumpage (price per unit of wood removed). The Reservation Forester coordinates the execution of the agreement on behalf of the Real Estate Officer, and any supported project's interface with logging personnel would be via the Forester. Among other terms, the agreements will specify "The Guide to Forestry Best Management Practices in Tennessee" as appropriate erosion control guidance and other requirements such as OSHA Title 29 CFR, Part 1910.266, "Logging Operations." During field surveys to determine the forest conditions, a general plan was developed for harvesting equipment to reach the timber, staging areas (log landings) to handle and load logs, and safe egress of loaded log trucks to reach public roads and marketing venues. There would be no cost to the project for these actions. Further, a project may experience a significant cost abatement as the volume of the site vegetation to be disposed is greatly reduced.

It is recommended that the contractor be provided project timelines and allowed to examine the site as soon as possible prior to SSP-2A Construction Area footprint clearing to verify timber quality, volume estimates, and access requirements and to arrange for a qualified logging crew to perform the harvest. The duration of logging operations varies with site size, terrain and access limitations, and seasonal weather and may be further constrained by timing considerations to protect endangered species or administrative delays caused by competing site security or utility operations. Ideally, a planning allowance of at least 12 months in advance of construction startup should be adequate for the logging period and potential delays.

It is important to understand that residual vegetation woody debris would remain following the harvest and that the land use would technically still be considered "forestland." The construction project would be responsible for taking the defining steps of converting the harvested forestland to a "developed" land use classification by initiating activities that are more purely "clearing" (removal of all vegetation, leaf litter, stumps, soil grading, etc.). The DOE timber sale agreement does not include any requirement for the performance of land clearing; state forestry best management practices would apply to the site until development is initiated.

Logging access/egress—The SSP-2A site is directly accessible from State Route 95 (Oak Ridge Turnpike) from two existing points that avoid wetland crossings. There is a designed woodlands access point from SR 95 585 ft northeast of the Imperium Drive intersection. Midway Turnpike is also an established logging access point to SR 95 and preferable for activities on the eastern portion of the tract.

Timber taken from the site would likely be sent in either of two different directions, depending on the markets used. For wood taken to Oak Ridge and other points to the northeast, typical routing would be northeastward along SR 95 into the business district of Oak Ridge, then westward on SR 62 to SR 61, and then eastward to the Oak Ridge Hardwoods Mill in Marlowe. For wood taken toward Kingston and points west, typical routing would be southwestwardly along SR 95 to Oak Ridge Forest Products' chipping facility at ETTP on the ORR or onward to I-40 and points southward. Figure 9 illustrates how a logging plan for the ORETTC facility might appear (large arrows indicate previously used logging access to Highway 95).

Disposal of residual vegetation—The preferred method for disposing of remaining vegetation is grinding/mulching. The mulched material may be repurposed as erosion control cover and berms, though depths may be recommended in order to promote biotic recovery and discourage leachates entering

nearby waterways. It is recommended nearby ORR sites be identified beforehand that could accommodate staging of any surplus mulch. To limit the impact of complete vegetation removal, this can be performed piecemeal, depending on the pace of the site grade work, though care must be taken to avoid leaving inaccessible pockets of debris that would become increased residual wildfire fuel loads.

Alternatively, woody debris may be burned in place with trench, pile, or windrow burning. Per the DOE ORR Wildland Fire Management Plan, all open burning on the ORR requires review and authorization by the Federal Reservation Manager, the appropriate site office, and the Reservation Forester; prerequisite burn plan development, review, and authorization can typically require 6–8 weeks to complete.

Given the unknown size of the proposed clearing, the amount of residual debris would be difficult to estimate but could overwhelm the capacity of ORR's Hawk's Nest Woody Debris Disposal Facility at ORNL. The burnyard is nearly 9 miles away, so hauling would not be economically feasible nor recommended.

Due to wildfire risk, under no circumstances should woody debris be left onsite untreated.

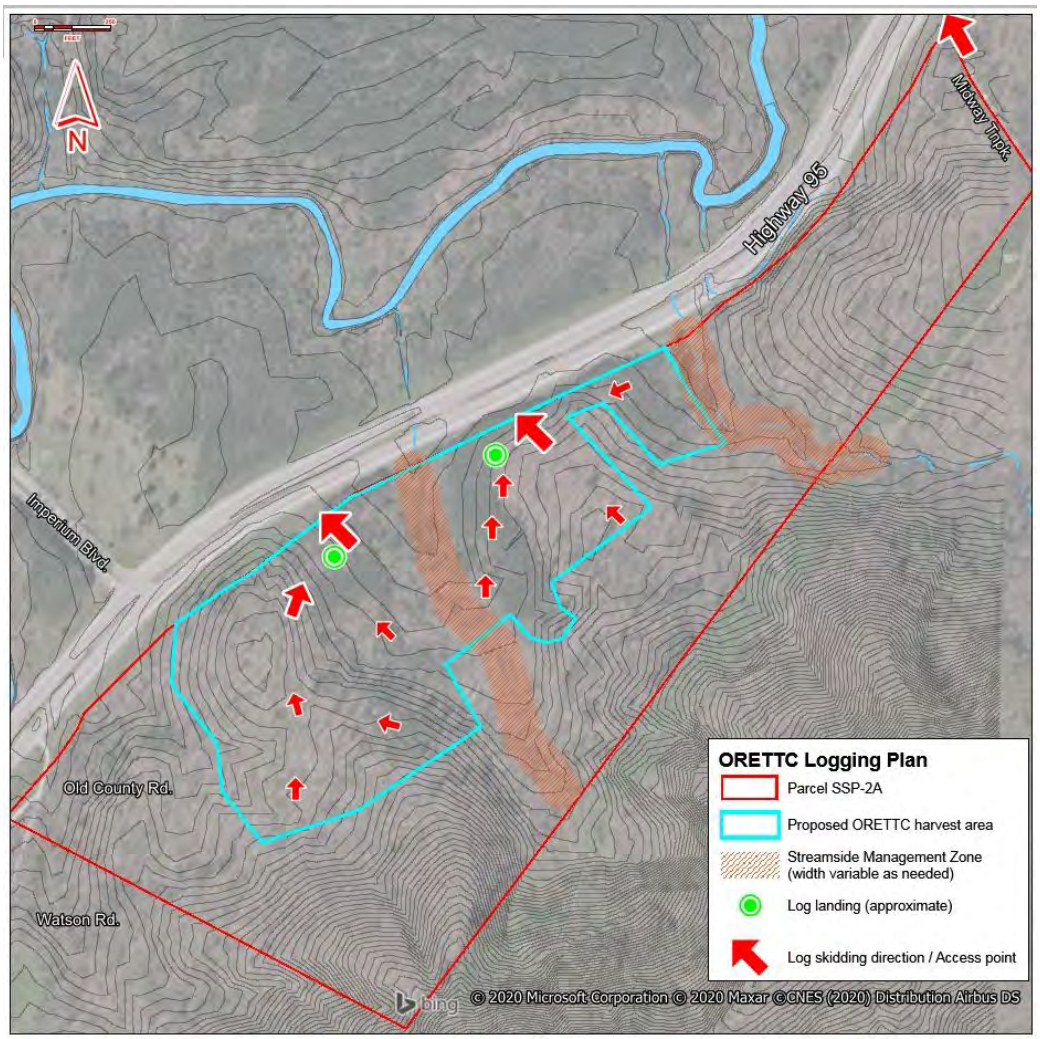

Figure 9. Logging plan to accompany ORETTC site construction activities. (Note: ORETTC boundaries shown are based off a previous conceptual design. See Figures 2, 3 and 19 for latest project design and boundaries of disturbance.)

4.1.4 Wildland fire planning

Wildland fire planning—Construction at the SSP-2A location will create an additional wildland interface of site operations with the reservation's wildfire fuels, requiring the application of current, applicable National Fire Protection Association (NFPA) Standards 1141, 1143, and 1144. The proposed SSP-2A site lies within portions of fire management units, #9 Old County, and construction would require modification to its corresponding wildland fire pre-plan.

Wildfire fuels and hazards—The parcel is generally composed of problematic wildfire fuels consisting of heavy down wood and dense vegetation growing in the wake of southern pine beetle outbreaks (Figure 10). Fire suppression in these fuels generally requires mechanized support as direct attack by personnel is unsafe.

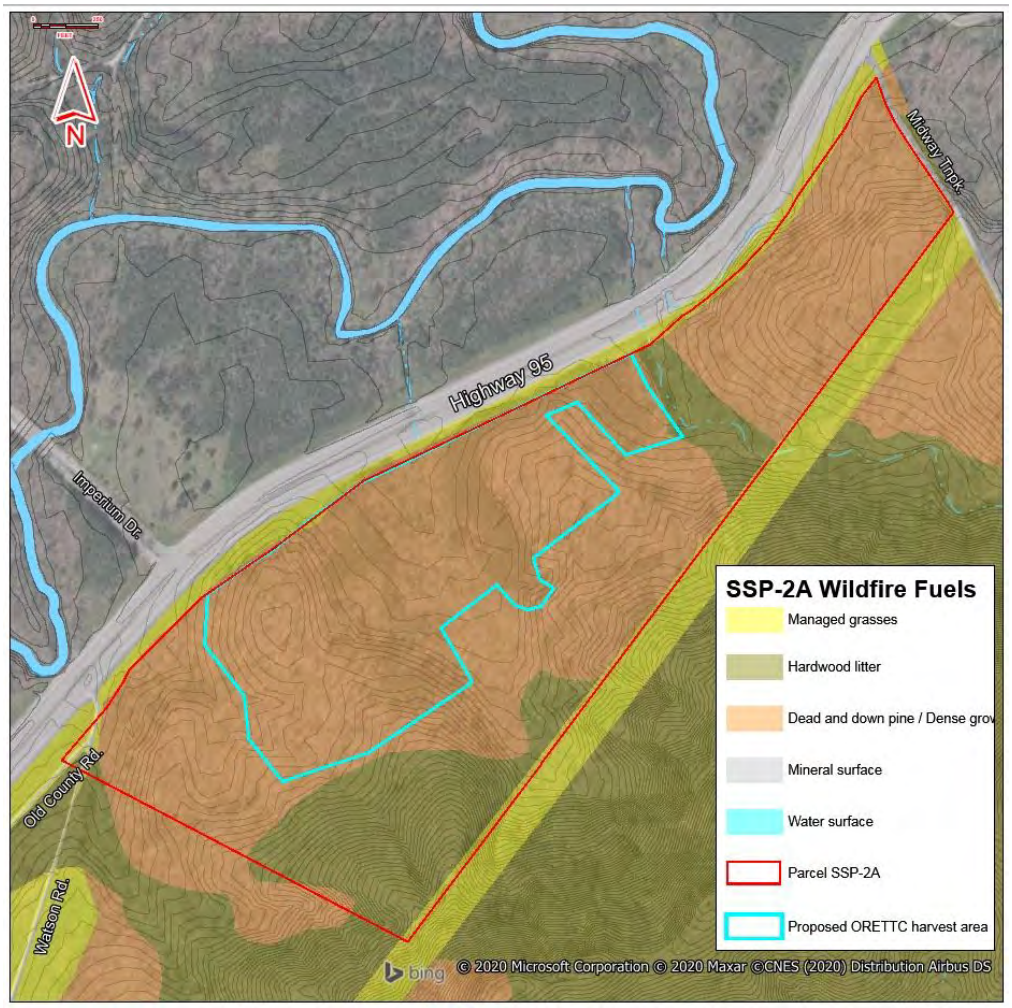

Figure 10. Wildfire fuels within the SSP-2A and ORETTC project area. (Note: ORETTC boundaries shown are based off a previous conceptual design. See Figures 2, 3 and 19 for latest project design and boundaries of disturbance.)

Figure 11 shows the Characteristic Fire Intensity Scale (FIS) at the SSP-2A area is generally moderate to high. Characteristic FIS specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. The FIS consist of five classes in which the order of magnitude between classes is tenfold. The minimum class, Class 1, represents very low wildfire intensities, and the maximum class, Class 5, represents very high wildfire intensities. Refer to descriptions below.

1. Class 1, Very Low:
   Very small, discontinuous flames, usually less than 1 ft in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.

2. Class 2, Low:
   Small flames, usually less than 2 ft long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

3. Class 3, Moderate:
   Flames up to 8 ft in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.

4. Class 4, High:
   Large flames, up to 30 ft in length; short-range spotting common; medium-range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective; indirect attack may be effective. Significant potential for harm or damage to life and property.

5. Class 5, Very High:
   Very large flames up to 150 ft in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

[This dataset was derived from updated fuels and canopy data as part of the 2010 Southern Wildfire Risk Assessment (SWRA) Update Project completed in May 2014 and made available by the Southern Group of State Foresters via SWRA web Portal (SouthWRAP).]

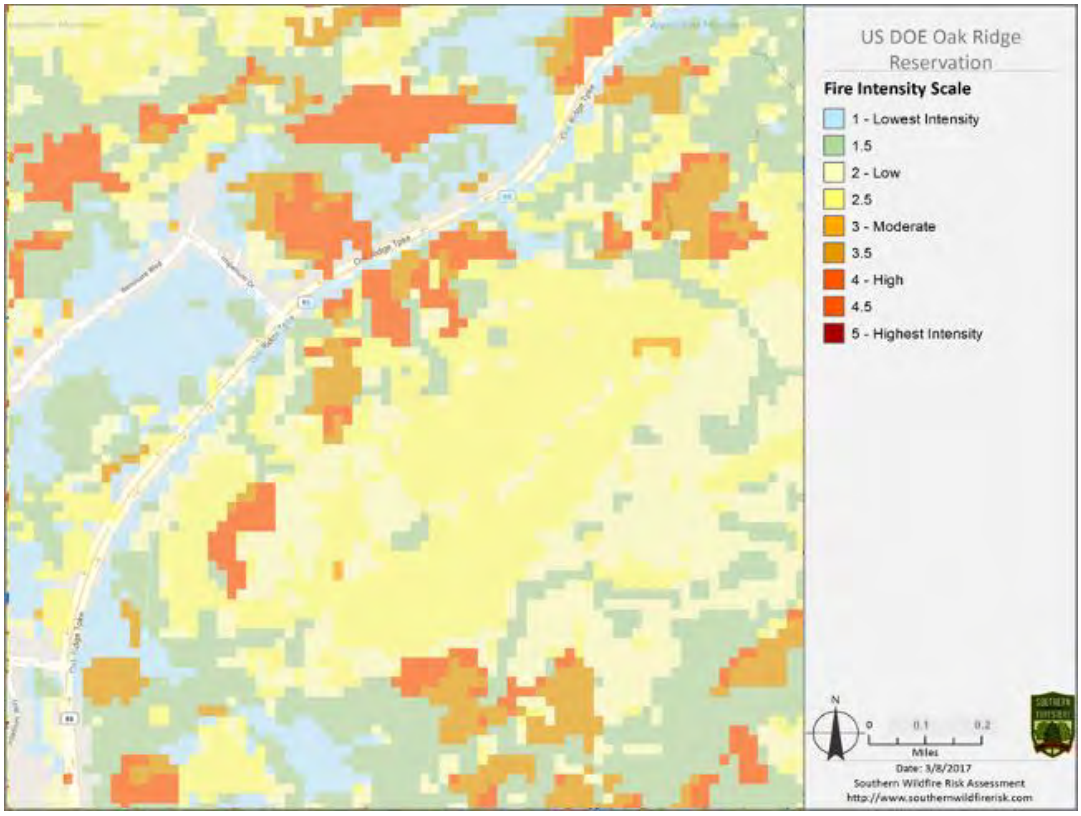

Figure 11. Fire Intensity Scale for the SSP-2A area.

As outlined in Section 4.1.2, these hazards can be most easily mitigated by the modification of surrounding pockets of pine during timber harvesting prior to construction. Residual fuels may need to be modified during construction clearing and setbacks maintained to ensure safe conditions remain post-construction. Additionally, increased fire ignition risks accompanying new developments could require mitigations to protect the White Wing Scrapyard contamination area (another moderate-to-high fire intensity area at the bottom center of Figure 11) and the Old Growth Forest Natural Area upslope of SSP-2A. (Note that the extent of any actual fuelbed modifications may require adjustments in favor of any coexistent ecological concerns determined during this review, or prior to initiation of the task.)

Emergency response and access—The site is currently within the City of Oak Ridge emergency response zone for the ORR. No impact to typical response times to and through the area is anticipated as a result of project completion.

Given the surrounding fuel types and terrain, access to the site must be maintained at strategic points to allow for wildfire defense. A fence is not currently planned for the facility, but should one be installed, gates should be wide enough to permit dozers/plows to pass and open inward to facilitate responder escapes from wildfires (gates opening outward often fail due to blockage by unmanaged vegetation). Site design should be reviewed to ensure a hydrant is accessible at all times by non-ORETTC personnel.

4.2 PREVIOUS LAND USE AND CULTURAL ACTIVITIES

Prior landownership and use—Parcel SSP-2A is derived from two older parcels acquired by the federal government for the Manhattan Project in 1942 (Figure 12). The bulk of the parcel was derived from Acquisition Parcel J-975 (J.E. Williams and wife), with the eastern portion originating from Acquisition Parcel J-939 (Lucy Montcastle). No improvements associated with these parcels were located on the

SSP-2A parcel, although a small tenant house with J-975 was located just outside on a site since disturbed by widening of State Route 95.

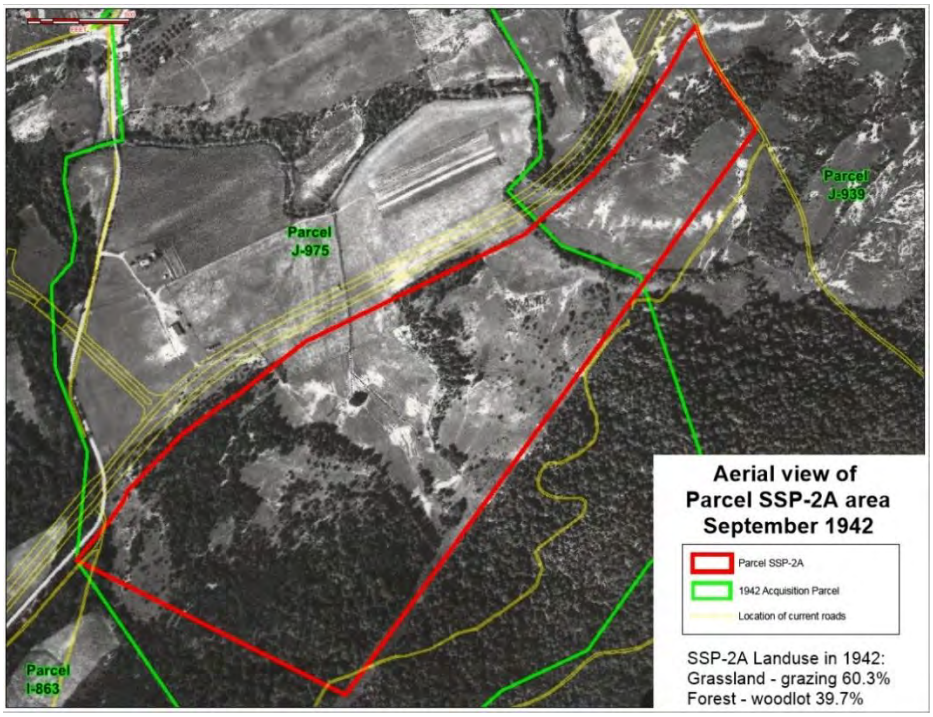

Figure 12. 1942 Aerial view of the SSP-2A parcel.

The land use was rural/agrarian, with only about 32 acres (39.7%) under forest, which included open woodland at that time, with the remaining 49 acres (60.3%) in pasture and grazing land (row crops occurred on more suitable soils north of the site, and what little development existed was northwest of the site). Obvious in the 1942 image are lighter patches indicative of soil erosion due to overgrazing on thin soils. The watershed in the center of SSP-2A was also clearly channelized before this time. Also visible at the southern line of Parcel SSP-2A is the TVA Norris–Wilson power transmission line, the oldest of several now crossing the reservation. It had been constructed about 6 years earlier.

Subsequent land use—After the conclusion of the Manhattan Project, reforestation initiatives were undertaken to quickly increase forest cover on abandoned farmland in valleys and lower slopes. The eroded soils in Parcel SSP-2A were planted in loblolly pine in 1950. Commercial thinning of this pine occurred in 1969 and 1978. In 1994, the remaining loblolly pine was harvested during an outbreak of southern pine beetles. The current dense pine is the result of the abundant seed that had accumulated in the forest litter prior to the previous harvest. There was also one hardwood sawtimber harvest conducted in 1975 that included the upland area of the southwest corner of the site. Figure 13 illustrates the area of both selective harvest and the loblolly pine planting and harvests.

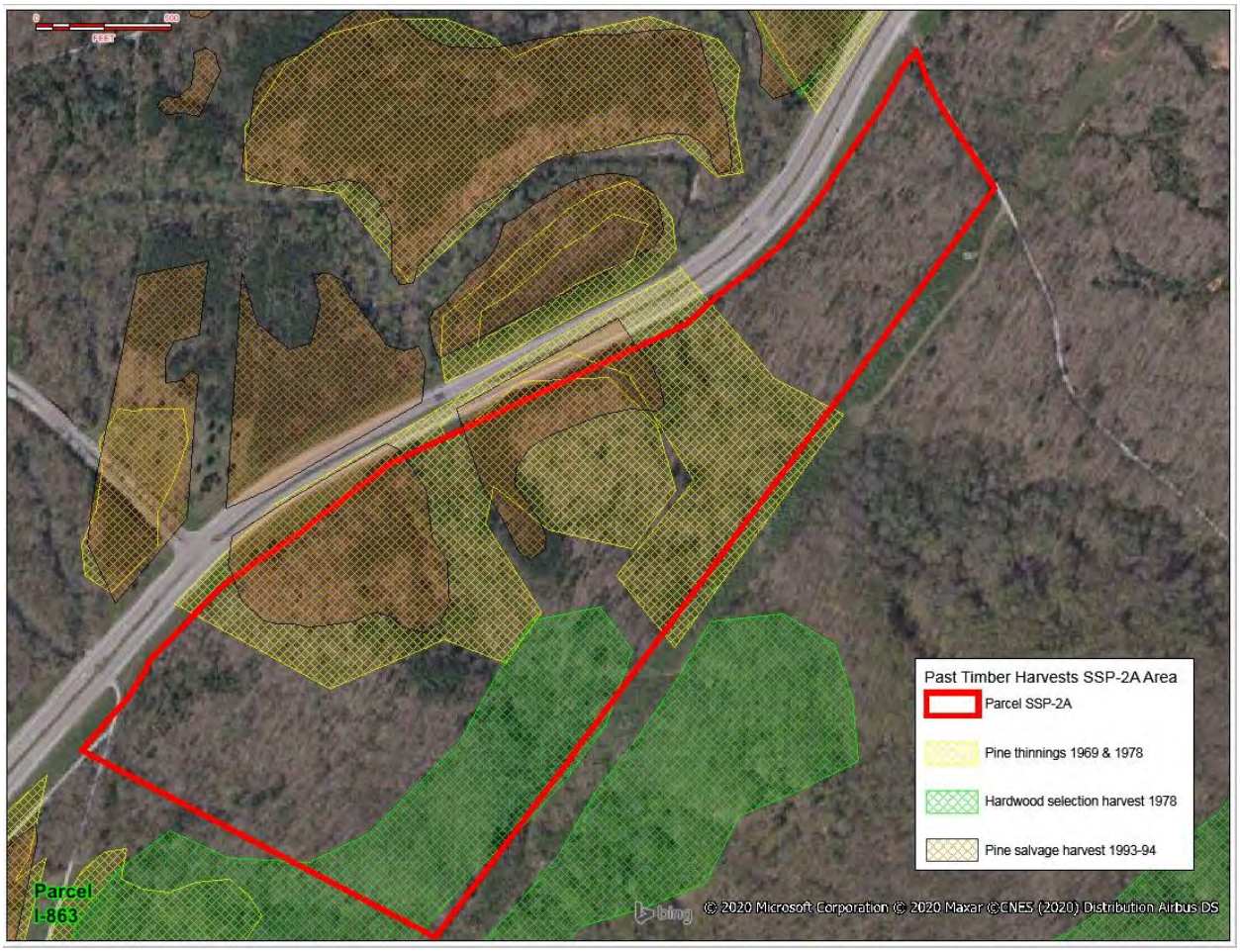

Figure 13. Prior timber harvest within and adjacent to the SSP-2A parcel.

4.3 WILDLIFE SURVEYS

All vertebrate wildlife known from the SSP-2A parcel are included in Appendix A. In total, >106 animals are known from the review area. This included 88 vertebrates: 9 amphibians, 39 birds, 25 mammals, 11 reptiles, and 4 fish (14 insects, 2 crustaceans, and 2 molluscs were also identified). Of all species known from the SSP-2A review area, at least 46 are afforded special legal protection under state or federal law. Among migratory birds, 3 species are considered by USFWS to be both Birds of Conservation Concern (BCC) and Birds of Management Concern (BMC), 2 species are considered BCC, and 3 species are considered BMC [all 39 bird species are afforded protection under the Migratory Bird Treaty Act (16 U.S.C. §§703-711)]. One migratory bird species, wood thrush (*Hylocichla mustelina*), is also a USFWS Focal Species. Five wildlife species are considered In Need of Management by the state of Tennessee (4 confirmed and 1 historical record), 3 species (including one unconfirmed bat) are state-listed Threatened, and 2 species (including 1 unconfirmed bat) are state-listed Endangered. Of these, 2 bat species (1 confirmed and 1 unconfirmed) are federal listed as Endangered, 1 unconfirmed bat is federal listed as Threatened, and two confirmed bat species are currently under review for federal listing (Appendix A, see also subsections below). At least one species is considered rare by TDEC (mountain disc, *Anguispira jessica*), and 6 confirmed species (plus 2 suspected species that cannot be confirmed at this time) are Focal Species for Management and Research for the ORR and ORNERP (Appendix A).

Exact locations for most animal resources were omitted here intentionally owing to their sensitivity. Locations have been provided to ORETTC project personnel.

4.3.1 Visual encounter surveys/cover boards (200 person-hours)

NRMP staff implemented VES 45 times between 22 June 2020 and 10 Sept 2020 along transects (60 person-hours) and all streams, wetlands, forest edges, and roadsides within the review area (60). A later survey effort (80 person-hours) was concentrated along stream, seep, and karst features that were identified through habitat surveys (Section 3.3.4) and the continually updated screening tool (Section 3.3.1).

NRMP staff detected 75 wildlife species during the approximately 200 hours of VES effort. This included the apparent first record of the state-listed black mountain salamander (*Desmognathus welteri*) on the ORR and for Roane County, Tennessee. VES efforts also confirmed the presence of state-listed Tennessee dace (*Chrosomus tennesseensis*) in both major drainages within the SSP-2A parcel, which includes the central stream that passes through the ORETTC. Additional species of note included the mountain disc snail, an ORR Focal Species and considered "Rare" by TDEC (TDEC 2020b; Withers 2016), several of which were located within two separate karst outcrops within the primary ORETTC footprint. Suitable breeding habitat was detected for four-toed salamanders (*Hemidactylium scutatum*) in several wetland and seep areas in the SSP-2A parcel and ORETTC footprint (Figure 14). The four-toed salamander is state-listed as "In Need of Management" and represents a Focal Species for Research and Management for the ORR and ORNERP.

Figure 14. Examples of four-toed salamander breeding habitat within the SSP-2A and ORETTC footprint.

4.3.2 Bat acoustic surveys (91 survey nights)

Initial habitat surveys of the SSP-2A parcel revealed the presence of suitable roost trees for forest dwelling bats, notably Indiana bat and northern long-eared bat. This was particularly true of the higher elevations where forest midstory was open. Areas within the ORETTC stream buffer and east of the central stream contained dense understory to midstory, with limited trees suitable for roosting (lighter green areas in Figure 15).

We obtained useable acoustic data from 11 acoustic bat detectors within the SSP-2A parcel between 26 June and 14 August 2020, covering 91 detector nights (Figure 15). In total, 10 native bat species were detected. Of these, detection frequencies provide strong evidence for 8 species and reasonable evidence for two species (Table 12). Both state- and federal-listed species were detected within or immediately adjacent to the SSP-2A parcel. Federal-Endangered Gray Bats (*Myotis grisescens*) were detected at frequencies that indicate use of the SSP-2A survey area for foraging (Gray Bats roost only in caves). Federal-Endangered Indiana Bat (*Myotis sodalis*) and Federal-Threatened Northern Long-eared Bat (*Myotis septentrionalis*) were detected at extremely low frequencies. State-Threatened Little Brown Bat (*Myotis lucifugus*) and State-Threatened Tricolored Bat (*Perimyotis subflavus*)—both species also Under Review for listing under the Endangered Species Act—were detected at high frequency within the SSP-2A survey area.

Relatively few bats were detected within the denser vegetation within the stream riparian that bisects the proposed ORETTC. Although the majority of the ORETTC footprint lacks suitable foraging or roosting habitat due to cluttered midstory and understory, this area contains several potential roost trees, either with peeling bark or as dead snags. Moreover, such dense vegetation limits the detectability of smaller habitat patches that might still be important, and it reduces the effective range of acoustic monitors. Finally, we note a deficiency in acoustic data coverage for the sparser and more mature upland forest areas on the NNSA side of the ORETTC facility footprint (Figure 15).

Additional surveys are necessary for the upcoming fall swarming and winter hibernation seasons. Although not shown in the maps herein, the ORR contains numerous caves within 5 miles of the review area. Limited cave surveys and acoustic data from cave entrances indicate that the ORR's caves support hibernating Indiana bats and northern long-eared bats and gray bat maternity colonies (data available upon request).

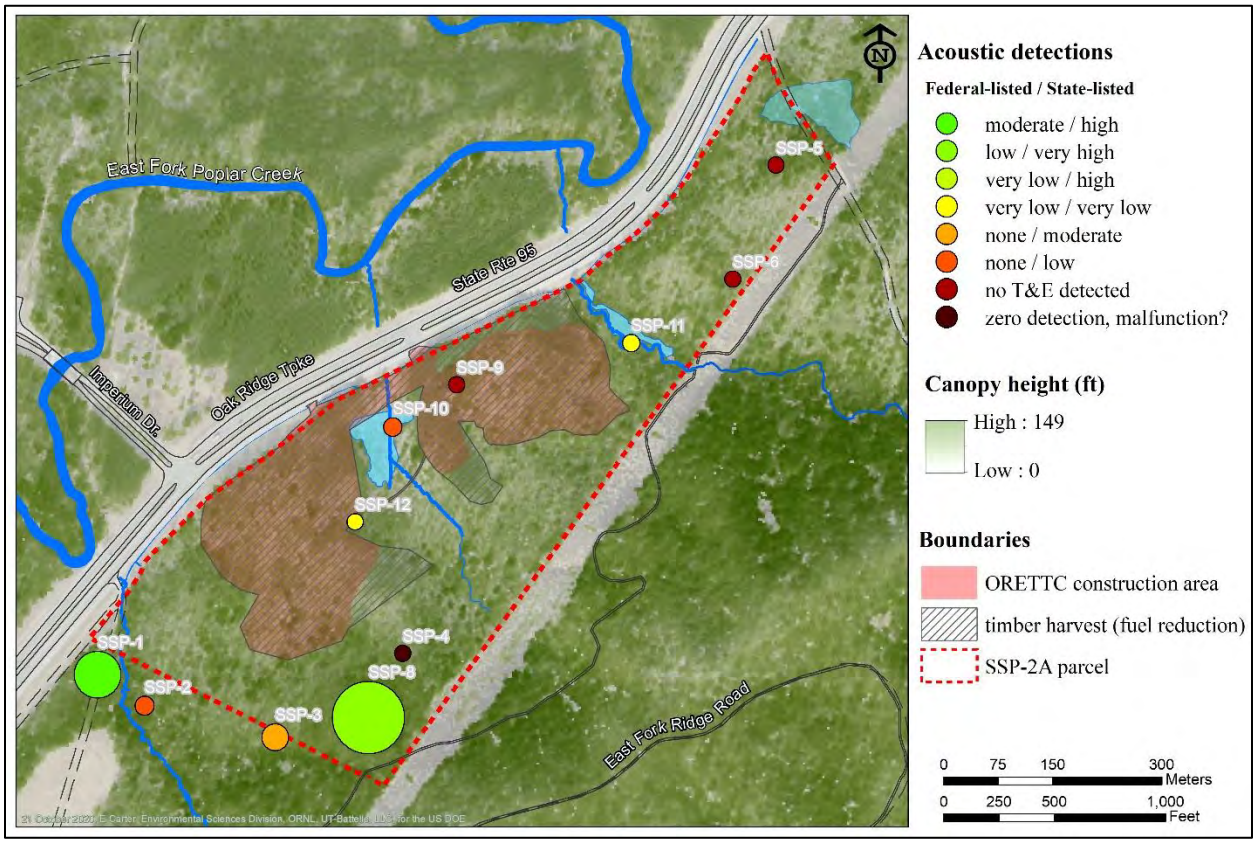

Figure 15. Locations of acoustic bat detectors and aquatic resources within the SSP-2A parcel. Bat detector locations are colored according to the frequency of detection of federal-listed species and are sized relative to the total number of calls detected for both state- and federal-listed species. Map background is aerial imagery combined with a LiDAR-derived canopy height overlay (partial transparency). Darker green regions indicate higher and denser canopy, lighter green regions indicate dense understory and a lack of overstory, and tan-to-grey regions indicate lack of vegetation.

Table 12. Detections from bat acoustic monitors. Monitors 1–4 were deployed for 12 nights, and monitors 5 and 6 were deployed for 11 nights, beginning 26 June 2020. Monitors 7–11 were deployed for 6 nights beginning 14 July 2020.

Species	Common name	Status			Monitor ID [SSP-#]											
		State	Federal	Other	1	2	3	4*	5	6	7	8	9	10	11	12
Eptesicus fuscus	Big Brown Bat				1410	10	62	0	0	1	12	344	0	3	0	0
Lasiurus borealis	Eastern Red Bat				426	7	5	0	0	0	1	45	0	0	0	0
Lasiurus cinereus	Hoary Bat				10	8	9	0	4	6	0	3	1	0	0	0
Lasionycteris noctivagans	Silver-Haired Bat				4	1	0	0	0	0	0	1	0	1	0	0
Lasiurus seminolus	Seminole Bat				6	1	0	0	0	0	0	3	0	0	0	0
Myotis grisescens	Gray Bat	E	E	G4	20	0	0	0	0	0	5	5	0	0	1	0
Myotis lucifugus	Little Brown Bat	T	UR	G3	139	7	40	0	0	0	3	138	0	1	1	1
Myotis septentrionalis	Northern Long-eared Bat	T	T	G1G2	0	0	0	0	0	0	0	2	0	0	0	0
Myotis sodalis	Indiana Bat	E	E	G2	0	0	0	0	0	0	0	2	0	0	0	0
Nycticeius humeralis	Evening Bat				17	2	0	0	0	0	0	7	0	0	1	0
Perimyotis subflavus	Tricolored Bat	T	UR	G2G3	16	3	1	0	0	0	90	79	0	3	0	0
Tadarida brasiliensis	Brazilian Free-Tailed Bat				2	6	2	0	8	3	4	29	0	2	0	0

Federal listing status codes:
E – Federally listed Endangered
T – Federally listed Threatened
UR – Currently Under Review for federal listing

State-listing status codes:
E – Endangered
T – Threatened
NM – In Need of Management
SC – Of Special Concern

* Detector SSP4 malfunctioned, hence no bat calls were recorded.

4.3.3 Avian point counts (20 person-hours)

In total, 37 bird species were recorded within the survey area from approximately 20 survey hours from 22 June 2020 to 13 August 2020. This includes 37 species protected under the Migratory Bird Treaty Act. Four species are considered by USFWS to be Birds of Management Concern, and two species are considered by USFWS to be Birds of Conservation Concern. Several additional species carry Partners in Flight conservation designations. These include two species considered to be Species in Steep Decline, six species considered to be Of Regional Concern, two species listed on the Yellow Watch List, and six species deemed Management Action Needed (Table 13). Additional Migratory Birds known from the SSP-2A parcel are included in Table 14 and Appendix A.

Table 13. Migratory Birds (under the MBTA) documented within the SSP-2A parcel during 2020 surveys.

Species	Common name	State	Federal	Other	PIF
Archilochus colubris	Ruby-throated Hummingbird				
Baeolophus bicolor	Tufted Titmouse				
Buteo platypterus	Broad-winged Hawk				
Megascops asio	Eastern Screech owl				
Meleagris gallopavo	Wild Turkey		BMC		
Cardinalis cardinalis	Northern Cardinal				
Contopus virens	Eastern-wood Pewee				RC, MA
Dryobates pileatus	Pileated Woodpecker				
Melanerpes carolinus	Red-bellied Woodpecker				
Coccyzus americanus	Yellow-billed Cuckoo				CBSD
Dryocopus villosus	Hairy Woodpecker				
Dryobates pubescens	Downy Woodpecker				
Colaptes auratus	Northern Flicker				CBSD
Empidonax virescens	Acadian Flycatcher				RC, MA
Geothlypis formosa	Kentucky Warbler		BCC+BMC		YWL, RC, MA
Hylocichla mustelina	Wood Thrush	NM*	BCC+BMC	Focal	YWL, RC, MA
Icteria virens	Yellow-breasted Chat				RC, MA
Melospiza melodia	Song Sparrow				
Molothrus ater	Brown-headed Cowbird				
Cyanocitta cristata	Blue Jay				
Corvus brachyrhynchos	American Crow				
Passerina cyanea	Indigo Bunting				
Pipilo erythrophthalmus	Eastern Towhee				RC, MA
Piranga olivacea	Scarlet Tanager				
Poecile carolinensis	Carolina Chickadee				
Polioptila caerulea	Blue-gray Gnatcatcher				
Seiurus aurocapilla	Ovenbird				
Setophaga americana	Northern Parula				
Setophaga citrina	Hooded Warbler				
Setophaga pensylvanica	Chestnut-sided Warbler				
Setophaga petechia	Yellow Warbler				

Table 13. (continued).

Species	Common name	State	Federal	Other	PIF
Sitta carolinensis	White-Breasted Nuthatch				
Spinus tristis	American Goldfinch				
Thryothorus ludovicianus	Carolina Wren				
Vireo griseus	White-eyed Vireo				
Vireo olivaceus	Red-eyed Vireo				
Zenaida macroura	Mourning Dove		BMC		

Federal status codes:
BCC – Birds of Conservation Concern
BMC – Birds of Management Concern
Focal –investment of resources to address conservation or management issues.

State status codes:
E – Endangered
T – Threatened
NM – In Need of Management (TWRA 2018)
SC – Of Special Concern

PIF status codes – Bird Conservation Region 28:
RC = Regional Concern
MA = Management Attention needed
YWL = Yellow Watch List
CBSD = Common Bird in Steep Decline

4.3.4 Additional wildlife survey results

Small mammal trapping (493 trap-nights)—No status small mammal species were detected during the survey. Common species included deer mice (*Peromyscus* spp) and chipmunk (*Tamias striatus*). Twenty-eight of 61 traps were pulled one trap-night early owing to damage caused by a black bear, which frequented the survey area. Contemporary records of state-listed long-tailed shrew (*Sorex dispar*) exist for SSP-2A (Table 14).

Drift fence surveys (small vertebrates and invertebrates) (30 trap days and nights)—The most common species captured during drift fence array surveys were harvestmen (*Leiobunum spp.).* Others included the upland chorus frog (*Pseudacris feriarum*), cotton rat (*Sigmodon hispidus*), white-footed mouse (*Peromyscus leucopus*), and various carabid beetles.

Camera-trap surveys (98 traps days and nights)—Ten species of wildlife were observed via camera trap surveys. The most common animals observed included raccoons (*Procyon lotor*) and white-tailed deer (Od*ocoileus virginianus*). Others included black bear (*Ursus americanus*), bobcat (*Lynx rufus*), wild turkey (*Meteagris gallopava silvestris*), cottontail rabbit (*Sylvilagus floridanus*), American crow (*Corvus brachyrhynchos*), squirrel (*Sciurus carolinensis)*, and eastern chipmunk (*Tamias striatus*) (Figure 16). Notably, black bear are known to use the ORR but remain a rare observation during field surveys. Indeed longer-term surveys that use similar methods at four densely forested sites on the ORR have not detected black bear directly (Carter et al. 2020b; Carter et al. 2020c; DeRolph et al. 2019a; Peterson et al. 2018). These results confirm previous and ongoing work that detail the importance of this area to wildlife movement through the ORR and broader eastern Tennessee (Carter et al. 2020a; Kwarta et al. in prep).

Sensitive species habitat screening tool—All species identified through the pre-screening tool are included in Table 14. The final sensitive fauna screening tool indicated habitat was present within the SSP-2A and ORETTC footprint for 19 species with federal listing statuses (i.e., Endangered, Threatened, Under Review, BCC, BMC, and USFWS focal species), 16 state-listed species (i.e., Need of Management, Threatened, and Endangered), and 8 Focal Species for Research and Management for the ORR and ORNERP (Table 14). All taxa known from the SSP-2A parcel are included in Appendix A.

Figure 16. Examples of wildlife observed via camera traps. The area is a wildlife corridor in eastern Tennessee and ranks among the highest areas on the ORR for reports of wildlife activity (Darling et al. unpublished data).

Table 14. Animals with various levels of protection status with potential to be affected by ORETTC construction activities. Tables include status at the federal and state level; Partners in Flight (PIF) conservation status (also ORNL focal species); historical occurrence, expected occurrence when one considers frequency of observation and current state of the ORR, and contemporary records for the Oak Ridge Reservation; and historical (pre-1995), expected, and contemporary occurrence (since 1995) for the SSP-2A and the maximal ORETTC affected area (Figure 3). Tables also include whether habitat for each species was detected within the SSP-2A parcel during summer 2020 field-based assessment (Section 3.3.1 and 3.3.4). Color ramp shading in the name columns indicates likelihood of negative effects to that species owing to ORETTC construction activities (unlikely ⟶ highly likely).

Scientific name	Common name	Status			Oak Ridge Reservation			SSP-2A+ORETTC			
		Federal	State	PIF	Historical	Expected	Contemporary	Historical	Expected	Contemporary	Habitat
				FISH							
Erimonax monachus	Spotfin chub	T	T		**yes, CH**	**unk**	no	no	no	**unk**	yes
Erimystax cahni	Slender chub	T	T		**no**	**no**	no	no	no	no	no
Hemitremia flammea	Flame chub		NM		yes	**unk**	no	yes	**unk**	**unk**	yes
Noturus flavipinnis	Yellowfin Madtom	T	T		no	no	no	no	no	no	no
*Chrosomus tennesseensis**	Tennessee dace*		NM		yes	yes	yes	yes	yes	yes	yes
				AMPHIBIANS							
*Desmognathus welteri**	Black Mountain salamander*		NM		no	yes	yes	no	yes	yes	yes
*Hemidactylium scutatum**	Four-toed salamander*		NM		yes	yes	yes	no	yes	**unk**	yes
				REPTILES							
*Pituophis melanoleucus**	Northern pinesnake*		T		yes	**unk**	no	no	**unk**	no	**unk**
*Ophisaurus attenuatus**	Slender glass lizard*		NM		yes	**unk**	no	no	**unk**	no	**unk**
				BIRDS							
Aegolius acadicus	Northern saw-whet owl	BMC			yes	yes	yes	no	**unk**	no	yes
Ammodramus henslowii	Henslow's sparrow	BCC,BMC,Focal	T	IM,RC,YWL	yes	yes	yes	no	no	no	no
Ammodramus savannarum	Grasshopper sparrow	BMC,Focal		CBSD,RC,IM	yes	yes	yes	no	no	no	no
Anhinga anhinga	Anhinga		NM		yes	yes	yes	no	no	no	no
Caprimulgus vociferus	Whip-poor-will	BCC			yes	yes	yes	no	yes	yes	yes
Coccyzus americanus	Yellow-billed Cuckoo			CBSD,RC,IM	yes	yes	yes	no	yes	yes	yes
Contopus cooperi	Olive-sided flycatcher	BCC,BMC		YWL	yes	yes	yes	no	no	no	no
Contopus virens	Eastern-wood Pewee			RC,MA	yes	yes	yes	no	yes	yes	yes
Dendroica discolor	Prairie Warbler	BCC		YWL,RC,MA	yes	yes	yes	no	yes	yes	yes
Dolichonyx oryzivorus	Bobolink	BMC		YWL,RC,MA	yes	yes	yes	no	no	no	no
Egretta caerulea	Little blue heron		NM		yes	yes	yes	no	no	no	no
Empidonax traillii	Willow flycatcher	BMC			yes	yes	yes	no	no	no	no
Empidonax virescens	Acadian Flycatcher			RC,MA	yes	yes	yes	no	yes	yes	yes
Falco peregrinus	Peregrine falcon	BCC,BMC		RC,MA	yes	yes	yes	no	no	no	no
Falco sparverius	American kestrel	BCC,BMC			yes	yes	yes	no	yes	no	no
Geothlypis formosus	Kentucky warbler	BCC,BMC		YWL,RC,MA	yes	yes	yes	no	yes	yes	yes
Haliaeetus leucocephalus	Bald eagle	BCC,BMC,Focal	NM		yes	yes	yes	no	no	no	no
Helmitheros vermivorus	Worm-eating warbler	BCC,BMC			yes	yes	yes	no	**unk**	**unk**	yes
*Hylocichla mustelina**	Wood thrush*	BCC,BMC,Focal	NM†	YWL,RC,MA	yes	yes	yes	no	yes	yes	yes
Icteria virens	Yellow-breasted Chat			RC,MA	yes	yes	yes	no	yes	yes	yes
Ixobrychus exilis	Least bittern	BCC	NM		yes	yes	yes	no	no	no	no
Lanius ludovicianus	Loggerhead shrike	BCC,BMC	NM	CBSD,FS	yes	yes	yes	no	no	no	no

Table 14. (continued).

Scientific name	Common name	Status			Oak Ridge Reservation			SSP-2A+ORETTC			
		Federal	State	PIF	Historical	Expected	Contemporary	Historical	Expected	Contemporary	Habitat
Limnothlypis swainsonii	Swainson's warbler	BCC,BMC	NM	RC,MA	yes	yes	yes	no	no	no	no
Melanerpes erythrocephalus	Red-headed woodpecker	BCC,BMC		YWL	yes	yes	yes	no	**unk**	**unk**	yes
Meteagris gallopava silvestris	Wild turkey	BMC			yes	yes	yes	yes	yes	yes	yes
Nycticorax nycticorax	Black-crowned Night-heron		NM		yes	yes	yes	no	**unk**	**unk**	**unk**
Parkesia motacilla	Louisiana waterthrush	BMC			yes	yes	yes	no	no	no	no
Pipilo erythrophthalmus	Eastern Towhee			RC,MA	yes	yes	yes	no	yes	yes	yes
Porzana carolina	Sora	BMC			yes	yes	yes	no	no	no	no
Protonotaria citrea	Prothonotary warbler	BCC,BMC		YWL,RC,MA	yes	yes	yes	no	no	no	no
Scolopax minor	American woodcock	BMC,Focal		YWL,RC	yes	yes	yes	no	**unk**	no	no
Setophaga cerulea	Cerulean warbler	BCC,BMC,Focal	NM	YWL,RC,IM	yes	yes	yes	no	no	no	**unk**
Sitta pusilla	Brown-headed nuthatch	BCC,BMC			yes	yes	yes	no	no	**unk**	yes
Sphyrapicus varius	Yellow-bellied sapsucker	BMC			yes	yes	yes	no	yes	yes	yes
Vermivora chrysoptera	Golden-winged warbler	BCC,BMC,Focal	T	CBSD,RWL	yes	yes	yes	no	no	no	no
Vermivora pinus	Blue-winged warbler	BCC,BMC			yes	yes	yes	no	yes	yes	yes
Zenaida macroura	Mourning Dove	BMC			yes	yes	yes	no	yes	yes	yes
				MAMMALS							
Sorex dispar	Long-tailed Shrew		NM		yes	yes	yes	no	yes	yes	yes
Synaptomys cooperi	Southern bog lemming		NM		yes	**unk**	no	no	**unlikely**	no	yes
Corynorhinus rafinesquii	Rafenisque's big-eared bat		NM		yes	yes	yes	no	yes	no	yes
*Myotis grisescens**	Gray bat*	E	E		yes	yes	yes	no	yes	yes	yes
Myotis leibii	Eastern small-footed bat		NM		yes	yes	yes	no	yes	no	yes
Myotis lucifugus	Little brown bat	UR	T		yes	yes	yes	no	yes	yes	yes
*Myotis septentrionalis**	Northern long-eared bat*	T	T		yes	yes	yes	no	yes	**likely**	yes
*Myotis sodalis**	Indiana bat*	E	E		yes	yes	yes	no	yes	**likely**	yes
*Perimyotis subflavus**	Tri-colored bat*	UR	T		yes	yes	yes	no	yes	yes	yes
				CLAMS							
Lampsilis virescens	Alabama Lampmussel	E	E		no	no	no	no	no	no	no
Hemistena lata	Cracking Pearlymussel	E	E		no	no	no	no	no	no	no
Dromus dromas	Dromedary Pearlymussel	E	E		yes	no	no	no	no	no	no
Cyprogenia stegaria	Fanshell	E	E		yes	no	no	no	no	no	no
Fusconaia cuneolus	Finerayed Pigtoe	E	E		yes	no	no	no	no	no	no
Plethobasus cooperianus	Orangefoot Pimpleback	E	E		yes	no	no	no	no	no	no
Lampsilis abrupta	Pink Mucket	E	E		yes	no	no	no	no	no	no
Obovaria retusa	Ring Pink	E	E		no	no	no	no	no	no	no
Pleurobema plenum	Rough Pigtoe	E	E		no	no	no	no	no	no	no
Quadrula cylindrica strigillata	Rough Rabbitsfoot	E	E		yes	no	no	no	no	no	no
Plethobasus cyphyus	Sheepnose Mussel	E	E		yes	no	no	no	no	no	no
Fusconaia cor	Shiny Pigtoe	E	E		yes	no	no	no	no	no	no
Cumberlandia monodonta	Spectaclecase	E	E		yes	no	no	no	no	no	no
Plethobasus cicatricosus	White Wartyback	E	E		no	no	no	no	no	no	no
				SNAILS							
Athearnia anthonyi	Anthony's riversnail	E	E		no	no	no	no	no	no	no
*Anguispira jessica**	Mountain disc*		Rare		yes	yes	yes	no	yes	yes	yes

Table 14. (continued).

Scientific name	Common name	Status			Oak Ridge Reservation			SSP-2A+ORETTC			
		Federal	State	PIF	Historical	Expected	Contemporary	Historical	Expected	Contemporary	Habitat
*Cambarus deweesae**	Valley flame crayfish*		E		yes	yes	yes	no	unk	unk	yes
Io fluvialis	Spiny riversnail	UR			yes	no	**unk**	no	**unlikely**	no	**unlikely**

Federal listing status codes:
- E – Federally listed Endangered
- T – Federally listed Threatened
- UR – Currently Under Review for federal listing
- CH – Critical Habitat present
- BCC – Birds of Conservation Concern
- BMC – Birds of Management Concern
- Focal – USFWS Focal

State-listing status codes:
- E – Endangered
- T – Threatened
- NM – In Need of Management
- SC – Of Special Concern
- Rare – Rare, not listed

Partners in Flight status codes – Region 28:
- RC = Regional Concern
- MA = Management Attention needed
- IM = Immediate Management Att Needed
- YWL = Yellow Watch List
- RWL = Red Watch List
- CBSD = Common Bird in Steep Decline

* Focal Species for Research and Management on the ORR and ORNERP

† In Need of Management by rule of TWRA (TWRA 2018)

4.4 PLANT SURVEYS

Botanical surveys of the SSP-2A parcel received ~40 person-hours of search effort, and the proposed ORETTC footprint received an additional 30 person-hours of effort. One listed plant species and one species of cultural significance to the Eastern Band of Cherokee Indians (EBCI) was detected within the ORETTC and SSP-2A parcel. At least five additional species of management concern were detected through both areas. The broader SSP-2A parcel will require additional sensitive plant surveys should impacts occur beyond the primary ORETTC facility footprint (Figure 2). Maps herein do not include plant species given their sensitive nature. Locations have been provided to project managers for use in avoidance measures. Sensitive plant species identified through the initial screening tool are included in Table 15 alongside likelihood of occurrence based on updated habitat surveys.

4.4.1 Federal-listed plant species

No federal-listed plants were found within the proposed ORETTC footprint. Federal-listed plant species are considered unlikely within the SSP-2A parcel. Several seeps and springs are suitable for *Platanthera integrilabia* (white fringeless orchid), which is known from wetlands and stream margins adjacent to the ORR. However, no specimens are known from the ORR at this time. Detection of some taxa (e.g., state-listed *P. integrilabia* and *P. flava* var. *herbiola*, which have seasonally limited diagnostic characters) might have been limited by the abbreviated late summer survey period.

4.4.2 State-listed plant species

American ginseng (*Panax quinquefolius*), state-listed Of Special Concern–Commercially Exploited, occurs throughout the SSP-2A parcel and was confirmed within the NNSA side of the ORETTC footprint. No other state-listed species have been confirmed, although some such as *Platanthera* spp and mountain witch-alder (*Fothergilla major*) may be expected. This is especially true within the springs and smaller seep wetlands within the broader SSP-2A parcel and central stream buffer for the ORETTC.

4.4.3 Plant species of management concern

Additional plant species that occur infrequently on the ORR and are of management concern for the ORR and ORNERP included (1) Netted Chain Fern (*Woodwardia areolata*), found near a spring within the central stream buffer that bisects the ORETTC footprint, (2) Crested Coralroot (*Hexalectris spicata*), and (3) Jacob's Ladder (*Polemonium reptans*). Two formerly listed species, goldenseal (*Hydrastis canadensis*) and October lady's-tresses (*Spiranthes ovalis*), also were found in the vicinity of the ORETTC footprint. Several examples of sensitive or otherwise indicator species are shown in Figure 17.

4.4.4 Plants with cultural significance

Green-headed coneflower (*Rudbeckia laciniata*) occurs within the SSP-2A parcel along the eastern stream (Figure 17, panel g). This species, also called Sochan, is a culturally significant plant species to the Eastern Band of Cherokee of Indians (ECBI). ORNL, as part of the Culturally Significant Plant Species Initiative, is working to protect and conserve culturally significant species (e.g., green-headed coneflower) on the ORR and the broader southern Appalachian region. In accordance with 36 CFR 2.6, the cultural significance of this species recently led to a General Agreement (GA) between the National Park Service and the ECBI that allows enrolled members of ECBI to harvest select parts of green-headed coneflower for traditional purposes from the Great Smoky Mountains National Park (NPS/EBCI Plant Gathering GA Final March 2019). DOE has not entered into such an agreement that would allow harvest on the ORR. However, in line with the goals of the Culturally Significant Plant Species Initiative, such

non-public-accessible lands provide opportunities for long-term protection. Preservation ensures the legacy of these honored species and enables repatriation elsewhere when the need arises.

Table 15. Status plant species with potential to occur within the SSP-2A parcel and proposed ORETTC footprint. Most species are still considered possible within the SSP-2A parcel at this time. Only American ginseng and green-headed coneflower have been confirmed within the ORETTC footprint.

Scientific name	Common Name	Status		Expected in SSP-2A
		Federal	State	
Spiraea virginiana	Virginia spiraea	T		unlikely
Platanthera integrilabia	White fringeless orchid	T		possible
Aureolaria patula	Spreading false foxglove		S	unknown
Berberis canadensis	American barberry		S	unlikely
Bolboschoenus fluviatilis	River bulrush		S	unlikely
Delphinium exaltatum	Tall larkspur		E	unlikely
Diervilla lonicera	Northern bush honeysuckle		T	unlikely
Draba ramosissima	Branching Whitlow-grass		S	no
Elodea nuttallii	Nuttall's waterweed		S	no
Eupatorium godfreyanum	Godfrey's thoroughwort		S	unlikely
Fothergilla major	Mountain witch-alder		T	possible
Helianthus occidentalis	Naked-stem sunflower		S	unlikely
Juglans cinerea	Butternut		T	no
Juncus brachycephalus	Small-headed rush		S	unlikely
Liparis loeselii	Fen orchid		T	unlikely
Panax quinquefolius	**American ginseng**		**S**	**yes***
Platanthera flava var. *herbiola*	Tubercled rein-orchid		T	possible
Rudbeckia laciniata	**Green-headed coneflower**	**(culturally significant†)**		**yes***
Spiranthes lucida	Shining Ladies'-tresses		T	unlikely
Thuja occidentalis	Northern white cedar		S	no

Federal: T = Threatened; State: S = Of Special Concern, T = Threatened, E = Endangered
***** Confirmed within the SSP-2A and ORETTC facility footprint
† Green-headed coneflower is of cultural significance to the Eastern Band of Cherokee Indians. ORNL, as part of the Southern Appalachian Man and the Biosphere Cooperative and Culturally Significant Plant Species Initiative is working to protect and conserve culturally significant species, including green-headed coneflower.

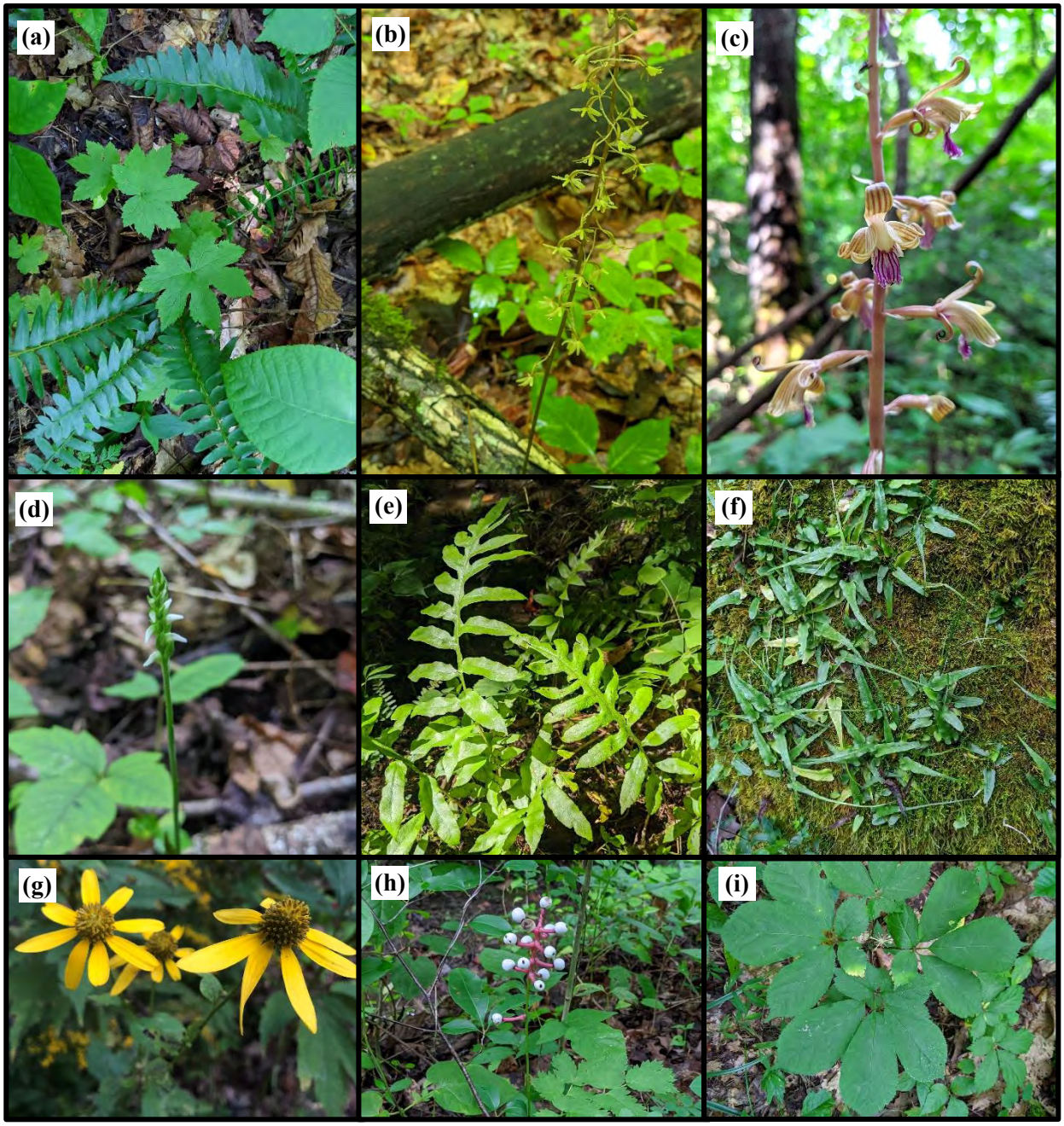

Figure 17. Examples of flora encountered during 2020 field surveys of the SSP-2A parcel and proposed ORETTC footprint. (a) goldenseal (*Hydrastis canadensis*), (b) cranefly orchid (*Tipularia discolor*), (c) coralroot (*Hexalectris spicata*), (d) October ladies'-tresses (*Spiranthes ovalis*), (e) sensitive fern (*Onoclea sensibilis*), (f) walking fern (*Asplenium rhizophyllum*), (g) green-head coneflower (*Rudbeckia laciniata*), (h) doll's-eyes (*Actaea pachypoda*), (i) American ginseng (*Panax quinquefolius*).

4.5 AQUATIC RESOURCES

Hydrologic models and field-mapped aquatic features for the SSP-2A parcel and surrounding watershed indicate a complex drainage structure (Figure 18). Subsurface flows are only approximate and based on likely points of entry into groundwater conduits. Resurgence, modeled according to the location and hydroperiod of surface aquatic features, would occur along most streams, seeps, and springs (Figures 19–20). This is supported by the presence of extensive stream bank undercutting and inward flow along the length of each stream along with some losing reaches (Figures 21–22).

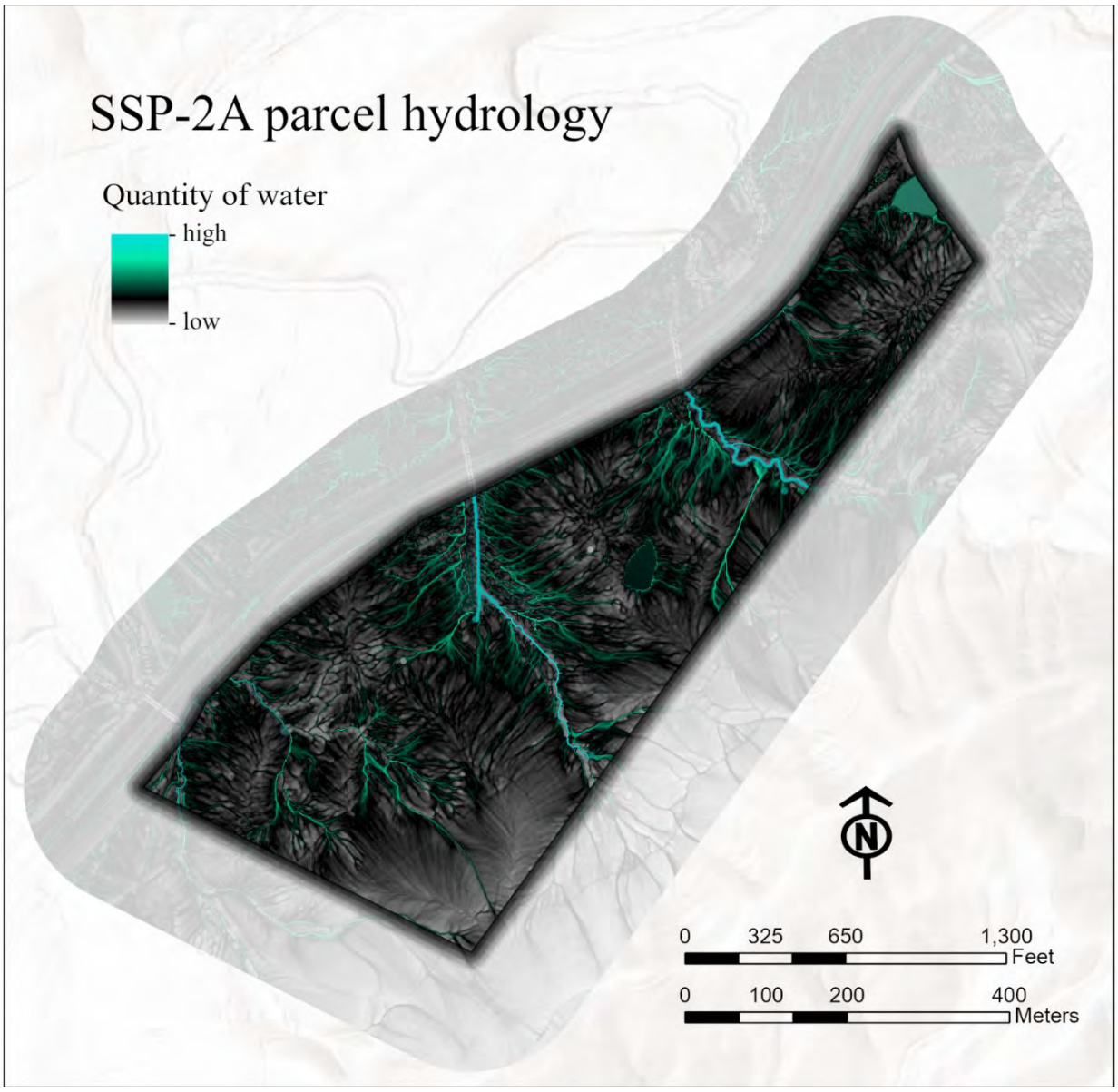

Figure 18. Final hydrologic model for the SSP-2A parcel. Shading represents the amount of water moved through the landscape via both surface and subsurface flow (composite). Movement of water was modeled as a function of elevation and known karst features (sinks, springs, macropores, and outcrops). Model was initially trained on known aquatic features (e.g., Rosensteel 1996; Baranski 2009, 2011, 2018) and continually retrained using aquatic and karst features as they were mapped. Teal regions indicate WWCs and/or expected routes of subsurface flow. Blue regions indicate field-mapped streams.

4.5.1 Wetlands

Total wetland acreage within the SSP-2A parcel was estimated at > 2.3 acres (0.93 ha) (Table 16). At least 1.1 acres (0.45 ha) of wetland occur within the ORETTC area of possible disturbance (Figures 19–20). At least 0.05 acre (0.02 ha) of this wetland overlaps directly with the ORETTC facility footprint (outside of the stream buffer zones) (Figure 19). Additional seep wetlands and springs occur throughout SSP-2A and might be affected by the planned sidewalk (Figure 2) and ~ 24.1 acres of graded earth. Sites within the stream buffer and within the broader SSP-2A parcel will require additional assessment if impacts occur beyond the ORETTC footprint (Figure 19). Smaller seep wetlands have not be mapped beyond point features but do add to the overall wetland acreage within the SSP-2A parcel and proposed ORETTC footprint. Additionally, several drainages that were classified via stream determinations as WWC—including some within the ORETTC facility footprint—contain hydric soils and thus likely represent linear wetlands under ACOE and TDEC guidance. Wetland delineations are necessary for these sites (Figure 19).

4.5.2 Streams and wet weather conveyances

Total stream length within the SSP-2A parcel was estimated at ~2634 ft (802.8 m) (Table 16). At least 927 ft (283 m) of WWC has been mapped; at least 1,591.4 ft (485.1 m) of stream occur within the ORETTC possible area of disturbance. Approximately 138.3 ft (42.2 m) of stream would be impacted directly via road and sidewalk crossings (Table 16). This does not include impacts owing to other potential crossings along site boundaries, effects of altered hydrology and water temperature, or other direct and indirect effects on aquatic and terrestrial communities (plants and animals) that are likely to result from physical changes to the landscape (e.g., ~ 24.1 acres of graded earth). These changes can result in loss of biodiversity (e.g., Grant et al. 2014) and thus an appreciable loss of aquatic resource value via TDEC guidance.

Hydrologic determinations remain necessary for several channels and probable WWCs (Figures 18–19; Table 16). Two primary drainages occur with potential to be affected by ORETTC construction and operations activities, including encroachment into the riparian of the eastern stream by wildfire fuel reduction/grading (Figure 19). Both streams contain abundant subsurface flow. Banks contain extensive undercutting and porous rock and soil that promote a shallow yet perennial hydroperiod (Figures 22–23). In a preliminary report provided by the authors to Consolidated Nuclear Security (CNS) on 16 July 2020, and additional data files provided on 14 August 2020, several streams were identified as “HD Needed” or as “Wet Weather Conveyance”. Four of these previously unclassified aquatic features were since classified as stream via TDEC Stream Determinations during August and September 2020 (Figure 19).

Table 16. Quantities of aquatic resources within the SSP-2A parcel, ORETTC’s possible area of disturbance, and the ORETTC infrastructure footprint. 0.05 acre (0.02 ha) of wetland originates from a single 1.1-acre (0.445-ha) wetland that is intersected by ORETTC infrastructure in three separate areas.

Aquatic Feature	SSP-2A	ORETTC (possible)*	ORETTC (direct)*
unclassified drainage	6393 ft (1949 m)	> 1919.6 ft (585.1 m)	~ 1709.6 ft (521.1 m)
seep/spring	7	2	2
wetland	> 2.3 acres (0.931 ha)	≥ 1.1 acres (0.445 ha)	0.05 acre (0.02 ha)
WWC	> 927 ft (283 m)	NA	NA
stream	2634 ft (802.8 m)	≥ 1591.4 ft (485.1 m)	~ 138.3 ft (42.2 m)

* See Figure 2 and associated text for explanations of ORETTC area of disturbance. Possible impacts to streams include those reaches of stream that would be impacted in the absence of proper stormwater management owing to grading and placement of impervious surface over major drainages within the catchment area (see also Figure 18).

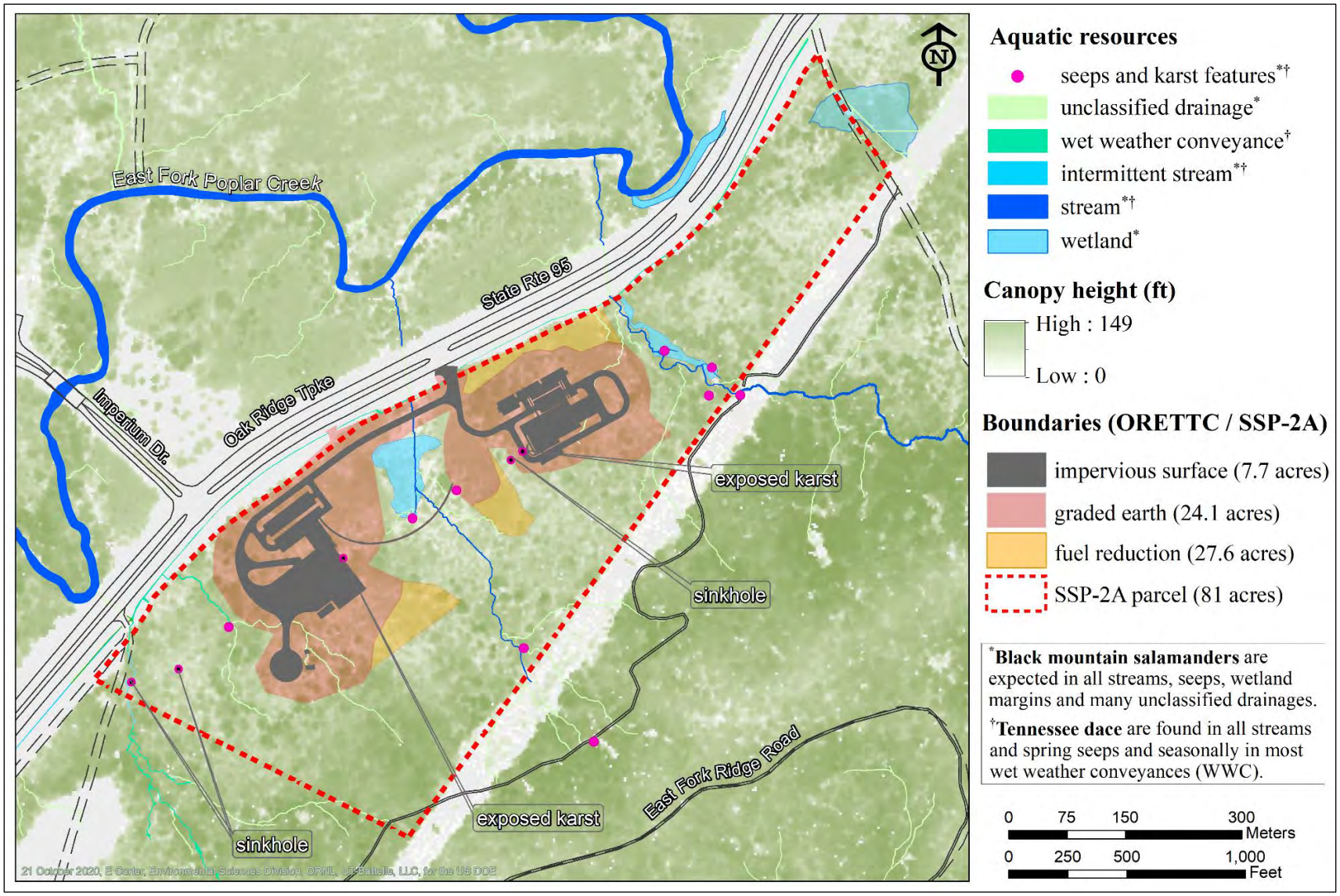

Figure 19. Field-mapped aquatic resources within the SSP-2A parcel. Known resources include classified streams (dark blue lines), perennial – ephemeral streams (light blue lines), wet weather conveyances (teal lines), unclassified drainages (faint yellow-green lines), and seeps and karst features (pink circles). (See Figure 2 for additional details on project infrastructure.)

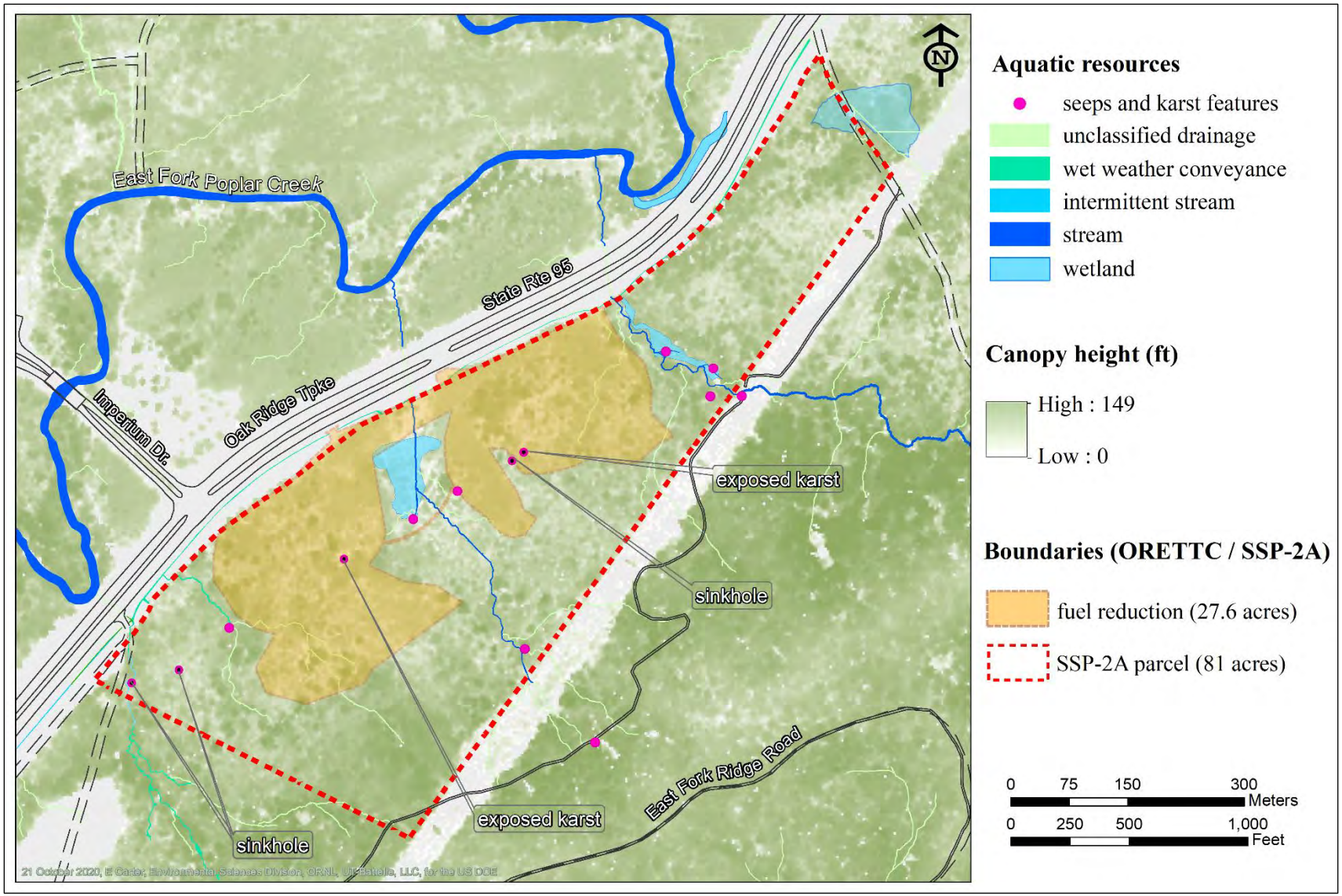

Figure 20**. Aquatic resources in relation to wildland fire fuel reduction for the ORETTC facility.**

All streams are expected to support Tennessee dace (*Chrosomus tennesseensis*) (Figures 21–22), which are listed as In Need of Management in Tennessee and represent an ORNL Focal Species for management and ongoing research. Two streams, including the stream that intersects the planned ORETTC facility, contain relatively dense populations of Tennessee dace (confirmed in July 2020 and indicated by the blue lines). Flame chub (*Hemitremia flammea* – Tennessee In Need of Management) were collected somewhere within this watershed during the 1940s and 1950s, but they have not been identified on the ORR since that time.

All streams and seeps within the SSP-2A parcel are also expected to support state-listed, In Need of Management, black mountain salamanders (*Desmognathus welteri*) (Figures 21–23). Both dace core habitat streams contain the only suspected populations of black mountain salamander on the ORR and the only observations for Roane County, Tennessee (genetic and phylogeographic analyses to determine the structure and origin of various *Desmognathus* spp on the ORR are currently under way). Watersheds adjacent to SSP-2A were inventoried in 2019, and the only site other than SSP-2A that might contain black mountain salamander populations is in the ORR's Old Growth Forest, which is connected hydrologically to SSP-2A streams. The Old Growth Forest is separated from SSP-2A by ≤ 150 ft of powerline right-of-way at the northeast end of the SSP-2A parcel.

Figure 21. Intermittent streams along the eastern boundary of the SSP-2A parcel.

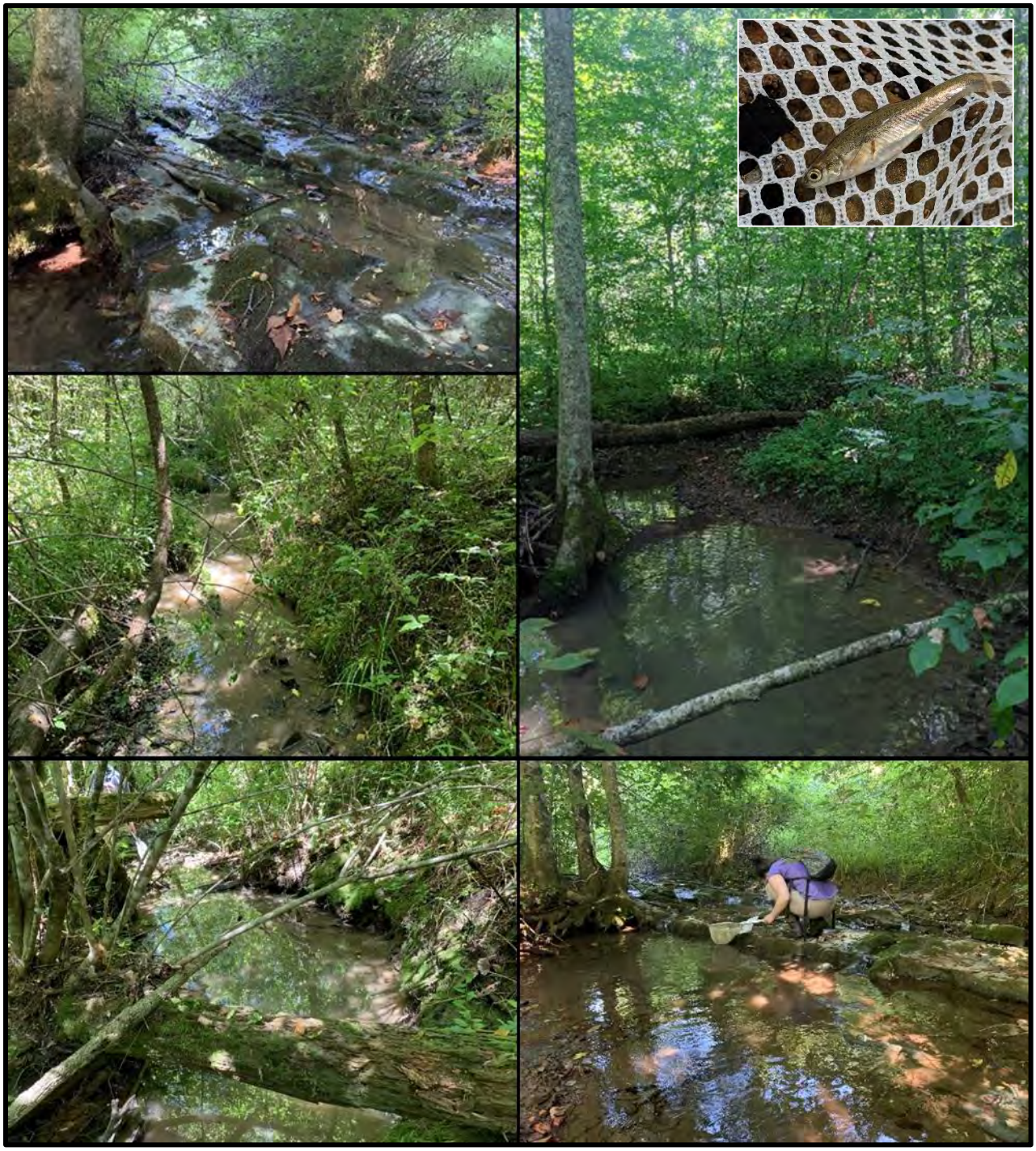

Figure 22. Diversity of structure and flow characteristics of streams within the central portion of the SSP-2A parcel. All reaches contain state-listed Tennessee dace (*Chrosomus tennesseensis*) (upper right inset, July 2020).

Figure 23. Representative springs/seeps within the SSP-2A parcel. All sites shown contain suspected populations of state-listed black mountain salamander (*Desmognathus welteri*) (top left inset), and all connected streams contain extant populations of state-listed Tennessee dace (*Chrosomus tennesseensis*). Both species are considered Focal Species for Research and Management on the Oak Ridge National Environmental Research Park and the focus of ongoing ecological and molecular study.

5. CONSIDERATION OF IMPACTS

Major natural features of concern within the SSP-2A and ORETTC footprint include aquatic and karst features, which also support an array of rare and sensitive fauna and at least some sensitive flora. Given the natural value of these resources, importance to research and science education on the ORR and ORNERP, and at least one plant of cultural significance, mitigation and avoidance measures are needed. Mitigation may also be required for impacts to aquatic resources, most notably wetlands.

Additional habitat features such as the upland exposed karst area on the SNRAF side that contains state-listed American ginseng and mountain disc snails (*Anguispira jessica*–an ORR Focal Species, considered "rare" by TDEC) correspond to the same upland forest in which bat acoustic surveys were insufficient but wherein suitable bat roosting habitat exists (Figure 15). As with the 100-ft stream buffer, avoidance and minimization of impacts in this area and specifically to the karst features would be prudent and an extra show of good faith to regulators and stakeholders of the ORR's and ORNERPS's resources. (ORNL NRMP previously supplied locations of all known sensitive features to ORETTC project personnel.)

5.1 AQUATIC RESOURCES AND KARST FEATURES

The complex structure of the SSP-2A parcel has greatly complicated wetland delineations and stream determinations for this site. The majority of the parcel occurs within the Chickamauga Group, a diverse rock unit that, here, is composed of exposed and shallow mantled karst. Streams and wetlands in the SSP-2A parcel and proposed ORETTC footprint are fed by abundant subsurface flows and resurgences. The southeast dipping of the bedrock, combined with the primarily northeastern surface drainage, generates a complex matrix of wet-woods, ephemeral pools, seeps, springs, wetlands, and wet weather conveyances and streams (Figures 18–19), many with losing reaches (Figures 21–23).

Additional wetland delineation and evaluation of WWCs is required before such requirements as Aquatic Resource Alteration Permits can be prepared. At this time, it is clear that the ORETTC facility will intersect an approximately 1-acre wetland formed along the central stream riparian. Both the SNRAF and state side of the ORETTC will intersect this complex wetland (see Figures 2 and 19). Furthermore, at least two portions of the central stream will be affected by a road and sidewalk crossing. According to current designs (Figure 2), the sidewalk will pass near a spring/seep that forms the head of the western branch of the central stream. It remains unclear if this portion of stream or the seep will be impacted directly. The sidewalk will then continue across the main branch of the central stream (Figure 19). The road to the north that will connect the SNRAF and state-side facilities will also pass over the central stream near its northernmost point before it passes beneath State Route 95 via 200 feet of existing culvert. Infrastructure along site boundaries is not expected at this time. ***TDEC and ACOE assessments and Aquatic Resource Alteration Permits are required before any WWC, stream, or wetland is affected by the ORETTC project (ACOE 2018; TDEC). Additional assessment of Exceptional Tennesssee Waters might also be required given the presence of state-listed fauna.***

Standard hydrology models that might be used during the design of ORETTC infrastructure are likely to lead to insufficient stormwater mitigation designs. Consideration of the numerous recharge zones, seeps, and general porous nature of the site's bedrock will be necessary. This is especially true of the central stream and wetland that bisects the ORETTC footprint. For more information on stormwater design considerations and relevant models, see Bonneau et al. (2017), Eger et al. (2017), Kong et al. (2017), and Li et al. (2019). As described in Section 5.2, these considerations also are relevant to the assessment of potential impacts to aquatic and semi-aquatic biota.

5.2 RARE AND SENSITIVE FAUNA

Owing to the underlying karst geology and drainage characteristics of the current natural area that comprise the ORETTC footprint, there is a high probability that the ~ 24 acres of graded earth will result in altered hydrology within the ephemeral wetland and stream at the center of the ORETTC facility (Figures 18–20). The listed species identified within the parcel (Table 14 and Appendix A) would be affected by the associated hydrologic and structural changes. The habitat requirements of these fauna are relatively specific to complex shallow subterranean habitat and are dependent on hydrologic stability, as facilitated by perennial seeps and springs that maintain consistent flow throughout the year (Culver and Pipan 2014). For instance, state-listed Tennessee dace rely on shallow headwater streams and seeps such as those within the SSP-2A parcel that typically support few or no additional fish species. The extremely shallow waters, losing reaches, and abundant seepy micropores provide a sustained aquatic refuge during relatively dry periods and abundant troglogphilic invertebrate prey (Etnier and Starnes 1991, 1993; Culver and Pipan 2014). Such streams in Tennessee are also unique in that they typically contain both sensitive fish and sensitive smaller-bodied salamanders such as state-listed black mountain salamanders (*Desmognathus welteri*) and four-toed salamanders (*Hemidactylium scutatum*) (semi-aquatic and aquatic-breeding amphibians with an aquatic larval stage that is vulnerable to fish predation) (Niemiller and Reynolds 2011). Finally, we were not able to assess subterranean fauna; however, there is high likelihood that several species that are considered rare or focal species by TDEC or that have current petitions under the ESA are present within the shallow subterranean habitat that underlies the ORETTC facility footprint [see, e.g., Neimiller et al. (2016), Neimiller et al. (2017), Engel et al. (2017)].

Impervious surfaces such as roads, sidewalks, buildings, and parking lots of the ORETTC will compromise the hydrologic stability and subterranean habitat in the area, well beyond its direct facility footprint. Such infrastructure isolates waters at the surface rather than by the typical diffuse subsurface drainage through underlying karst (Bonneau et al. 2017; Kong et al. 2017). However questionable, it also introduces contaminants via runoff, alters microclimate via reduced canopy and heat effects of paved surfaces and buildings, and increases risk of direct mortality through increased anthropogenic activity (Zaimes et al. 2007; Kingsbury et al. 2015; Eger et al. 2017; Li et al. 2019).

5.2.1 Federal-listed bats and Migratory Birds

Thirty-nine species of migratory birds are known within the ORETTC footprint and SSP-2A parcel (Appendix A). Migratory birds are protected under the Migratory Bird Treaty Act, and several species within the review area carry additional USFWS designations such as BCC, BMC, and USFW Focal species (Table 14 and Appendix A). Discussions and potential consultation with USFWS should be initiated to determine project requirements for minimizing impacts to these species in accordance with regulations and agreements between DOE and USFWS (see Section 2, Basis for Sensitive Resources Assessment).

Federal-listed bats were detected at relatively low frequency within the ORETTC footprint and SSP-2A parcel. If we assume a maximum disturbance area of 25 acres for the ORETTC facility, it is the opinion of the ORNL NRMP that the ORETTC project could proceed with no significant impact to federal- or state-listed forest bats. However, pine forest thinning for fuel reduction will be a necessary safety component of ORETTC construction and operations. This fuel reduction must occur in parallel with ORETTC construction activities and should be considered the responsibility of DOE, because wildland fire management is a requirement on the DOE ORR. Moreover, personnel and equipment access to address fire risk to additional areas of the ORR owing to fuel loads in the SSP-2A parcel will be impeded by the ORETTC. Although this ~3.5-acre additional effect on forest resources is unlikely to introduce significant impacts on forest-dwelling bats, an additional survey might be required by USFWS during the fall swarming and winter hibernation seasons. Minimally, potential roost trees should be assessed

immediately prior to tree cutting, or such manipulation should be carried out between 15 October and 31 March. For projects that affect Indiana bat swarming habitat (near hibernacula), this period should be reduced to 15 November through 31 March (USFWS 2017). Discussions and potential consultation between DOE and USFWS will ultimately determine project requirements and avoidance and minimization measures.

5.2.2 Undetected rare species

Surveys of the SSP-2A parcel and proposed ORETTC footprint occurred from late June through early September 2020. This abbreviated and seasonally restricted survey period severely limits detection of rare flora and fauna. Many plants have low detectability owing to dense surrounding vegetation or lack diagnostic features during summer. Furthermore, many rare and sensitive wildlife species exhibit seasonally restricted activity patterns. For example, some amphibians aestivate or remain dormant during warm summer months, and many migratory bird species are absent altogether.

Species accumulation curves for survey results presented here indicate a clear deficiency in the detection of wildlife (Figure 24). At their simplest, species accumulation curves represent the cumulative number of species observed according to survey effort. When all species (not individuals) have been detected within an area, the curves become saturated. This saturation is indicated by horizontal "flatness" or an asymptote in the number of species observed, as no new species are detected regardless of additional survey effort. Species that are not detected typically represent rarer species, which tend to also be those that are listed or protected under state and federal law. When considering all vertebrate wildlife and migratory birds separately, neither reached saturation during summer 2020 surveys of the SSP-2A parcel (Figure 24).

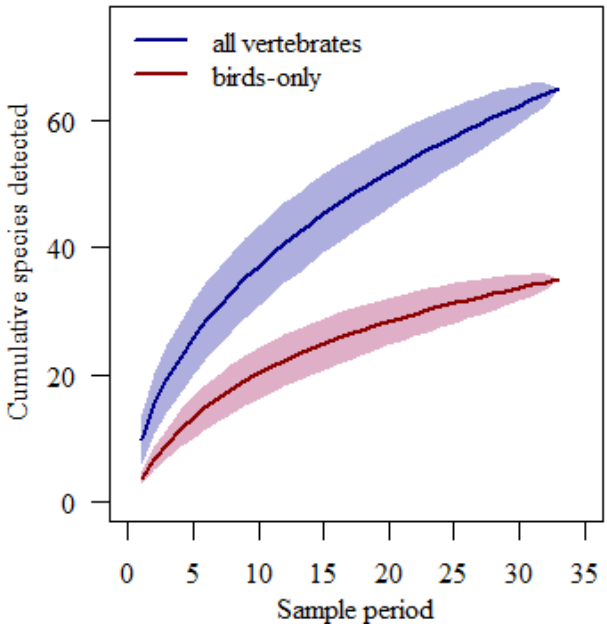

Figure 24. Species accumulations curves for wildlife surveys of the SSP-2A parcel. Lines represent the cumulative number of species detected through time. Lack of saturation (an asymptotic horizontal "flattening") in accumulation curves indicates that rarer species were not detected during 2020 field surveys of the ORETTC and SSP-2A parcel. Lines represent cumulative richness, and shaded regions represent the interquartile range of simulated values for all vertebrates (blue) and birds only (red).

5.3 ADDITIONAL CONSIDERATIONS

5.3.1 Deer reduction hunts for the ORR

TWRA and ORNL operate deer reduction harvests on the ORR that are intended to increase public safety through reduced deer-vehicle collisions, healthier ecosystems via healthier deer herds and reduced browse in natural areas, and protection of human health through reduced risk of zoonotic disease, as outlined in various management plans for the ORR. Deer hunts also provide outdoor recreation opportunities to the public and are thus a vital component of positive relations between DOE, the state of Tennessee, and the public.

Development and operations of the ORETTC will negatively impact deer reduction efforts and hunting opportunities in a high deer density/high harvest area of the ORR. A required no hunting safety buffer would extend 300 ft on all sides of the ORETTC footprint, beginning at the outermost use areas, including safety buffers around all adjacent roads. This would represent an approximately 70-acre loss of huntable land on the ORR. The specific tract of forest that comprises the ORETTC footprint consistently produces the largest deer harvest numbers on the ORR during annual hunts, in terms of both number and size of bucks taken by hunters (~8 deer per year) (Giffen et al. 2012; Carter et al. 2020a). The area also sees a high frequency of deer-vehicle collisions (Giffen et al. 2012). Eliminating hunting around the ORETTC, including a required 300 ft buffer around any facility or manicured campus areas—combined with a stated daily visitor number of up to 500—would likely increase animal-vehicle collisions along State Route 95. Necessary wildland fire fuel reduction in the current dense pine forest immediately east of the ORETTC will further increase the density of deer and exposure to traffic via an increase in forage and suitable bedding area. Additional areas on the ORR are not available to offset this effect via hunting because (1) acreage available for hunts has steadily declined owing to development projects over the past several years, (2) there will be an additional decline of 140–253 acres in the next 2 years, (3) and no areas adjacent to the SPP-2A parcel are open to hunters. The latter applies to both badged and non-badged hunter access.

5.3.2 Wildlife corridors

The area that encompasses the ORETTC footprint is known to be a wildlife corridor in eastern Tennessee. It remains the subject of research and management by the ORNL Environmental Sciences Division and the NRMP. Attempts have and continue to be made to establish a permanent tract of protected land through the ORR (including portions of the SSP-2A parcel) that includes a least cost path of travel for wildlife through the ORR. The camera trap in the ORETTC facility footprint confirmed that black bear and other medium-to-large forest fauna rely on this area for movement (Carter et al. 2020a; Kwarta et al. in prep). The ORETTC facility will intersect this corridor. Maintenance of a 100 ft stream buffer on either side of the central stream (Figure 2) might reduce impacts to wildlife movement, but the road and sidewalk crossing would continue to deter these typically shy species and/or promote conditions for negative human-wildlife interactions.

5.3.3 Research and science education of the ORR and ORNERP

Effects on research and science education on the ORR and ORNERP require further consideration.

5.4 CUMULATIVE IMPACTS

Since 2010, approximately 300 acres of previously declared natural area (Baranski 2009, 2011, 2018) on the ORR and ORNERP has been lost to new project development, and 243 acres are currently slated for deforestation and development (Figure 4). Thus far, the cumulative effects of these projects have not been

considered alongside new development and land use changes. Although the US ESA defines cumulative impact in terms of the specific project, cumulative impacts remain an often-overlooked or misunderstood component of the NEPA, which, per 40 CFR 1508.7, defines cumulative impact as follows:

> *"Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."*

Thus, impacts to resources owing to ORETTC development *might* not be significant when considered individually, such as (1) a marginal loss of forest resources for listed bat species, (2) lost hunting and deer reduction opportunities for the ORWMA, or (3) effects on research and science education on the ORNERP. When considered alongside past, present, and future project development, additional review and consideration are clearly warranted. Stakeholders of the ORR's and ORNERP's natural and cultural resources also require further consideration.

6. MITIGATION AND AVOIDANCE

Although ~ 0.05 acre of wetland is estimated to be lost via construction activities (Figure 19), this includes loss of part of a larger 1.1-acre wetland. TDEC considers impacts to wetlands in terms of aquatic resource value (Table 1). Thus, combined with elimination of nearby upland habitat for aquatic-terrestrial fauna and the potential for altered hydrology, appreciable loss of aquatic resource value is expected. Moreover, the presence of state-listed species (Section 4.3–4.5) increases present wetland and stream value, which can affect compensatory mitigation requirements in the state of Tennessee (Section 2).

Compensatory mitigation for federal-listed bats is not expected given low-detection frequencies within the ORETTC footprint. However, hibernacula are known to occur nearby, and some suitable roost trees are present within the ORETTC area. Construction activities should occur in accordance with existing guidance on tree cutting (Section 5.2.1). Good faith effort might involve installation of artificial roost structures. These activities can be carried out with assistance of the ORNL NRMP.

Exact locations for most plant and animal resources were intentionally omitted here owing to their sensitivity. However, ORNL NRMP previously supplied locations of all known sensitive resources (biotic and abiotic) within the SSP-2A parcel to ORETTC project personnel for use in avoidance where possible.

6.1 STREAM (AND SPRING / SEEP) CROSSINGS WITHIN THE ORETTC

Stream crossings by roads and pedestrian bridges are among the most impactful activities that occur in small- to medium-sized watersheds. On the ORR, numerous road crossings of various design have negatively impacted all of the major drainages. These impacts include introduction of sediments, contaminants from road runoff, and alteration of available habitat. Many of these factors remain a major focus of ORNL's Aquatic Ecology Group (https://www.ornl.gov/group/ae).

The most significant impact to the ORR's drainages typically results from limitations imposed on movement by both terrestrial and aquatic wildlife. Highway 95 presents the most significant barrier to wildlife movement from east to west across the ORR. A close examination of important corridors in eastern Tennessee reveals that the less contiguous natural areas that exist west of Hwy 95 are too isolated to support major movements or core habitat at a regional level (Kwarta et al. in prep). Moreover, in most areas where movement appears to be important to maintain current biodiversity, connectivity would be facilitated by bridges that pass beneath Hwy 95. Smaller road systems across the ORR do not often

contain such infrastructure that allows safe movement for medium- to large-size wildlife or continuously traversable habitat for aquatic fauna and/or small-bodied terrestrial and semi-aquatic species (e.g., waterways or riparian areas with natural substrates that minimize exposure).

Dedicated wildlife road crossings have been increasingly implemented with a positive effect across the globe. Such road crossings are typically aimed at ungulates and other large mammals. At their most basic, these crossings are bridges or large open-bottom arches that contain natural substrates and are wide and tall enough to facilitate movement by wildlife. However, with careful design through consideration of the unique movement patterns and habitat requirements of the animal communities within a given area, road crossings can be implemented to optimize local and regional biodiversity, and/or they can be targeted at vulnerable focal species (e.g., smaller open-bottom culverts for amphibians and reptiles).

When one considers (1) which species on the ORR are at highest risk of habitat loss and isolation and (2) which species within broader eastern Tennessee are most affected by land use on the ORR, and (3) the cost of bridging, it becomes clear that smaller open-bottom culverts would provide the greatest biodiversity and ecosystem health benefits when implemented in smaller watersheds. Benefits of these structures can include improved aquatic and wildlife connectivity both for horizontal passage and via vertical drainage into underlying shallow subterranean habitat (excluding stormwater management channels). The realization of the full suite of benefits of open-bottom culverts has recently led DOE Reservation Management for the Oak Ridge Site to replace round culverts with open-bottom arch culverts for several roads that pass over streams and some WWCs.

Installation of open-bottom culverts comes with two caveats. First, culverts should ideally be wide enough to facilitate passage by terrestrial fauna. That is, the culvert footprint should encompass the full width of the stream, its banks, and some riparian area during normal flows. In some cases, dry platforms can be installed along the inside edges of arch culverts. Otherwise, the amount of terrestrial habitat to include within the culvert can be just inches if the goal is to facilitate passage by small vertebrates, or it may be several feet if medium- to large-sized wildlife are targeted, as could be applied along the central stream that bisects the ORETTC footprint. Second, wildlife road crossings may be targeted solely at terrestrial fauna, so they need not be associated with an aquatic resource. These terrestrial road crossings may even, as promoted by the Federal Highway Administration, cross over rather than under a road. These larger, over-the-road crossings are most apt to larger roads and likely well-beyond consideration and unsuitable for ORETTC site design. Given the importance of the stream and stream buffer within the ORETTC project area to movement by larger wildlife, larger open bottom culverts should be considered for the road. The relatively small size of the stream might, however, reduce costs and allow a bridge crossing. This is especially applicable should the sidewalk crossing be necessary.

For more on wildlife crossings from the U.S. Department of Transportation, see https://rosap.ntl.bts.gov/view/dot/41646.

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APPENDIX A. COMPLETE LIST OF VERTEBRATE FAUNA FOUND WITHIN THE SSP-2A PARCEL

Type	Scientific name	Common name	State status	Federal status	PIF/Other status
Amphibian	*Anaxyrus americanus*	American toad			
Amphibian	*Desmognathus fuscus* complex	Northern dusky salamander			
Amphibian	*Desmognathus welteri**	Black mountain salamander	NM		
Amphibian	*Eurycea bislineata/wilderae*	Two-lined salamander			
Amphibian	*Hyla chrysoscelis*	Cope's gray treefrog			
Amphibian	*Lithobates clamitans*	Green frog			
Amphibian	*Lithobates sylvaticus*	Wood frog			
Amphibian	*Pseudacris feriarum*	Upland chorus frog			
Amphibian	*Pseudotriton ruber*	Red salamander			
Bird	*Archilochus colubristurker*	Ruby-throated hummingbird			
Bird	*Baeolophus bicolor*	Tufted titmouse			
Bird	*Buteo platypterus*	Broad-winged hawk			
Bird	*Caprimulgus vociferus*	Whip-poor-will		BCC	
Bird	*Cardinalis cardinalis*	Northern cardinal			
Bird	*Coccyzus americanus*	Yellow-billed cuckoo			CBSD, RC, IM
Bird	*Colaptes auratus*	Northern Flicker			CBSD
Bird	*Contopus virensg*	Eastern wood-pewee			RC, MA
Bird	*Corvus brachyrhynchos*	American crow			
Bird	*Cyanocitta cristata*	Blue jay			
Bird	*Dendroica discolor*	Prairie Warbler			YWL, RC, MA
Bird	*Dryocopus pileatus*	Pileated woodpecker			
Bird	*Empidonax virescens*	Acadian flycatcher			RC, MA
Bird	*Geothlypis formosa*	Kentucky warbler		BCC, BMC	YWL, RC, MA
Bird	*Hylocichla mustelina*	Wood thrush	NM	BCC, BMC, Focal	YWL, RC, MA
Bird	*Icteria virens*	Yellow-breasted chat			RC, MA
Bird	*Leuconotopicus villosus*	Hairy woodpecker			
Bird	*Melanerpes carolinus*	Red-bellied woodpecker			
Bird	*Melospiza melodia*	Song sparrow			
Bird	*Meteagris gallopava silvestris*	Wild turkey		BMC	
Bird	*Molothrus ater*	Brown-headed cowbird			
Bird	*Passerina cyanea*	Indigo bunting			
Bird	*Picoides pubescens*	Downy woodpecker			

Type	Scientific name	Common name	State status	Federal status	PIF/Other status
Bird	*Pipilo erythrophthalmus*	Eastern towhee			RC, MA
Bird	*Piranga olivacea*	Scarlet tanager			
Bird	*Poecile carolinensis*	Carolina chickadee			
Bird	*Polioptila caerulea*	Blue-gray gnatcatcher			
Bird	*Seiurus aurocapilla*	Ovenbird			
Bird	*Setophaga americana*	Northern parula			
Bird	*Setophaga pensylvanica*	Chestnut-sided warbler			
Bird	*Setophaga petechia*	Yellow warbler			
Bird	*Sitta carolinensis*	White-breasted nuthatch			
Bird	*Sphyrapicus varius*	Yellow-bellied sapsucker		BMC	
Bird	*Spinus tristis*	American goldfinch			
Bird	*Thryothorus ludovicianus*	Carolina wren			
Bird	*Vermivora pinus*	Blue-winged warbler		BCC, BMC	
Bird	*Vireo griseus*	White-eyed vireo			
Bird	*Vireo olivaceus*	Red-eyed vireo			
Bird	*Zenaida macroura*	Mourning dove		BMC	
Mammal	*Blarina brevicauda*	Short-tailed shrew			
Mammal	*Canis latrans*	Coyote			
Mammal	*Eptesicus fuscus*	Big brown bat			
Mammal	*Lasionycteris noctivagans*	Silver-haired bat			
Mammal	*Lasiurus borealis*	Red bat			
Mammal	*Lasiurus cinereus*	Hoary bat			
Mammal	*Lasiurus seminolus*	Seminole bat			
Mammal	*Lynx rufus*	Bobcat			
Mammal	*Mephitis mephitis*	Striped Skunk			
Mammal	*Myotis grisescens*	Gray bat	E	E	
Mammal	*Myotis lucifugus*	Little brown bat	T	UR	
Mammal	*Myotis septentrionalis**	Northern long-eared bat	T	T	
Mammal	*Mytotis sodalis**	Indiana bat	E	E	
Mammal	*Nycticeius humeralis*	Evening bat			
Mammal	*Odocoileus virginianus*	Deer			
Mammal	*Perimyotis subflavus*	Tri-colored bat	T	UR	
Mammal	*Peromyscus leucopus*	White-footed mouse			
Mammal	*Procyon lotor*	Raccoon			
Mammal	*Sciurus carolinensis*	Eastern gray squirrel			

Type	Scientific name	Common name	State status	Federal status	PIF/Other status
Mammal	*Sigmodon hispidus*	Cotton rat			
Mammal	*Sorex dispar*	Long-tailed shrew	NM		
Mammal	*Sylvilagus floridanus*	Eastern cottontail			
Mammal	*Tadarida brasiliensis*	Brazilian free-tailed bat			
Mammal	*Tamias striatus*	Eastern chipmunk			
Mammal	*Ursus americanus*	American black bear			
Fish	*Chrosomus tennesseensis*	Tennessee dace	NM		
Fish	*Cottus carolinae*	Banded sculpin			
Fish	*Hemitremia flammea*	Flame chub	NM		
Fish	*Rhinichthys atratulus*	Eastern blacknose dace			
Reptile	*Agkistrodon contortrix*	Eastern copperhead			
Reptile	*Carphophis amoenus*	Eastern Wormsnake			
Reptile	*Coluber constrictor*	Eastern Racer			
Reptile	*Diadophis punctatus*	Ring-necked snake			
Reptile	*Nerodia sipedon*	Northern Watersnake			
Reptile	*Plestiodon fasciatus*	Common Five-lined skink			
Reptile	*Scincella lateralis*	Little brown skink			
Reptile	*Storeria dekayi*	Dekay's brown snake			
Reptile	*Storeria occipitomaculata*	Redbelly snake			
Reptile	*Terrapene carolina*	Eastern box turtle			
Reptile	*Thamnophis sirtalis*	Common gartersnake			
		Notable invertebrates			
Mollusc	*Anguispira jessica*	Mountain disc	Rare		

Federal status codes (ESA): FE: federally endangered; FT: federally threatened; UR: under federal review for listing under ESA.
State status codes: Rare: considered rare by TDEC; NM: in need of management by rule of TWRA (TWRA 2018); SD: state-listed in need of management; ST: state threatened; SE: state endangered.
Partners in Flight status codes (Bird Conservation Region 28): RC = Regional Concern; MA = Management Attention needed; IM = Immediate Management Attention Needed; YWL = Yellow Watch List; RWL = Red Watch List; CBSD = Common Bird in Steep Decline.
***** Historical record.
† Considered possible based on nearby records and limited acoustic detection.

Beth,

Please see below an email of concurrence from David Pelren (USFWS) on our determination that the ORETTC project as described is “not likely to adversely affect federally listed bats” relative to the 28-acre project site. Please note that any changes in the project, as stated below by Mr. Pelren, will require additional consultation with the USFWS.

If you have any questions or need anything further, please let me know.

Thanks very much,

Neil

Neil R. Giffen
Natural Resources Manager
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cell phone: 865-963-9974
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From: Pelren, David <david_pelren@fws.gov>
Sent: Thursday, September 24, 2020 3:29 PM
To: McCracken, Kitty <mccrackenmk@ornl.gov>
Cc: Tennessee ES, FWS <tennesseeES@fws.gov>; Sykes, Robbie <robbie_sykes@fws.gov>
Subject: RE: [EXTERNAL] Request for concurrence on ORETTC project FWS #2020-I-1806

Kitty -

Thank you for the phone conversation earlier today (September 24) and follow-up email that you provided regarding the Oak Ridge Enhanced Technology and Training Center (ORETTC) project (FWS #2020-I-1806). The clarification and update were helpful regarding the most recent plans for construction, especially the point that a total of 28 acres is currently proposed. The Fish and Wildlife Service (Service) had provided concurrence by email on September 16 with your determination that adverse effects to federally listed bats were not expected as a result of the proposed construction for the 13-acre site. You have determined that the project is not likely to adversely affect federally listed bat species relative to the entire 28-acre project area, and you requested that the Service provide a statement of concurrence with that determination.

Based on the site location and scope of the project, the Service does concur with the determination that the project as described is not likely to adversely affect federally listed bats relative to the 28-acre project site. We conclude that the requirements of the Endangered Species Act (the Act) of 1973, as amended, are fulfilled for federally listed bats. Obligations under the Act should be reconsidered if (1) new information reveals impacts of the proposed action that may affect listed species or critical habitat in a manner not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

Feel free to contact me for further coordination regarding this project.

David Pelren
Fish and Wildlife Biologist

Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
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From: McCracken, Kitty <mccrackenmk@ornl.gov>
Sent: Thursday, September 24, 2020 12:37 PM
To: Pelren, David <david_pelren@fws.gov>
Cc: Schultz, Beth <Elizabeth.Schultz@cns.doe.gov>; Giffen, Neil <giffennr1@ornl.gov>; Carter, Evin <cartere@ornl.gov>; Tennessee ES, FWS <tennesseeES@fws.gov>; Sykes, Robbie <robbie_sykes@fws.gov>
Subject: RE: [EXTERNAL] Request for concurrence on ORETTC project FWS #2020-I-1806

Dave,
Thank you for the USFWS concurrence on the 13-acre site development for the Oak Ridge Enhanced Technology and Training Center (ORETTC). As discussed in our phone conversation of September 24, 2020, the total disturbance area will likely be 25 acres plus an additional 3 acres of tree removal to meet fire safety guidelines for the developed area. A total of 28 acres is expected to be altered/developed for this ORETTC project. As discussed in previous emails, we do not expect any impacts to federally listed bat species or species under consideration for listing within the 28-acre project areas. Please let us know if you concur with this assessment of the area.

Thank you.

Kitty McCracken
Natural Resources Management Team
Oak Ridge National Laboratory
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
865-576-5269 (office)
865-924-4706 (cell)

From: Pelren, David <david_pelren@fws.gov>
Sent: Wednesday, September 16, 2020 1:42 PM
To: McCracken, Kitty <mccrackenmk@ornl.gov>
Cc: Schultz, Beth <Elizabeth.Schultz@cns.doe.gov>; Giffen, Neil <giffennr1@ornl.gov>; Carter, Evin <cartere@ornl.gov>; Tennessee ES, FWS <tennesseeES@fws.gov>; Sykes, Robbie <robbie_sykes@fws.gov>
Subject: FW: [EXTERNAL] Request for concurrence on ORETTC project FWS #2020-I-1806

Kitty -

Thank you for coordinating with the Tennessee Ecological Services Field Office to address the potential for impacts to federally listed bats relative to the Oak Ridge Enhanced Technology and Training Center (ORETTC) project (FWS #2020-I-1806). The proposed project area is a site within the 81-acre SSP-2A parcel, which is located east of the intersection of State Route (SR) 58 and SR 95, across from the Imperium Drive entrance to

the Horizon Center. We have reviewed the email that you sent on August 26, 2020, with an attached file ("Preliminary Date for Sensitive Resources Surveys of the SSP-2A Parcel and Proposed Oak Ridge Enhanced Technology and Training Center (ORETTC) Facility"). The current project design includes construction of training and activities facility buildings, a maintenance building, a live burn building, and rubble pit at a 13-acre site on the U.S. Department of Energy Oak Ridge Reservation. The project plan is currently under development and may be expanded to include a total area of disturbance of approximately 25 acres. The Oak Ridge National Laboratory's Natural Resources Management Team is currently inventorying a variety of species at the proposed project site. Bat acoustic surveys have been conducted, and the gray bat (*Myotis grisescens*) is the only federally listed bat species that has been detected on or adjacent to the SSP-2A parcel. Further, we understand that potential gray bat roosting habitat (i.e., caves or similar structures) is not known to exist within the project area. You concluded that the project is not likely to adversely affect any federally listed bats under the current 13-acre design scenario, including the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*), and you requested concurrence with that determination.

Based on the site location and scope of the project, we believe the project plan adequately addresses potential direct, indirect, and cumulative effects to federally listed species and their habitats. The Fish and Wildlife Service concurs with the determination that the project as described is not likely to adversely affect federally listed bats, and we conclude that the requirements of the Endangered Species Act (the Act) of 1973, as amended, are fulfilled for federally listed bats this project as detailed for the design that involves 13 acres of disturbance. Obligations under the Act should be reconsidered if (1) new information reveals impacts of the proposed action that may affect listed species or critical habitat in a manner not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

Finally, because of the documented presence of the Indiana bat and northern long-eared bat in the general vicinity of the proposed project area, we believe that removal of any suitable bat roosting trees in preparation for project construction activities between November 15 and March 31 would be prudent. We request that this measure be implemented to the greatest extent feasible. Also, as a proactive measure for improvement of bat habitat and as a possible educational tool, we suggest that installation of several artificial bat roosting structures (e.g., rocket box and/or "Brandenbark" poles) at this project site be considered.

We look forward to further coordination regarding threatened and endangered species relative to the ORETTC project. Feel free to contact me if further coordination regarding bats or other species would be helpful.

David Pelren
Fish and Wildlife Biologist
Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974
mobile phone: 931-261-5844

From: Sykes, Robbie <robbie_sykes@fws.gov>

Sent: Wednesday, August 26, 2020 11:17 AM
To: McCracken, Kitty <mccrackenmk@ornl.gov>; Pelren, David <david_pelren@fws.gov>
Cc: Giffen, Neil <giffennr1@ornl.gov>; Carter, Evin <cartere@ornl.gov>; steve.stone@npo.doe; mary.hitson@npo.doe. <mary.hitson@npo.doe>; susan.morris@npo.doe; Schultz, Beth <Elizabeth.Schultz@cns.doe.gov>
Subject: RE: [EXTERNAL] Request for concurrence on ORETTC project, US DOE Oak Ridge Reservation

Kitty,

Thanks for the additional information. We received the draft EA for this from Beth last Thursday. Dave Pelren is reviewing the proposal, and I will forward the information on to him.

Sincerely,

Robbie Sykes
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
446 Neal Street
Cookeville, TN 38501
(tele. 931/525-4979)

From: McCracken, Kitty <mccrackenmk@ornl.gov>
Sent: Wednesday, August 26, 2020 10:40 AM
To: Sykes, Robbie <robbie_sykes@fws.gov>
Cc: Giffen, Neil <giffennr1@ornl.gov>; Carter, Evin <cartere@ornl.gov>; steve.stone@npo.doe; mary.hitson@npo.doe. <mary.hitson@npo.doe>; susan.morris@npo.doe; Schultz, Beth <Elizabeth.Schultz@cns.doe.gov>
Subject: [EXTERNAL] Request for concurrence on ORETTC project, US DOE Oak Ridge Reservation

Robbie,

A project area on the US DOE Oak Ridge Reservation is undergoing evaluation for development. The SSP-2A parcel is an 81-acre tract of land bordered on the north by TN Hwy. 95, on the east by a gravel road and housing development, on the west by a gravel road, forest and grassy fields, and on the south by a TVA powerline right-of-way and heavily forested area. The forest on SSP-2A ranges from mixed hardwoods and pines with open mid-story and understory at higher elevations, to mostly small pines and scrubby, highly cluttered mid- and understory vegetation. This latter area also includes two streams with small tributaries and wetland areas. The ORNL Natural Resources Management Program has been conducting an ongoing assessment of the sensitive resources on this parcel.

Within the 81-acre SSP-2A parcel, the current plans are to construct a technology and training center, known as the Oak Ridge Enhanced Technology and Training Center (ORETTC). This project will involve the removal of forest and other vegetation to build a facility, including buildings, access road, parking lot, and fence. The draft Environmental Assessment (EA) for this project, which has been transmitted to you separately, estimates that a total of approximately 13 acres will be disturbed as a result of this project. However, the actual design for the facility is still in the stages of development and there remains the potential that the actual impact area could be expanded outside of the 13 acres outlined in the draft EA. Therefore, in order to adequately capture potential impacts to sensitive resources as a result of this project, ORNL Natural Resources is evaluating different design scenarios. These scenarios are based on knowledge of all current design options under consideration. Attached is a preliminary data report from our ongoing assessment of the SSP-2A parcel. This data report includes a list of wildlife of concern which have the potential to be in the area. The report also includes maps and results of all the surveys done to date. Figure 1 in this report provides estimates for different levels of impact, ranging from approximately 13 acres to around 25 acres, based on different design scenarios.

Access to the ORETTC facility would be located in the lower elevations where forest is younger with cluttered mid-story and understory. The facility footprint will impact forest and watershed areas on the north slope of the SSP-2A parcel. Acoustic surveys for federal and state listed bat species were initiated in June and July 2020 throughout the larger SSP-2A area, with a total of 99 nights of monitoring (6–12 survey nights among 11 recording units). No calls from federally listed bats (Indiana bat, gray bat, and northern long-eared bat) were detected within the eastern portion of the ORETTC project area. Calls from bat species under consideration for federal listing (little brown bat and tricolored bat), along with a small number of gray bat calls were recorded at higher elevations on the SSP-2A parcel or outside the boundaries of the SSP-2A parcel. We were not yet able to obtain data for the slightly more mature forested area in the western portion of the project area.

Based on the above findings along with those outlined in the attached preliminary report, and assuming a maximum disturbance area of 25 acres, it is the opinion of the ORNL Natural Resources Management Team that the ORETTC facility could be developed with no likely effect to federal (or state) listed bats. This current request is to seek your concurrence on this specific finding. However, evaluation of the remaining portions of the SSP-2A area will continue. Additional surveys will be necessary to determine presence of wildlife and plants and evaluate the overall impact that any further alteration of the larger 81-acre area might have on potential habitat. Therefore, no opinion on the entire SSP-2A parcel can be made at this time. Moreover, there is potential for impacts to forest resources to extend beyond the footprint of the ORETTC conceptual design (e.g., pine forest thinning for fuel reduction), described in the attached document (see Figure 2). The final findings of our ongoing sensitive resources surveys will be presented in the final EA for this project, to be completed on or around September 30th.

Please feel free to contact me with any questions.

Thank you,

Kitty McCracken
Natural Resources Management Team
Oak Ridge National Laboratory
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
865-576-5269 (office)
865-924-4706 (cell)

APPENDIX B

Wetlands Assessment

B.1 INTRODUCTION

This Wetlands Assessment (Appendix B) has been prepared concurrently with the *Environmental Assessment for the Oak Ridge Enhanced Technology and Training Center* and in accordance with 10 Code of Federal Regulations (CFR) 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements". This assessment fulfills the U. S. Department of Energy's (DOE)/National Nuclear Security Administration's (NNSA) responsibilities under Executive Order 11990, "Protection of Wetlands." Executive Order 11990 requires Federal agencies to minimize the destruction or degradation of wetlands, and to avoid undertaking new construction located in wetlands unless they find there is no practicable alternative to such construction.

Definition of "Wetland" Under 10 CFR Part 1022.4

Wetland means an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

NNSA, in accordance with 10 CFR Part 1022, seeks to identify, evaluate, and as appropriate, implement alternative actions that may avoid or mitigate adverse wetlands impacts, and provide early and adequate opportunities for public review of plans or proposals for actions that may affect wetlands. This Wetlands Assessment serves to document the proposed activities that have the potential to affect the wetlands, and to consider alternatives to the proposed action.

An application for General Aquatic Resource Alteration Permit for Construction or Removal of Minor Road Crossings (form CN-1091), along with any other required information, would be submitted to Tennessee Department of Environment and Conservation (TDEC). Notice of coverage by TDEC of activities that qualify under general permits also serve as a section 401 Water Quality Certification pursuant to the federal Clean Water Act. Work shall not commence until a written Notice of Coverage (NOC) from TDEC is received.

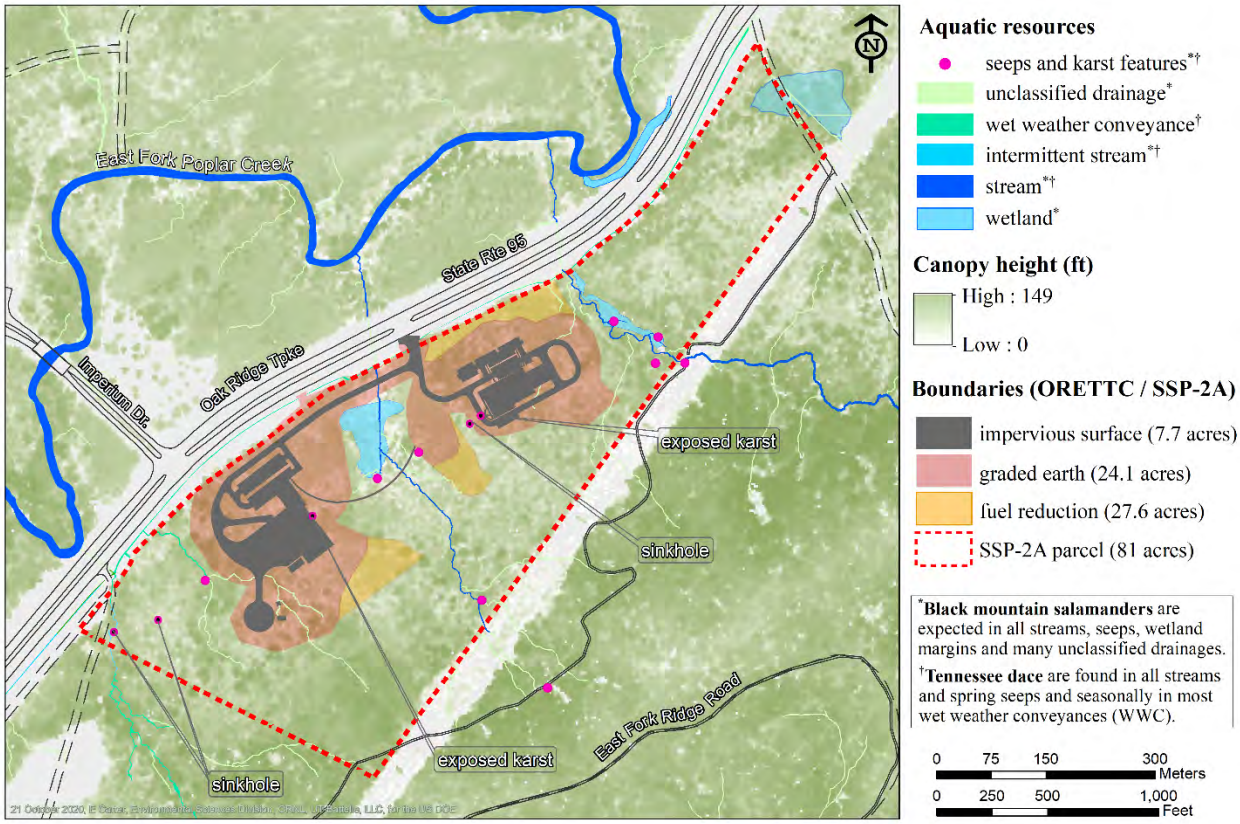
Pursuant to the *Clean Water Act*, an application for Nationwide Permit 14, Linear Transportation Projects would be submitted to the U.S. Army Corps of Engineers (USACE). NNSA would submit a pre-construction notification to the USACE prior to commencing the activity for the loss of waters of the United States greater than 0.1 acres.

B.2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

B.2.1 Proposed Action

The Proposed Action is described in Section 2.1 of the EA. The Proposed Action would require two stream crossings (i.e., the construction of a 36-foot wide roadway and 10-foot wide pedestrian walkway across a perennial stream) (*see* Figure B-1). A single stream would be crossed, and the two crossings would be nearby such that both crossing would be considered a single and complete project for purposes of permit authorization. The width of the stream bed and ordinary high-water marks at the crossings is approximately six feet. Use of bottomless culvert arches would span the stream crossings, thereby avoiding stream impacts, and allow the stream to flow freely. The design

of the roadway and walkway would avoid wetland impacts to the greatest extent practicable, while still providing a safe and functional route for ORETTC operations.



Note: Grading plans for the ORETTC estimate that approximately 24.1 acres of land could be disturbed.
Source: ORNL 2020.

Figure B-1. ORETTC Roadway and Walkway Project Area

B.2.2 ETTP Alternative

Under the ETTP Alternative, the ORETTC would be constructed and operated at ETTP. No wetlands or floodplains would be affected.

B.2.3 No Action Alternative

Under the No Action Alternative, the ORETTC would not be constructed and conditions at the existing site would remain unchanged and wetlands would remain unaffected.

B.2.4 Alternatives Considered but Eliminated

Section 2.4 of the EA discusses site alternatives for the ORETTC that were considered but eliminated from detailed analysis. In the process of developing the Proposed Action analyzed in this EA, NNSA considered siting alternatives for the ORETTC at: (1) another ORR location (i.e., the CTF); (2) offsite near Bethel Valley Road and Scarborough Road; and (3) onsite at Y-12. Those locations were eliminated from detailed analysis for the reasons stated in Section 2.4. In

developing the Proposed Action, NNSA also considered potential implementation options at the ORETTC proposed site that could potentially avoid wetland impacts. Given that the development of the ORETTC requires the use of land on each side of the perennial stream, and there is an operational need for internal circulation across that stream, there is no practical means to avoid the wetlands at the proposed location. Wetlands could be avoided at the ETTP location.

B.3 POTENTIAL WETLAND IMPACTS

A preliminary wetlands determination and delineation has been performed based on a July 2020 biological survey of the ORETTC proposed site (ORNL 2020). NNSA has determined that the ORETTC could impact approximately 0.05 acres (for the road and pedestrian bridge) of total wetland under the current site design. Limiting the road corridor to 36 feet wide and the pedestrian corridor to 10 feet wide across the 100-foot riparian buffer on either side of the stream (CNS 2020a) would minimize potential impacts to potential wetlands. Impacts to wetlands would be minimized by crossing the stream at the narrowest point, spanning the stream, crossing at a right angle to the stream, and minimizing the width of the transportation corridor.

The proposed use of a clear span bottomless culvert arch for the sidewalk and road crossings would avoid impacts to the channel (i.e., the stream is untouched). Because the stream crossings would be to a single stream and the two crossings would be nearby, both crossing would be considered a single and complete project for permit authorization. Wetland loss due to construction (facility, road, and pedestrian crossings) could total approximately 0.05 acres within the watershed. During the permitting process, NNSA would work with USACE and TDEC to identify and develop expansion and/or creation of wetland acreage in areas near the ORETTC.

The Proposed Action could involve the discharge of fill material into wetlands. All activities would be performed in compliance with associated permits and with the project Storm Water Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs). The proposed use of BMPs such as biodegradable sediment control barriers to protect the stream from erosion would further reduce potential wetland impacts. No contaminated soil is anticipated to be encountered during the proposed activities (DOE 2013).

APPENDIX C

Comments and Responses on the Draft EA

C.1 INTRODUCTION

In August 2020, NNSA published the Draft EA on the DOE NEPA web page (https://www.energy.gov/nepa/doe-environmental-assessments) and the NNSA NEPA web page (https://www.energy.gov/nnsa/nnsa-nepa-reading-room) for public review and comment.[19] As shown in Table 1-1 of Section 1.5, NNSA announced the availability of the Draft EA in local newspapers and provided an email address and postal address where comments could be submitted. NNSA provided an approximately 30-day comment period.

NNSA received eight comment documents on the Draft EA. Table C-1 provides a list of the commenters who submitted comment documents on the Draft EA. A list of the comments, as well as NNSA's corresponding responses to those comments, are provided in Section C.2. All comment documents received are included in the Administrative Record for this EA. In the process of preparing this Final EA, NNSA reviewed and considered all comments received on the Draft EA. Based on the comments and other considerations, NNSA has made revisions to the EA, as appropriate.

Table C-1. Index of Commenters

Advocates for the Oak Ridge Reservation
Colclasure, Doug (2 submittals)
Gross, Sandra; Tennessee Citizens for Wilderness Planning
Shaw, John; Roane County Environmental Review Board
Smith, Ellen (2 submittals)
Taylor, Matt; TDEC

C.2 COMMENTS AND RESPONSES

NNSA reviewed every comment document received and prepared responses to address those comments. The comments and NNSA's corresponding responses are shown below.

1. *Commenters state that the comment period for the Draft EA should be extended up to 60 additional days. Commenter cites the difficulty of conducting a review within the allotted comment period due to the Covid-19 pandemic, denial of site visit due to the pandemic, delays in getting a printed copy of the Draft EA, delays in mail service, and the lack of printed copies of the Draft EA's at the DOE Information Center on the day of release. Commenter also questioned why NNSA did not hold a public meeting. Commenters stated that there was inadequate opportunity for public involvement.*

Response: Although DOE procedures implementing NEPA (10 CFR Part 1021) do not require public comment on an EA, NNSA decided, in its discretion, that public comment in this instance would be helpful and issued the Draft EA for public review and comment for an approximately 30-day period. In response to public comments, NNSA considered extending the comment period, but declined. However, in preparing this Final EA, NNSA considered all comments received. No late comments were received. NNSA declined to hold a public hearing on the Draft EA, which is not required for documents such as an EA. In general, NNSA only provides electronic copies of its NEPA documents, which is allowable under the CEQ regulations.

[19] The Draft EA was published on the DOE NEPA web page on August 20, 2020 and on the NNSA NEPA web page on August 24, 2020.

2. *Commenter states that the ORETTC would be a significant change proposed for the entire landscape and wildlife habitat for generations. Commenter states that the SSP-2A site has no infrastructure and will require clearing a forest undisturbed for more than 75 years. Such an outcome can only be classified as "Significant Impact" and more importantly avoidable.*

Response: The potential impacts of the ORETTC on the landscape and wildlife habitat are assessed in Chapter 3 of this Final EA. As described in that chapter, construction of the ORETTC would disturb approximately 24.1 acres, or approximately 0.06 percent of the total forest land at ORR. Much of the site is largely younger, second growth, as characterized by dominant species considered to be pioneering types. The permanent footprint of the facility, including roads, would be 7.7 acres. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. No appreciable visual resource impacts are expected, as the ORETTC proposed site is largely wooded and would only be visible from traffic on the Oak Ridge Turnpike. Construction of ORETTC would have minor short- and long-term adverse effects on biological resources. Potential impacts on biological resources include loss of habitat and wildlife disturbance. Given the small land disturbance, the ORETTC would not reduce the distribution or viability of species or habitats of concern.

3. *The commenter states that it appears environmental evaluations are continuing even though the Draft EA document has been released. The commenter states that there were contractor vehicles at the site with what appeared to be construction-related equipment. Commenter states that it appears some early construction site work has already begun. Commenter suggests other such disturbances have occurred throughout the proposed site, and questions whether significant environmental damage has occurred throughout the area. Commenter questions whether this is a violation of the EA process.*

Response: No construction activities associated with the ORETTC began in advance of this Final EA and the associated FONSI. However, NNSA has conducted site characterization activities, including geotechnical (subsurface) core boring. Such activities are allowable as a categorical exclusion under the DOE procedures implementing NEPA (10 CFR Part 1021, Appendix B, Section B3.1). Knowing the geotechnical (subsurface) conditions is very important before beginning design as this can impact the specific design, location, and ultimate cost of the facility. The ORNL Natural Resource Management staff accompanies the geotechnical contractor to denote areas where sensitive resources could be located. The geotechnical contractor uses a track-mounted rig to minimize any potential environmental impacts associated with the geotechnical activities.

4. *Commenter states that the notice in the Oak Ridge newspaper of the Draft EA could have been more prominent and descriptive for public awareness. Commenter states that the announcement was small print among incidental adds. Commenter states that, while "5 miles west of Y-12" is accurate, commenter questions whether "adjacent to Forest Creek Village residential development on the Oak Ridge Turnpike one mile west of Wisconsin Ave" would be more informative. Commenter also questions why the announcement of the availability of the Draft EA was not published several times for better public awareness.*

Response: NNSA published newspaper notices, as discussed in Section 1.5 of this Final EA. The notice of availability of the Draft EA was published in a manner similar to other DOE public notice announcements. NNSA thinks the information in the notice was adequate, and agrees with the commenter that it accurately informed the public of the proposed location of the ORETTC. As shown in Table 1-1 in Section 1.5, the announcement of the availability of the Draft EA was published more than once.

5. *Commenter states that while a national and consolidated Emergency Response Training Facility, as envisioned with this project, may be justifiable, the process being undertaken in choosing a location on the ORR is not. Commenter states that there is no consideration given to brownfield sites such as ETTP where 500 acres is available. Commenter states that the site selection lacks creative or credible stewardship of public resources , both landscapes and funding.*

Response: During the site selection process, sites such as ETTP were initially considered for the ORETTC. However, ETTP was ranked lower compared to the ORETTC proposed site (and other sites), and was eliminated from detailed analysis. In response to public comments, NNSA has reevaluated the potential use of the ETTP and has added an analysis of it to this Final EA (*see* Section 2.2 of this Final EA). Chapter 3 of this Final EA includes an analysis of the ETTP site for the ORETTC.

6. *Commenters states that the public announcements should include the name, email address, and phone number of the NNSA local manager in charge of the project to facilitate the public in asking questions and receiving answers. Commenter also states that the initial newspaper announcements, which only contained the web address for the NNSA NEPA web page, did not link to the published document.*

Response: The public announcements provide a postal mailing address and email address where comments/questions may be submitted. NNSA does not generally post the name, phone number, and email address of specific NNSA employees. NNSA notes that responsible NNSA managers reviewed all documents submitted during the comment period and approved all responses in this appendix. The initial newspaper announcements did not link to the published Draft EA because of an administrative error. That error caused the Draft EA to initially be posted on only the DOE NEPA web page on August 20, 2020. After the Draft EA was published on the NNSA NEPA web page on August 24, 2020, NNSA published a second set of newspaper announcements with working links to the Draft EA on both the NNSA NEPA web page and the DOE NEPA web page.

7. *Commenter asks if the EA was completed on August 4, 2020, and if the EA was completed on that date, why were environmental staff continuing to visit the site as late as August 24, 2020, and performing what appeared to be data collecting?*

Response: The Draft EA was not completed on August 4, 2020. The Draft EA was approved and published on the DOE NEPA web page on August 20, 2020. As discussed in comment-response 3, NNSA has been conducting allowable site characterization activities, including geotechnical (subsurface) drilling, at the ORETTC proposed site.

8. *Commenter states that NNSA has improperly selected a project management firm and construction contractor before completion of the EA. Commenter contends that the NEPA review is not timely and implies that decisions have already been made to proceed with the Proposed Action in advance of the EA completion. Commenter cites the following in support of this contention: (1) a March 2020 advertisement in a local newspaper seeking a developer/construction manager to design and build a training facility; and (2) design work was to begin in June (two months before the Draft EA was published) so construction could begin in November 2020.*

Response: Although selection of a project management firm and construction contractor is beyond the scope of the EA, such action would not be improper or a violation of NEPA, as such selection and award

of a contractor has no environmental impacts and does not limit the choice of reasonable alternatives for the Proposed Action. A decision to proceed with the Proposed Action was not made in advance of this Final EA and a FONSI.

9. *Commenter states that the current plan for ORETTC to be located on a greenfield fails to address the cumulative natural resource impact to the ORR. Commenters state that DOE should prepare a site-wide environmental impact statement (EIS) for the entire ORR, as provided for in DOE NEPA regulations at 10 CFR Part 1021.330, to include comprehensive consideration of land use. Commenter cites the receipt of two different DOE draft EAs on the same day for two different DOE proposed actions (the ORETTC EA and DOE/EA-1113-A2, the EA Addendum for Proposed Revitalization of Parcel ED-1 at the Horizon Center) at locations that are located across a highway from each other. Commenter states that neither EA acknowledges the existence of the other proposed action or discusses their potential cumulative impacts. Commenter states that a major issue of concern regarding this project is the lack of mention of the proposed Motorsports Park Center, which is to be located just across the street for the training facility. That proposal mentions as many as 8,000 cars to visit.*

Response: As described in Chapter 3 of this EA, construction of the ORETTC would disturb approximately 24.1 acres, or approximately 0.06 percent of the total land at ORR. Of this 24.1 acres, approximately 7.7 acres would remain permanently disturbed by the facility footprint, parking lots, and the access road. The other 16.4 acres would be temporarily disturbed (i.e., surfaces would remain pervious) to grade the land and provide greenspace around the ORETTC to enhance the campus-feel. In addition, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources. Chapter 4 of this EA has been revised to include consideration of the potential cumulative impacts associated with the proposal to increase the allowable land uses in the Horizon Center (Parcel ED-1) to include hotels, a recreational vehicle park, a motorsports park, a vehicle test facility, residential development, and an amphitheater. That potential development could impact an additional 58 acres. Based on the cumulative impact analysis in Chapter 4 of this EA, the cumulative land disturbance would be approximately 231 acres, which is less than one percent of the land on the ORR. With regard to traffic, the "Draft Environmental Assessment Addendum: Proposed Revitalization of Parcel ED-1 at the Horizon Center, Oak Ridge, Tennessee" (DOE/EA-1113-A2) and Draft FONSI (DOE 2020b) concluded that traffic impacts would not be significant. Whether a site-wide EIS should be prepared for ORR is beyond the scope of this EA.

10. *Commenter states that the project represents a national-scale need, and if this is truly the purpose and need for action, it is not obvious why the only reasonable alternative (other than No Action) is to construct and operate a new facility on a specific piece of land in Oak Ridge, Tennessee. Commenter questions why the national-scale need be met by a facility in some completely different part of the country. .*

Response: Section 2.4 of this Final EA has been revised to include a discussion as to why sites outside of the ORR were eliminated from detailed analysis.

11. *Commenter states that the 81-acre site is much larger than the area apparently required for the proposed facilities. This suggests that a much smaller site would have been ample. Commenter questions why the rest of the site was transferred and wonders what it would be used for?*

Response: This EA assesses the potential impacts of the construction and operation of the ORETTC, which would be sited within the 81-acre parcel described in Section 3.2.1 of this Final EA. Section 2.4 of this Final EA describes the site selection process which led to the designation of Alternative 1 as the proposed site for the ORETTC within the 950-acre SSP-2 parcel. The 81-acre site is actually a subset of the 95 acres identified as Alternative 1, and provided NNSA with the flexibility to determine the optimum configuration of the ORETTC facilities for analysis in this EA. There are no plans to develop any other portions of the 81-acre parcel and they would remain a buffer area for the ORETTC once it becomes operational.

12. *Commenter states that because the purpose and need for Federal action includes both the ORETTC and the ERTF, the proposed action in the EA should be the siting, construction, and operation of the combined facilities. Accordingly, we believe that the construction, and operation of the ERTF facility must be assessed as part of the action assessed in this EA. Commenter states that in Section 3.2.2, this text indicates the land area that would be cleared or disturbed for the Federal portion of the proposed facility, but there does not appear to be any indication of the land areas affected by construction of the state-funded portion.*

Response: This EA assesses the potential impacts of the construction and operation of all facilities associated with the ORETTC. As stated in Section 1.4, the construction and operation of the ERTF is also evaluated as part of the Proposed Action in this EA. The impacts to land in Section 3.2.2 include the ERTF. However, Section 3.2.2 also correctly discusses differences between the DOE-owned land and the RCIDB-land (for the ERTF) with regard to zoning requirements.

13. *Commenter states that the assessment of impacts should not make conclusions about significance. Commenters state that these are statements of conclusions that are reserved for a FONSI and do not belong in the EA.*

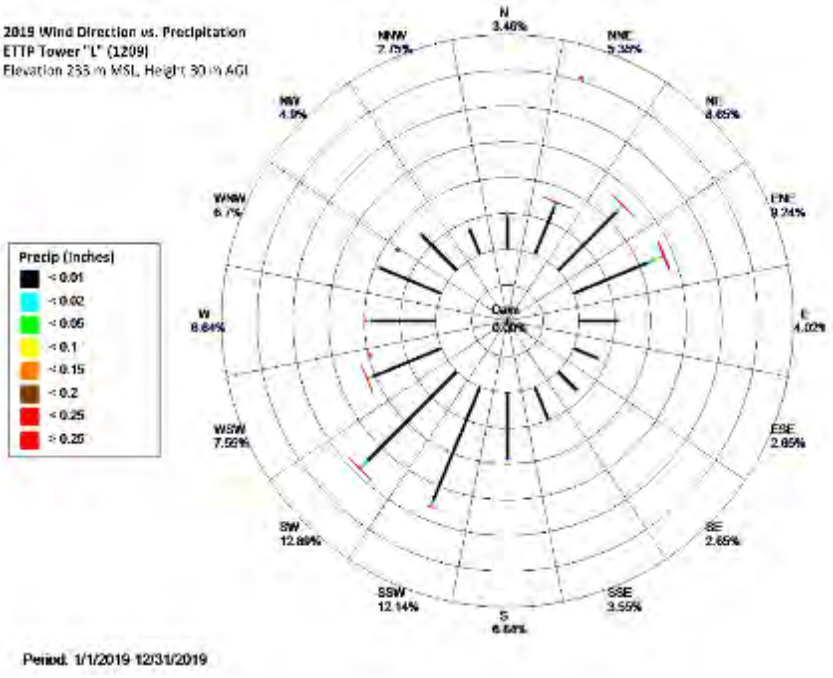
Response: Chapter 3 of this Final EA has been revised to eliminate any text that could be interpreted as "conclusions as to significance." In some instances, where quantified impacts are not possible, the subject matter experts who prepared various sections of the EA have used adjectives to characterize potential impacts.

14. *Commenter states that Section 3.3.1 is not accurate when it states that "The land is not readily accessible to the public." Commenter states that the proposed site is located on a public highway and is adjacent to a residential subdivision (under development), so portions of the site are very visible. Commenter states that no attempt to show what the area would look like after development.*

Response: Section 3.3.1 has been revised to incorporate the comment. Figures 3-7 and 3-8 present renderings of the ORETTC facilities and show what the site would look like if the ORETTC is constructed.

15. *Commenter questions: (1) the height at which smoke plumes be emitted, (2) the prevailing wind directions at this site; (3) the distance a smoke plume could travel; (4) smoke concentrations that would be experienced by nearby residents; (5) whether burn activities would be scheduled when weather conditions that would minimize offsite impact or to avoid time periods when sensitive members of the public might be in areas where exposure is likely; (6) would the burning activity be similar to what occurs periodically at the municipal fire department training tower in Oak Ridge, or would it involve different fuel types or a tower of a different height; and (7) could the emissions of fine particles affect Roane County attainment of air quality criteria for $PM_{2.5}$?*

Response: (1) Plumes would generally be emitted at heights of around 100-150 feet.
(2) The prevailing wind directions at this site are shown in the wind rose below:



(3) There are many variables that could affect how far a smoke plume could travel, including: duration/intensity of release, height of release, atmospheric pressure, prevailing winds (speed and direction), air temperature, and relative humidity, to name a few. As an extreme example, smoke from the current California wildfires has been estimated to travel more than 10 miles high and has reached places thousands of miles away. The smoke from the weekly ORETTC drills would typically last less than one hour and be of low intensity. The smoke plume would be expected to dissipate within approximately one mile of the ORETTC facility.
(4) With regard to smoke concentrations, NNSA estimates that the smoke concentrations would be similar to the periodic live fire training that occurs at many municipal fire training facilities around the country;
(5) Live fire training would be scheduled to minimize any potential impacts offsite the ORETTC. Reviewing the weather days in advance would be part of the burn plan. For example, if heavy fog were in the area during a scheduled training, NNSA would hold off until the fog had lifted to a safe point;
(6) The live fire training would be similar to what occurs periodically at the municipal fire department training tower in Oak Ridge. The guiding directive is NFPA 1403 "Standard on Live Fire Training Evolutions," and the fuels that would be used would be natural gas, propane, and Class A material such as paper and wood;
(7) There are no conceivable training scenarios in which the emissions from the live fire training would cause any NAAQS standards to be exceeded. Emissions from live fire training would be well below the *de minimis* thresholds.

16. *Commenter asks if the increased runoff volume would cause bank erosion and gully formation in the stream channels that drain the site.*

Response: Although increased erosion in streams receiving runoff is possible, a number of erosion control measures would be required during construction, as described below and in Section 3.6.2 of this EA. As part of the NPDES permit for construction, the development and implementation of a SWPPP would be required to help minimize any pollution that might leave the site by stormwater. The SWPPP would contain a detailed site plan and schematics for the installation of temporary and permanent stormwater and erosion control devices to effectively manage the site during construction and facility operation.

The northern and southern streams and their associated springs and wetlands are outside of the construction footprint, and therefore would not be directly impacted by construction. During construction, soil erosion and sedimentation would increase due to increased soil exposure. However, the implementation of erosion prevention and sediment control measures such as silt fence, filter sock, and temporary slope breakers, would reduce impacts to adjacent surface waters. Installing and maintaining erosion controls around the perimeter of the construction footprint especially along sloped areas would help mitigate the potential for sediment transport into the streams. Additionally, the installation of temporary slope breakers terminating in sumps would help to trap sediment, and reduce water velocity prior to drainage into stream channels, thereby reducing erosion potential from storm events within receiving streams. However, the potential for adverse impacts to surface water would exist until disturbed areas are stabilized and revegetation is established.

17. *Commenter questions whether water from fire training activities and detained stormwater would need to be discharged periodically, and whether it would be released to one or more of the small streams that drain the site. What are the expected impacts of discharging this water? How much volume will it add to normal stream flow? Will the chlorinated drinking water used in fire training be stored in ponds long enough for the chlorine to dissipate so that its discharge does not adversely affect aquatic life in the receiving streams?*

Response: Approximately 250,000 gallons of water would be used for fire-training annually. This training water would be detained in a pond with a volume of 18,000 cubic feet, which would allow for controlled release of the water. The volume of water entering receiving streams would be reduced by evaporation and seepage, by about 50 percent.

Water discharges at ORR are tested for residual chlorine levels, bacterial constituents, and disinfectant by-products; sample results in 2018 showed that all constituents were within acceptable limits. For the ORETTC project, significant impacts are not expected to EFPC, as the chlorine limits established under the NPDES permit have been protective of water quality along the EFPC in other areas, specifically from Y-12 located at the headwaters of the EFPC. The TDEC NPDES permit action level is 1.2 g/day total residual oxidant (TRO) at any outfall. At ORR, if TRO is found above detection (>0.05 mg/L), steps are taken to improve de-chlorination. For example, ORNL uses sodium sulfite tablets and in some cases liquid sodium bisulfite drip proportionate to the flow to neutralize/dechlorinate discharges with high chlorine content (i.e. from cooling water).

18. *Contractual documents between NNSA, the State, the RCIDB, and any operating contractors should emphatically prohibit the use of foam and chemical agents in firefighting training.*

Response: Contractual documents are beyond the scope of the EA. The NNSA is on record in the EA as stating that, "No foam or chemical agents would be used for firefighting training" (*see* Section 3.6.2 of this EA).

19. *Commenter states that estimates of the land areas of forest (or other vegetation) and wetlands that would be lost should classify the affected lands according to more specific vegetation type. Not all forests are equal in value, and not all wetlands are the same. Commenter asks how the habitats that would be lost compare in quality and area to the total presence of similar habitats on the ORR and in the area?*

Response: As indicated in Section 3.8.1, Habitat, the ORETTC site is not within a designated natural area; however, a tributary that crosses the ORETTC site is designated as an aquatic natural area. The ORETTC site contains forest stands that are largely younger, second growth, as characterized by dominant species considered to be pioneering types. The EA has been revised to add text that the ORR Forest Management Plan (ORNL 2015) designates the proposed site as conifer (pine) forest type. Section 3.8.1, Threatened, Endangered, or Sensitive Species, states that the vast majority of the project site does not have suitable bat foraging habitat due to cluttered mid-story and under-story vegetation. Section 3.8.2, Proposed Action Impacts, states that the stream through the ORETTC site would be crossed twice by the road and pedestrian walkway (sidewalk) that connect the two training facilities. Use of bottomless culvert arches or similarly a bottomless bridge would span the stream crossings, thereby avoiding stream impacts, and allow the stream to flow freely.

20. *Commenter asks if the diagram of proposed facilities in Figure 3-14 includes the state component of the project, or are these just the Federal facilities?*

Response: (Note: Figure 3-14 in the Draft EA is now Figure 3-15 in this Final EA) As shown in Figure 2-2 (and Figure 3-15), the ERTF (northeast of stream) would be state-funded and developed by the RCIDB.

21. *Commenter states that more attention should be given to avoiding or minimizing impacts to aquatic resources. Commenter asks if it is necessary for the two sets of buildings to be on opposite sides of this stream and connected by a road. Commenter asks if both sets of buildings be located between the same pair streams. Alternatively, couldn't the public highway be used for more traffic between the two areas, thus reducing the width of the interior roads?*

Response: As presented in the ORETTC Master Site Plan (CNS 2020a), the developable area identified with minimal constraints for the Proposed Action would be on either side of the stream. The alternatives 2-4 that were evaluated against a matrix of 20 criteria (including contiguous developable area, site access, proximity to utilities, and environmental considerations, such as the potential to impact cultural resources, endangered species, and wetlands) were dismissed from detailed analysis because of low scores on the alternatives criteria. The EA has been revised to emphasize the use of bottomless arch culverts, considering the high ecological value of the perennial stream that intersects the ORETTC site, as recommended in the ORR Forest Management Plan (ORNL 2015), Tennessee Division of Forestry, Best Management Practices in Tennessee (TDA 2003), and Tennessee Department of Environment and Conservation, Tennessee Erosion and Sediment Control Handbook (TDEC 2012).

22. *Commenter states that limiting the road corridor to 36 feet wide and the pedestrian corridor to 10 feet wide across the 100-foot riparian buffers on either side of the stream hardly seems like a commitment to minimize impacts to wetlands and streams. Commenter states that a 24-foot width should be ample for this segment of the road and sidewalks seldom are as wide as 10 feet. Commenter requests that NNSA consider using permeable decking material for any pedestrian walkways that cross the wetland and stream.*

Response: The 36-foot-wide corridor for the road considers construction of a 24-foot-wide roadway with a 6-foot-wide road shoulder on either side as the limit of disturbance which is generally standard for constructing a two-lane roadway. The 10-foot-wide sidewalk considers constructing a 5-foot-wide sidewalk with 2.5-foot-wide buffer on either side for maintenance and the limit of disturbance. During the design process, NNSA will consider the use of permeable decking material for the pedestrian walkway that crosses the wetland and stream.

23. Commenter states that the region also has city police departments, including the Oak Ridge Police Department, which is the primary law enforcement agency for the ORETTC proposed site.

Response: Section 3.10.2 of the EA has been updated to include the Oak Ridge Police Department.

24. Commenter asks NNSA to classify the types of jobs of the 20 permanent workers.

Response: The 20 permanent workers would be made up of instructors/trainers and some maintenance and security personnel.

25. Commenter asks how the project would affect local property tax receipts? Also commenter asks if the transfer of property for the ERTF would eliminate in lieu of tax payments for that land? If so, how much revenue would be lost to local jurisdictions? .

Response: Currently three communities in the ROI receive Payments in Lieu of Taxes (PILT) payments: the City of Oak Ridge, Anderson County, and Roane County. In 2017, the Oak Ridge Site had 65,538 acres of PILT eligible-acreage and DOE/NNSA paid communities approximately $3.4 million (GAO 2019). PILT payments vary considerably across DOE sites. No precise figure can be determined in advance for each year's PILT authorized level as several factors affect the calculation of payment to a given community including: (1) the number of acres eligible for PILT payments, (2) county's population, (3) payment in prior years from other specified federal land payment programs, (4) state laws directing payments to a particular government purpose, and (5) the Consumer Price Index as calculated by the BLS. If the land occupied by the ORETTC and ERTF are PILT eligible, it is anticipated that the transfer of 24 acres of land for the ERTF would not significantly impact the revenue received by the communities.

26. Commenter questions whether some training activities would use radioactive and hazardous materials, and questions whether it make sense to locate them close to an important public highway. Commenter questions whether an operating accident could ever cause temporary closure of Highway 95.

Response: As stated in Section 3.1 of this EA, limited sealed sources would be utilized for training purposes and stored on-site. A sealed source is radioactive material that is permanently sealed in a capsule or bonded and in a solid form. The capsule of a sealed radioactive source is designed to prevent the radioactive material from escaping or being released during normal usage and under probable accident conditions. Less than 100 pounds of hazardous waste associated with cleaning supplies and spent training materials would be generated annually, which is less than 0.01 percent of the hazardous waste generate at ORR. NNSA does not foresee any accident at the ORETTC that would result in the closure of Highway 95.

27. Commenter questions whether the presence of a nearby airport increase the impacts of firefighter training at the ORETTC. Specifically, commenter questions whether smoke from fire training

activities could affect operations at the proposed Oak Ridge airport, or whether the Federal Aviation Administration rules restrict fire training activity at the ORETTC.

Response: At the proposed location, the ORETTC would be located more than approximately three miles from the General Aviation Airport at the ETTP. A weekly fire training activity would not impact airport operations and there are no Federal Aviation Administration rules that would restrict fire training activity at the ORETTC. In fact, many airports around the county conduct live fire exercises on airport property for airport fire department training.

28. *Commenter states that there is a potential discrepancy in Section 3.7.1, in which the text references seismic maps from 2014, yet Figures 3-12 and 3-13 are labeled as seismic maps from 2018.*

Response: The text in Section 3.7.1 has been corrected to indicate the seismic maps are from 2018.

29. *Commenter states that the discussion of seismic risk suggests that any earthquake damage that might occur would be minimal. It does not appear that these determinations considered some of the more recent literature regarding likelihood of more powerful seismic events in the area. The commenter questions whether this information is accounted for in the cited USGS 2018 report.*

Response: The USGS 2018 National Seismic Hazard Model for the Conterminous United States provides the best available seismic hazard maps for the area. Those maps indicate that the study area is located in an area with a moderate seismic hazard class rating. This does not imply that any earthquake damage that might occur would be minimal. The ORETTC would be constructed in accordance with all applicable seismic standards, as appropriate, to minimize damage in the event of an earthquake. Given the absence radioactive material at the ORETTC (with the exception of sealed sources), and minimal hazardous material associated with cleaning supplies and spent training materials, NNSA does not expect that seismic risks for the ORETTC would be notably different than other non-nuclear, nonhazardous facilities in the area. Based on a recently completed study of potential impacts from earthquakes at Y-12, NNSA notes that earthquakes in the range of 6.0 magnitude are possible in the region (NNSA 2020).

30. *Commenter states that based on the potential habitats within the project area, some of the rare, threatened, or endangered plant species noted in the attachment to this letter may be present in the work area. The commenter encourages NNSA to consider evaluating these taxa and their preferred habitats and actions which can mitigate potential impacts to these species when undertaking project activities.*

Response: Section 3.8.2, Threatened, Endangered, or Sensitive Species, has been revised to state that NNSA evaluated the potentially affected rare, threatened, or endangered plant species for measures to avoid potential impacts. Text has been added to state that NNSA intends to implement these recommendations/suggestions for protection of state and federal listed species.

31. *Commenter requests that NNSA provide a legend on Figure 3-15 to facilitate clearer interpretation.*

Response: (Note: Figure 3-15 in the Draft EA is now Figure 3-16 in this Final EA). A legend has been added to Figure 3-16.

32. Commenter states that if any demolition of buildings/existing structures is required as part of the proposed project, NNSA will need to provide advance asbestos renovation/demolition notification(s) according to the requirements for notification found in Chapter 1200-03-11-.02, Hazardous Air Contaminants (Asbestos) of TDEC's regulations. The commenter also suggests that NNSA consult with a permit writer when more information is available regarding the project to ensure all potential requirements are met. Additionally, the commenter encourages NNSA to discuss anticipated emissions generated by the gasoline and diesel fueled trucks and construction equipment used. The commenter encourages NNSA to include the detailed results of the modeling evaluation conducted and confirmation of the model employed in the Final EA.

Response: No buildings/existing structures are required to be demolished as part of the proposed project and no asbestos renovation/demolition notification would be required. NNSA will consult with permitting personnel as appropriate to ensure compliance with any air permitting requirements. The air modelling that was performed for the EA takes into account all emissions associated with construction equipment. The air modelling evaluation is included in the Administrative Record for this EA.

33. Commenter identifies several editorial/minor changes that should be made to the EA.

Response: The following changes were made:

a. Section 3.2.1: "...the City Council shall..." was changed to "...the City Council may..."
b. Sections 3.2.1 and 3.12.1: the phrase, "has not been known to have any hazardous substance released/spilled on it," was added.
c. Section 3.2.1: NNSA clarified that the proposed ORETTC site does not contain any environmentally contaminated areas.
d. Section 3.7.2: Because there is a sinkhole on the proposed ORETTC site, NNSA deleted the following sentence: "Karst features were not discovered in vicinity of the site."
e. Section 3.9.1: "... contain portions off five..." was changed to "... contain portions of five...".
f. Section 3.10.1: "In Roane county..." was changed to "In Roane County..."

34. Commenter states that the EA should address the maximum daily users (500 personnel per day) or the midpoint of users (375 personnel).

Response: The maximum daily user estimate of 500 personnel has been deleted from the EA. Because NNSA decided that 250 personnel is the best estimate of daily users, the EA evaluates that quantity.

35. Commenter asks about safety precautions related to wildfire prevention.

Response: As shown in Figure 2-3, which was added to the Final EA, approximately 3.5 acres of forest would be thinned to reduce wildland fire fuel sources.

36. Commenter questions whether there will be outside notification alarms during facility operation, and if so, whether NNSA is considering the noise levels for these alarms.

Response: There may be alarms used during training exercises, but any noise would be short-term, intermittent, and would not be expected to result in notable impacts beyond the ORETTC site boundary.

37. Commenter asks if consideration has been given for equipment refueling activities, especially heavy equipment during construction?

Response: NNSA would use best management practices to eliminate/minimize any potential impacts associated with fuel use/fuel refueling operations.

38. Commenter asks if the Final EA will contain the latest biological surveys and whether NNSA will solicit additional public comments on those surveys.

Response: Appendix A of the Final EA has been updated with the most recent biological surveys. NNSA is not soliciting additional public comments.

39. Commenter asks if a "300 foot buffer" around the facility footprint is enough of a safely measure for hunting in the area.

Response: NNSA has removed the 300 foot buffer description from the EA. NNSA will coordinate with the Tennessee Wildlife Resources Agency on appropriate safety measures regarding hunting in the vicinity of the ORETTC.

40. Commenter asks if a local support arrangement would be provided by ETTP or Oak Ridge City for law enforcement, fire department, etc. services for the ORETTC. .

Response: NNSA will coordinate with local agencies regarding services related to the ORETTC.

41. Commenter asks if firearms will be allowed on the site.

Response: Operations at ORETTC would not require live firearms. Operations would comply with local and State laws.

42. Commenter asks if a traffic light would be considered to service the ORETTC?

Response: A traffic light is not anticipated to be required for the ORETTC. However, NNSA is continuing to investigate access requirements and will coordinate with TDOT on the permitting for access to the ORETTC.

43. Commenter states that the TVA Small Modular Reactor and the ETTC motorsport park should be added to the cumulative impacts analysis.

Response: As discussed in Chapter 4, NNSA has added the ETTC motorsport park to the cumulative impact analysis. NNSA considered adding the TVA Small Modular Reactor to the cumulative impacts analysis, but concluded that such a project is not yet reasonably foreseeable.