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CLINCH RIVER NUCLEAR SITE ADVANCED NUCLEAR REACTOR TECHNOLOGY PARK UNIT 1 SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Oak Ridge, Roane County, Tennessee
SEIS-455-00-000-1736263692

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COVER SHEET

Clinch River Nuclear Site Advanced Nuclear Reactor Technology Park Unit 1 Supplemental Environmental Impact Statement

Proposed action: Site preparation, construction, operation, and decommissioning of one GE Hitachi BWRX-300 small modular reactor unit at the Clinch River Nuclear Site.

Type of document: Draft Supplemental Environmental Impact Statement

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Comments due date: March 18, 2025

Abstract:

TVA prepared this Supplemental Environmental Impact Statement (SEIS) to assess the environmental impacts associated with site preparation, construction, operation, and decommissioning of one small modular reactor (SMR) unit at the Clinch River Nuclear (CRN) Site. This action provides an opportunity to evaluate and demonstrate the feasibility of deploying a single GE Hitachi Nuclear Energy (GEH) BWRX-300 small modular reactor (SMR) unit at the CRN Site (CRN-1). This SEIS tiers from the previous Clinch River Nuclear Site Advanced Nuclear Reactor Technology Park Final Programmatic Environmental Impact Statement (PEIS). New information relevant to the assessment of potential impacts that differed from that considered in the PEIS is updated in this SEIS, as appropriate.

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SUMMARY

Introduction

The Tennessee Valley Authority (TVA) prepared this Draft Supplemental Environmental Impact Statement (SEIS) to assess the environmental impacts associated with the proposed action to undertake site preparation, construction, operation, and decommissioning of a nuclear facility at TVA's Clinch River Nuclear (CRN) Site. The proposed action provides an opportunity to evaluate and demonstrate the feasibility of deploying a single GE Hitachi Nuclear Energy (GEH) BWRX-300 small modular reactor (SMR) unit at the CRN Site. The project is hereafter referred to as CRN Unit 1 (CRN-1).

The CRN Site is located on the northern bank of the Clinch River Arm of the Watts Bar Reservoir (the Reservoir) in the City of Oak Ridge, Roane County, Tennessee, approximately 25 miles west-southwest of the City of Knoxville, Tennessee. The CRN Site comprises 935 acres of TVA-managed land adjacent to the United States (U.S.) Department of Energy's (DOE) approximately 33,000-acre Oak Ridge Reservation (ORR). The proposed location is the site of the historical DOE Clinch River Breeder Reactor Project (CRBRP). The CRBRP was canceled in 1983 after preliminary site work was essentially completed. DOE's Site Redress Plan was approved and implemented leaving the site in a safe and environmentally stable condition. TVA and DOE terminated a license agreement for the CRN Site in 1989, and TVA resumed custody and control of the CRN Site from that date.

In May 2016, TVA submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) at the CRN Site for two or more SMRs, with a total combined nuclear generating capacity not to exceed 800 megawatts electric (MWe). The NRC prepared and released a Final Environmental Impact Statement (NRC ESP FEIS) to assess the environmental impacts of the action proposed in the TVA ESP application (ESPA). The NRC ESP FEIS identified issuance of an ESP for the CRN Site as the preferred alternative.

The NRC issued an ESP (ESP-006) to TVA on December 19, 2019, following issuance of NRC's Record of Decision (ROD) regarding the ESP on December 17, 2019. ESP-006 represents NRC's approval of the CRN Site as suitable for the future demonstration of the construction and operation of two or more SMRs generating up to 800 MWe, but it does not authorize TVA to construct or operate a nuclear facility. The ESP establishes early resolution of numerous site safety, environmental, and emergency preparedness issues, and provides sufficient information to allow NRC to resolve the majority of environmental issues associated with construction and operation of two or more SMRs on the CRN Site. ESP-006 is valid for 20 years from the date of issuance.

In June 2019, TVA released the agency's Integrated Resource Plan (IRP) Final EIS and the Final 2019 IRP. The IRP identified various generating resources TVA intends to evaluate to meet energy needs of the TVA Power Service Area over a 20-year planning period. The 2019 IRP recommended TVA continue to evaluate emerging nuclear technologies, including SMRs, as part of technology innovation efforts aimed at developing future electricity generation capabilities. The 2019 IRP remains valid and guides future generation planning until TVA's subsequent IRP is issued with any modified recommendations. This SEIS supports TVA's decision-making process related to new nuclear generation within the TVA system, to advance recommendations of the 2019 IRP.

In May 2021, the TVA Board of Directors endorsed the Strategic Intent and Guiding Principles framework to help TVA develop innovative, cost-effective technologies that will help achieve net-zero carbon emissions. In December 2021, the Board authorized the implementation of a New Nuclear Program. The New Nuclear Program includes a multi-stage decision making process relative to CRN-1 with three discrete "Decision Gates." These Decision Gates are (1) Authorize Planning, (2) Authorize Project, and (3) Authorize Construction. At Decision Gate 1, TVA's Chief Executive Officer was delegated the authority to enter into one or more contracts with one or more advanced nuclear reactor vendors and other private entities, as necessary and appropriate, to pursue the initial planning for this Program, including development of the Construction Permit Application (CPA).

In August 2022, TVA published the Clinch River Nuclear Site Advanced Nuclear Reactor Technology Park Final Programmatic Environmental Impact Statement (PEIS) to assess the potential environmental impacts associated with site preparation, construction, operation, and decommissioning of an advanced nuclear technology park, consisting of various facilities, at the CRN Site. The PEIS programmatically considered the development and decommissioning of various types of advanced nuclear reactors using the plant parameter envelope (PPE) bounding analysis previously considered in the NRC ESP FEIS as well as supplemental bounding site development attributes.

TVA issued a ROD on September 29, 2022, confirming TVA's selection of PEIS Alternative D – Nuclear Technology Park at Area 1 and Area 2 with SMRs and/or advanced Non-Light Water Reactors. TVA's New Nuclear Program does not prejudice or foreclose any of the alternatives under consideration in the PEIS. Rather, it facilitates the possibility that a reliable, affordable, flexible, and clean advanced nuclear reactor option could be available by 2032. Furthermore, it advances necessary planning for future required TVA decision-making for the potential deployment of innovative new nuclear technology consistent with the target supply mix in TVA's 2019 IRP and aligned with aspirations outlined in TVA's 2021 Strategic Intent and Guiding Principles (TVA 2021a). To advance planning for future new nuclear technology development, TVA's Board of Directors has authorized spending not to exceed $200 Million for the period Fiscal Year 2022 through Fiscal Year 2024 to implement this New Nuclear Program. On August 22, 2024, TVA's Board of Directors authorized an additional $150 million in funding for Fiscal Year 2025 through Fiscal Year 2026 to support advanced nuclear design work and development at the CRN site. Under Decision Gate 1, TVA is preparing an application for submittal to the NRC that seeks authorization to construct (i.e., a CPA) CRN-1.

Purpose and Need for Action

The primary purpose of the proposed action is to demonstrate the feasibility to license, construct, and operate an SMR at the CRN Site. Section 1.1 of the ESPA ER and Section 1.3 of the NRC ESP FEIS also describe TVA's proposed action, purpose and need, and objectives.

The proposed action is needed to support the recommendations outlined in TVA's 2019 IRP to evaluate emerging nuclear technologies, including SMRs, as part of technology innovation efforts aimed at developing future electricity generation capabilities (TVA 2019a) and to enable TVA's Board of Directors to consider next steps in TVA's efforts to explore advanced reactor options that could, in part, be used to help TVA achieve net-zero carbon emissions by 2050 while maintaining a firm, fixed, reliable power supply (TVA 2022b).

Programmatic Approach

As defined by the Council on Environmental Quality, a programmatic review "…describes any broad or high-level NEPA review" in which subsequent actions would be implemented that

would “tier” to the programmatic NEPA review (CEQ 2020). TVA’s NEPA regulations authorize programmatic review “to address a proposed program, policy, or plan” to “support high-level or broad decision-making, and can provide the foundation for the efficient review of specific tiered implementing actions.” 18 C.F.R. § 1318.503 (a) & (b). In the PEIS, TVA committed to conducting a supplemental NEPA analysis tiering from the PEIS for any potential project or site-specific TVA action at the CRN Site which was not evaluated in that document.

The PEIS used a bounding approach to evaluate the impacts from creating an Advanced Nuclear Reactor Technology Park, using PPE analysis established in TVA’s ESPA to the NRC in 2019 and other bounding analyses not detailed in the ESPA. The PPE represents an “envelope” that encompasses a range of reactor types having varying levels of design maturity. Analysis of environmental impacts based on a bounding approach encompasses a maximum of potential impacts resulting from implementing each of the alternatives considered. Further details regarding the programmatic approach and bounding analyses are incorporated by reference from the PEIS Section 1.5.

In accordance with 42 USC 4336b, federal agencies may rely on analyses of the PEIS for five years without conducting additional review unless there are substantial new circumstances or information about the significance of adverse effects that bear on the analysis. Therefore, this SEIS incorporates by reference information and analysis from the PEIS, as appropriate. Where TVA determined that new circumstances or information are available that affects the significance of adverse effects, the analysis is updated in the SEIS.

Public and Agency Review of Draft SEIS

TVA’s public and agency involvement for the Draft SEIS includes publication of a notice of availability in the Federal Register on January 31, 2025, and a 45-day public review of the Draft SEIS. TVA is soliciting public and agency input on the Draft SEIS via local newspaper announcement, news releases, and notices sent to local, state, and federal agencies, and federally recognized tribes. TVA encourages the public and agencies to comment, via email, TVA website, or by postal mail. TVA will host a public open house on February 27, 2025, at the East Tennessee Economic Council, 1201 Oak Ridge Turnpike, Oak Ridge, TN 37830 from 5:30 – 7:30 p.m. ET. In addition, a virtual meeting will be held on February 25, 2025, from 5:30 – 7:30 p.m. ET. Details for the virtual meeting are available on the project website at http://tva.com/nepa. Public comments on the Draft SEIS must be submitted by March 18, 2025.

Alternatives

In preparation of the PEIS, TVA considered a range of alternatives for site preparation, construction, operation, and decommissioning of a Nuclear Technology Park at the CRN Site with up to 800 MWe generated by advanced nuclear reactors including:

- Alternative A: No Action Alternative
- Alternative B: Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-Light Water Reactors
- Alternative C: Nuclear Technology Park at Area 2 with Advanced non-Light Water Reactors
- Alternative D: Nuclear Technology Park at Areas 1 and 2 with SMRs and/or Advanced non-Light Water Reactors

Details regarding the various nuclear reactor designs and technologies considered by TVA, and the alternatives eliminated from consideration, including Alternative A – No Action, are incorporated by reference from the PEIS (Sections 2.1 and 2.3, respectively). TVA issued a ROD on September 29, 2022, confirming TVA's selection of PEIS Alternative D – Nuclear Technology Park at Area 1 and Area 2 with SMRs and/or advanced Non-Light Water Reactors. TVA's New Nuclear Program does not prejudice or foreclose any of the alternatives under consideration in the PEIS.

This SEIS tiers from the PEIS and concentrates on the issues pertinent to PEIS Alternatives B and D, and specifically placement of SMRs within the Area 1 footprint. It evaluates the site preparation, construction, operation, and decommissioning of one GEH BWRX-300 SMR at the CRN Site (CRN-1), largely within the PEIS Area 1 footprint. While the ROD identified PEIS Alternative D as the selected alternative, because the new alternative evaluated in this SEIS is limited to Area 1 and does not consider activities within Area 2, this new alternative is tiered from PEIS Alternative B and is herein known as Alternative B1 – Construction, Operation, and Decommissioning of CRN-1.

The No Action Alternative was fully evaluated in the PEIS and determined to not meet the purpose and need. No changes to the No Action Alternative are considered in this SEIS, however it remains a possible alternative.

Under Alternative B1, TVA would undertake site preparation, construction, operation, and decommissioning of one GEH BWRX-300 SMR at the CRN Site (CRN-1). A decision to pursue construction of CRN-1 pursuant to the Decision Gate process described above would be necessary before TVA began nuclear safety-related and other capital project construction activities at the CRN site for this Alternative B1. TVA would also need to receive appropriate approval from the NRC, in the form of an exemption or a Construction Permit, before beginning any safety-related construction activities. Additionally, TVA would need to apply for and obtain an Operating License before operating CRN-1.

The BWRX-300 is a thermal fission boiling water reactor (BWR) that is light-water-moderated, cooled with natural circulation, and designed with passive safety systems. This reactor has a nominal gross electrical power output of 300 MWe. It is the tenth generation of the GEH BWR, an evolution of the 1,520 MWe Economic Simplified BWR previously licensed by the NRC. TVA views the BWRX-300 as a mature technology that could be ready for commercial deployment within a decade.

The scope of this SEIS includes evaluation of impacts associated with the proposed activities within the CRN-1 Project Area (Figure ES-1), which includes the CRN Site and associated offsite areas including the Barge and Traffic Area (BTA) and the offsite 161-kilovolt (kV) transmission line corridor. Final design of the CRN-1 is still in progress. Site optimization plans currently underway would reduce the project footprint, likely eliminating some construction impacts including reducing the amount of tree removal needed as compared to what is evaluated in this Draft SEIS.

TVA considers only those transmission line activities on the CRN Site and those offsite extending to the first transmission line interconnect at Bear Creek Road to be directly attributable to CRN-1. As such, improvements beyond the first transmission line interconnect are considered system maintenance activities and are appropriately evaluated as part of the analysis of cumulative impacts analysis in this SEIS.

Plant Parameter Envelope

The ESP PPE evaluated in the PEIS contains a set of site characteristics and site-related design parameters that TVA expected would bound the design characteristics of the reactor or reactors that might be constructed at the CRN Site. The PPE values serve to bound site characteristics and reactor design information. The PPE was used by the NRC in the preparation of the NRC ESP FEIS and was included in ESP-006 issued by NRC to TVA. For the CPA TVA has updated parameters of the PPE to reflect the site-specific deployment of CRN-1.

Overview of Environmental Impacts Associated with the Proposed Action

Environmental consequences of the proposed action and alternatives are and will continue to be assessed in multiple phases, including those associated with site preparation, construction, operation, and decommissioning activities at the CRN Site. For purposes of this SEIS, construction phase activities include pre-construction or site preparation (grading, excavation, infrastructure development, and other actions), actual fabrication and erection of the nuclear reactor and associated facilities, other site improvements, and related interfaces and operations. Information presented in this SEIS tiers from the PEIS and updates the affected environment and related impact analyses associated with PEIS Alternatives A (No Action) and B. With few exceptions, the assessment of impacts associated with PEIS Alternative B reflect the more detailed designs associated with the deployment of CRN-1, including the site layout plan and arrangement of site structures, grading, characteristics of the cooling system, roadway improvements and related transportation features, and transmission system elements. In addition, to provide for greater flexibility for certain project elements, TVA has included a bounding approach to encompass characteristics of the proposed action and impacts for two project elements:

- Cooling water intake structure type and configuration
- Source and methods for obtaining qualified backfill for CRN-1

TVA conducted a data review to identify any new information relevant to the assessment of potential impacts that differed from those considered in the PEIS. Through this process, TVA determined that several resource sections are fully bounded by the analyses, control measures, and commitments included in the PEIS. Either the information and the related impact analyses for the resource may be unchanged or the impacts of any new information were effectively the same as that described for the PEIS. Additionally, for these fully bounded resources the scope and magnitude of impact is noted to be reduced from that characterized in the PEIS due to the substantially reduced scope of the proposed action. Therefore, the following resource analyses are incorporated by reference from the PEIS in their entirety: geology and soils; meteorology, air quality, and climate change; noise; socioeconomics; environmental justice; solid and hazardous waste; public safety and nonradiological health; radiological effects of normal operations; nuclear plant safety and security; and decommissioning.

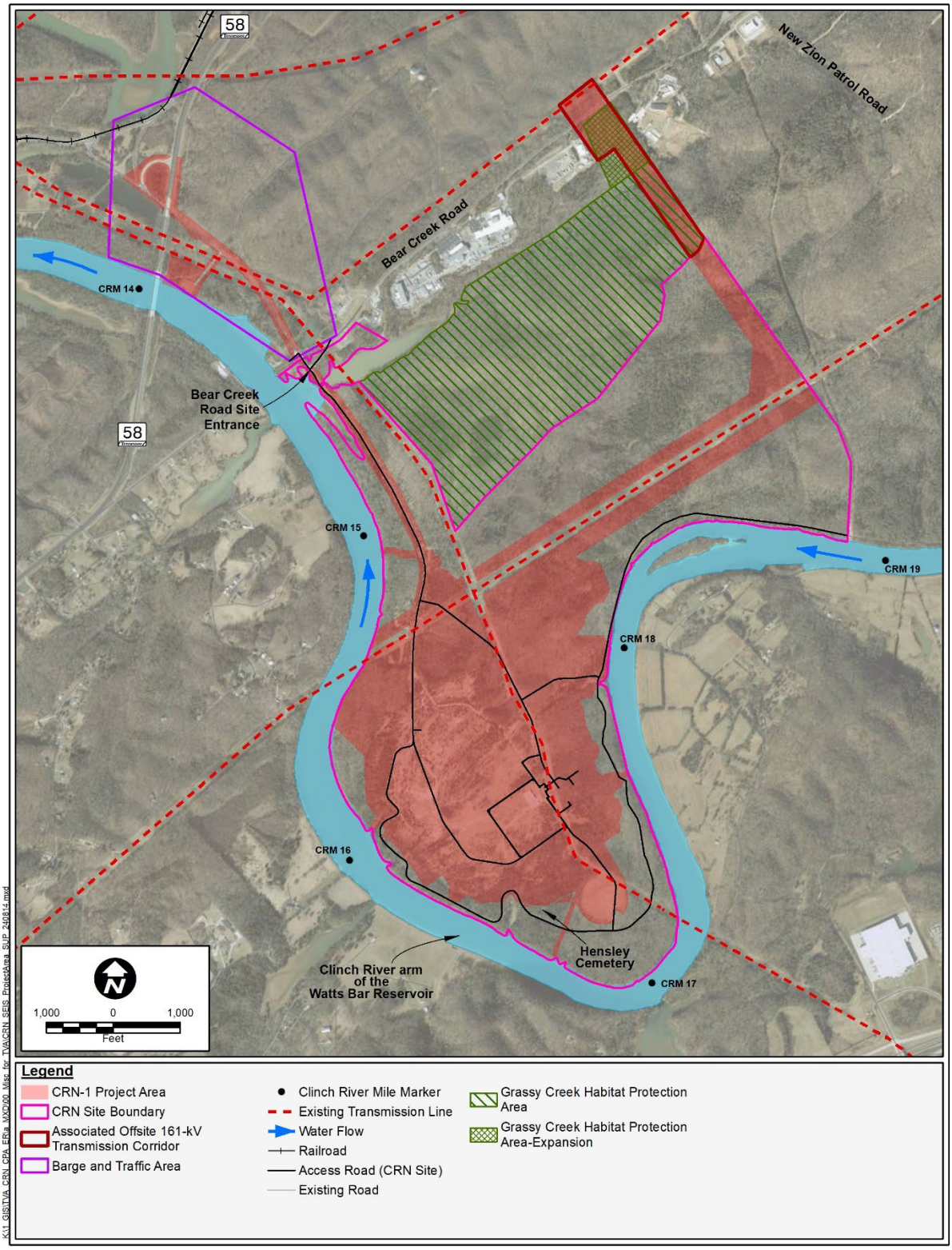

Figure ES-1. CRN-1 Project Area

Some of the site development features and activities described in the PEIS have been updated as appropriate for CRN-1 and are assessed in this SEIS. However, the following have been eliminated or modified under the proposed alternative and are therefore not assessed:

- Extensive shoreline stabilization (eliminated except for localized stabilization measures in proximity to the intake and discharge structures)
- TN 95 access
- Melton Hill Hydroelectric dam bypass
- Northbound access ramp between TN 58 and Bear Creek Road
- Supplemental onsite barge landing area
- Railroad offload area
- Upgrades and reconductoring within existing transmission line corridors beyond the Bear Creek Road interconnect (only considered part of TVA's ongoing maintenance program), and
- Development of Area 2 as defined in the PEIS

With the elimination of these project development activities, certain direct and indirect impacts to various resources described in the PEIS, including water resources, aquatic ecology, managed and natural areas; and archaeological resources and historic structures, would not occur and therefore, impacts under CRN-1 are substantially reduced. The environmental impact determinations by resource for SEIS Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 are summarized and compared to the environmental impact determinations for the No Action Alternative (Alternative A) and PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-LWRs, in Table ES-1. For a majority of the resources, the impact conclusions did not change or were less than the impact determinations in the PEIS. Red font indicates where the impact determination has changed from the PEIS impact determination. Alternative A - No Action has not changed from the PEIS and, therefore, the impacts associated with this alternative are incorporated by reference. New information available for a variety of resources is presented in this SEIS and summarized below.

Information for threatened and endangered terrestrial species and habitats has been updated since publication of the PEIS, including changes in the federal listing status of several species pursuant to the Endangered Species Act (ESA) and the results of recent terrestrial plant and wildlife surveys within the Project Area. The northern long-eared bat has been reclassified as federally endangered and the tri-colored bat has been proposed to be listed as endangered under the ESA. Potential impacts to federally listed tree-roosting bats alongside existing rights-of-way (ROWs) during maintenance activities were addressed in TVA's programmatic consultation with the U.S. Fish and Wildlife Service (USFWS) on routine actions and federally listed bats in accordance with ESA Section 7 (a)(2), originally completed in April 2018 and updated in May 2023 (USFWS 2023). For those activities with potential to affect federally listed bats, TVA committed to implementing specific conservation measures. The CRN Site is within swarming habitat for the tricolored bat. Therefore, tree removal would occur between November 15 and March 31.

In January 2025, TVA submitted a biological assessment to the USFWS for consideration. No threatened and endangered species would be jeopardized by the proposed actions with the use of appropriate avoidance, minimization, and conservation measures. Information provided in the

USFWS Biological Opinion represents new information and will be incorporated in the Final SEIS.

Regarding potential impacts to the transportation network, the northbound access ramp between TN 58 and Bear Creek Road has been eliminated from consideration since publication of the PEIS. However, TVA determined that the impact of CRN-1 on the roadway network would be moderate to large during the peak construction period, which is greater than and notably different from the findings in the PEIS. Impacts would remain minor during operation. TVA would coordinate with Tennessee Department of Transportation, DOE, and the City of Oak Ridge to consider and implement mitigative strategies (e.g., signalizations, roadway improvements) to minimize impacts to the extent practicable. TVA would conduct all appropriate reviews as needed if required road upgrades are not bounded by the evaluations in the PEIS or this SEIS.

Construction of the alternative submerged offshore intake structure within the navigation channel would result in short term localized interruptions in navigational use of the Reservoir in proximity of the intake structure during construction and is notably different from the findings in the PEIS.

In compliance with TVA's site-specific programmatic agreement (PA) regarding the management of historic properties affected by the project, when detailed designs associated with the deployment of CRN-1 were developed, TVA evaluated the potential effects on archaeological sites previously identified as potentially eligible for the National Register of Historic Places (NRHP). Four potentially eligible sites are located within areas that could be affected by grading, roadway improvements, and construction. TVA completed phase II testing at each of those sites to determine their NRHP eligibility. As a result of the testing TVA determined three of the sites are ineligible for the NRHP. While those sites would be affected, no avoidance, minimization, or mitigation are required by the PA or the regulations implementing the National Historic Preservation Act. TVA also determined that most of the remaining site lacks any characteristics that would make it eligible for the NRHP, but in two small areas the potential for significant, intact deposits was not fully eliminated. Therefore, those smaller areas remain potentially eligible for the NRHP and would be avoided. Historic or cultural resources previously determined as eligible for the NRHP and described in the PEIS are not discussed in this SEIS. This SEIS presents the new information regarding the findings of the phase II testing.

Mitigation measures and TVA's programs, policies, and procedures for reducing construction-related impacts include habitat protection within the Grassy Creek Habitat Protection Area (HPA), implementation of a stormwater pollution prevention plan (SWPPP) and an Integrated Pollution Protection Plan (IPPP), use of other best management practices (BMPs) that minimize erosion and stabilize the land surface, compliance with NPDES permitting limits, implementation of wetland and stream mitigation plans in accordance with USACE and TDEC requirements, compliance with the terms of the Watts Bar Interagency Agreement and adherence to the terms of the Programmatic Agreements for historic and cultural resources. The BMPs are implemented through permitting requirements and plans and procedures developed for constructing, operating, and decommissioning CRN-1.

Environmentally Preferable Alternative

In the short-term, Alternative A – No Action causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources at the CRN Site. However, the No Action Alternative does not meet the purpose and need for the project, nor enable TVA to demonstrate the feasibility of SMR

technology deployment at the CRN site, which informs TVA's analysis of whether SMRs can support TVA's increasingly clean electricity generation goals for firm, fixed, reliable, affordable electricity for the people we serve. Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 would forward technology innovation efforts aimed at developing future electricity generation capabilities which could replace aging and more environmentally impactful technologies. Therefore, over the long-term, Alternative B1 would be the environmentally preferable alternative.

TVA's Preferred Alternative

TVA's preferred alternative is Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 on the CRN Site. Alternative B meets the purpose and need of the project to support TVA's goal to demonstrate the feasibility to design, construct, operate, and decommission SMR technology at the CRN Site. Alternative B1 supports the recommendations outlined in TVA's 2019 IRP (TVA 2019a).

Table ES-1. Summary and Comparison by Resource Area of Alternative A – No Action with PEIS Alternative B and SEIS Alternative B1

Resource Area	PEIS Alternative A – No Action	PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-LWRs	SEIS Alternative B1 – Construction, Operation and Decommissioning of CRN-1
Geology and Soils	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor to Moderate** *Operation:* **Minor**
Water Resources	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Floodplains and Flood Risk	No impacts	*Construction:* **Minor** *Operation:* **None**	*Construction*: **Minor** *Operation:* **None**
Wetlands	No impacts	*Construction:* **Minor**	*Construction:* **Minor**
Aquatic Ecology	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Terrestrial Ecology	No impacts	*Construction:* **Moderate** *Operation:* **Minor**	*Construction:* **Moderate** *Operation:* **Minor**
Threatened and Endangered Species	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor to Moderate** *Operation:* **Minor**
Managed and Natural Areas	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Recreation	No impacts	*Construction:* **Minor** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Meteorology, Air Quality, and Climate Change	No impacts	*Construction:* **Minor** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Transportation	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Moderate to Large** *Operation:* **Minor**
Visual Resources	No impacts	*Construction and Operation:* **Minor to Moderate**	*Construction and Operation:* **Minor to Moderate**
Noise	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**

Resource Area	PEIS Alternative A – No Action	PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-LWRs	SEIS Alternative B1 – Construction, Operation and Decommissioning of CRN-1
Socioeconomics			
Land Use	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Demographics	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Employment and Income	No impacts	*Construction and Operation:* **Beneficial, Minor to Moderate**	*Construction and Operation:* **Beneficial, Minor to Moderate**
Community Characteristics	No impacts	*Construction:* **Minor** *Operation:* **Minor to Moderate**	*Construction:* **Minor** *Operation:* **Minor to Moderate**
Environmental Justice	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Archaeological Resources and Historic Structures	No impacts	*Construction:* **Moderate**	*Construction and Operation:* **Minor**
Solid and Hazardous Waste	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Radiological Effects of Normal Operations	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Uranium Fuel Effects	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Nuclear Plant Safety and Security	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Decommissioning	No impacts	**Minor**	**Minor**

Note: PEIS = Programmatic Environmental Impact Statement, SMR = Small Modular Reactor, LWRs = Light Water Reactor, SEIS = Supplemental Environmental Impact Statement, CRN-1 = CRN Unit 1
Red font indicates the changed impact determination from the PEIS.

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Symbols, Acronyms, Abbreviations, and Glossary of Terms

°F	Degrees Fahrenheit
AECOM	Architecture, Engineering, Construction, Operations, and Management Company
APE	Area of Potential Effects
ARAP	Aquatic Resource Alteration Permit
BMP	Best Management Practice
BTA	Barge and Traffic Area
BWR	Boiling Water Reactor
CAA	Clean Air Act
CEC	Categorical Exclusion Checklists
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Ci	Curies
Ci/yr	Curies per year
CP	Construction Permit
CPA	Construction Permit Application
CRBRP	Clinch River Breeder Reactor Project
CRM	Clinch River Mile
CRN	Clinch River Nuclear (Site)
CRN-1	CRN Unit 1
CWA	Clean Water Act
CWIS	Cooling Water Intake Structure
CWS	Circulating Water System
dBA	A-weighted Decibels
DOE	United States Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
ER	Environmental Report
ESA	Endangered Species Act
ESP	Early Site Permit
ESPA	Early Site Permit Application
et seq.	*et sequens* (and the following)
ETTP	East Tennessee Technology Park

FEIS	Final Environmental Impact Statement
FLH	Fort Loudoun Hydroelectric
FP	Fossil Plant
FSLG	Flood Storage Loss Guideline
GEH	GE Hitachi Nuclear Energy
gpd	gallons per day
gpm	gallons per minute
HLW	High Level Waste
HP	Hydroelectric Plant
HPA	Habitat Protection Area
IPaC	Information for Planning and Consultation
IPPP	Integrated Pollution Prevention Plan
IRP	Integrated Resource Plan
kV	kilovolt
LLC	Limited Liability Company
LLW	Low-level Waste
LOS	Level of Service
LWMS	Liquid Waste Management System
LWR	Light Water Reactor
MBTU/hr	Million British Thermal Units per hour
mgd	million gallons per day
MHH	Melton Hill Hydroelectric
MTU	Metric Ton of Uranium
MW	Megawatts
MWd	Megawatt-days
MWe	Megawatts electric
MWh	Megawatt hours
MWt	Megawatts thermal
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	United States Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NRIC	National Reactor Innovation Center

NSR	New Source Review
OGS	Offgas system
OREM	Oak Ridge Office of Environmental Management
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PA	Programmatic Agreement
PCB	Polychlorinated Biphenyls
pCi/g	Picocuries per gram
PEIS	Programmatic Environmental Impact Statement
PPE	Plant Parameter Envelope
REMP	Radiological Environmental Monitoring Program
RFFA	Reasonably Foreseeable Future Action
ROD	Record of Decision
ROW	Rights-of-Way
SEIS	Supplemental Environmental Impact Statement
SME	Subject Matter Expert
SMR	Small Modular Reactor
SWMS	Solid Waste Management System
SWPPP	Stormwater Pollution Prevention Plan
ΔT	Temperature change relative to ambient conditions
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TN 58	Tennessee State Route 58
TN 95	Tennessee State Route 95
TNSHPO	Tennessee State Historic Preservation Office
TR	Temperature of River water
TRAM	Tennessee Rapid Assessment Method
TROC	Temperature Rate of Change
TVA	Tennessee Valley Authority
TVAR	Tennessee Valley Archaeological Research
UFC	Uranium Fuel Cycle
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

USNC	Ultra Safe Nuclear Corporation
WOTUS	Waters of the United States
WWC	Wet Weather Conveyance

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1. Introduction

The Tennessee Valley Authority (TVA) prepared this Draft Supplemental Environmental Impact Statement (SEIS) to assess the environmental impacts associated with the proposed action to undertake site preparation, construction, operation, and decommissioning of a nuclear facility at the Clinch River Nuclear (CRN) Site (Figure 1-1). The proposed action provides an opportunity to evaluate and demonstrate the feasibility of deploying a single GE Hitachi Nuclear Energy (GEH) BWRX-300 small modular reactor (SMR) unit at the CRN Site. The project is hereafter referred to as CRN Unit 1 (CRN-1).

TVA's goal is to demonstrate that emerging nuclear technologies are capable of incrementally supplying clean, secure, reliable power that is less vulnerable to disruption by constructing and operating one advanced nuclear reactor at the CRN Site (Figure 1-1).

The CRN-1 Project is divided into phases that include site preparation, construction, operation and decommissioning. This SEIS evaluates the impacts associated with each of these phases.

This Draft SEIS is developed in accordance with the National Environmental Policy Act (NEPA), at 42 United States Code (USC) § 4321 *et seq.*; the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508, as updated May 1, 2024); TVA's corollary NEPA regulations at 18 CFR Part 1318; the Fiscal Responsibility Act of 2023 (Public Law 118-5 - June 3, 2023); and associated guidance from various federal and state agencies.

1.2. Background and Current Project

The CRN Site is located on the northern bank of the Clinch River arm of the Watts Bar Reservoir (the Reservoir) in the City of Oak Ridge, in Roane County, Tennessee (Figure 1-1), approximately 7 miles east of the City of Kingston, Tennessee, and approximately 25 miles west-southwest of the City of Knoxville, Tennessee. The CRN Site comprises 935 acres of TVA-managed land adjacent to the United States (U.S.) Department of Energy's (DOE) approximately 33,000-acre Oak Ridge Reservation (ORR). The proposed location is the site of the historical DOE Clinch River Breeder Reactor Project (CRBRP). At the time of the CRBRP cancellation in 1983, preliminary site work was essentially completed, including all necessary sediment ponds, construction shops, concrete batch plants, the reactor building excavation, extensive site grading, and a concrete crane platform. After Congress terminated funding for the CRBRP project, DOE's Site Redress Plan was approved and implemented leaving the site in a safe and environmentally stable condition. TVA and DOE terminated a license agreement for the CRN Site in 1989, and TVA resumed custody and control of the CRN Site from that date.

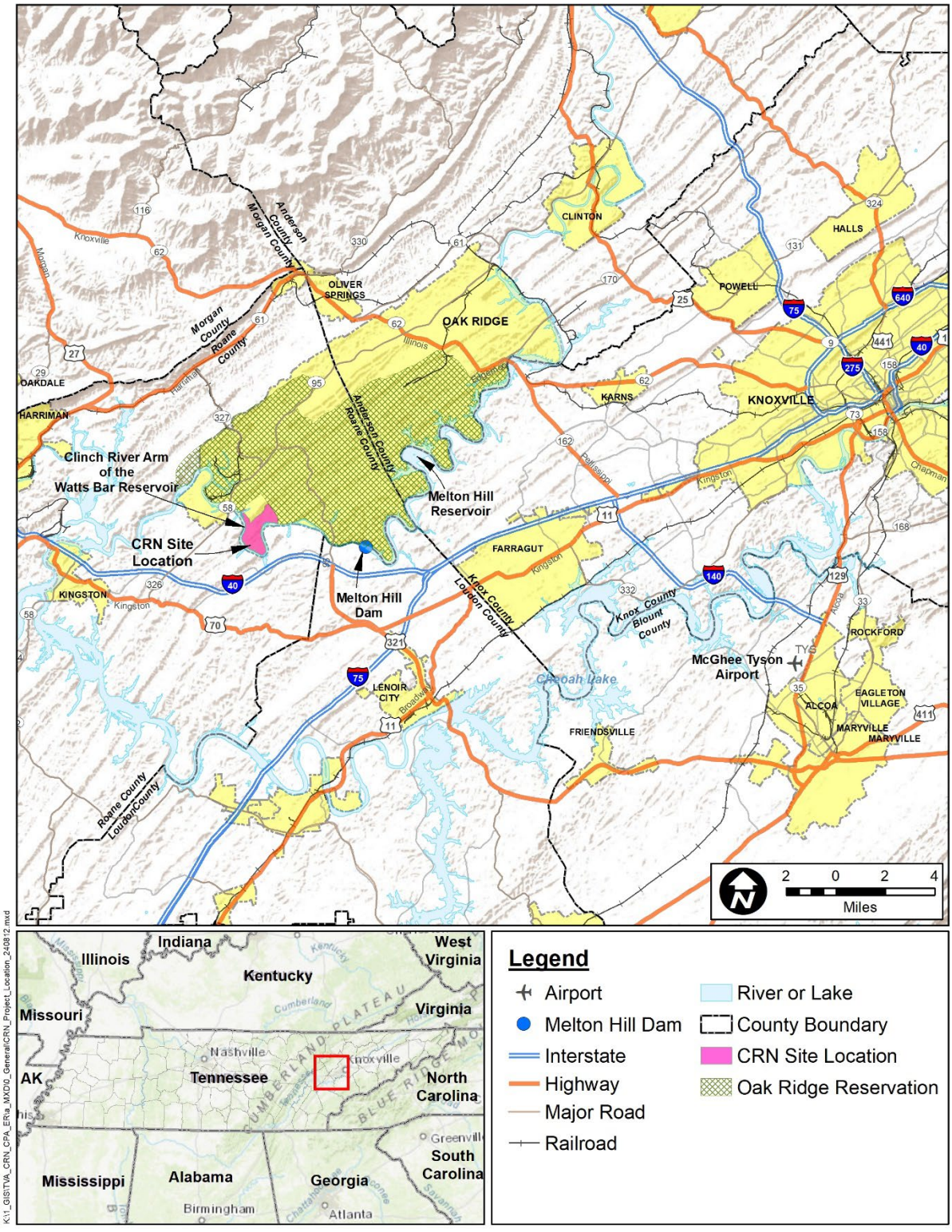

Figure 1-1. CRN Site Location

In May 2016, TVA submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) at the CRN Site for two or more SMRs, with a total combined nuclear generating capacity not to exceed 800 megawatts electric (MWe).

In April 2019, the NRC issued a Final Environmental Impact Statement (NRC ESP FEIS) which assessed the environmental impacts of the action proposed in the TVA CRN ESP application (ESPA). The Nashville District, Regulatory Division, U.S. Army Corps of Engineers (USACE) was a cooperating agency with the NRC during preparation of the NRC ESP FEIS to verify the information presented was adequate to support a permit application to the USACE relating to potential impacts to jurisdictional waters of the U.S (WOTUS), should TVA submit an application to construct a nuclear plant at a future date. The NRC issued ESP-006 to TVA on December 19, 2019, which provides NRC approval of the CRN Site for the development of new nuclear power units demonstrating the feasibility of SMR technology.

ESP-006 represents NRC's approval of the CRN Site as suitable for the future demonstration of the construction and operation of two or more SMRs generating up to 800 MWe, but it does not authorize TVA to construct or operate a nuclear facility. The ESP establishes early resolution of numerous site safety, environmental, and emergency preparedness issues and provides sufficient information to allow NRC to resolve the majority of environmental issues associated with construction and operation of two or more SMRs on the CRN Site. ESP-006 is valid for 20 years from the date of issuance.

TVA develops its Integrated Resource Plans (IRP) to provide direction on how to best meet future electricity demand by identifying the most effective energy resource strategies that will meet TVA's mission to serve the people of the TVA region. In June 2019, TVA released the agency's IRP Final Environmental Impact Statement (EIS) and the Final 2019 IRP. The 2019 IRP identified various generating resources TVA evaluated to meet energy needs of the TVA Power Service Area over a 20-year planning period. The 2019 IRP recommended TVA continue to evaluate emerging nuclear technologies, including SMRs, as part of technology innovation efforts aimed at developing future electricity generation capabilities. TVA's pursuit and acquisition of an ESP for the CRN Site in 2019 supported the recommendation in the 2019 IRP. The 2019 IRP remains valid and guides future generation planning consistent with least-cost planning principles until TVA's subsequent IRP is issued with any modified recommendations. This SEIS supports TVA's decision-making process related to new nuclear generation within the TVA system, to advance the recommendations of the 2019 IRP.

In May 2021, the TVA Board endorsed the Strategic Intent and Guiding Principles (TVA 2021a) framework to help TVA develop innovative, cost-effective technologies that will help achieve net-zero carbon emissions. TVA's Board authorized the implementation of a New Nuclear Program in February 2022 to advance SMR planning efforts at the CRN Site, and to explore the potential for additional reactors to support TVA's 2050 decarbonization aspirations. The New Nuclear Program includes a multi-stage decision making process for CRN-1 with three discrete "Decision Gates." These Decision Gates are (1) Authorize Planning, (2) Authorize Project, and (3) Authorize Construction. A multi-stage decision gate process is consistent with both industry and TVA enterprise best practices for potential projects on a similar scale to potential new nuclear deployment. At Decision Gate 1, TVA's Chief Executive Officer was delegated the authority to enter into one or more contracts with one or more advanced nuclear reactor vendors and other private entities, as necessary and appropriate, to pursue the initial planning for this Program, including development of the Construction Permit Application (CPA). The Board approval of the New Nuclear Program at the first Decision Gate does not authorize the

subsequent Decision Gate actions, including the construction and operation of this proposed action, which would require future Board approvals.

In support of the recommendations outlined in TVA's 2019 IRP and to support TVA's mission of innovation towards a low carbon future for the Tennessee Valley TVA began preparation of the Clinch River Nuclear Site Programmatic Environmental Impact Statement (PEIS) in 2021. In August 2022, TVA published the Clinch River Nuclear Site Advanced Nuclear Reactor Technology Park Final Programmatic Environmental Impact Statement (PEIS) (TVA 2022a) to assess the potential environmental impacts associated with site preparation, construction, operation, and decommissioning of an advanced nuclear technology park, consisting of various facilities, at the CRN Site. The PEIS programmatically considered the development and decommissioning of various types of advanced nuclear reactors using the plant parameter envelope (PPE) bounding analysis previously considered in the NRC ESP FEIS as well supplemental bounding site development attributes. Site design and deployment of any specific SMR technology was not evaluated in the PEIS. The PEIS is discussed in further detail in Section 1.5.

TVA's Record of Decision (ROD), signed on September 29, 2022, confirms TVA's selection of PEIS Alternative D – Nuclear Technology Park at Area 1 and Area 2 with SMRs and/or advanced Non-Light Water Reactors. As indicated in the PEIS, a subsequent NEPA analysis that tiers from the PEIS would be required to evaluate potential construction, operation, and decommissioning of specific nuclear reactors selected for deployment at the CRN Site. The BWRX-300 is one of the technologies evaluated in the PEIS.

TVA's New Nuclear Program does not prejudice or foreclose any of the alternatives under consideration in the PEIS. Rather, it facilitates the possibility that a reliable, affordable, flexible, and clean advanced nuclear reactor option could be available by 2032. Furthermore, it advances necessary planning for future required TVA decision-making for the potential deployment of innovative new nuclear technology consistent with the bounding assumptions in TVA's 2019 IRP and aspirations outlined in TVA's 2021 Strategic Intent and Guiding Principles (TVA 2021a). To advance planning for future new nuclear technology development, on February 10, 2022, TVA's Board of Directors authorized spending not to exceed $200 Million for the period Fiscal Year 2022 through Fiscal Year 2024 to implement this New Nuclear Program. On August 22, 2024, TVA's Board of Directors authorized an additional $150 million in funding for Fiscal Year 2025 through Fiscal Year 2026 to support advanced nuclear design work and development at the CRN site. Under Decision Gate 1, TVA is preparing an application to be submitted to the NRC that seeks authorization to construct (i.e., a CPA) CRN-1.

1.3. Purpose and Need

The primary purpose of the proposed action is to demonstrate the feasibility to license, construct, and operate a SMR at the CRN Site. Section 1.1 of the ESPA Environmental Report (ER) and Section 1.3 of the NRC ESP FEIS also describe TVA's proposed action, purpose and need, and objectives.

The proposed action is needed to support the recommendations outlined in TVA's 2019 IRP to evaluate emerging nuclear technologies, including SMRs, as part of technology innovation efforts aimed at developing future electricity generation capabilities (TVA 2019a) and to enable TVA's Board of Directors to consider next steps in TVA's efforts to explore advanced reactor options that could, in part, be used to help TVA achieve net-zero carbon emissions by 2050 while maintaining a firm, fixed, and reliable power supply (TVA 2022b). A decision to pursue

construction of CRN-1 pursuant to the Decision Gate process described above would be necessary before TVA began safety-related and other capital project construction activities at the CRN site for this Alternative B1. Additionally, TVA would need to receive appropriate approval in the form of a Construction Permit from the NRC before beginning safety-related construction activities.

1.4. Decision to be Made

This SEIS is being prepared to inform TVA decision makers and the public about the potential environmental impacts of the proposed action. Specifically, the decision to be made by TVA is whether to conduct site preparation, construction, operation, and decommissioning of CRN-1 and to evaluate and demonstrate the feasibility of deploying this emerging advanced nuclear technology, as part of TVA's technology innovation efforts aimed at developing future generation capabilities.

1.5. Programmatic Approach

As defined by CEQ, a programmatic review "…describes any broad or high-level NEPA review" in which subsequent actions would be implemented that would "tier" to the programmatic NEPA review (CEQ 2020). TVA's NEPA regulations authorize programmatic review "to address a proposed program, policy, or plan" to "support high-level or broad decision-making, and can provide the foundation for the efficient review of specific tiered implementing actions." 18 C.F.R. § 1318.503 (a) & (b). In the PEIS, TVA committed to conducting a supplemental NEPA analysis tiering from the PEIS for any potential project or site-specific TVA action at the CRN Site which was not evaluated in that document. Therefore, TVA has prepared this SEIS to evaluate the development and potential environmental impacts associated with CRN-1.

The PEIS used a bounding approach to evaluate the impacts from creating an Advanced Nuclear Reactor Technology Park, using PPE analysis established in TVA's ESPA to the NRC in 2019 and other bounding analyses not detailed in the ESPA. The PPE represents an "envelope" that encompasses a range of reactor types having varying levels of design maturity. Analysis of environmental impacts based on a bounding approach encompasses a maximum of potential impacts resulting from implementing each of the alternatives considered. Further details regarding the programmatic approach and bounding analyses are incorporated by reference from the PEIS Section 1.5.

In accordance with 42 USC 4336b, federal agencies may rely on analyses of the PEIS for 5 years without conducting additional review unless there are substantial new circumstances or information about the significance of adverse effects that affect the analysis. Therefore, this SEIS incorporates by reference information and analysis from the PEIS as appropriate. Where new circumstances or information is available that affects the significance of adverse effects, the analysis is updated in this SEIS.

1.6. Related Environmental Reviews

Previous environmental reviews prepared for actions related to the CRN Site are incorporated by reference from Section 1.6 of the PEIS. The following environmental reviews were prepared since publication of the PEIS for actions related to the CRN Site:

- *Clinch River Nuclear Site Construction Permit Application, Environmental Report, Part X,* In-progress (CPA ER). The CPA ER is being prepared and will be submitted as part of the TVA application for a construction permit (CP) for the CRN Site. TVA is preparing the CPA

ER to analyze the environmental effects of construction, operation, and decommissioning of CRN-1. The NRC will use the CPA ER to complete its environmental review that will evaluate TVA's proposed action and inform NRC's decisions to issue a CP to TVA.

Previous Categorical Exclusions prepared for actions related to the CRN Site are incorporated by reference from Section 1.6 of the PEIS. Other minor actions at the CRN Site that qualified as Categorical Exclusions were addressed in the following Categorical Exclusion Checklists (CECs) completed by TVA:

- CRN Site Grassy Creek Culvert Cleanup – CEC 48726, October 3, 2022
- CRN Site Phase II Archaeological Investigation – CEC 48798, October 11, 2022
- CRN Replace River Road Culverts – CEC 50241, August 23, 2023
- CRN Borings to Support 3D Groundwater Modeling – CEC 52665, July 11, 2024

1.7. Scope of the SEIS and Summary of Proposed Action

This SEIS provides an analysis of the potential environmental impacts of Phase 1 of the CRN Project, specifically the proposed site preparation, construction, operation, and decommissioning of CRN-1. A detailed description of the alternatives and the proposed action considered is provided in Chapter 2. The scope of this SEIS includes evaluation of impacts associated with the proposed activities within the CRN-1 Project Area (Figure 1-2), which includes the CRN Site and associated offsite areas including the Barge and Traffic Area (BTA) and the offsite 161-kilovolt (kV) transmission line corridor.

TVA considers only those transmission line activities on the CRN Site and those offsite extending to the first transmission line interconnect at Bear Creek Road to be directly attributable to CRN-1. As such, improvements beyond the first transmission line interconnect are considered system maintenance activities and are appropriately evaluated as part of the analysis of cumulative impacts analysis in this SEIS.

Consistent with NEPA regulations described in Section 1.1, TVA considered the possible environmental effects of the proposed action and determined potential effects to the environmental resources listed below were relevant to the decisions to be made, and therefore, assessed the potential impacts on the following resources.

- Geology and Soils
- Water Resources
- Floodplains and Flood Risk
- Wetlands
- Aquatic Ecology
- Terrestrial Ecology
- Threatened and Endangered Species
- Managed and Natural Areas
- Recreation
- Meteorology, Air Quality, and Climate Change
- Transportation
- Visual Resources
- Noise
- Socioeconomics
- Environmental Justice
- Archaeological Resources and Historic Structures
- Solid and Hazardous Waste
- Non-radiological Public Health & Safety
- Radiological Effects of Normal Operation
- Uranium Fuel Use Effects
- Nuclear Plant Safety and Security

This SEIS also addresses specific requirements associated with a number of federal laws and regulations, such as the National Historic Preservation Act (NHPA), Endangered Species Act (ESA), Clean Water Act (CWA), and Clean Air Act (CAA), as well as pertinent executive actions including Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13112 as amended by 13751 (Invasive Species), EO 13990 Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, EO 14008 Tackling the Climate Crisis at Home and Abroad, EO 14057 Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, and any other relevant EOs to TVA's NEPA analysis.

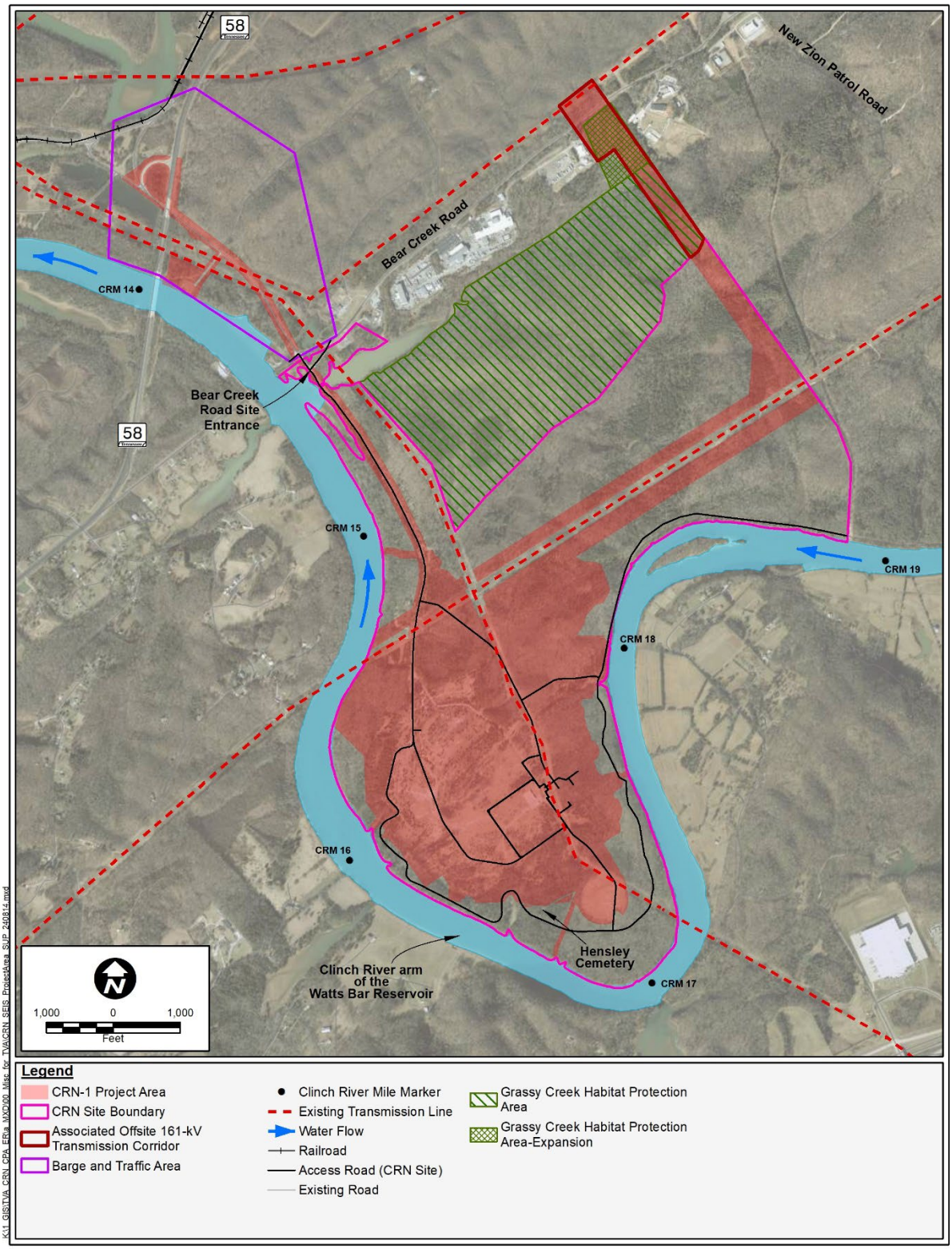

Figure 1-2. CRN-1 Project Area

1.8. Public and Agency Involvement

1.8.1. Scoping for PEIS

This SEIS is a tiered document addressing the potential environmental effects associated with construction, operation, and decommissioning of CRN-1, a technology that was included in the impact analysis of the PEIS. Therefore, no separate scoping was completed for the SEIS.

Prior to preparation of the PEIS, TVA solicited comments on the scope of the Draft PEIS, alternatives under consideration, and the range of environmental issues to be addressed. A public scoping period was held from February 2 to March 19, 2021. TVA contacted local, state, and federal government agencies, local power companies, directly served customers, and sent a media advisory to news outlets across the TVA Power Service Area. A public notice advertisement was also placed in several newspapers. TVA encouraged the public to comment, via email, TVA website, or by postal mail. In addition to the website, TVA established a "virtual meeting room," which offered virtual public engagement throughout the NEPA process.

As part of scoping, TVA hosted a live virtual scoping webinar on March 1, 2021, to gather input and answer questions from the public and stakeholders. A total of 98 individuals, registered for the meeting. Among those registered, 69 were not affiliated with TVA and 58 attended the question-and-answer session following the presentation. TVA considered and addressed all scoping comments during preparation of the Draft PEIS. A summary of scoping feedback is incorporated by reference from PEIS Section 1.8.1.

1.8.2. Public and Agency Review

1.8.3. Public and Agency Review of the Draft PEIS

TVA's public and agency involvement for the Draft PEIS included a 45-day public review period. TVA solicited public and agency input via local newspaper announcement, news releases, and notices sent to local, state, and federal agencies, and federally recognized tribes. TVA encouraged the public and agencies to comment, via email, TVA website, or by postal mail. Additionally, TVA hosted a virtual public open house on March 10, 2022. Approximately 160 individuals registered for the event which was attended by 75 individuals at the event's peak attendance. During the comment period, TVA received 18 formal comment submissions from Tennessee Department of Environment and Conservation (TDEC), the City of Oak Ridge, Gallatin Department of Electricity, and the general public. TVA considered and addressed all comments during preparation of the Final PEIS. Further details of the public and agency review and comments are incorporated by reference from the PEIS Section 1.8.2.

1.8.4. Public and Agency Review of the Draft SEIS

TVA's public and agency involvement for the Draft SEIS includes publication of a notice of availability in the Federal Register on January 31, 2025, and a 45-day public review of the Draft SEIS. TVA is soliciting public and agency input on the Draft SEIS via local newspaper announcement, news releases, and notices sent to local, state, and federal agencies, and federally recognized tribes. TVA encourages the public and agencies to comment, via email, TVA website, or by postal mail. Additionally, TVA will host a public open house on February 27, 2025, at the East Tennessee Economic Council, 1201 Oak Ridge Turnpike, Oak Ridge, TN 37830 from 5:30 – 7:30 p.m. ET. In addition, a virtual meeting will be held on February 25, 2025, from 5:30 – 7:30 p.m. ET. Details for the virtual meeting are available on the project website at http://tva.com/nepa. Public comments on the Draft SEIS must be submitted by March 18, 2025.

1.9. Necessary Permits and Licenses

TVA would seek and obtain all necessary permits, licenses, and approvals required for the alternative selected and deemed necessary by any authority having jurisdiction over the alternative selected. Appendix A of this document provides a complete list of potential permits and authorizations that are expected to be required, depending upon the alternative selected. Representative permits, licenses, and approvals are included by reference.

Actual permit requirements for any specific construction project would be evaluated based on site-specific conditions and technology selection, and details of the permitting requirements would be determined based upon final project designs.

Future actions at the CRN Site relating to construction and operation of CRN-1 would also require the preparation of ERs for NRC licensing in addition to any necessary and appropriate supplementary NEPA analyses. As described in Section 1.2, TVA is currently preparing a CPA, to be submitted to the NRC, seeking authorization to construct CRN-1. TVA will determine later whether and when to pursue additional licensing to operate CRN-1.

CHAPTER 2 – ALTERNATIVES

In preparation of the PEIS, TVA considered a range of alternatives for site preparation, construction, operation, and decommissioning of a Nuclear Technology Park at the CRN Site in the City of Oak Ridge, Roane County, Tennessee with up to 800 MWe generated by advanced nuclear reactors including:

- Alternative A: No Action Alternative
- Alternative B: Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-Light Water Reactors
- Alternative C: Nuclear Technology Park at Area 2 with Advanced non-Light Water Reactors
- Alternative D: Nuclear Technology Park at Areas 1 and 2 with SMRs and/or Advanced non-Light Water Reactors

Details regarding the various nuclear reactor designs and technologies considered by TVA, and the alternatives eliminated from consideration are incorporated by reference from the PEIS (Sections 2.1 and 2.3, respectively). TVA issued a ROD on September 29, 2022, confirming TVA's selection of PEIS Alternative D – Nuclear Technology Park at Area 1 and Area 2 with SMRs and/or advanced Non-Light Water Reactors. TVA's New Nuclear Program does not prejudice or foreclose any of the alternatives under consideration in the PEIS.

This SEIS tiers from the PEIS and concentrates on the issues pertinent to PEIS Alternatives B and D, and specifically placement of SMRs within the Area 1 footprint. While the ROD identified PEIS Alternative D as the selected alternative, because the new alternative evaluated in this SEIS is limited to Area 1 and does not consider activities within Area 2, this new alternative is tiered from PEIS Alternative B and is herein known as Alternative B1 – Construction, Operation, and Decommissioning of CRN-1. This chapter presents an overview of the Alternative B1 specific to the deployment of CRN-1. It also includes a summary and comparison of alternative impacts by resource area.

2.1. Project Alternatives

2.1.1. Alternative A – No Action

The No Action Alternative was fully evaluated in the PEIS and determined to not meet the purpose and need of demonstrating the feasibility of deploying advanced nuclear reactors at the CRN Site as part of TVA's technology innovation efforts aimed at developing future generation capabilities. No changes to the No Action Alternative are considered in this SEIS. The No Action Alternative is hereby incorporated by reference from the PEIS.

2.1.2. Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

Under Alternative B1, TVA would undertake the site preparation, construction, operation, and decommissioning of one GEH BWRX-300 SMR at the CRN Site, hereafter referred to as CRN-1. Figure 2-1 illustrates the layout for CRN-1 on the CRN Site and associated offsite areas. Figure 2-2 provides a visual rendering of the proposed facility. Final design of the CRN-1 is still in progress. Site optimization plans currently underway would reduce the project footprint, likely eliminating some construction impacts including reducing the amount of tree removal needed as compared to what is evaluated in this Draft SEIS.

The BWRX-300 is a thermal fission boiling water reactor (BWR) that is light-water-moderated, cooled with natural circulation, and designed with passive safety systems. This reactor has a nominal gross electrical power output of 300 MWe. It is the tenth generation of the GEH BWR, an evolution of the 1,520 MWe Economic Simplified BWR previously licensed by the NRC. TVA views the BWRX-300 as a mature technology that could be ready for commercial deployment within a decade.

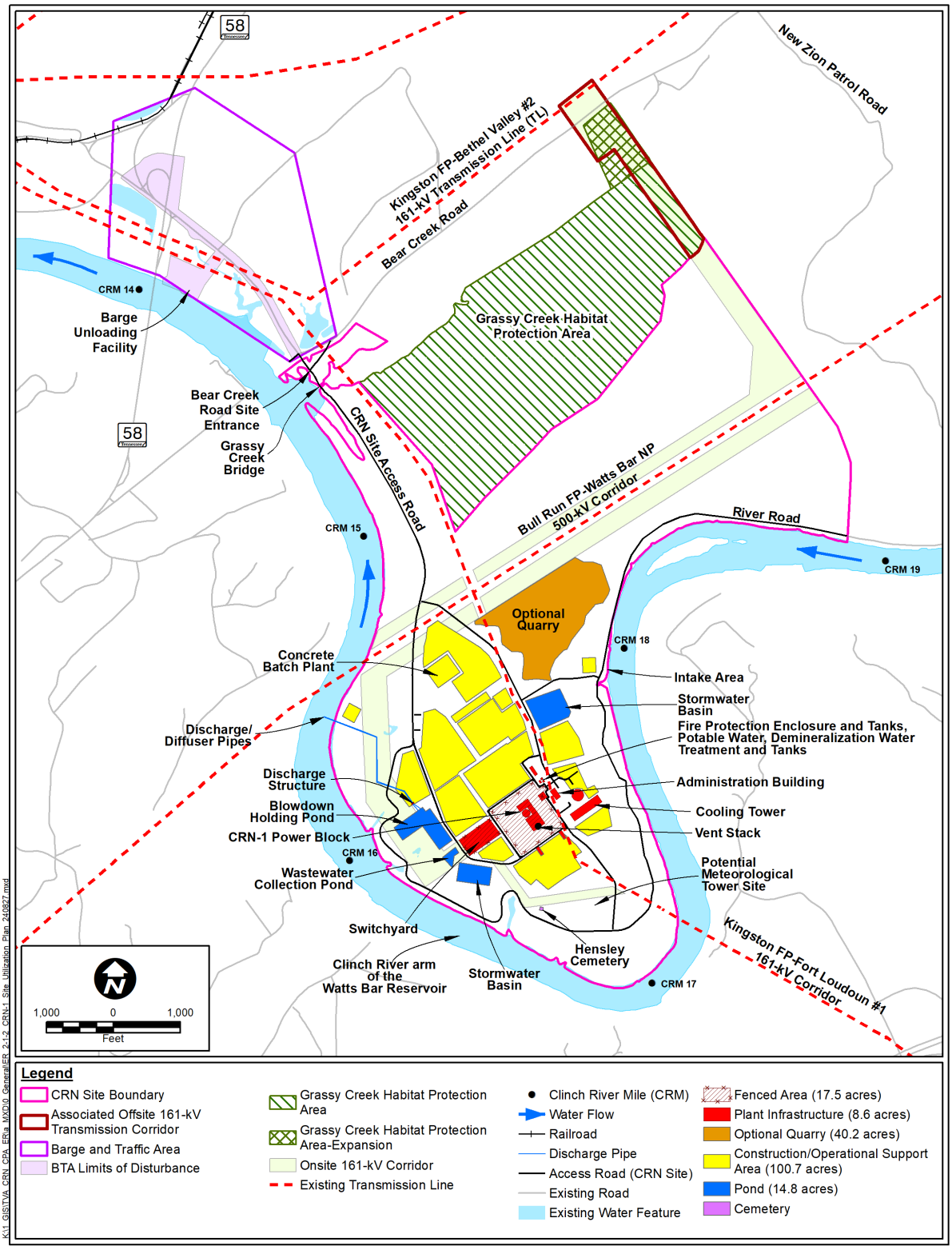

Figure 2-1. Alternative B1 – CRN-1 Layout

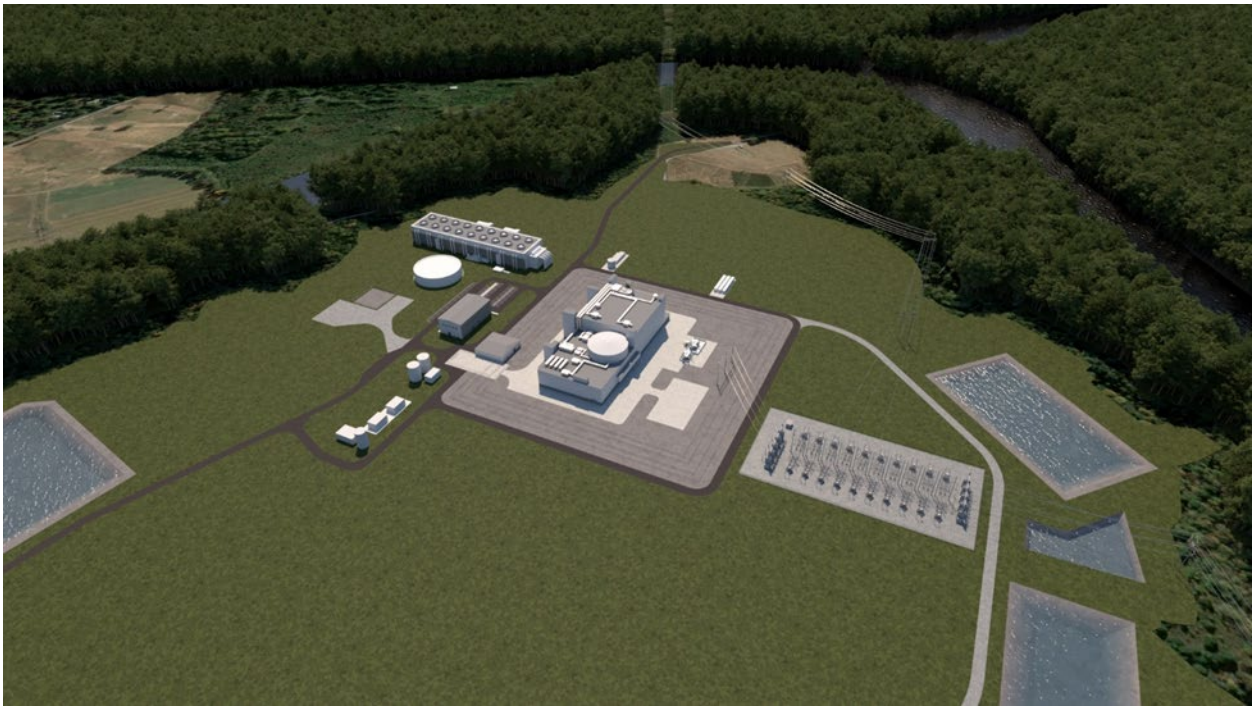

Figure 2-2. CRN-1 Visual Rendering

2.2. Plant Parameter Envelope

The ESP PPE evaluated in the PEIS contains a set of site characteristics and site-related design parameters that TVA expected would bound the design characteristics of the reactor or reactors that might be constructed at the CRN Site. The PPE values serve to bound site characteristics and reactor design information. The PPE was used by the NRC in the preparation of the NRC ESP FEIS and was included in ESP-006 issued by NRC to TVA. For the CPA TVA is utilizing design-specific values (for the same PPE parameters) to reflect the site-specific deployment of CRN-1. Tables B-1 and B-2 in Appendix B present a comparison of the PPE and CRN-1 values for site characteristics and site-related design parameters.

2.3. CRN-1 Development Characteristics

The following sections provide descriptions of the activities required for site preparation, construction, operation, and decommissioning of CRN-1 and descriptions of the proposed plant. Descriptions of these activities and plant components and systems for all Action Alternatives in the PEIS are largely applicable for CRN-1 and are incorporated by reference. New and additional development details specific to the GEH BWRX-300 design are presented in the following sections.

2.3.1. General Site Layout and Development

CRN-1 would be located in the portion of the CRN Site defined as Area 1 in the PEIS which is located on a relatively flat plateau within the southwest part of the CRN Site (Figures 1-2 and 2-1). The general existing grade within the CRN Site varies from 950 above mean sea level to 770 feet above mean sea level. As described in the PEIS, previous extensive site development and grading occurred within the CRN Site during the CRBRP. Development of CRN-1 is expected to impact the Site Disturbance Area shown in Figure 2-3. Final design of the CRN-1 is

still in progress. Site optimization plans currently underway would reduce the project footprint, likely eliminating some construction impacts including reducing the amount of tree removal needed as compared to what is evaluated in the SEIS.

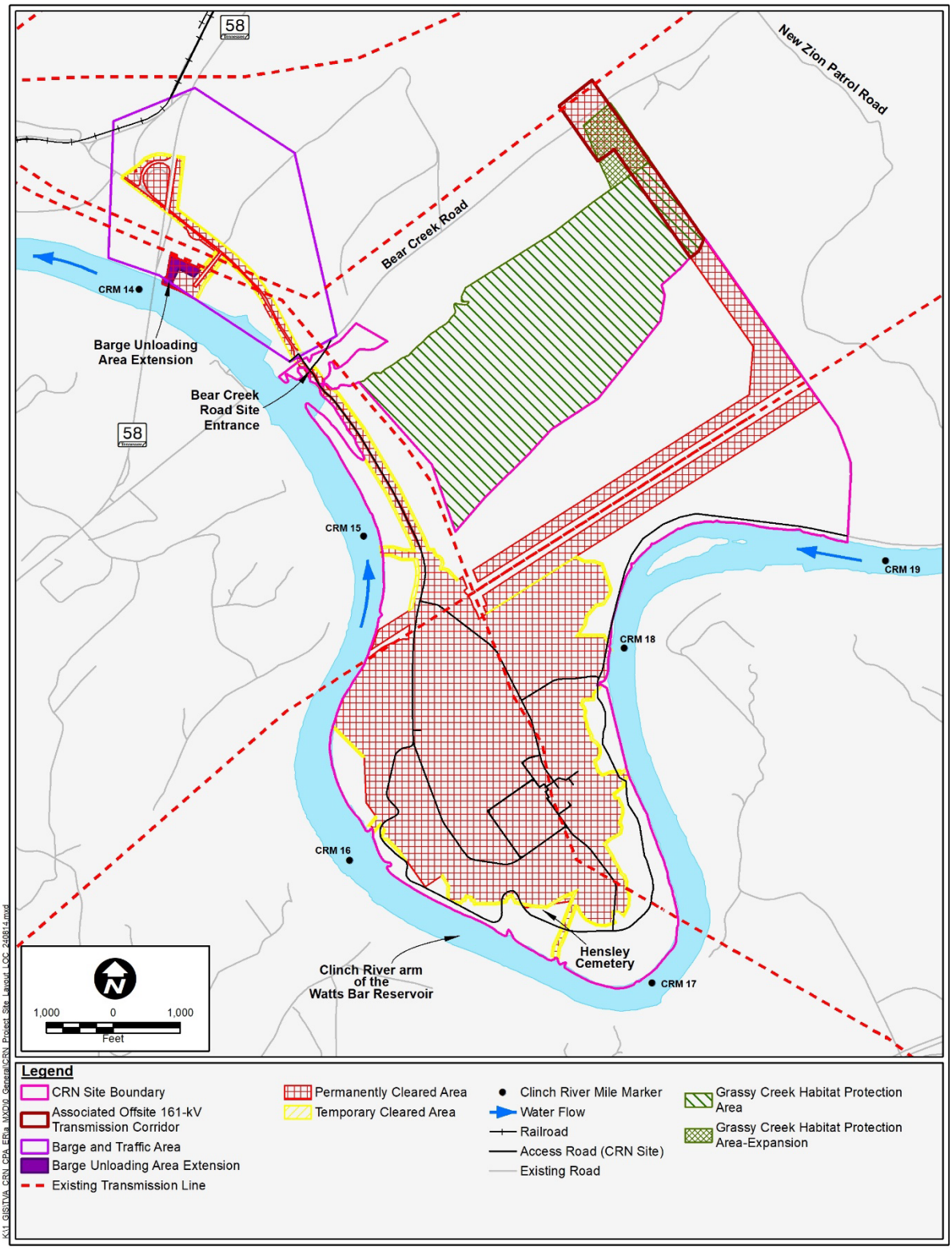

Figure 2-3. Alternative B1 – CRN-1 Site Disturbance Area

2.3.1.1. CRN-1 Site Layout

The proposed CRN-1 facility layout differs from that presented in the PEIS. These differences include the location of the cooling tower, blowdown holding pond, onsite transmission lines, and switchyard. CRN-1 also includes the addition of an optional onsite quarry outside the plant area to provide materials necessary to support construction activities. The “power block” area shown in Figure 2-1 refers to onsite structures that would contain the reactor, turbine, radioactive waste systems, the control room, and a service building. The “plant area” refers to all structures and facilities that would be constructed on the CRN Site, including the power block, other buildings, switchyard, cooling tower, blowdown holding pond, stormwater basins, intake and discharge structures, and parking lots. Construction/operation support areas would be used for the concrete batch plant, parking, construction laydown, and storage.

Land clearing, grading, and excavation, including major cut and fill activities, would be required in conjunction with development of CRN-1 including the plant area, laydown areas, transmission line corridors, and the roadway network. TVA intends to use onsite cut/fill material to balance and minimize the need for offsite borrow material. Potential use of borrow material is discussed later in this section.

Excavation for the power block would occur in conjunction with other site preparation activities. The reactor building would be deeply embedded below grade requiring deep excavation. The radioactive waste building, turbine building, control building, and service building would be above-grade structures requiring minimal excavation.

After the completion of construction, areas used to support construction activities not reused to support facility operations would be regraded and landscaped. Some areas cleared for temporary construction facilities would be revegetated, and topographical features created during construction would be re-contoured to match the surrounding areas. Other areas may be left as graveled lots for future operational use areas. TVA would also implement sustainability measures during construction and operation of CRN-1 to include development of pollinator habitats and other sustainable development and land management policies within the CRN Site in association with a site biodiversity plan that would be prepared in accordance with TVA’s Biodiversity Policy.

2.3.1.2. Borrow Needs

TVA is evaluating two options for obtaining borrow material that may be needed for construction of CRN-1. Both options are being evaluated by TVA to provide flexibility for final selection during detailed design.

The first option is to obtain borrow material from an offsite quarry. TVA has identified the Midway Quarry in Mascot, TN to provide approximately 400,000 cubic yards of engineered backfill material, if needed. Midway Quarry is an existing permitted quarry near Knoxville that can supply the required backfill material for construction of CRN-1. The fill material from the offsite quarry (if needed) would be brought to the CRN Site by truck during an approximately two-year period using existing roads and haul roads developed onsite.

The second alternative consists of the development of an onsite quarry to supply needed borrow material. The optional quarry facility would be located near the center of the CRN Site, just south of the 500-kV line, as depicted in Figure 2-1. Operations at the optional onsite quarry would include stripping of the overburden and weathered rock formations that are not suitable as backfill, and drilling and blasting to commence quarry operations and establish ingress and

egress to the pit. Rock material for use as backfill in the construction of CRN-1 would come from the geologic Knox Formation. Up to approximately 400,000 cubic yards of structural fill would be recovered from the quarry as needed.

The onsite quarry (if needed) would be operational for two years with continuous drilling operations. Initial blasting frequency would be one to two times per week to establish the pit. After establishment of routine quarry operations, blasting operations would be anticipated weekly. TVA would stabilize, but not restore, the quarry pit area following quarrying activities.

Material excavated during quarry operations not used as fill would be disposed of onsite within the identified area of disturbance (Figure 2-3). The quarry design would include equipment and/or holding ponds within the disturbed area for managing run-off and wastewater generated by the quarry. Stormwater best management practices would be instituted and maintained during the entire period of construction and quarry operations.

Haul roads to access the quarry site, along with utilities to support operations such as temporary power, water and sewer services, parking area, stockpile areas for crushed material, and work trailers, would also be constructed.

2.3.1.3. Landscape and Stormwater Drainage

Landscaping would be developed in accordance with TVA's implementation of a vegetation management plan that seeks to foster biodiversity in select areas by promoting native wildflowers and grasses. This plan would benefit pollinators and other wildlife like grassland birds and would be first implemented during the design and construction phase. TVA plans to continually assess the feasibility of incorporating biodiversity conservation measures into the final layout as site development continues. Specific sustainability measures for the associated offsite 161-kV transmission corridor and other areas on the CRN Site would be finalized and implemented when construction at the site is complete.

Stormwater drainage control measures would be installed in compliance with the TDEC construction stormwater permit and may include grading; creation of berms around spoils areas; installation of riprap and sedimentation filters; and building of ditches, swales, piping, culverts, and detention ponds to control stormwater runoff before its release to the Reservoir.

2.3.1.4. Road Development

Development of CRN-1 would require the construction and/or improvements of existing and temporary roadways within both the CRN Site and associated offsite areas (Figure 2-1). Tennessee State Route 58 (TN 58) and Bear Creek Road represent the access routes for the CRN Site as it is assumed all traffic entering and exiting the site would use these roads. By comparison, the PEIS assumed 20 percent of construction and operational phase traffic would use the proposed Tennessee State Route 95 (TN 95) access which has been eliminated from CRN-1.

The peak traffic volume for CRN-1 is 1,001 vehicles during construction entering and exiting the CRN Site from TN 58 through the Bear Creek Road entrance during the peak hour. Based on TVA's traffic impact analysis described in Section 3.12.2.1, TVA has identified specific mitigation measures that could be implemented to prevent deterioration of traffic levels below Tennessee acceptable standards at the TN 58 and Bear Creek Road intersection due to the increased traffic. To accommodate the CRN-1 associated traffic increases, TVA would

coordinate with the Tennessee Department of Transportation (TDOT), DOE, and the City of Oak Ridge to consider the following improvements:

- Intersection improvements at TN 58 and Bear Creek Road Ramp (e.g., signalization, expanded lane storage, additional turning and/or receiving lanes).
- Realignment of U.S. Government Property Road at the Bear Creek Road Ramp to develop an improved intersection.
- Addition of left- and right-turn only lanes at Bear Creek Road at the CRN Site driveway.
- Installation of bollards on Bear Creek Road extending from southbound Bear Creek Road through the site entrance intersection to direct southbound vehicles to the outermost receiving lane into site.
- Bear Creek Road realignment to a "T" intersection, eliminating the existing curve at the CRN Site entrance.

2.3.1.5. Shoreline Stabilization and Restoration

The PEIS evaluated the need for extensive shoreline stabilization and restoration along the Reservoir. For the CRN-1 project, TVA determined, except for localized stabilization at the intake and discharge, no extensive shoreline stabilization or restoration would be needed. Shoreline stabilization associated with these structures is included in the disturbance areas shown in Figure 2-3 and would include installation of rip rap up to 4 feet in depth at the site of shoreline excavations. Further details regarding construction of the intake and discharge are provided in Section 2.3.3 of this SEIS.

2.3.2. Transmission

While power production is incidental to accomplishing the purpose and need of this project as described in Chapter 1, TVA intends to connect CRN-1 to the TVA power service grid. As such, Alternative B1 would require transmission upgrades to complete the connection between CRN-1 and existing power transmission systems that were described in the PEIS. These potential transmission actions on the CRN Site and within associated offsite areas are shown on Figure 2-1 and include:

- Construction of a new 161-kV switchyard on the CRN Site.
- Loop in the Kingston Fossil Plant (FP) – Fort Loudoun Hydroelectric Plant (HP) #1 161-kV transmission line (approximately 0.2-mile double circuit), including a relocated portion of the existing line within the CRN Site and connection to the new switchyard.
- Loop in the Kingston FP – Bethel Valley HP #2 161-kV line (approximately 0.7-mile double circuit) which would require a new 161-kV above ground transmission line extending offsite perpendicular to Bear Creek Road (Figure 2-1). This proposed transmission line would require a 120-foot-wide right-of-way (ROW). Because specific placement of the transmission towers won't be known until the site design is finalized, this SEIS considers a transmission corridor that is up to 280 feet wide.

Potential transmission system improvements beyond the interconnect with the Kingston FP – Bethel Valley HP #2 transmission line may include recircuiting, reconductoring, or other improvements associated with changes in other generation sources or system needs in the vicinity of the CRN Site which have not yet been determined by TVA. These improvements

beyond the first transmission line interconnect are considered system maintenance activities and are appropriately evaluated as part of the analysis of cumulative impacts.

2.3.3. Cooling Water System

The primary components of the cooling water system (CWS) for CRN-1 would include the cooling water intake structure, mechanical draft cooling tower, blowdown holding pond, discharge structure and discharge diffuser which are shown on Figure 2-1. The CWS provides plant cooling for all normal plant operating modes using cooling water to transfer heat from the main condenser to the environment through a heat exchanger. During power operation, circulating water pumps would provide cooling water to the main condenser and reject the heat from the main condenser to the environment via the mechanical draft cooling tower.

Makeup water, or water that is added to compensate for losses due to evaporation or other losses, for the CWS would be withdrawn from the Reservoir through the intake structure and pumped into the cooling tower. Water would flow through the condenser and heat exchangers and return to the cooling tower. A portion of the water would be lost through evaporation and drift. The remaining water would be cooled and contained in the cooling tower basin for redistribution to the condenser. To maintain chemistry in the cooling water system, a portion of the water in the cooling tower basin is discharged to a holding pond as “blowdown”. Water from the blowdown holding pond would be discharged into the Reservoir through a diffuser pipe.

2.3.3.1. Cooling Water Intake System

TVA is evaluating two alternatives intake designs for CRN-1, located at Clinch River mile (CRM) 17.9. The first alternative consists of a recessed shoreline intake structure. This alternative is located outside of the defined navigation channel, which at the intake location is bank to bank, and avoids potential conflicts with navigation. A short intake channel would connect the structure to the Reservoir. Preliminary plan and profile drawings for this alternative are shown in Figures 2-4 and 2-5, respectively, and depict a rectangular concrete structure partitioned into separate bays for each pump unit. Construction of this alternative would occur in two stages, with the onshore facility and part of the new short connecting channel constructed first, while leaving the shoreline intact to act as a dam during building. After completion of the first stage, the portion of the shoreline acting as a dam would be removed to complete the short channel connection to the Reservoir. All excavation would use onshore equipment.

The second alternative consists of a submerged offshore intake structure which includes a subsurface conduit extending between a submerged intake in the Reservoir, within the navigation channel, and a vertical shaft wet well on the bank. The maximum height above the Reservoir floor would be limited to 3 feet in accordance with navigational requirements. This alternative consists of screens which would cover the submerged intakes, and a compressed airburst system which would prevents debris and sediment from collecting at the surface of each screen. Preliminary plan and profile drawings of the submerged offshore intake structure alternative are shown in Figures 2-6 and 2-7, respectively. Construction of this alternative would require both onshore excavation for the vertical shaft wet well foundation and offshore excavation for the in-Reservoir retrieval pit, as well as a temporary cofferdam in the Reservoir.

Installing the submerged offshore intake structure would require clearing, shallow excavation, and backfilling. Any excavated material would be disposed of appropriately depending on the characterization of the material and in accordance with provisions of the Watts Bar Interagency Agreement and CWA Section 404 permit conditions. The Watts Bar Interagency Agreement was established in 1991 in partnership with the USACE, DOE, TDEC, and the U.S. Environmental

Protection Agency (EPA), to coordinate review of permitting and other use authorization activities that could result in the disturbance, re-suspension, removal, and/or disposal of contaminated sediments in the Reservoir.

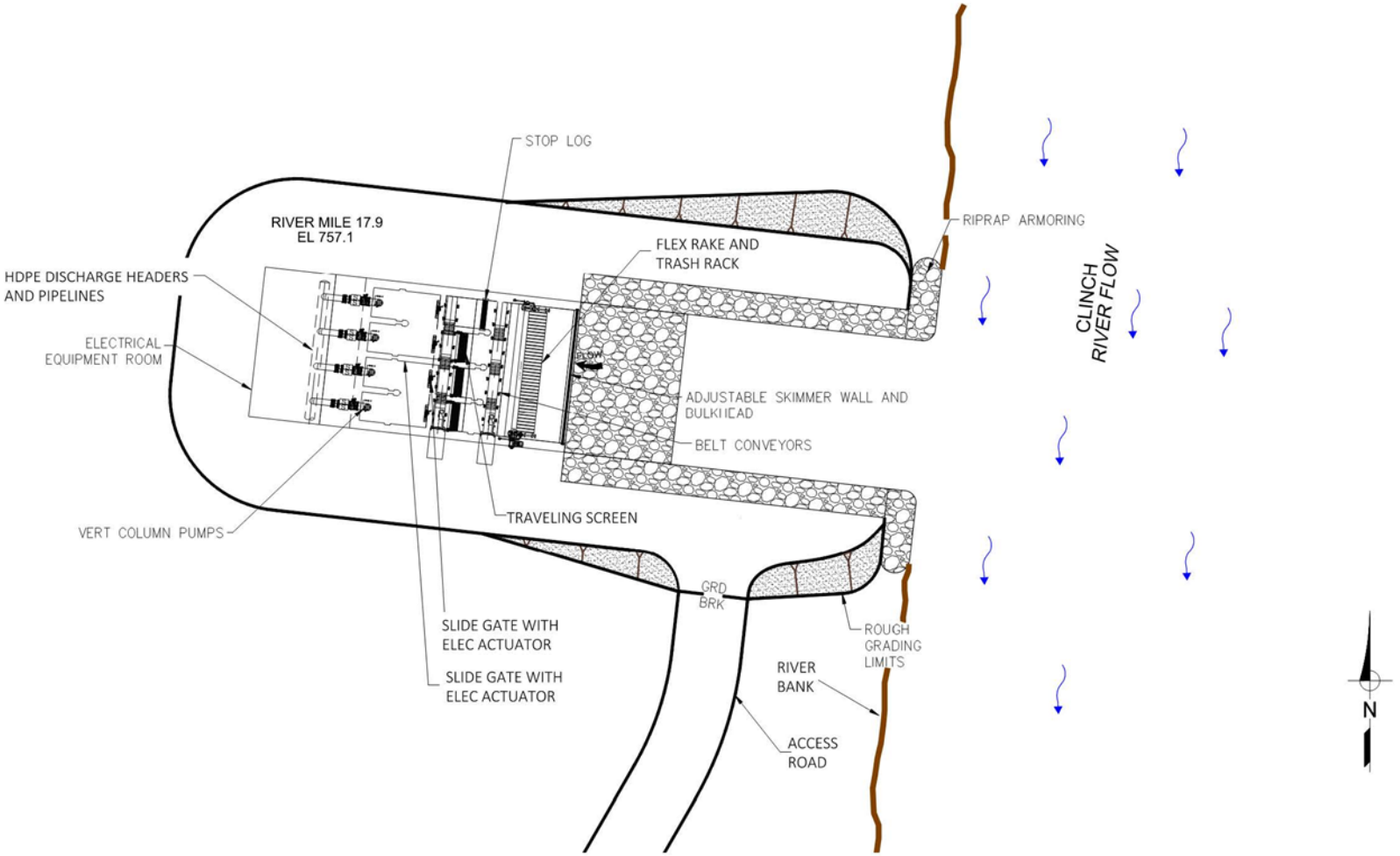

Figure 2-4. Recessed Intake Alternative Structure Plan

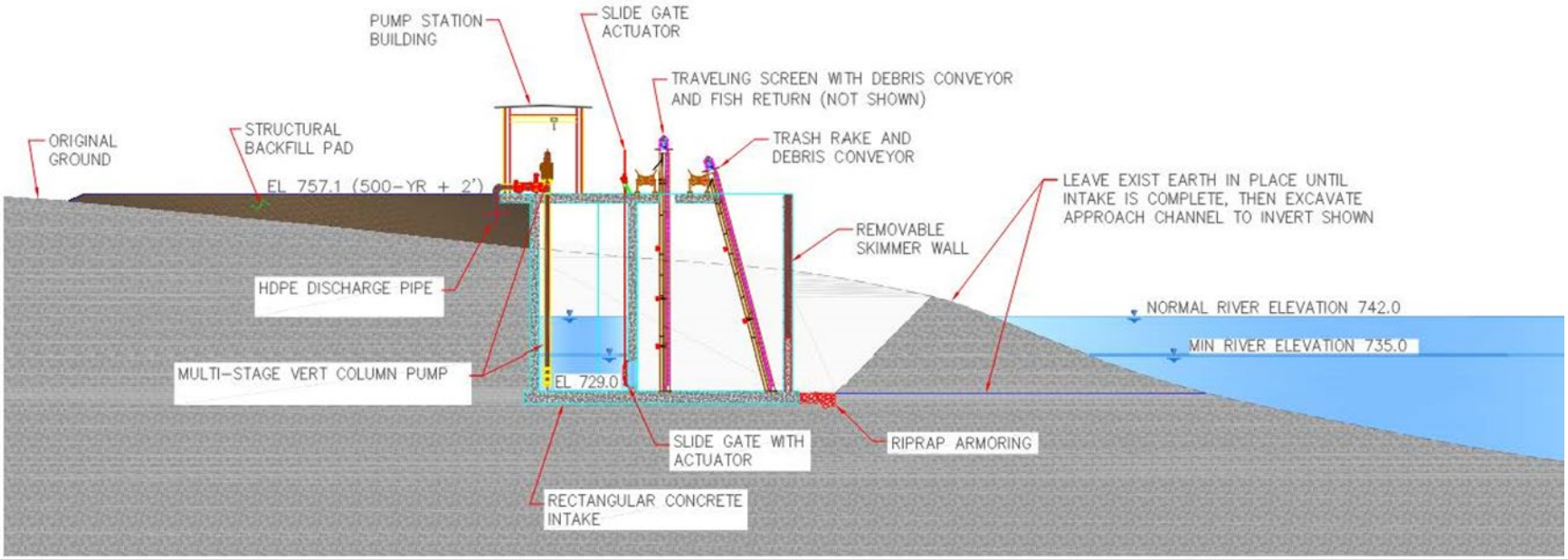

Figure 2-5. Recessed Intake Alternative Structure Profile

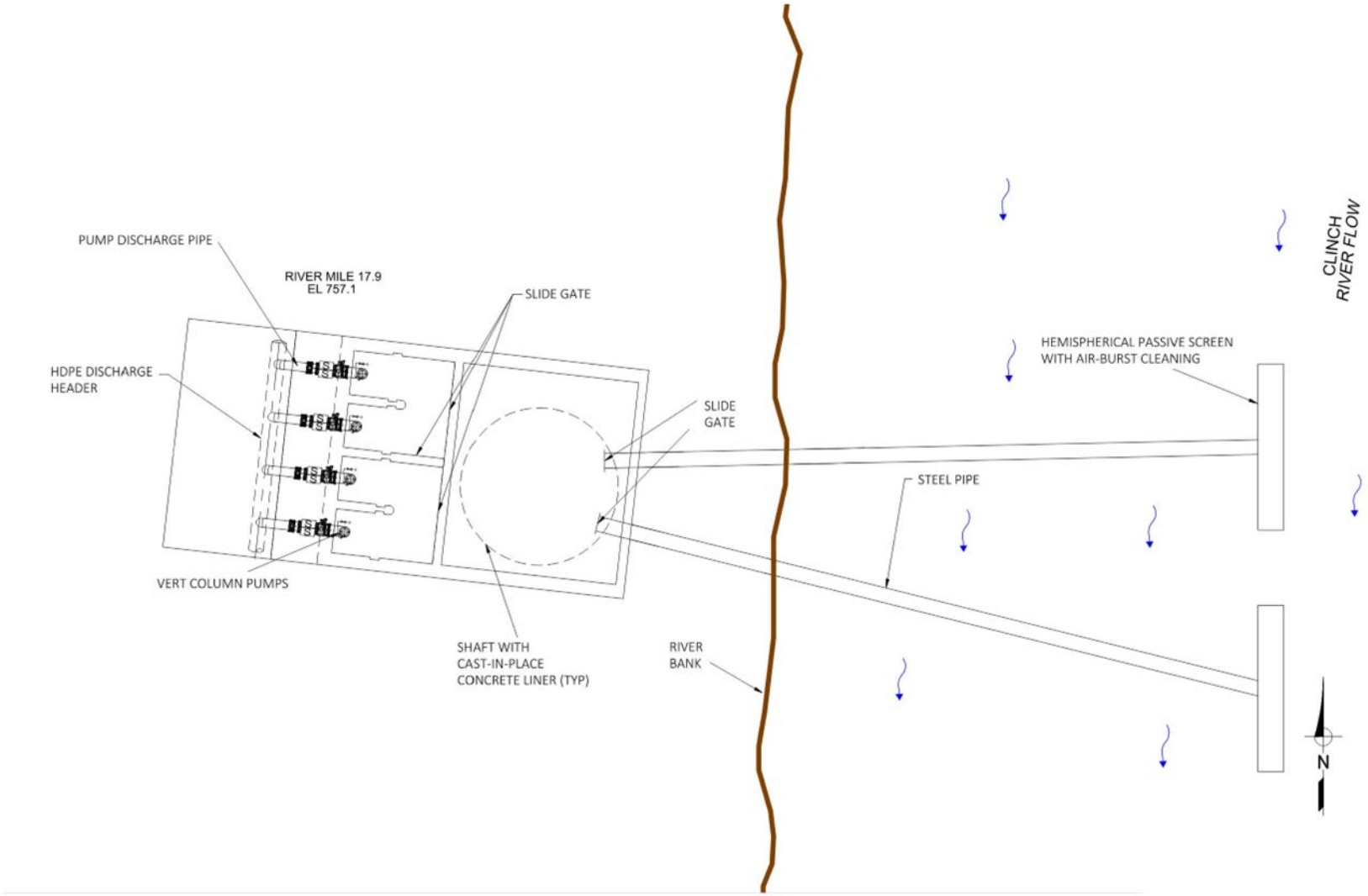

Figure 2-6. Submerged Offshore Intake Alternative Structure Plan

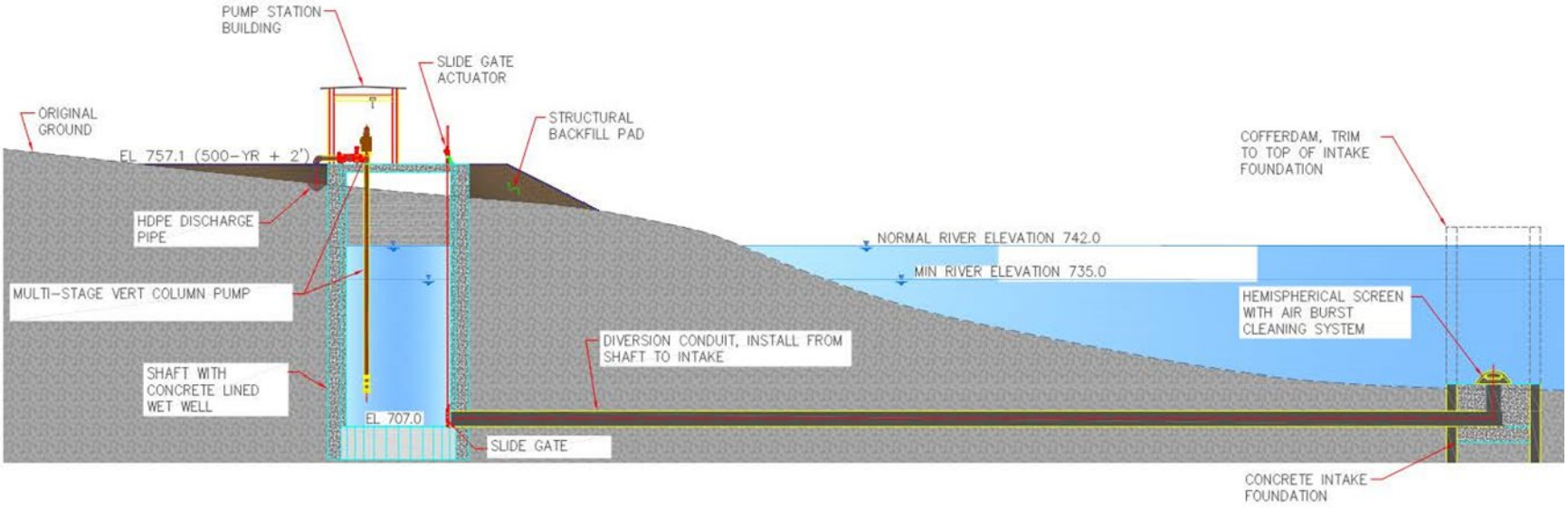

Figure 2-7. Submerged Offshore Intake Alternative Structure Profile

Both intake structure design alternatives would comply with CWA 316(b) regulations by providing aquatic life protection. The maximum velocity upstream of each intake alternative would be maintained to ensure the velocity through the screens and trash rack is less than 0.5 feet per second per the requirements of the CWA.

2.3.3.2. Cooling Tower

Heat dissipation for the CWS would be accomplished using a mechanical draft cooling tower. The cooling tower would be located on approximately 4 acres east of the plant area as shown in Figure 2-1 (Appendix B, Table B-2, Item 3.3.1). The cooling tower deck would be 64 feet above plant grade. The quantity of water in the cooling tower basin would be approximately 4.8 million gallons, circulating through the tower at a rate of approximately 244,680 gallons per minute (gpm).

2.3.3.3. Cooling Water Discharge System

Blowdown from the cooling towers as well as effluent from the production of demineralized water would be discharged to the blowdown holding pond located on the west side of the plant, as shown in Figure 2-1. The pond would provide adequate settling for CRN-1 and would be approximately 8 feet deep and 55,300 square feet in area, with a total volume of approximately 442,200 cubic feet (3,307,886 gallons).

Installing the cooling water discharge system would require clearing, shallow excavation, and backfilling. As described in Subsection 2.3.3.1, excavated material would be disposed of appropriately depending on the characterization of the material and in accordance with provisions of the Watts Bar Interagency Agreement and CWA Section 404 permit conditions.

Plan and profile drawings of the discharge system are shown in Figures 2-8, 2-9, and 2-10. The discharge structure is located near the blowdown holding pond and the discharge diffuser is located at CRM 15.55. The discharge outfall for the blowdown holding pond would be located at CRM 15.55, as shown in Figure 2-1. During operation of the discharge system, water would pass from the blowdown holding pond via a buried pipe and through an instrumentation vault within the discharge structure for measurement of flow and temperature. It then would continue into two approach conduits to two diffusers located at the river bottom to promote mixing to minimize potential hydrothermal impacts. The discharge would have a maximum temperature of 90.7 degrees Fahrenheit (°F) (Appendix B, Table B-2, Item 3.3.5).

Discharges to the Reservoir would be subject to appropriate treatment systems and monitored to ensure constituent concentrations are in accordance with the limits established by TDEC through a National Pollutant Discharge Elimination (NPDES) permit. The CRN-1 NPDES permit would include discharge limits established to protect receiving waters and monitoring requirements to ensure compliance with those limits. Temperatures and chemical concentrations for all discharges would comply with the terms and conditions of the NPDES permit.

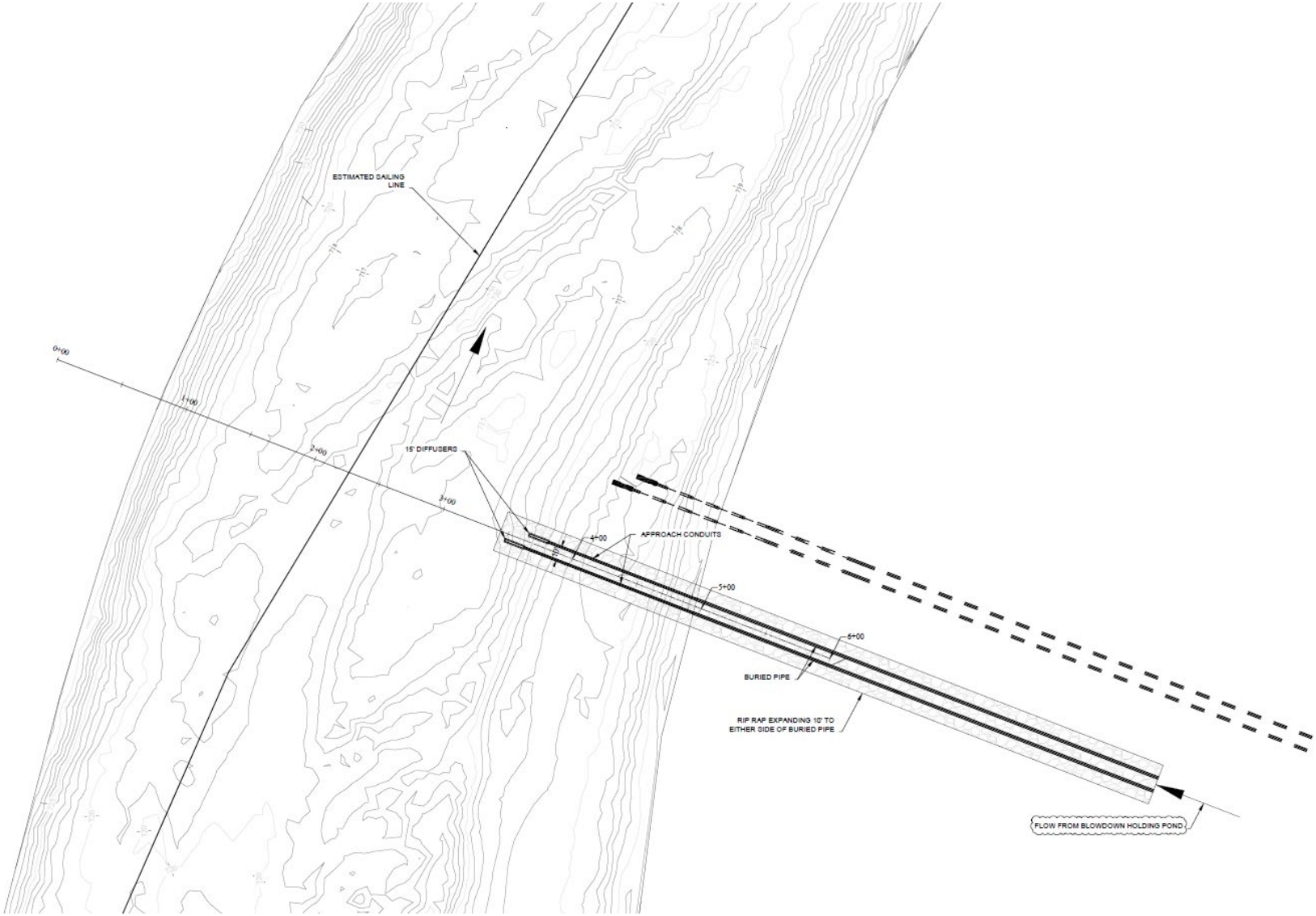

Figure 2-8. Diffuser and Discharge Piping Plan View

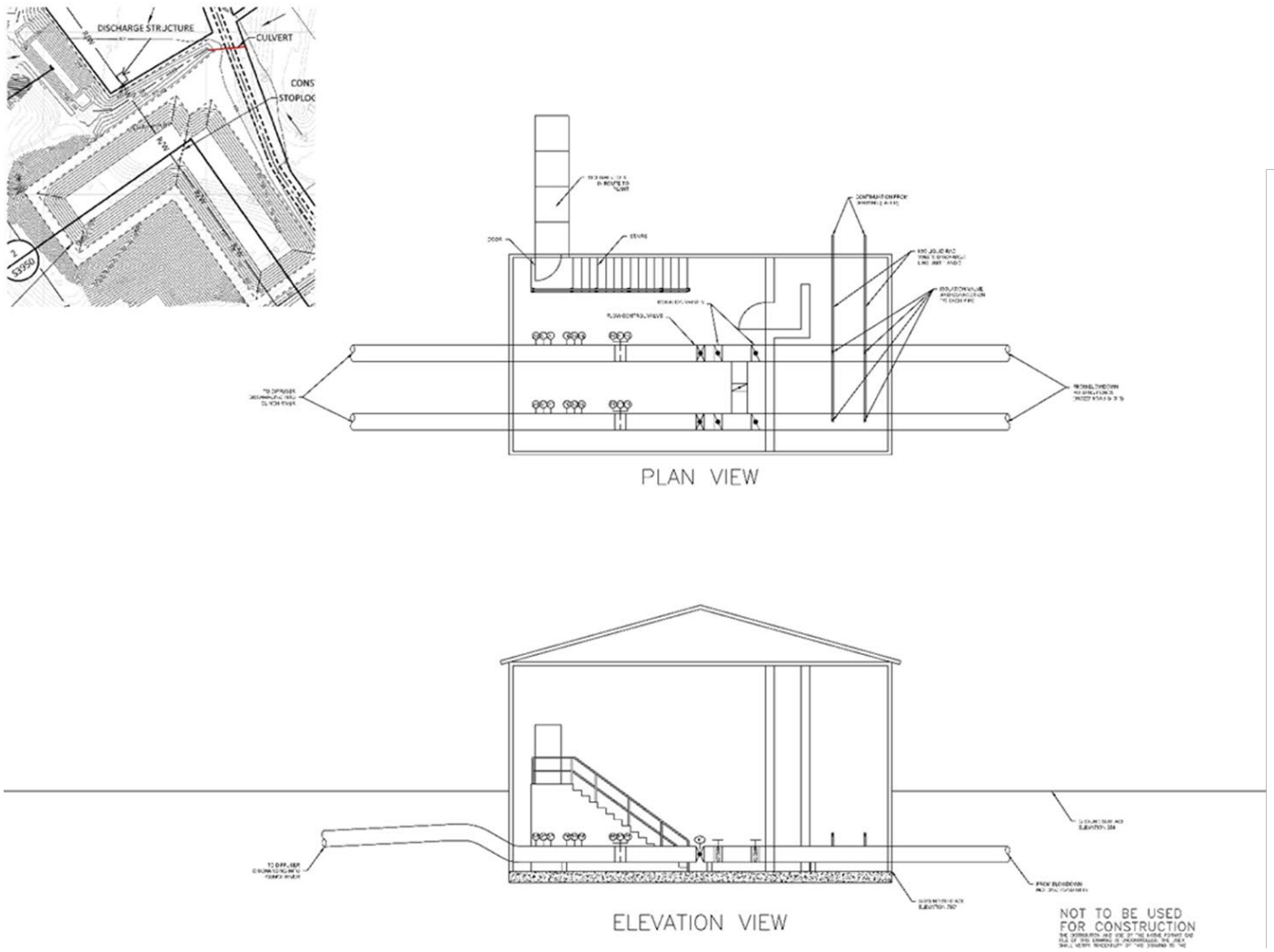

Figure 2-9. Discharge Structure Plan and Profile

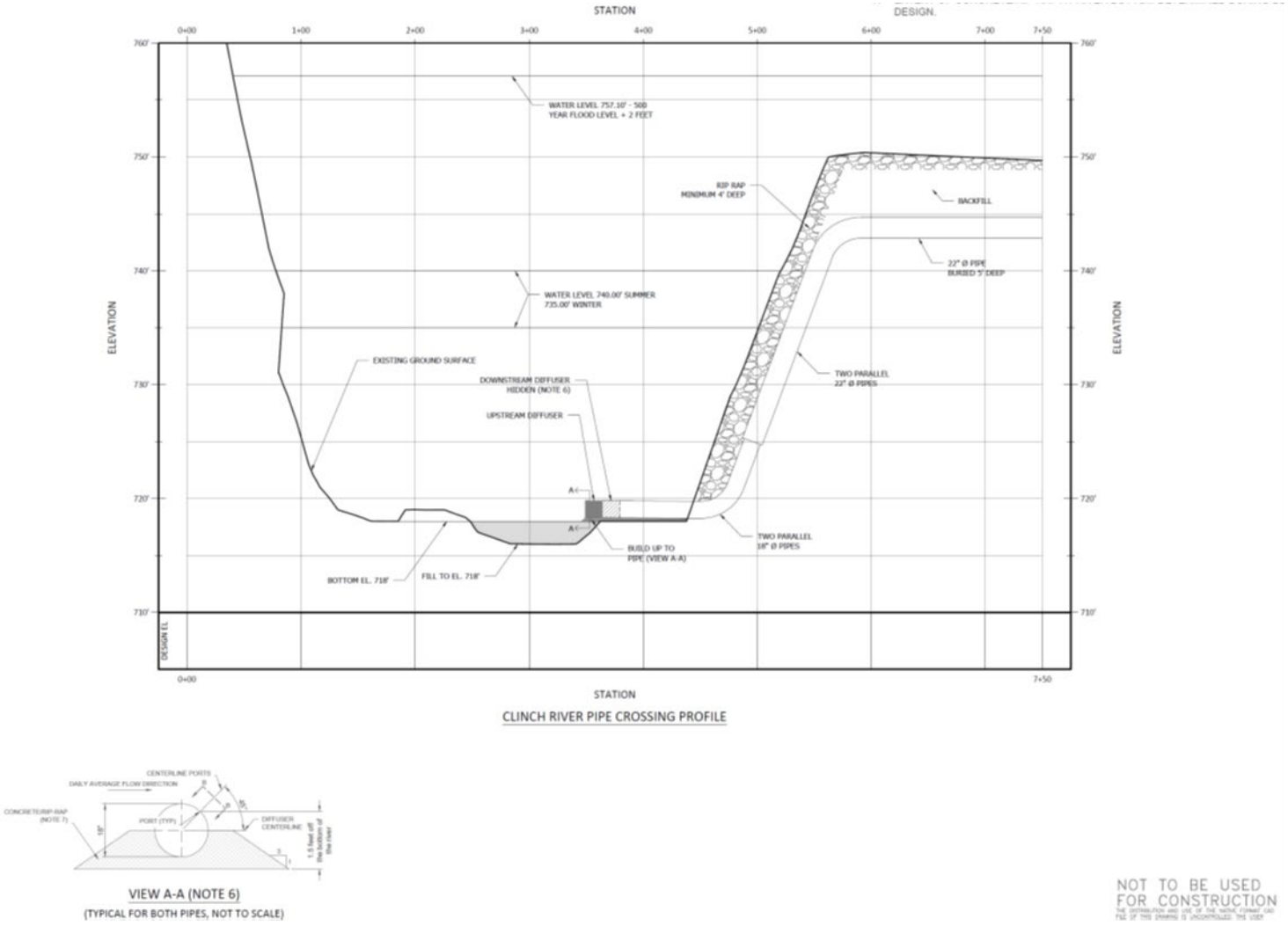

Figure 2-10. Diffuser Profile in Channel

2.3.4. Barge Facility

TVA plans to use the existing offsite DOE former K-25 Barge Loading Area, located in the BTA, to support barge unloading activities (Figure 2-1). This facility includes a gravel pad, parking, an access road, and a sheet pile retaining wall on the edge of the Reservoir. The depth of the Reservoir in this area is sufficient for delivery of equipment and materials needed for construction of CRN-1. TVA anticipates expanding the barge landing area by approximately 5 acres from that evaluated in the PEIS. The expansion would accommodate improvements to allow for deliveries of heavy equipment, plant components, and other materials. Refurbishment of the barge facility may include reducing the height of the sheet pile wall; vegetation clearing; grubbing and grading; replacement of a culvert; limited placement of fill, widening, and resurfacing of the haul path; addition of tie off points for the barge; and temporary support of overhead transmission lines.

2.3.5. Construction and Operation Timeline and Workforce

Table 2-1 summarizes the projected major milestones for CRN-1 preconstruction activities, construction, startup, and operations. Preconstruction is scheduled to begin in 2025, but this may change. TVA would have to apply for and receive a CP and Operating License from NRC in advance of the relevant milestones listed in Table 2-1.

Table 2-1. Anticipated Timeline for Construction and Operation of CRN-1

Milestone	Estimated Date
Initiation of Preconstruction	Time (T) = 0 (2025)
Plant Safety-Related Construction Begins	T = 24 months
Safety-Related Construction Complete	T = 75 months
Startup Testing Begins	T = 86 months
Commence Commercial Operation	T = 95 months

Notes: CRN-1 = Clinch River Nuclear, T = time

The maximum estimated workforce during construction of CRN-1 is 1,300 (Appendix B, Table B-2, Item 17.4.1). If the onsite quarry were to be implemented, quarry operations would occur two years prior to construction of power block foundations, with material stockpiled onsite. Peak quarry operation would require 30 total staff and would not be expected to overlap with the peak construction workforce for CRN-1. However, if additional material were required once power block construction begins, then a workforce of approximately 15 additional people would be required for the onsite quarry. The continued workforce of 15 people is included in the peak construction workforce of approximately 1,300. The quarry is not expected to be staffed once power block foundations are complete. Per the traffic assessment conducted in support of the CPA ER, it is expected that the construction workforce, taking into account carpooling, would result in peak onsite traffic of 1,001 vehicles.

The full-time operations workforce for CRN-1 is estimated to be approximately 205 personnel (Appendix B, Table B-2, Item 16.3.1). In addition to the full-time operations workforce, a temporary outage workforce consisting of approximately 280 personnel (Appendix B, Table B-2, Item 16.3.2) would be required every 12 to 24 months.

2.3.6. Water Use

Water is required to support the facility during construction and operation. Water uses for the construction of the facility include dust control, concrete batch plant operation, and potable and sanitary water for the construction workforce. Water uses for the operation of CRN-1 include those related to the CWS, potable and sanitary water system, fire protection system, demineralized water, and a liquid radioactive waste treatment system.

The source of water for cooling water system of CRN-1 would be the Reservoir. The intake would withdraw an estimated average of 4,147 gpm with a design summer withdrawal of 5,414 gpm. Of the total intake volume, 5,365 gpm is the design makeup water for the CWS during normal plant operation. The proposed CWS uses a mechanical draft cooling tower for heat dissipation from the systems as described in Section 2.3.3.2.

The source of water for the potable and sanitary water systems and for the fire protection system would be municipal water from the City of Oak Ridge Public Works Department. Wastewater would be discharged to the City of Oak Ridge sanitary treatment system. The average water supply rate for the potable and sanitary water systems during plant operation would be approximately 3 gpm, with the maximum rate expected to be 50 gpm (Appendix B, Table B-2, Items 5.1.1 and 5.1.2). The rate of potable water use during construction is expected to be one to two gallons per worker per day. The expected maximum water supply rate for the fire protection system is expected to be 30 gpm.

The water use for concrete batch plant operation during construction is estimated at 5,000 to 10,000 gallons per day (gpd). This water would most likely be drawn from the municipal water supply. However, non-potable water sources, such as surface water, may be treated and used for concrete batch operation. Surface water the Reservoir would be used during construction for purposes such as dust control at a rate of approximately 30,000 to 40,000 gpd.

2.3.7. Waste Management

The following sections describe the waste-management systems proposed for the CRN Site, including systems for liquid, gaseous, and solid radioactive and nonradioactive waste management.

2.3.7.1. Radioactive Waste Management

Radioactive Waste Management including liquid, gaseous, and solid radioactive waste was addressed in PEIS 2.5.8.1. CRN-1 is expected to generate liquid, gaseous, and solid radioactive wastes and the anticipated waste management activities (radioactive or otherwise) are anticipated to be within the bounds of the previously analyzed PEIS unless otherwise noted below.

The CRN-1 radioactive waste management systems would be designed to maintain releases of radioactive materials in effluents to “as low as is reasonably achievable” levels to meet the requirements of NRC regulations 10 CFR Parts 20 and 50, including the design objectives of Appendix I to 10 CFR Part 50. Brief descriptions of the radioactive waste management systems are provided in this section and a comparison of these activities with the bounding analysis in PEIS.

The average normal liquid radioactive effluent activities for CRN-1 are provided in Appendix B, Table B-2, Item 10.3.1. Appendix B, Table B-2, Item 9.5.1 gives the average normal gaseous radioactive effluent activities for CRN-1.

2.3.7.1.1. Liquid Radioactive Waste

The CRN-1 liquid waste management system (LWMS) is designed to collect, process, and dispose of liquid radioactive waste generated during normal operation. The LWMS collects liquid waste from various plant areas and systems through the Equipment and Floor Drain System. Liquid waste consists of floor drain wastes, equipment drains, and process drains collected throughout the entire facility. All anticipated discharges from the LWMS would meet regulatory requirements as described in 10 CFR Part 20 and 10 CFR Part 50 Appendix I.

2.3.7.1.2. Gaseous Radioactive Waste

The offgas system (OGS) is designed to process and control the release of gaseous radioactive effluents to the site environs to maintain the exposure of persons in unrestricted areas to radioactive gaseous effluents as low as reasonably achievable.

The primary functions of the OGS are designed to be most applicable when the reactor is operating at high power. Production of radiolytic hydrogen and oxygen and of radioactive noble gas isotopes are minimal outside of power operation mode, thus, the OGS is not required to be running in reactor startup, shutdown, and refueling modes.

During normal plant operation, non-condensable gases develop in the reactor steam. These need to be removed to maintain turbine efficiency. The gases are drawn from the main condenser via the steam jet air ejectors. The mixture is then passed through the offgas recombiner where hydrogen and oxygen are catalytically recombined to form water. After recombination, the offgas is routed to a condenser to remove moisture, then routed to effluent conditioning components and charcoal adsorber tanks. The charcoal adsorber tanks provide a delay period for radioisotope decay as the offgas mixture passes through. The mixture exiting the adsorber tanks is routed to a chimney for release to the environment. The OGS includes sample capability from various points for radiochemistry information and system health information.

As indicated in Appendix B, Table B-2, Item 9.5.1 the anticipated total activity dose consequence for gaseous emissions is lower than ESP PPE.

2.3.7.1.3. Solid Waste Management System

The CRN-1 solid waste management system (SWMS) would control, collect, handle, process, package, and temporarily store solid radwaste generated by the plant prior to shipping the waste offsite. Nonradioactive solid waste is handled separately and is addressed in Subsection 2.3.8. The SWMS processes the filter backwash sludges, reverse osmosis concentrates, charcoal media, and bead resins generated by the LWMS, fuel pool cooling and cleanup system, isolation condenser system pool cooling and cleanup system, and condensate filters and demineralizer systems. Contaminated solids such as high efficiency particulate air cartridge filters, rags, plastic, paper, clothing, tools, and equipment are also processed in the SWMS. Other sources of solid radwaste including lab waste, chemicals, oily sump waste, and detergent, would be processed through the SWMS. Liquids from the SWMS would be drained to the equipment and floor drain system which would transfer the liquid to the LWMS for processing.

The SWMS would continuously operate during all plant operational modes, including startup, refueling, and shutdown, and would carry out the following functions in accordance with NUREG-0800, the Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, Light Water Reactor Edition:

- Continuously remove nonradioactive and radioactive dissolved and suspended solids, corrosion products, and spent bead resin so they do not enter the floor and equipment drain system.
- Store radioactive spent resin until it has decayed to a safe level.
- Dewater and package the solid waste for temporary on-site storage prior to shipping the waste offsite.

Dry solid radioactive wastes would be collected in containers located in appropriate areas throughout the plant, as dictated by volume of wastes generated during operation and maintenance. The filled containers would be sealed and moved to controlled-access enclosed areas for temporary storage. Wet solid radioactive wastes would be collected in a 208-liter drum and loaded in the drum evaporator. The drum evaporator removes excess moisture through evaporation, which is routed to the Radwaste Building ventilation system for elimination. Both wet and dry drums are stored until they can be shipped offsite.

Class A, B, and C waste from CRN-1 would be transported for disposal to a permitted radioactive waste disposal facility in Andrews, Texas. Class A waste may also go to a permitted facility in Clive, Utah. Other permitted facilities may also be used for radioactive waste disposal from CRN-1.

Appendix B, Table B-2, Item 11.2.1 provides the average normal annual activities from projected principal radionuclides in solid radioactive waste from the ESP-006 PPE. Values for CRN-1 are not yet available. Therefore, values from the ESP-006 PPE are considered bounding. The total projected annual activity from solid waste in the ESP-006 PPE is 57,200 curies per year. The projected volume of solid radioactive waste generated per year in the ESP-006 PPE is 5,000 cubic feet per year (Appendix B, Table B-2, Item 11.2.3).

Spent fuel would be stored in the CRN-1 Fuel Pool located in the reactor building. The bottom of the BWRX-300 cask pit in the Fuel Pool would be located at grade elevation; the top of the cask pit/bottom of the Fuel Pool and the top of the Fuel Pool would be located above grade. The Fuel Pool would have sufficient capacity to store eight years of used fuel and an additional full core off-load. When necessary, spent fuel would be stored onsite in dry casks on an independent spent fuel storage installation pad to be licensed in a separate, future action.

2.3.8. Non-Radioactive Waste Management

2.3.8.1. Chemical Concentrations in Effluent Streams

The anticipated constituents and concentrations in liquid effluent from CRN-1 that would be released to the Reservoir are provided in Appendix B, Table B-2, Item 3.3.3. Chemical treatment of water drawn from the Reservoir is required for cooling tower makeup and the production of demineralized water. Biocides, antiscalants, dechlorination agents, and sulfuric acid (to control alkalinity) would be added to raw water. The chemical concentrations in effluent streams would be maintained through engineering and operational/administrative controls to meet the requirements of a TDEC-approved Biocide/Corrosion Treatment Plan and NPDES permit, as well as requirements and limitations set by relevant federal, regional, or local regulatory agencies at the time of construction and operation. The concentrations of most components are bounded by ESP-006 PPE values. All effluent concentrations would meet TDEC NPDES permit limits.

2.3.8.2. Sanitary System Effluents

Sanitary waste from CRN-1 would be discharged to the City of Oak Ridge municipal system. The City of Oak Ridge Public Works Department operates two wastewater treatment plants, Turtle Park and Rarity Ridge, with a combined capacity of 30.6 million gallons per day (mgd) (TDEC 2024a; TDEC 2024b) and a normal combined flow of 5.6 mgd (City of Oak Ridge 2024a). Sanitary wastewater from CRN-1 is treated by the City of Oak Ridge wastewater treatment plants. These plants discharge effluent to East Fork Poplar Creek and to the Reservoir. The projected effluent flow from the CRN-1 potable/sanitary water system to the municipal sewer is estimated to average 3 gpm (Appendix B, Table B-2, Item 5.1.1). This equates to an average daily flow of 4,320 gpd. The estimated maximum flow rate is 50 gpm, or a maximum daily flow of 72,000 gpd (Appendix B, Table B-2, Item 5.1.2).

2.3.8.3. Gaseous Effluents

Nuclear reactors emit gaseous and particulate emissions to the air. For reactor technologies using cooling towers, the cooling towers are expected to be the primary source of particulate emissions. The primary sources of emissions from auxiliary systems are expected to be auxiliary boilers, standby diesel generators, and emergency standby gas turbine generators. The design of CRN-1 does not include auxiliary boilers or gas turbines. Temporary emissions from engines and fugitive dust and odors would be produced from construction activities, including an onsite quarry. Emissions commonly include particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides.

The expected emissions from the CRN-1 cooling tower would be 30.68 tons per year which is significantly less than the NSR threshold limit of 250 tons per year.

Estimated emissions for CRN-1 are shown in Appendix B, Table B-2, Items 13.1, 13.2, 14.1.2, 14.1.3, 14.2.2 and 14.2.3 and show that the CRN Site would not produce more than 250 U.S. tons per year of any regulated NSR pollutant and thus does not qualify as a major stationary source as specified by the EPA Emission Standards in 40 CFR 52 (b)(1)(i)(b).

Emissions would be produced in conjunction with an onsite quarry (if required), including emissions from truck and equipment operation and particulates from periodic blasting. Emissions would also be produced if an offsite quarry is utilized, including emissions produced from truck transport of fill material from offsite. Construction and operations workforce vehicles would also contribute to emissions for CRN-1.

2.3.8.4. Liquid Effluents

Nonradioactive liquid effluents (separate from sanitary wastewater) would be discharged to the Reservoir through a discharge structure described in Section 2.3.3.3. CPA ER Section 3.2.3.1.4 provides quantities of water discharged from CRN-1. The blowdown holding pond serves as the collection point for most process waste streams except sanitary waste, some stormwater discharges, and quarry and excavation dewatering discharges (Figure 2-1).

An onsite quarry would require dewatering operations. Like typical quarries in the region, the onsite quarry is expected to include equipment and/or holding ponds within the disturbed area necessary for managing both quarry-related wastewater and stormwater. The facility's wastewater discharges, including that from dewatering and stormwater, would be regulated by TDEC through an NPDES permit which would include discharge limits established to protect receiving waters and monitoring to ensure compliance with those limits. Temperatures and

chemical concentrations for all discharges would comply with the terms and conditions of the NPDES permit.

Stormwater would be prevented from entering the onsite quarry via ditches and berms in the overburden soil. Berms would prevent stormwater (sheet flow) from entering the quarry pit. Swales and additional detention/retention basins would be used to capture, direct, and reduce sedimentation flows across the entire construction site and areas of disturbance. Stormwater would ultimately be directed to the Reservoir.

2.3.8.5. Solid Waste

Nonradioactive solid wastes include typical industrial wastes such as metal, wood, and paper, as well as process wastes including hazardous and universal wastes. The PEIS noted that TVA may choose to construct and operate an onsite landfill for construction, site clearing, and grading debris. TVA is no longer considering an onsite landfill for CRN-1, although some excess spoils material, including topsoil, from construction may be disposed of onsite. All other solid waste, including solid waste from construction of the plant area and onsite quarry, would be disposed of at offsite licensed disposal facilities.

TVA expects a conservative upper limit of 290 tons of trash per month to be produced during operation, based on a full-time workforce of 500. Because the full-time operating workforce of CRN-1 is 205 workers, the nonradioactive solid waste generated by operation of the CRN-1 is expected to be less than the 290 tons of trash estimated in the ESP.

TVA would follow all applicable federal, state, and local requirements and standards for handling, transporting, and disposing of solid waste, including hazardous waste. This includes up to 1,891 cubic yards of potentially contaminated sediments from underwater excavation required to construct the intake and discharge structures. Potentially contaminated sediment would be retained within designated upland areas, sampled, tested, managed, shipped, and disposed of according to the Watts Bar Interagency Working Group agreement and applicable federal requirements.

2.4. Tiering from the Programmatic Bounding Analysis

The PPE used in the PEIS included the parameter values in ESP-006. The ESP-006 PPE is based on parameter values that TVA established by considering four light water SMRs under development in the United States at the time of the preparation of the ESPA ER. As stated in Chapter 1, this SEIS evaluates a single GEH BWRX-300 unit based on boiling water reactor technology for use at the CRN Site (CRN-1). Table 2-2 summarizes the selected technology-specific design and construction information for CRN-1 in comparison with the selected bounding attributes and characteristics from the PPE utilized in the PEIS analysis. Appendix B includes a full listing of CRN Site characteristics and CRN Site related design parameters and their respective values associated with CRN-1 (proposed action).

Table 2-2. Selected Design and Construction Parameters

Parameter	PEIS PPE Value	CRN-1 Value
MWe generated by the CRN Site	800 MWe (value for site)	300 MWe gross/unit (value for site)
Megawatts thermal (MWt) generated by the CRN Site	2,420 MWt	~870 MWt

Parameter	PEIS PPE Value	CRN-1 Value
Normal plant heat sink	Clinch River arm of the Watts Bar Reservoir / Atmosphere	Reservoir / Atmosphere
Waste heat rejected to the circulating water system across the condensers	1,639 megawatts (MW) (5,593 million British thermal units per hour [Mbtu/hr])	~570 MW (1,945 MBTU/hr)
Cooling tower blowdown flow to the reservoir in gpm	12,800 gpm (maximum) 4,270 (expected)	1,341 gpm
Cooling tower evaporation rate for CRN Site in gpm	12,800 gpm (expected and maximum)	2,800 gpm (average) 4,022 gpm (maximum)
Raw water consumption for the CRN Site in gpm	12,800 gpm	4,024 gpm
Discharge flow rate of potentially radioactive effluent streams in gpm	900 gpm (expected normal and maximum)	Maximum ratio of 1 gpm radwaste discharge to 100 gpm nonradioactive discharge
Volume of solid radioactive waste generated in cubic feet per year	5,000 cubic feet per year (site value)	5,000 cubic feet per year
Acreage to support plant operation	153 acres	~53.2 acres
Height of power block structure from plant grade	160 feet	103 feet
Depth of power block structure from plant grade	138 feet	<120 feet
Expected sound produced by cooling towers in A-weighted decibels (dBA)	<70 dBA measured at 1,000 feet from noise source	<70 dBA measured at 1,000 feet from noise source
Expected sound level due to construction activities in dBA	101 dBA measured at 50 feet	~101 dBA at 50 feet for routine construction noise 126 dBA at 50 feet for blasting
Estimated number of permanent plant workers to support operation	500 workers	205 workers
Estimated number of onsite workers during construction	2,200 workers	1,301; Not including utility/customer oversight and regulator presence
Estimated number of workers to support refueling or major maintenance activities	1,000 workers	280 workers

Source: Appendix B Table B-2

Notes: PEIS = Programmatic Environmental Impact Statement, CRN-1 = CRN Unit 1, Mwe = Megawatts electric, MWt = Megawatts thermal, Mbtu/hr = British thermal units per hour, gpm = gallons per minute, dBA = A-weighted decibels

2.5. Comparison of Alternatives

The environmental impact determinations by resource for Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 are summarized and compared to the environmental impact determinations for PEIS Alternative A – No Action and PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-Light Water Reactors (LWRs), in Table 2-3. The impact determinations for Alternative B1 are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections in Chapter 3. For a majority of the resources, the impact conclusions did not change or were slightly less than the impact determinations in the PEIS. Red font indicates where the impact determination has changed from the PEIS impact determination. Alternative A - No Action has not changed from the PEIS and therefore the impacts associated with this alternative are incorporated by reference.

Table 2-3. Summary and Comparison by Resource Area of Alternative A – No Action with PEIS Alternative B and SEIS Alternative B1

Resource Area	PEIS Alternative A – No Action	PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-LWRs	SEIS Alternative B1 – Construction, Operation and Decommissioning of CRN-1
Geology and Soils	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor to Moderate** *Operation:* **Minor**
Water Resources	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Floodplains and Flood Risk	No impacts	*Construction:* **Minor** *Operation:* **None**	*Construction*: **Minor** *Operation:* **None**
Wetlands	No impacts	*Construction:* **Minor**	*Construction:* **Minor**
Aquatic Ecology	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Terrestrial Ecology	No impacts	*Construction:* **Moderate** *Operation:* **Minor**	*Construction:* **Moderate** *Operation:* **Minor**
Threatened and Endangered Species	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor to Moderate** *Operation:* **Minor**
Managed and Natural Areas	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Recreation	No impacts	*Construction:* **Minor** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Meteorology, Air Quality, and Climate Change	No impacts	*Construction:* **Minor** *Operation:* **Minor**	*Construction:* **Minor** *Operation:* **Minor**
Transportation	No impacts	*Construction:* **Minor to Moderate** *Operation:* **Minor**	*Construction:* **Moderate to Large** *Operation:* **Minor**
Visual Resources	No impacts	*Construction and Operation:* **Minor to Moderate**	*Construction and Operation:* **Minor to Moderate**
Noise	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**

Resource Area	PEIS Alternative A – No Action	PEIS Alternative B – Nuclear Technology Park at Area 1 with SMRs and/or Advanced non-LWRs	SEIS Alternative B1 – Construction, Operation and Decommissioning of CRN-1
Socioeconomics			
Land Use	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Demographics	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Employment and Income	No impacts	*Construction and Operation:* **Beneficial, Minor to Moderate**	*Construction and Operation:* **Beneficial, Minor to Moderate**
Community Characteristics	No impacts	*Construction:* **Minor** *Operation:* **Minor to Moderate**	*Construction:* **Minor** *Operation:* **Minor to Moderate**
Environmental Justice	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Archaeological Resources and Historic Structures	No impacts	*Construction:* **Moderate**	*Construction and Operation:* **Minor**
Solid and Hazardous Waste	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Radiological Effects of Normal Operations	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Uranium Fuel Effects	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Nuclear Plant Safety and Security	No impacts	*Construction and Operation:* **Minor**	*Construction and Operation:* **Minor**
Decommissioning	No impacts	**Minor**	**Minor**

Note: Red font indicates the changed impact determination from the PEIS.
PEIS = Programmatic Environmental Impact Statement, SMR = Small Modular Reactor, LWRs = Light Water Reactor, SEIS = Supplemental Environmental Impact Statement, CRN-1 = CRN Unit 1

2.6. Environmentally Preferable Alternative

In the short-term, Alternative A – No Action causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources at the CRN Site. However, the No Action Alternative does not meet the purpose and need for the project, nor enable TVA to demonstrate the feasibility of SMR technology deployment at the CRN site, which informs TVA's analysis of whether SMRs can support TVA's increasingly clean electricity generation goals for firm, fixed, reliable, affordable electricity for the people we serve. Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 would forward technology innovation efforts aimed at developing future electricity generation capabilities which could replace aging and more environmentally impactful technologies. Therefore, over the long-term, Alternative B1 would be the environmentally preferable alternative.

2.7. TVA's Preferred Alternative

TVA's preferred alternative is Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 on the CRN Site. Alternative B1 meets the purpose and need of the project to support TVA's goal to demonstrate the feasibility to design, construct, operate, and decommission SMR technology at the CRN Site. Alternative B1 supports the recommendations outlined in TVA's 2019 IRP (TVA 2019a).

2.8. Summary of Mitigation Measures and Best Management Practices

Best Management Practices (BMPs), mitigation measures, and commitments identified in Section 2.9 of the PEIS are incorporated by reference with the following changes. Additional project specific BMPs may be applied as appropriate on a site-specific or technology-specific basis to enable efficient maintenance of construction projects and further reduce potential impacts on environmental resources.

2.8.1. Updated Best Management Practices

- BMPs would be implemented including those described in A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority (TVA 2022c).

2.8.2. Updated Proposed Mitigation Measures

- If an onsite quarry is needed, detailed quarry plans would include construction of detention basins within the quarry area to manage and control flow before its discharge to the Reservoir in accordance with NPDES permitting requirements (TVA 2023a).
- TVA would develop and implement all appropriate water quality control measures and practices as part of the quarry design and operations, including integration of the quarry as part of the stormwater pollution prevention plant (SWPPP) and integrated pollution prevention plan (IPPP).
- To compensate for unavoidable impacts to WOTUS and/or TDEC regulated waters, including wetlands, TVA would implement a wetland and stream mitigation plan including compensatory mitigation in accordance with USACE and TDEC requirements.
- Conservation measures, including removal of up to 250 acres of trees in winter (November 15 – March 31) to avoid nesting and roosting wildlife and installation of artificial bat roosting structures, would be implemented to minimize adverse impacts to bats. Additional avoidance and minimization measures would reduce or eliminate the potential for drilling

and blasting to impact bats roosting in caves. Consultation under Section 7 (a)(2) of the ESA is underway regarding potential impacts to federally listed bats for construction and operation activities. Potential impacts to federally listed tree-roosting bats alongside existing transmission line corridors were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7 (a)(2), originally completed in April 2018 and updated in May 2023 and November 2024 (USFWS 2024b). For those activities with potential to affect federally listed bats, TVA committed to implementing specific conservation measures in addition to those resulting from the formal USFWS consultation undertaken for construction and operation of CRN-1.

- TVA would implement sustainability measures during construction of CRN-1 to include development of pollinator habitats and other sustainable development and land management policies in association with development and implementation of a site biodiversity plan in accordance with TVA's Biodiversity Policy (TVA 2021b).
- TVA has expanded the Grassy Creek Habitat Protection Area (HPA) by 14 acres to provide protection to two state-listed rare plants species.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. Scope of Analysis

This chapter describes the baseline environmental conditions (affected environment) of environmental resources in the CRN-1 Project Area (Figure 1-2) and anticipated environmental consequences that would occur from implementation of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1 described in Chapter 2. As noted in Section 2.5, Alternative A - No Action has not changed from the PEIS and therefore the impacts associated with this alternative are incorporated by reference

3.1.1. Impact Assessment

Environmental consequences of the proposed action and alternative are and will continue to be assessed in multiple phases, including those associated with site preparation, construction, operation, and decommissioning activities at the CRN Site. For the purposes of this SEIS, construction phase activities include pre-construction or site preparation (grading, excavation, infrastructure development, and other actions), actual fabrication and erection of the nuclear reactor and associated facilities, other site improvements, and related interfaces and operations. Notably, the NRC differentiates between “preconstruction” and “construction” based on their licensing jurisdiction (10 CFR 51.4) and has clarified that nuclear power plant construction refers to those activities having a nexus to radiological health and safety and/or common defense and security. Further, NRC has also clarified that preconstruction includes clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. These preconstruction activities may take place before the application for an ESP, CP, or combined license is submitted, but are subject to the authority of local, state, or other Federal agencies as appropriate. Because TVA is subject to NEPA and other federal laws and regulations, TVA must complete an environmental review prior to taking any decision-making action on either alternative considered in this SEIS. Impacts from these activities are evaluated in this chapter together as part of the “construction” phase.

Impacts to the environment may be beneficial or adverse and may apply to the full range of natural, aesthetic, historic, cultural, and socioeconomic resources within the CRN-1 Project Area and surrounding area. Impact severity is dependent upon their relative magnitude and intensity and resource sensitivity. In this document and in the PEIS, four descriptors are used to characterize the level of impacts in a manner similar to that described by the NRC and consistent with TVA’s current practice. In order of degree of impact, the descriptors are as follows:

- No Impact (or “absent”) – Resource not present or affected by project alternatives under consideration.
- Minor (similar to NRC’s “SMALL”) – Environmental effects are not detectable or are so small they would not noticeably alter any important attribute of the resource.
- Moderate – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- Large – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

This SEIS tiers from the PEIS and updates the affected environment and related impact analyses associated with PEIS Alternatives A and B. With few exceptions the assessment of impacts associated with PEIS Alternative B reflect the more detailed designs associated with the deployment of CRN-1 including the site layout plan and arrangement of site structures, grading, characteristics of the cooling system, roadway improvements and related transportation features, and transmission system elements (i.e. transmission line, switchyard). In addition, to provide for greater flexibility for certain project elements, TVA has included a bounding approach to encompass characteristics of the proposed action and impacts for two project elements:

- Cooling water intake structure type and configuration
- Source and methods for obtaining qualified backfill for CRN-1

3.1.2. SEIS Data Review

As part of the development of this SEIS, TVA conducted a data review to identify any new information relevant to the assessment of potential impacts of construction, operation, and decommissioning of CRN-1 that differed from that considered in the PEIS. This thorough and systematic review considered changes in the characteristics of baseline environmental conditions (affected environment) since 2021 and the potential impacts based on the description of the proposed action in Chapter 2.

As part of this analysis, TVA reviewed each resource category to identify key inputs that were relied on to support the findings and conclusions in the PEIS including:

- Characteristics of the affected environment for each environmental resource
- Reactor or site design characteristics or attributes

Resource subject matter experts (SMEs) reviewed the affected environment, assessed impacts to respective resources and compared their findings to key inputs used in the PEIS. Assessment of environmental impacts for each resource followed a typical analysis of direct, indirect, and cumulative effects of the proposed action on environmental resources. As appropriate, this analysis considered the relevant context (geographic reference areas), sensitivity or rarity of the resource, and magnitude (intensity) of effect. Use of BMPs and measures to avoid, minimize, and/or mitigate potential impacts were also considered in the impact assessment process.

For the cumulative effects analysis, past, present, and reasonably foreseeable future actions previously identified in the PEIS were updated and supplemented with current information (see Section 3.1.6).

Based on the new information for each key input and its potential environmental impacts, SMEs determined whether the information was either consistent with the previous information included in the PEIS or notably different:

- Consistent – information that was effectively the same or substantially similar to that considered in the PEIS.
- Notably different – information that was new and not previously considered or substantially different from that considered in the PEIS.

Key inputs determined to be “consistent” correspond to topics or analyses that are incorporated by reference from the PEIS; whereas key inputs determined to be “notable” are discussed in relevant sections within this chapter, as appropriate.

3.1.3. Content Incorporated by Reference

Information from the PEIS that is substantively unchanged and therefore not notably different is incorporated by reference into this SEIS. Having conducted the data review described in Section 3.1.2 of this document, TVA determined several resource sections are fully bounded by the analyses, control measures, and commitments included in the PEIS. Either the information and the related impact analyses for the resource may be unchanged or the impacts of any new information were effectively the same as that described for the PEIS. Additionally, for these resources the scope and magnitude of impact is noted to be reduced from that characterized in the PEIS due to the substantially reduced scope of the proposed action (see Section 3.1.4). Therefore, the following resource analyses are incorporated by reference from the PEIS in their entirety:

- Geology and Soils (PEIS Section 3.2)
- Meteorology, Air Quality, and Climate Change (PEIS Section 3.11)
- Noise (PEIS Section 3.14)
- Socioeconomics (PEIS Section 3.15)
- Environmental Justice (PEIS Section 3.16)
- Solid and Hazardous Waste (PEIS Section 3.18)
- Public Safety and Nonradiological Health (PEIS Section 3.19)
- Radiological Effects of Normal Operations (PEIS Section 3.20)
- Nuclear Plant Safety and Security (PEIS Section 3.22)
- Decommissioning (PEIS Section 3.23)

3.1.4. Project Elements from the PEIS Excluded from SEIS Analysis

Some of the site development features and activities described in the PEIS have been updated as appropriate for CRN-1 and are assessed in this SEIS. However, the following have been eliminated or modified under the proposed alternative and are therefore not assessed:

- Extensive shoreline stabilization (eliminated except for localized stabilization measures in proximity to the intake and discharge structures)
- TN 95 access
- Melton Hill Hydroelectric dam bypass
- Northbound access ramp between TN 58 and Bear Creek Road
- Supplemental onsite barge landing area
- Railroad offload area
- Upgrades and reconductoring within existing transmission line corridors beyond the Bear Creek Road interconnect (only considered part of TVA’s ongoing maintenance program)

- Development of Area 2 as defined in the PEIS

With the elimination of these project development activities, impacts to various resources described in the PEIS will not occur and therefore, impacts under CRN-1 are substantially reduced as described throughout this chapter.

3.1.5. Reasonably Foreseeable Future Actions

CEQ's revised 2024 NEPA regulations (40 CFR 1508.1(i)) include the requirement that agencies consider changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and include the following:

> (3) Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time.

Having conducted the data review described in Section 3.1.2 of this document, TVA performed an extensive review to identify updated information pertaining to actions included in the PEIS Table 3-1, as well as new actions that were not previously considered in the cumulative effects analysis PEIS. Table 3-1 of this SEIS identifies past, present, and reasonably foreseeable future actions (RFFAs) within a 15-mile radius of the CRN Site and identifies those that are either new or updated from those addressed in the PEIS. Potential cumulative effects are considered in this PEIS if they are expected to occur at the same time and place as the proposed action and may overlap in time and geography. Actions that occur in the "past" or "present" inherently have exerted environmental effects that are already integrated into the base condition for each of the resources analyzed in the affected environment described in the PEIS.

Past and present actions and those RFFAs whose status had not changed were assumed to be encompassed in TVA's prior analysis and were therefore not considered to be new information. TVA identified new information related to the following:

- TVA generation/site projects
- Other energy/DOE related projects
- Transmission projects
- Other industry/development projects
- Transportation projects

For all environmental resources except transportation and cultural resources, TVA determined that the new information would not result in cumulative effects different than those documented in the PEIS. Therefore, the cumulative impact assessment in this SEIS only addresses those two environmental resources. The cumulative impact analyses for all other resources are incorporated by reference.

Table 3-1. Summary of Reasonably Foreseeable Future Actions in Proximity to the CRN Site

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
TVA Generation/Site Projects					
CRN Site Grassy Creek Bridge Replacement	Replacement of a damaged culverted crossing and temporary bridge with new culvert and permanent bridge to access the CRN Site.	N/A	Completed in 2023 by TVA	N	None
CRN Site National Reactor Innovation Center (NRIC) Project	The CRN Site has been identified as a candidate host location for an NRIC construction demonstration project.	N/A	NRIC is currently engaged in final site selection, design, and planning.	N	--
CRN Site Culvert Replacement Project	Replacement of 2 culverts on CRN Site River Road	N/A	Completed 2023	N	TVA 2023b.
Other Energy/DOE Related Projects					
Retirements and Replacement of the Kingston FP	TVA would demolish the nine existing Kingston FP coal units, construct a new 1,500-MW natural gas dual-fuel capable combined cycle aeroderivative combustion turbine plant, a 3 to 4 MW solar array, a 100 MW battery energy storage system, and a new transmission line infrastructure on the Kingston Reservation. Off-site transmission system upgrades are proposed along six existing transmission lines located in Eastern Tennessee.	8 miles west	TVA released a FEIS on February 16, 2024 that evaluates the potential impacts of retirement and replacement. The April 2024 ROD reflects TVA's final decision regarding the Kingston retirement and replacement project.	N	TVA 2024a, b.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
Fusion Facility at Former Bull Run Fossil Plant	Pilot demonstration project to research, build, and operate a prototype fusion facility at the Bull Run Reservation. Project would utilize the former Bull Run Fossil Plant turbine building and construct some additional structures such as tanks.	15.5 miles northeast	TVA is in review of the project proposal, in discussions with the project proponent, and in planning for anticipated NEPA review.	N	Knox News 2024.
Retirement of the Bull Run Fossil Plant	Decontamination and deconstruction of 865-MW net-capacity coal-fired plant.	15.5 miles northeast	In December 2023, TVA retired the Plant. TVA released the Final EA for the Bull Run Fossil Decontamination and Deconstruction project in June 2023.	U	TVA 2023h.
Melton Hill Hydroelectric Facility Turbine and Rotor Replacement	TVA replaced the current variable blade Kaplan turbine with a fixed blade propeller turbine on Unit 1. Work included installation of discharge ring, turbine shaft, turbine guide bearing, generator shaft, wicket gate mechanisms, servo motors, shift ring, head cover, and other components.	4 miles east	TVA developed a categorical exclusion to satisfy NEPA requirements that was signed on 5/4/2021. Installation/testing of the turbine was being completed in 2023.	N	TVA 2021c.
Kairos Power, Limited Liability Company (LLC) Hermes Low Power Demonstration Reactor CP	Construct and operate Hermes to demonstrate key elements of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor technology for possible future commercial deployment.	3.5 miles northwest	NRC's FEIS was released August 17, 2023. Construction Permit was issued on December 12. 2023.	N	NRC 2023a. Kairos 2024.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
Kairos Power, LLC Hermes 2 Reactor CP	Construct and operate Hermes 2, consisting of two 35-MW reactors adjacent to the Hermes Test Reactor at East Tennessee Technology Park (ETTP) in Oak Ridge, TN.	3.5 miles northwest	CP application under review by NRC.	N	NRC 2023b.
TRISO-X Fuel Fabrication Facility	Construction of fuel fabrication facility at Horizon Center Industrial Park for production of TRISO-X fuel for use in Xe-100 reactors.	3 miles north-northeast	Groundbreaking occurred October 13, 2022. Facility is set to be commissioned and operational by 2025. NRC's EIS for the issuance of a license for the possession and use of special nuclear material is underway. The public scoping period closed February 14, 2023.	N	NRC 2022.
ETTP Property Transfer / Development of Heritage Center Industrial Park	Transfer of DOE property to private companies/Community Reuse Organization of East Tennessee and development of the 1,200-acre Heritage Center. Both new and renovated industrial buildings are available for sale or lease, as well as approximately 555 acres served by a robust, redundant utility system.	2 miles north	In 2020 core clean-up was completed at the ETTP site which included demolishing more than 500 structures, addressing major areas of soil contamination, and final cleanup decisions for the majority of ETTP. Remaining soil and groundwater remediation is underway and is expected to continue through 2024. An additional 600 acres is slated for transfer for economic development in the years ahead. Numerous parcels within	U	Oak Ridge Office of Environmental Management (OREM) 2023. Heritage Center 2022.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
			the Heritage Center industrial park have recently sold or are pending sale. DOE released its updated 10-year Program Plan in November 2022, which includes completion of soil and groundwater cleanup and all land transfers at ETTP within that period.		
Oak Ridge National Laboratory (ORNL)	Remediation of radiologically and chemically contaminated facilities	Within Oak Ridge Reservation (ORR)	DOE released its updated 10-year Program Plan in November 2022. The plan includes removal of all uranium-233 inventory and debris, all transuranic waste at ORNL, as well as remediating numerous former reactors, associated infrastructure, and shuttered laboratories within the central campus.	U	OREM 2022a.
Y-12 National Security Complex	Remediation of contaminated facilities and mercury contamination.	Within ORR	DOE and the National Nuclear Security Administration released an updated 10-year Program Plan in November 2022. The plan includes the demolition of high-risk buildings at Y-12 and remediation of underlying contaminated soil and groundwater.	N	OREM 2022a.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
Uranium Processing Facility at Y-12	Construction of a multi-facility complex to replace aging infrastructure at Y-12; will have processing capabilities for enriched uranium casting, oxide production, and salvage and accountability operations to support the United States' nuclear weapons stockpile, defense nuclear non-proliferation, and naval reactors program.	Within ORR	Uranium Processing Facility is currently under construction. Construction of four of the seven project components is complete. Construction advertised to be complete by the end of 2025.	U	Bechtel Corporation 2023. Oakridger 2022. DOE 2011.
Outfall 200 Mercury Treatment Facility at Y-12	Construction of headworks, treatment facility, and interconnecting pipeline for mercury treatment facilities.	Within ORR	Construction was scheduled to be complete in December 2022 with commissioning and start up activities through mid-2023; however, construction delays have occurred. Construction crews installed the initial equipment to the project's treatment plant site and placed micro-piles to help lay the foundation for the headworks facility site in March 2023.	N	Oakridger 2023a.
Sludge Processing Mock Test Facility at ORNL	The facility will play a vital role in maturing technologies needed to continue processing Oak Ridge's inventory of transuranic sludge waste. DOE's OREM's contractor will test six critical technology elements to gather the data necessary to complete the final design and construction of the	Within ORR	Site preparation for the Sludge Processing Mock Test Facility was completed in 2022. DOE's OREM anticipates approximately two years of testing to gather the data needed to confirm the best designs and approaches	U	OREM 2020. OREM undated.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
	Sludge Processing Facility later this decade. Two of those technologies will be tested at the mock test facility.		for the Sludge Processing Facility's final design.		
Oak Ridge Enhanced Technology and Training Center	Operation of a facility to train first responders and other experts in nuclear operations, safeguards, and emergency response. Facilities consist of a Simulated Nuclear and Radiological Activities Facility and a Technical Rescue Training Area; an Emergency Response Training Facility; a maintenance building; and utilities, roads, and supporting infrastructure.	5.5 miles north	Construction has been completed. Facility opened on January 9, 2023.	N	Oakridger 2023b.
Ultra Safe Nuclear Corporation (USNC) Pilot Fuel Manufacturing Facility	A Pilot Fuel Manufacturing operation at the ETTP, site of Manhattan Project's former K-25 gaseous diffusion plant. USNC commissioned and operates production-scale modules involved in manufacturing of TRISO coated fuel particles and its proprietary Fully Ceramic Micro-encapsulated (FCM®) fuel.	3 miles north	USNC held a ribbon cutting on August 18, 2022.	N	Nuclear Newswire 2022.
Environmental Management Waste Management Facility	Landfill for low-level radiological and hazardous wastes generated from ORNL/ORR's cleanup projects comprised of six disposal areas, or cells, that have a total disposal capacity of 2.3 million cubic yards.	2 miles north within ETTP	The existing Environmental Management Waste Management Facility disposal area has only 18% capacity remaining. As a result, the Environmental Management Disposal	U	OREM 2022b.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
			Facility is being constructed.		
Environmental Management Disposal Facility	DOE OREM's contractor will build a new hazardous and radioactive waste disposal facility to manage radioactive, hazardous, and toxic wastes generated by the remediation of Y-12, ETTP and ORNL.	Within ORR	On September 30, 2022, the DOE, the EPA, and TDEC signed a ROD completing the Comprehensive Environmental Response, Compensation, and Liability Act process. A ground-breaking was conducted in 2023.	U	TDEC 2023.
Orano Project Ike	Orano would develop the "Project Ike" a 750,000 square foot uranium enrichment facility on 920 acres of DOE land in the ETTP. Anticipating 305 new full-time jobs.	5 miles north	Planning and licensing application in development	N	Orano USA 2024.
Transmission Projects					
Future Transmission Uprates and Reconductoring	Various uprate and reconductoring projects beyond the first transmission interconnect with the CRN Site. These are subject to recurring TVA maintenance activities, new TVA projects, and would largely be conducted within existing Transmission Line corridors. Actions may include transmission upgrades to address potential thermal overloads, transmission loops, fiber lines, and new or upgraded breakers.	Various	Subject to future TVA transmission and project planning.	N	None
Other Industry/ Development Projects					

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
Tellico West Industrial Park	Approximately 225-acre industrial park.	20 miles south-southeast in Vonore, TN	Facilities and parcels in the Park are available for development.	U	Tellico Reservoir Development Agency 2023.
Roane Regional Business and Technology Park	Business and Industrial Park (655 acres) with sites for development.	1 mile east	Currently 24 sites are available for development. On June 17, 2022, the Jones Road Site, the largest site in the park (40 acres) was sold to The TPA Group, a developer from Atlanta, Georgia, for $1.3M, with plans to build a 250,000 square foot speculative building, a total planned investment of $32M. Site preparation and construction is underway. The Roane Regional Business and Technology Park Master Plan has identified approximately 317 acres available for development.	U	Roane ESC, Undated. Roane Alliance 2022. Roane ECD 2018.
Roane County Industrial Park Cardiff Valley Road Site	Roane Specialized Services, LLC (made up of Roane Transportation and Roane Metals) purchased the 45-acre site. Plans included the addition of a new corporate office and warehouse facility, truck fleet parking, and storage space for their existing customers.	15 miles west	Roane County Industrial Development Board accepted formal offer in February 2021. Construction of a 50,000 square foot warehouse and corporate office completed in 2023.	U	Roane Alliance 2021. Shea 2023.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
Horizon Center Industrial Park	1,000-acre business park that can accommodate 4 million square feet of space for research and development, light manufacturing, and office facilities. 500 acres have been set aside for environmental preservation and protection.	4 miles north	Development sites available ranging in size from 11 to 148 acres.	U	Oak Ridge Industrial Development Board 2023.
Helium Test Facility	Test facility to support small modular reactor design validation.	5 miles north	15-acre project site in Horizon Center Industrial Park currently in planning stage for facility development.	N	Kinectrics 2023.
Rockwood Iron and Metal Cleanup Project	Clean up of former ironworks and metals operations.	18 miles west	EPA has designated the site as a non-NPL Superfund (Brownfields) site. An Eligible Response Site Exclusion decision has been made at this site. Clean up is dependent on state-led action.	U	EPA 2023a.
Smoky Mountain Smelters	Clean up of former fertilizer and smelting operations.	25 miles east	EPA placed the site on the Superfund NPL in 2010 because of contaminated soils, sediment, and surface water resulting from past industrial operations at the site. The USEPA has performed short-term cleanup actions to stop immediate threats. The Remedial Action began in February 2023	U	EPA 2023b.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
			and was completed by September 2023.		
Transportation/Infrastructure Projects					
Oak Ridge General Aviation Airport	Development of a general aviation airport to support projected growth in the region. The proposed airport includes a 5,000-foot runway and would support general aviation in the vicinity of Oak Ridge.	3 miles north	The State of Tennessee's 2023 budget included $11M which was used towards the purchase of property. A Draft EA (April 2023) was issued by the Federal Aviation Administration. A public hearing was conducted in August 2023. The goal is to have the airport completed and operational in 2026. Airport plan paused due to the proposed Orano facility. Airport location uncertain.	U	City of Oak Ridge 2024b. GMC 2023. Oakridger 2024a.
Future Planned TDOT or Local Roadway Improvement Projects within Project Vicinity	Roadway improvement projects in Roane County including bridge repair/replacement, resurfacing, maintenance, and repair.	Various	As of January 23, 2023, TDOT lists 317 projects that are underway or planned within Roane County. An additional 1,317 projects are identified within the surrounding counties of Loudon (212), Knox (820), and Anderson (285).	U	TDOT 2023.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
City of Oak Ridge Water Treatment Plant	The City of Oak Ridge has designed and is constructing a new ultrafiltration membrane drinking water treatment plant to replace the existing 80-year-old conventional treatment plant, which is currently at capacity and beyond its useful life. The project also includes construction of raw water intake pumps, traveling screens, a finished water pump station, and water pipelines as well as the rehabilitation of the existing finished water tanks. The new plant will have a capacity of 12 million gallons per day and will be located at the existing raw water intake off Pump House Road.	11 miles northeast	Groundbreaking occurred on October 19, 2022. The plant is expected to be operating by spring 2025.	U	EPA 2023c.
Other Industry/Development Projects					
Downtown Oak Ridge Development Project	Downtown Oak Ridge development project along the Wilson Street corridor creating an intimate, walkable and urban place with buildings addressing the street, flanked by generous sidewalks and streetscapes. Restaurants, shops, offices, apartments, condominiums, and green spaces combine to make a vibrant new district.	11 miles northeast	On January 13, 2020, Oak Ridge City Council unanimously approved (7-0) a resolution endorsing the Vision for the Wilson Street Corridor. A request for proposals was issued to develop the now mostly vacant land. In March 2022 two firms were selected and the two proposals were blended into a single master plan.	N	Oak Ridge 2020. Ballard 2023.
The Preserve at Clinch River	The Preserve is a 1,400-acre, master planned community,	2-3.5 miles west	Located west of TN 58, construction began in 2002	N	The Preserve 2023.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
	currently separated into eight neighborhoods.		and new homes continue to be constructed. Additional areas are planned for development, and lots continue to be released for sale. Three of the neighborhoods have sold all available lots.		
Roane County School Construction	Proposed plan would retire Kingston, Harriman, and Rockwood high schools, combining them in a new 1600 student facility near Roane State Community College. It would also include moving Oliver Springs High to the Oliver Springs Middle school, adding a new gym and technical education space, sewer upgrades for the Midway area schools, moving Ridge View Elementary to Rockwood High School and moving Harriman Middle School to Harriman High School.	13 miles west	On July 9, 2018, the Roane County Commission voted unanimously against a property tax increase that would help fund the entire project. However, the County Commission did fund the Oliver Springs and Midway portions of the project. On April 27, 2021, the Roane County School Board approved a motion to study building a new Roane County High School and another new high school that would combine Harriman and Rockwood. The study would also provide information on moving Ridge View Elementary School to Rockwood High School and moving Harriman Middle School to Harriman High School.	N	Ball 2018. Jones 2021.

Project Name	Description	Approximate Distance from CRN Site	Status	New (N), Updated (U), or Discontinued (D)	Reference(s)
American Nuclear Corporation	Producer of radioactive sources and detectors, active from 1962 to 1970. License revoked in 1970 after discovery of contamination leaking into the Clinch River.	15 miles northeast	Remediation of the site began in spring 2024 and remains in progress. Activities include stabilizing building contamination for safe dismantling and demolition; dismantling and demolishing the former facility and hot cell, excavating contaminated soils and buried debris, and transporting and disposing of contaminated materials to an approved offsite disposal facility. Work could be completed in late 2024.	N	Cooper 2022. EPA 2024. Oakridger 2024b.
Actions Evaluated in ESP Proceeding that are No Longer Considered					
Roane-Pineville 500-kV Transmission Line	70-mile-long transmission line	--	Proposed in-service date of 2018. Project has not been progressed and is presumed to be discontinued.	D	--

Notes: D = Discontinued, N= New, U = Updated

CP = Construction Permit, CRN = Clinch River Nuclear, DOE = U.S. Department of Energy, EIS = Environmental Impact Statement, EPA = U.S. Environmental Protection Agency, ETTP = East Tennessee Technology Park, FCM = Fully Ceramic Micro-encapsulated, FEIS = Final Environmental Impact Statement, FP = Fossil Plant, GEH = GE Hitachi Nuclear Energy, LLC = Limited Liability Company, M = Million, MW = Megawatts, NEPA = National Environmental Policy Act, NRC = U.S. Nuclear Regulatory Commission, NRIC - National Reactor Innovation Center, OREM = Oak Ridge Office of Environmental Management, ORNL = Oak Ridge National Laboratory, ORR = Oak Ridge Reservation, ROD = Record of Decision, TDEC = Tennessee Department of Environment and Conservation, TDOT = Tennessee Department of Transportation, TVA = Tennessee Valley Authority, USNC = Ultra Safe Nuclear Corporation

3.2. Water Resources

3.2.1. Affected Environment

3.2.1.1. Surface Water Resources

Surface water resources at and in the vicinity of the CRN Site are described in PEIS Section 3.3.1.1. The PEIS also presents information regarding surface water use in the region and in the vicinity of the CRN Site. Surface water quality on the CRN Site was also presented based on the preapplication sampling program.

One issue was not resolved regarding surface water hydrology in the PEIS. As stated in Section 3.3.2.2.1.1 of the PEIS, the USACE would be asked to issue a jurisdictional determination verifying which wetlands and other waters at the CRN Site are jurisdictional under the CWA. As such, the jurisdictional limits of onsite streams and wetlands and the associated Section 401 Water Quality Certification and related Section 404 permitting was an unresolved issued in the PEIS.

3.2.1.1.1. Surface Water Hydrology

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to surface water hydrology that is consistent with that considered in the PEIS:

- Hydrologic characteristics of the Reservoir
  - Water elevations of the Reservoir

TVA also identified new information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.2.1.1.1.1. Bathymetry

Updated bathymetric mapping was conducted by TVA in 2022 (TVA 2022da). Based upon bathymetry data, in general, bank heights are approximately 15 to 18 feet above the channel bottom. A submerged bar exists near CRM 16.0 and just upstream of the proposed CRN-1 diffuser location. The top elevation of the bar ranges from 734 to 736 feet, which is below the average water surface elevation (737 to 738 feet), and substantially lower than the summer pool elevation of 741.25 feet. A very small area of the bar is exposed at the winter pool elevation of 735.5 feet.

The streambed low elevations, or thalweg, range from approximately 714 feet to 720 feet with only a minor downward trend in the downstream direction around the CRN Site. There are isolated pools along the right descending bank near CRM 16.5 to 17.0 with bed levels as low as approximately 710 feet.

3.2.1.1.1.2. Specific Surface Water Resources on the CRN Site and Associated Offsite Areas

The Project Area footprint for the CRN-1 project is updated from that in the PEIS. Therefore, TVA updated the surface water resource delineations and functional assessments for streams and ponds located on the CRN-1 Project Area. The updated surface water resources identified on the CRN Site and associated offsite areas are illustrated in Table 3-2 and Figure 3-1.

Table 3-3 provides a summary of the updated survey results of non-wetland surface water resource delineations within the Project Area. Wetland resources are discussed in Section 3.5. New information includes quantification of length/area of surface water resources. The 2021 surface water resource delineation identified fewer ponds, perennial streams, and Wet Weather Conveyance (WWCs) and two additional intermittent streams within the CRN Site Project Area. The reduced number of ponds on the CRN Site is due to the reclassification of all or parts of onsite ponds as wetland areas (e.g., W007, W011, W028) or the redesignation of a feature as a constructed non-wetland depression (e.g., P03). Additionally, there were notably fewer WWCs found in the BTA in the 2021 surface water resource survey because the survey focused on the narrower areas of anticipated impact rather than the entirety of the BTA. Differences among identified streams and WWCs is also due to the reclassification of these resources based upon field observation during the updated delineation and the addition of the associated 161-kV offsite transmission line corridor.

Table 3-2. Surface Water Resources (streams/ponds) on the CRN Site and Associated Offsite Areas

Location	Type	Identifier	Number	Length (feet)	Area (acres)
	CRN Site Shoreline[1]	R01a		29,659	
	BTA Shoreline[2]	R01b		7,564	
CRN Site					
	Ponds		**3**		**0.65**
		P01			0.31
		P02			0.18
		P04			0.16
	Perennial Streams		**3**	**2,777**	
		STR07		603	
		STR11		2,116	
		STR12		58	
	Intermittent Streams		**4**	**878**	
		STR04		165	
		STR05		299	
		STR06		123	
		STR10		291	
	WWCs		**14**	**6,056**	
		EPH03		139	
		EPH04		56	
		EPH05		25	

Location	Type	Identifier	Number	Length (feet)	Area (acres)
		EPH06		118	
		EPH07		124	
		EPH08		124	
		EPH09		614	
		EPH10		679	
		EPH11		1,052	
		EPH12		919	
		EPH13		540	
		EPH14		322	
		EPH18		83	
		EPH19		1,261	
		Associated Offsite Areas			
		Barge and Traffic Area			
	Ponds		**0**		**0**
	Perennial Streams		**1**	**1,666**	
		STR03[3]		1,666	
	Intermittent Streams		**1**	**335**	
		STR01		335	
	WWCs		**2**	**1,107**	
		EPH01		553	
		EPH02		554	
		161-kV Offsite Transmission Corridor			
	Ponds		**0**		**0**
	Perennial Streams		**1**	**384**	
		STR09		384	
	Intermittent Streams		**2**	**1,301**	
		STR08		1,181	
		STR17		120	
	WWCs		**1**	**242**	
		EPH18		242	
		Project Area Total			

Location	Type	Identifier	Number	Length (feet)	Area (acres)
	Ponds		**3**		**0.65**
	Perennial Streams		**5**	**4,827**	
	Intermittent Streams		**7**	**2,514**	
	WWCs[4]		**16**	**7,405**	

Sources: NRC and USACE 2019; TVA 2022a
Notes: BTA = Barge and Traffic Area; CRN = Clinch River Nuclear; kV = kilovolt; WWC = wet weather conveyance
1) Approximately CRM 14.2 to CRM 18.9
2) Approximately CRM 13.9 to CRM 14.2
3) STR03 considered to be a backwater feature of the Reservoir and not a unique stream feature for the BTA.
4) WWC EPH18 crosses from the CRN Site into the 161-kV transmission corridor and is only counted once in the Project Area total.

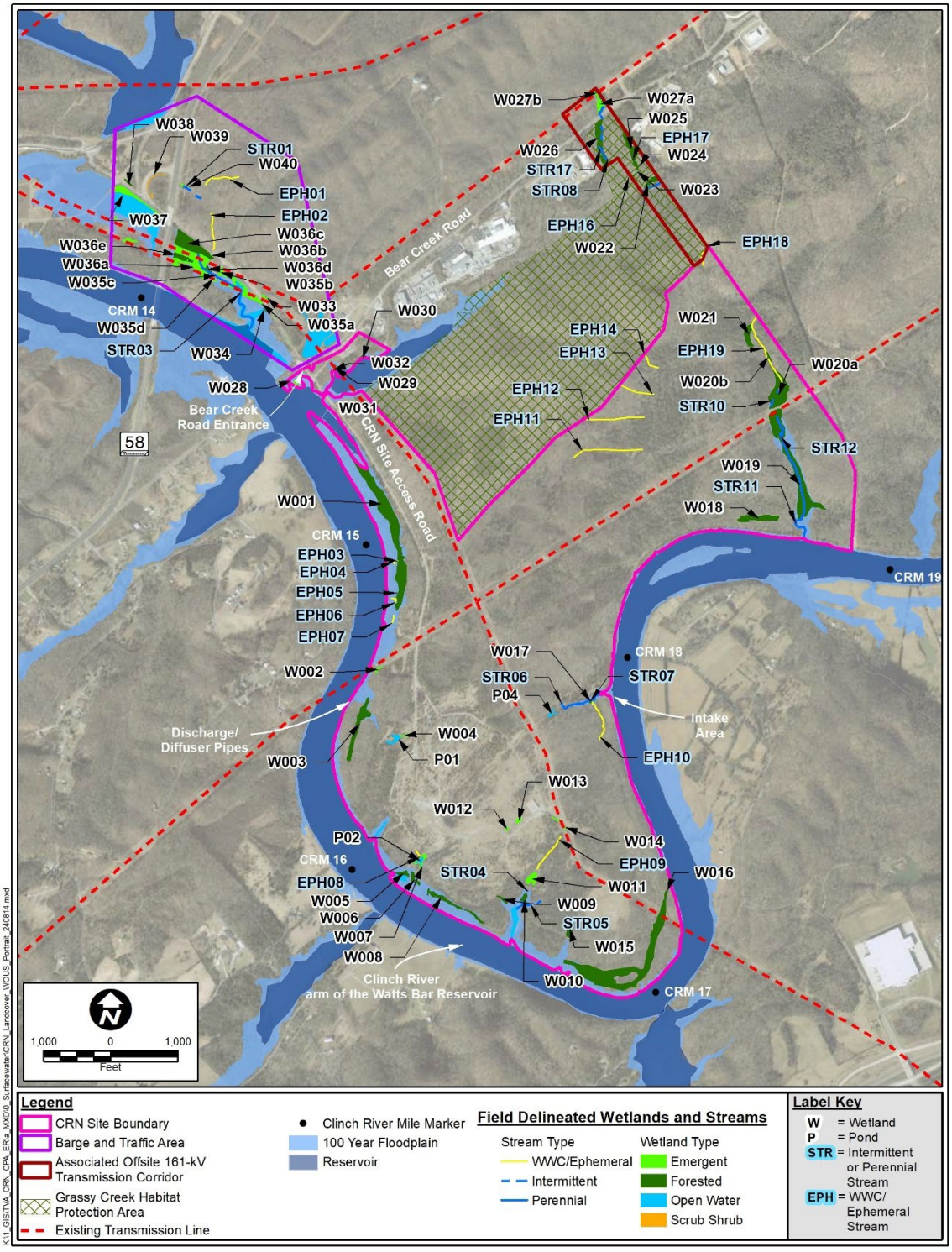

Figure 3-1. Identified Surface Water Resources on the CRN Site and Associated Offsite Areas

Table 3-3. Updated Surface Water Resources (streams/ponds) on the CRN Site and Associated Offsite Areas

Location	Type	Updated Surface Water Resource Delineations[1]		
		Number	Length (feet)	Area (acres)
CRN Site	Ponds	3	-	0.65
	Perennial Streams	3	2,777	-
	Intermittent Streams	4	878	-
	WWCs	14	6,056	-
Barge and Traffic Area	Ponds	0	-	0
	Perennial Streams	1	1,666	-
	Intermittent Streams	1	335	-
	WWCs	2	1,107	-
161-kV Offsite Transmission Corridor	Ponds	0	-	0
	Perennial Streams	1	384	-
	Intermittent Streams	2	1,301	-
	WWCs	1	242	-
Project Area Total	Ponds	3	-	0.65
	Perennial Streams	5	4,827	-
	Intermittent Streams	7	2,514	-
	WWCs[2]	16	7,405	-

Source: TVA 2022b
Notes: CRN = Clinch River Nuclear; kV = kilovolt; WWC = wet weather conveyance; "-" = not applicable
1) Wetlands are excluded from this table. See Section 3.5.
2) WWC EPH18 crosses from the CRN Site into the 161-kV transmission corridor and is only counted once in the Project Area total.

3.2.1.1.2. Water Use

City of Oak Ridge water capacity is relevant as most of the surface water used by the City of Oak Ridge is withdrawn from Melton Hill Reservoir, which feeds the Clinch River arm of the Watts Bar Reservoir. Additionally, water necessary for the project is intended to be supplied by the City of Oak Ridge.

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to surface water use that is consistent with that considered in the PEIS:

- Net water demand in the Clinch River Basin
- Non-consumptive and consumptive water use
- Water demand and capacity for the City of Oak Ridge

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.3.1.1 is incorporated by reference.

3.2.1.1.3. Water Quality

TVA did not identify any relevant new information related to regional water quality, state monitoring and 303(d) listed impaired waters, or the TVA reservoir monitoring program.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to surface water quality that is consistent with that considered in the PEIS:

- Onsite and vicinity surface water quality
- Surface water quality in onsite stormwater retention ponds
- Temperature of the Reservoir

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.2.1.1.3.1. Sediment Characteristics within of the Reservoir

As a result of hazardous and radioactive contamination of benthic sediments from historical practices and activities that occurred upstream of the CRN Site, the Reservoir from CRM 0.0 to CRM 44 is designated as a Comprehensive Environmental Response, Compensation, and Liability Act site (EPA 1997). Contaminants exceeding background levels in 2015, as identified in the PEIS, included aluminum, boron, lithium, potassium, and cesium-137.

In 2011, sediment samples were collected at locations on the Clinch River at CRMs 15.5, 18.5 and 22.0 to characterize contaminants present. TVA characterized contaminants present in benthic sediments in 2023. In 2023, sediment samples were collected at CRMs 14.0, 15.0, 18.0, and 21.5.

Due to riverine conditions in the Reservoir, depositional areas were lacking in the mid-channel area. The mid-channel substrates were predominantly composed of varying proportions of bedrock, cobble, gravel, sands, and/or mollusk shells. Depositional areas were encountered only at near-shore locations, primarily where bank structures divert enough river flow to reduce velocities enough to allow suspended sediments (silts and clays) to be deposited. Additionally, only shallow layers (up to 4 inches deep) of depositional sediments were encountered, and most depositional sediments were mixed with a high proportion of sand.

The analytical results for sediments were compared to EPA Region 4 ecological screening values for freshwater sediments (TVA 2023c) as well as constituent concentrations in sediment samples collected between 2010 and 2022 at far-field locations upstream (Melton Hill Reservoir, CRM 24.5) and downstream (Watts Bar Reservoir, Tennessee River Miles 532.5 and 560.8) of the CRN Site. EPA's ecological screening values are provided as a reference point only. Results exceeding these screening values do not necessarily indicate that constituent concentrations were elevated above background for the given area/region (TVA 2023c).

Polychlorinate biphenyls (PCB) and pesticides were not detected in the sediment samples collected in the vicinity of the CRN Site and metals concentrations were below EPA Region 4 ecological screening values. Additionally, the sediments collected in the vicinity of the CRN Site had lower metals concentrations than typically found in more lacustrine environments within

TVA reservoirs. Radiological parameters detected included low concentrations of gross alpha and gross beta that ranged from 2.86 to 24.4 picocuries per gram (pCi/g). Additionally, results for cesium-137, radium-226 and radium-228 were also low, ranging from 0.012 to 3.083 pCi/g. By comparison, ecological screening criteria values for Radium-226 and Radium-228 are substantially higher (100 and 90 pCi/g, respectively) (TVA 2023c).

The lack of high depositional areas near the CRN Site likely resulted in sediments having higher proportions of sands and gravels, or coarse particulates than typically encountered in more lacustrine environments where velocity is not sufficient to keep fine silts and clays in suspension. Higher fractions of coarse particulates can influence (reduce) the amount of adsorbed chemicals (chlorinated pesticides, PCBs, and most metals) present. Surficial sediments (upper 1.5 inches) collected at the far-field locations in Melton Hill and Watts Bar reservoirs were found to contain detectable concentrations of PCB Aroclor 1242 in some years. Furthermore, TDEC's Division of Water Pollution Control has issued fish consumption advisories for Melton Hill and Watts Bar reservoirs due to PCBs (TVA 2023c).

Results of these analyses indicated that the sediments in the Reservoir reach near the CRN Site are of higher quality than prior characterizations. Nonetheless, in accordance with the terms of the 1991 Watts Bar Interagency Agreement that includes the USACE, DOE, TDEC, and the EPA, TVA consulted with the Watts Bar Interagency Working Group regarding the sediment sampling results. On July 30, 2024, the Watts Bar Interagency Working Group concluded the results are below the risk-based action level of concern (Appendix C).

3.2.1.2. Groundwater

As described in the PEIS, groundwater at the CRN Site is present in both the unconsolidated surface materials and bedrock. The weathered bedrock acts as a water table aquifer with depth to groundwater within the CRN Site ranging from near surface to 25 feet below ground surface. The presence and orientation of rock fractures and the extent of conduits and cavities resulting from dissolution controls the occurrence and movement of groundwater at the CRN Site. Groundwater monitoring wells previously installed at the CRN Site provide information regarding seasonal changes in groundwater levels, groundwater quality and other groundwater parameters. The PEIS also presents information regarding groundwater use in the region and in the vicinity of the CRN Site. Water quality of groundwater on the CRN Site was also presented based on the preapplication sampling program.

3.2.1.2.1. Groundwater Hydrology

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to groundwater hydrology that is consistent with that considered in the PEIS:

- Measured or calculated groundwater parameters including gradient and velocity on the CRN Site

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.3.1.2 is incorporated by reference.

3.2.1.2.2. Groundwater Use

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to groundwater use that is consistent with that considered in the PEIS:

- Regional groundwater use levels
- Well locations within 1.5 miles of the CRN Site

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.3.1.2 is incorporated by reference.

3.2.1.2.3. Groundwater Quality

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to groundwater quality that is consistent with that considered in the PEIS:

- Onsite groundwater quality

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.3.1.2 is incorporated by reference.

3.2.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

3.2.2.1. Surface Water

3.2.2.1.1. Surface Water Hydrology

In PEIS Section 3.3.2, potential effects associated with development of the CRN Site on surface water were associated with construction phase direct and indirect impacts due to site grading, culvert replacement, transmission line development, and roadway improvements. The PEIS also concluded that other impacts could occur to aquatic ecosystems within the Reservoir due to construction of intake and discharge structures, extensive shoreline stabilization measures, flow bypass system at the Melton Hill Dam and development of a supplemental onsite barge facility. The PEIS stated that with implementation of mitigative measures, BMPs and adherence to state and federal regulations and permit requirements, impacts would be minor.

Potential operational impacts summarized in the PEIS include those associated with operation of the cooling water intake structure, impacts from the discharge, and stormwater runoff. TVA would design the intake and discharge structure to meet Best Technology Available criteria, and to reduce scour and minimize effects to surface water resources. Based on that information, the PEIS concluded that impacts on aquatic resources from operation were determined to be minor.

3.2.2.1.1.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on surface water hydrology that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.2.2.1.1.1.1. Hydrologic Alterations to Onsite and Offsite Streams, Ponds, and WWCs

The CRN-1 site grading plan and site layout plan provide detailed information on the extent of hydrological alterations that would occur as a result of construction activities in the Project Area and associated offsite land areas. Figure 3-2 identifies the surface waters and wetlands that would be disturbed by the CRN-1 Project. These disturbances include land clearing and grading activities that may entail the placement of fill material in the identified surface water resource. Table 3-4 presents a summary of total impacts to individual streams, ponds, and WWCs on the CRN Site and associated offsite areas.

In total, the proposed action would result in permanent impacts to:

- 0.65 acres of three ponds (P01, P02, and P04)
- 3,586 lineal feet of 11 perennial/intermittent streams (STR03, STR04, STR05, STR06, STR07, STR08, STR09, STR10, STR11, STR12, and STR17)
- 2,694 lineal feet of eight WWCs (EPH02, EPH03, EPH04, EPH08, EPH09, EPH10, EPH18, and EPH19)

The proposed action would also result in temporary impacts to:

- 101 lineal feet of three perennial/intermittent streams (STR01, STR03, and STR04)
- 64 lineal feet of three WWCs (EPH02, EPH04, and EPH10)

Permanent impacts to streams STR11 and STR12 on the CRN Site are related to building a new 161-kV transmission line within the proposed 240-foot corridor and these streams would be avoided where possible. Impacts to the perennial stream in the BTA (STR03) would be limited to the potential need to expand an existing culvert under the access road to the barge facility. Quantification of impacts to individual specific surface water resources, based upon the proposed disturbance areas, can be found in Table 3-5.

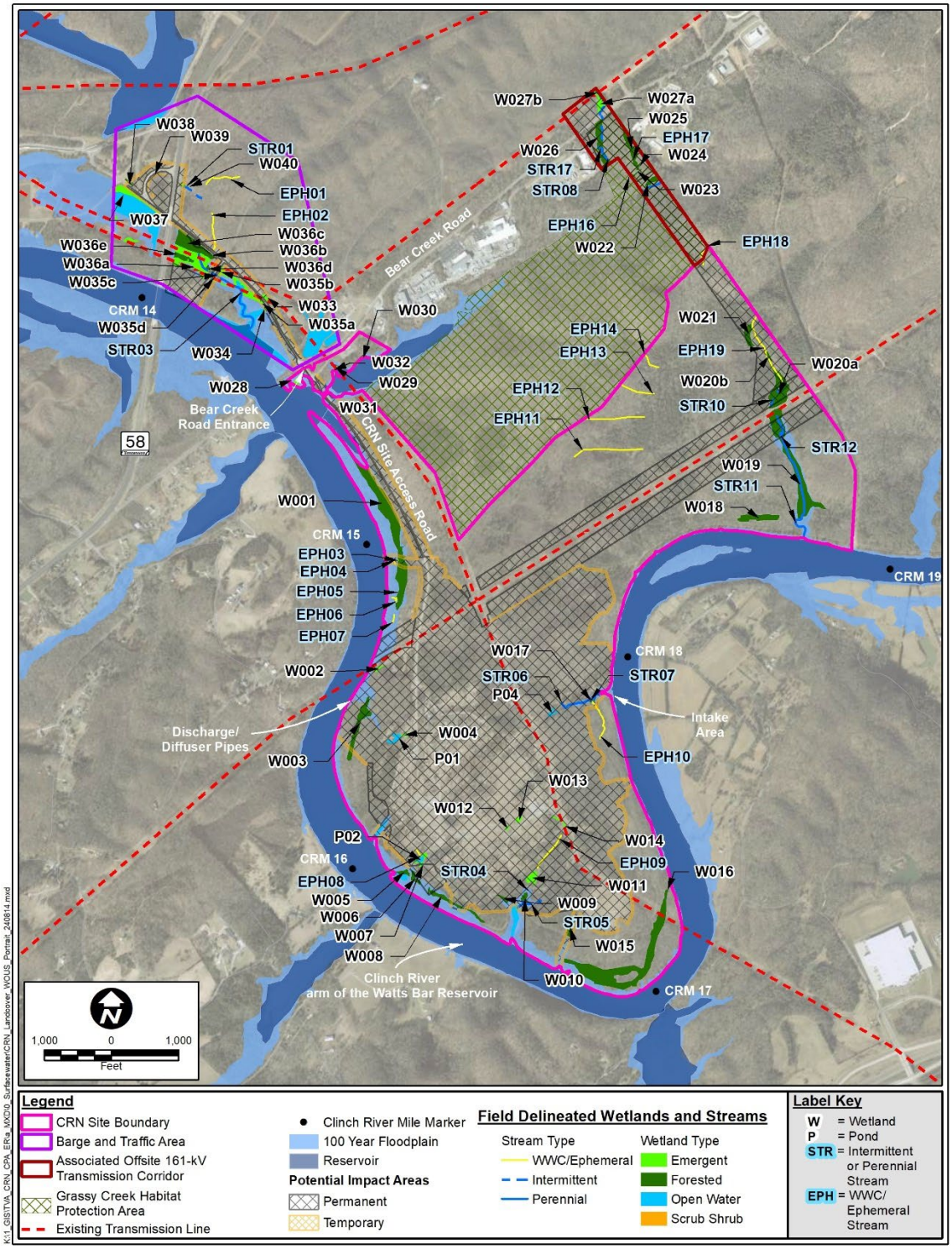

Figure 3-2. Impacts to Surface Water and Wetlands

Table 3-4. Table Summary of Impacts to Surface Water Resources (streams/ponds) on the CRN Site and Associated Offsite Areas

Location	Impacts to Streams and Ponds for CRN-1			
	Type	Number	Disturbance Type	Length (Feet) / Area (Acres)
CRN Site				
	Ponds (acres)	3	Permanent	0.65
		0	Temporary	-
	Streams (feet)	7	Permanent	1,822
		1	Temporary	25
	WWCs (feet)	7	Permanent	2,375
		2	Temporary	51
Associated Offsite Areas				
Barge and Traffic Area				
	Ponds (acres)	0	Permanent	-
		0	Temporary	-
	Streams (feet)	1	Permanent	79
		2	Temporary	76
	WWCs (feet)	1	Permanent	77
		1	Temporary	13
161-kV Offsite Transmission Line[1]				
	Ponds (acres)	0	Permanent	-
		0	Temporary	-
	Streams (feet)	3	Permanent	1,685
		0	Temporary	-
	WWCs (feet)	1	Permanent	242
		0	Temporary	-
Project Area Total				
	Ponds (acres)	3	Permanent	0.65
		0	Temporary	-
	Streams (feet)	11	Permanent	3,586
		3	Temporary	101
	WWCs (feet)	8	Permanent	2,694
		3	Temporary	64

Source: NRC and USACE 2019; TVA 2022b

Notes: CRN = Clinch River Nuclear; kV = kilovolt; TVA = Tennessee Valley Authority; WWC = wet weather conveyance; "-" = not applicable

1) Impacts to streams within the 161-kV transmission line corridor are localized and minimized in accordance with TVA's streamside management zone provisions as described in the TVA *Guide for Environmental Protection and Best Management Practices for Construction and Maintenance Activities* (TVA 2022c).

Table 3-5. Impacts to Individual Surface Water Resources (streams/ponds) on the CRN Site and Associated Offsite Areas

Feature ID	Type	Permanent Impacts	Temporary Impacts
CRN Site			
Ponds (acres)			
P01	Pond	0.31	0
P02	Pond	0.18	0
P04	Pond	0.16	0
Total (acres)		**0.65**	**0**
Streams (lineal feet)			
STR04	Intermittent	140	25
STR05	Intermittent	299	0
STR06	Intermittent	123	0
STR07	Perennial	603	0
STR10	Intermittent	284	0
STR11	Perennial	315	0
STR12	Perennial	58	0
EPH03	Ephemeral/WWC	139	0
EPH04	Ephemeral/WWC	38	18
EPH08	Ephemeral/WWC	124	0
EPH09	Ephemeral/WWC	614	0
EPH10	Ephemeral/WWC	130	33
EPH18[1]	Ephemeral/WWC	83	0
EPH19	Ephemeral/WWC	1,247	0
Total (feet)		**4,197**	**76**
Associated Offsite Areas			
Barge/Traffic Area			
Streams (lineal feet)			
STR01	Intermittent	0	16
STR03[2]	Perennial	79	60
EPH02	Ephemeral/WWC	77	13
Total (feet)		**156**	**89**
161-kV Offsite Transmission Corridor[3]			
Streams (lineal feet)			
STR08	Intermittent	1,181	0
STR09	Perennial	384	0

Feature ID	Type	Permanent Impacts	Temporary Impacts
STR17	Intermittent	120	
EPH18[1]	Ephemeral/WWC	242	0
Total (feet)		**1,927**	**0**

Source: TVA 2022b

Notes: BTA = Barge and Traffic Area; CRN = Clinch River Nuclear; EPH = ephemeral stream/WWC; ID = identification; kV = kilovolt; P = pond; STR = perennial/intermittent stream; TVA = Tennessee Valley Authority; WWC = wet weather conveyance

1) WWC EPH18 crosses from the CRN Site into the 161-kV transmission corridor and is only counted once in the Project Area total.

2) STR03 is considered to be a backwater feature of the Reservoir and not a unique feature for the BTA.

3) Impacts to streams within the 161-kV transmission line corridor are localized and minimized in accordance with TVA's streamside management zone provisions as described in the TVA *Guide for Environmental Protection and Best Management Practices for Construction and Maintenance Activities* (TVA 2022c).

Streams located within the 161-kV transmission line corridor would be impacted and, where possible, streams would be avoided. Impacts, such as those streams impacted within the transmission line corridor, would be localized and minimized in accordance with TVA's streamside management zone provisions as described in the *TVA Guide for Environmental Protection and Best Management Practices for Construction and Maintenance Activities* (TVA 2022c).

Indirect physical alteration of receiving streams may also result from increased runoff volumes and rates during construction or diversions of runoff in conjunction with the land disturbance on the CRN Site. Conversion of existing undeveloped lands to either impervious uses (developed areas, parking lots, buildings) or less pervious lands may result in increased runoff rates to receiving streams. Stormwater runoff and associated sediment transport from the CRN Site would be controlled via engineered structures, collected in engineered stormwater retention ponds, and infiltrated to the ground, or released to the Reservoir in a controlled manner. As illustrated in Figure 2-1, four stormwater retention ponds would be constructed to moderate the increased runoff from impervious structures and surfaces and allow infiltration to reduce runoff directly into the Reservoir. These stormwater ponds would limit stormwater flow rates into receiving streams and the Reservoir and associated increases in stormwater discharges during high intensity precipitation events.

Hydrologic alterations to streams would comply with applicable permit requirements, including a CWA Section 404 permit from the USACE and an Aquatic Resource Alteration Permit (ARAP) authorization from the TDEC, and a SWPPP to meet TDEC stormwater construction permit discharge requirements for erosion protection, sediment detention and stormwater management. Construction of CRN-1 would impact a greater number of streams and ponds than was evaluated in the PEIS. Additionally, updated information indicates whether these impacts are temporary or permanent.

3.2.2.1.1.1.2. Hydrologic Alterations to the Clinch River Arm of the Watts Bar Reservoir

3.2.2.1.1.1.2.1. Cooling Water Intake Structure and Discharge

As described in Section 2.3.3.1, TVA is evaluating two alternatives intake designs for CRN-1, located at CRM 17.9. Construction of the cooling water intake structure (CWIS) and the discharge structure result in localized hydrologic alterations within the Reservoir. The specific

locations of these structures are shown in Figure 3-2. The Reservoir is the only water body that would receive effluents associated with constructing the intake and discharge.

Construction of the CWIS and discharge diffuser would require underwater and shoreline excavation and stabilization activities in the Reservoir. The estimated volume of material subject to building the CRN-1 intake structure is 2,550 cubic yards of onshore material, and approximately 350 cubic yards of material from offshore underwater excavation. Construction of the intake structure would result in a disturbance area within the Reservoir of approximately 2,000 square feet. Building a temporary cofferdam of approximately 55 feet by 20 feet would be required for installation of the intake screens. Excavation related to the cofferdam installation would result in approximately 5,000 cubic yards of onshore material and 1,300 cubic yards of wetted materials. All material removed from the Reservoir would be tested and disposed of in accordance with the conditions of the 1991 Watts Bar Interagency Agreement. Material to be removed from the Reservoir would be sampled and characterized for hazardous and radioactive contamination prior to removal. Depending upon results, the material would be either disposed of immediately at an existing, permitted disposal facility or retained in upland short-term sediment detention areas prior to spreading onsite.

The construction of the submerged offshore intake structure which includes a subsurface conduit extending between a submerged intake in the Reservoir, within the navigation channel, and a vertical shaft wet well on the bank. Construction of this alternative would require both onshore excavation for the vertical shaft wet well foundation and offshore excavation for the in-Reservoir retrieval pit, as well as a temporary cofferdam in the Reservoir.

TVA has revised the proposed location of the discharge diffuser location from CRM 15.5, as stated in the PEIS, upstream to CRM 15.55. As summarized in Table 3-6 the estimated volume of material to be removed in conjunction with building the discharge piping (including piping along the riverbank and river bottom) is 2,272 cubic yards (1,681 cubic yards along the riverbank and 591 cubic yards from the reservoir bottom). As described above all material removed from the Reservoir would be tested and disposed of in accordance with the 1991 Watts Bar Interagency Agreement. Fill material, consisting of riprap materials (32 feet wide) would also be placed adjacent to the proposed diffuser to provide stabilization.

Shoreline stabilization associated with building these structures is included in the disturbance areas described above and includes installation of rip rap up to 4 feet in depth at the site of shoreline excavations. Construction activities for the CWIS and discharge structure would be localized and temporary, and would comply with applicable permit requirements, including a CWA Section 404 permit and Rivers and Harbors Act Section 10 from the USACE, and an ARAP authorization from TDEC. Additionally, any instream work disturbing sediments of the Reservoir must be coordinated in accordance with the terms and practices of the 1991 Watts Bar Interagency Agreement as well as BMPs to reduce sedimentation and erosion during construction activities (TVA 2022a, 2023d).

As described above, the proposed location and configuration of the CWIS (including the submerged offshore intake structure) and discharge structure, the means of construction, and the volume of dredged materials removed is updated and notably different from that described in the PEIS. However, because the construction activities for the intake and discharge structures would be localized and temporary, and would comply with applicable permit requirements, the effects on Reservoir hydrology are minor.

Table 3-6. Impacts to Clinch River Arm of Watts Bar Reservoir as a Result of Shoreline and Underwater Excavation

Structure	Parameter	Excavation Volume (cy)
Discharge	Shoreline Excavation	1,681
	Underwater Excavation	591
Cooling Water Intake Structure	Onshore and Shoreline Excavation	2,550
	Underwater Excavation	350
Temporary Cofferdam	Shoreline Excavation	5,000
	Underwater Excavation	1,300

Source: TVA 2023a
Notes: cy = cubic yards

3.2.2.1.1.1.2.2. Other Alterations to the Reservoir

As described in Section 3.1.4, the proposed project no longer includes other actions within the Reservoir that contributed to the assessment of impacts from hydrologic alterations to surface water. Specifically, these included a supplemental barge facility, flow bypass system at the Melton Hill Dam, and extensive shoreline stabilization. As such no impacts would occur to the areas of the Reservoir potentially affected by these actions.

3.2.2.1.1.1.3. Mitigative Measures for Unavoidable Impacts to Surface Water

To address unavoidable impacts to WOTUS and TDEC regulated waters, including wetlands, TVA would provide compensatory mitigation in accordance with USACE and TDEC requirements. Mitigation consists of replacing impacted aquatic functions by creation, restoration, or improvements to streams and wetland habitat elsewhere within the landscape. To achieve this functional replacement, compensatory mitigation typically is conducted through either credit purchase from existing mitigation banks, credit purchase from an in-lieu fee program, or provision of permittee responsible mitigation. A mitigation bank, in-lieu fee site, and permittee responsible mitigation generate mitigation credits based on functional lift to degraded aquatic resources. TVA would determine functional loss associated with proposed aquatic resource impacts and coordinate with the USACE and TDEC to ensure acquired mitigation credits suffice to compensate for unavoidable impacts.

Details regarding the mitigative measures were not determined during the PEIS because the USACE had not made a jurisdictional determination. regarding. Nonetheless, TVA would comply with all required wetland mitigation measures determined for jurisdictional wetlands that could be affected by activities associated with construction of CRN-1. Furthermore, TVA would follow the State of Tennessee BMPs and TVA BMPs when working in and around wetlands. Because USACE and TDEC permitting would require mitigation for stream and wetland impacts, TVA would also apply such mitigative measures to surface water impacts waters.

3.2.2.1.1.1.4. Summary of Construction Impacts on Surface Water Hydrology

TVA considered all identified new and notable information in combination with PEIS Section 3.3.2 to assess the potential effects from construction activities on surface water hydrology. TVA

determined that because the onsite supplemental barge facility, flow bypass system at the Melton Hill Dam, and extensive shoreline stabilization are eliminated from consideration, the overall impact of construction on surface water hydrology is less than the impacts assessed in the PEIS. Therefore, the impact to surface water hydrology is minor and notably different from the impact determined in the PEIS.

3.2.2.1.1.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to operational impacts on surface water hydrology that is consistent with that considered in the PEIS:

- Average and maximum total withdrawal rates from the cooling water intake structure
- Discharge of cooling water blowdown and plant systems wastewater
- Physical impacts of cooling water discharge
- Alterations in flow in the Reservoir

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, the assessment of construction impacts on surface water hydrology in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.1.2. Surface Water Use

3.2.2.1.2.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any new information related to operational impacts on surface water use. Therefore, the assessment of construction impacts on surface water use in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.1.2.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to operational impacts on surface water use that is consistent with that considered in the PEIS:

- Operational phase water demand

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, the assessment of operational impacts on surface water use in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.1.3. Surface Water Quality

3.2.2.1.3.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction impacts on surface water quality that is consistent with that considered in the PEIS:

- Extent of instream disturbance in the Reservoir

TVA considered all identified new and notable information in combination with PEIS Section 3.3.2 to assess the potential effects from construction impacts on surface water quality. TVA determined the overall impact of construction on surface water quality is similar to the impacts

assessed in the PEIS. Therefore, the assessment of construction activities on surface water quality in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.1.3.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to operational impacts on surface water quality that is consistent with that considered in the PEIS:

- Water quality effects of plant effluents
- Physical water quality effects of plant discharge
- Thermal effects of plant discharge

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.2.2.1.3.2.1. Water Quality Effects of Plant Effluents

Constituent concentrations of all plant effluents would be monitored and controlled within limits established in accordance with the TDEC NPDES permit for CRN-1 such that parameter concentrations in the discharge would not exceed water quality compliance parameters. The estimates of plant effluents including residual chemicals and concentrated solutes within the discharge are less than those assessed in the PEIS.

3.2.2.1.3.2.2. Physical Water Quality Effects of Plant Discharge

Effects on water quality related to plant discharge of CRN-1 could occur from sediment erosion, suspension, or transport that occurs during plant operations. Because discharge rates are reduced relative to those considered in the PEIS, and the discharge system incorporates both design and mitigative measures that reduce erosion and scour, related effects on water quality are also reduced.

3.2.2.1.3.2.3. Thermal Effects of Plant Discharge

PEIS Section 3.3.2 states that prior hydrothermal modeling simulations determined that the addition of a Melton Hill Dam bypass to provide a steady, downstream 400 cubic feet per second (approximately 180,000 gpm) flow would improve thermal mixing and that the discharge would meet the applicable water-quality criteria with a mixing zone about 150 feet in diameter.

To evaluate the effects of the thermal impacts of the CRN-1 discharge, TVA updated previous hydrothermal modeling to characterize the thermal impacts of operation in the Reservoir. Specifically, hydrothermal impacts of operation of CRN-1 within the Reservoir were modeled under differing flow scenarios because flows within the Reservoir depend upon water releases from Melton Hill Hydroelectric (MHH) facility and Fort Loudoun Hydroelectric (FLH) facilities.

TVA produced a two-dimensional model using CE-QUAL-W2 Version 4.1 that presents average temperatures at depth across a longitudinal centerline within the Reservoir. The CE-QUAL-W2 model was applied to the Reservoir by breaking it into a large number of “segments” which have length and vertical layers of one meter thickness. Initial modeling results are based upon monthly mean values and modeling runs using monthly maximum values (i.e., worst case extreme low-flow conditions). Both summer and winter conditions were modeled in addition to a range of release scenarios from MHH, and simulations represent actual operations of dams (TVA 2023d). Summer operations of MHH tend to result in extreme events for river water

temperature (TR), temperature change relative to ambient conditions (ΔT), and temperature rate of change (TROC), while winter operating conditions tend to lead to extreme events for ΔT and TROC (TVA 2023d). Extreme temperature events occur from displacing the upper end of a warm water layer that naturally occurs in Watts Bar Reservoir and is present to various extents nearly year-round when MHH is not continuously operated.

The two-dimensional model results indicate that, in the summer months under low-flow conditions, the discharge plume is not a major factor in thermal compliance (Figure 3-3). In the winter modeling runs, when the difference between the river temperature and the diffuser discharge temperature (i.e., the “excess” temperature) is larger than in the summer, model results indicate water temperature impacts from the operation of CRN-1 are negligible (Figure 3-4). Modeling runs did not indicate any potential temperature violation issues for CRN-1 operations. Based on the modeling analysis, no supplemental releases from MHH were needed to support thermal mixing, and therefore, the Melton Hill Dam bypass would not provide a thermal compliance benefit and thus the bypass would not be needed (TVA 2023d). Therefore, as described in Section 3.1.4, the flow bypass system from Melton Hill Dam was eliminated as a project element.

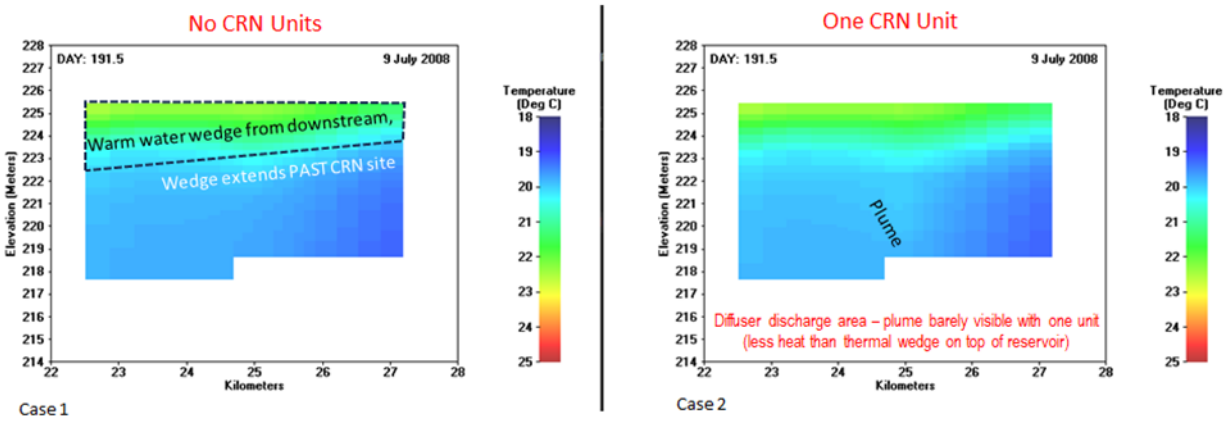

Figure 3-3. Two-Dimensional Modeled Discharge Plume for Summer Low-Flow Conditions

Source: TVA 2023d

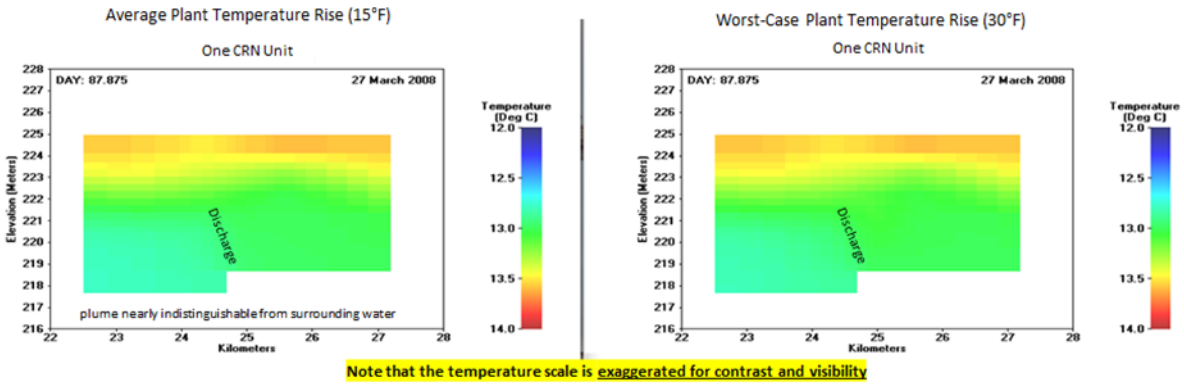

Figure 3-44. Two-Dimensional Modeled Discharge Plume for Winter Conditions with Average and Extreme Plant Temperature Rise

Source: TVA 2023d

Additionally, mixing of the thermal discharge with the ambient river water was analyzed using CORMIX version 12.0GT. Mixing conditions are complex because of the flow characteristics of the Reservoir at the proposed CRN-1 discharge location. At times, conditions are stagnant due to zero discharge from MHH. At times, the flow reverses to an upstream direction (i.e., flow reversal) due to rising water levels further downstream in Watts Bar Reservoir due to releases from FLH.

CORMIX software simulations were made in both summer and winter operating conditions. CORMIX analyses assumed a flow condition velocity of 0.0 feet per second. The diffuser type selected is a unidirectional diffuser with all ports directed downstream and upward at an angle of 45°. Results of CORMIX modeling also indicated that, based on critical temperature values of representative important species and the rapid mixing of the diffuser, the zone of passage is effectively the entirety of the cross-sectional area of the Reservoir. Therefore, the thermal plume does not create a barrier to upstream or downstream movement of important fish species. As

such, dilution distances of the thermal plume are less than the 150-foot mixing zone considered in the PEIS.

A thermal ”pancake” of warm surface water is present in the Reservoir. The current characterization of a thermal pancake demonstrates a condition that is better understood as a more persistent thermal stratified condition. Sudden large releases from MHH in the summer may have the effect of pushing the upstream end of the thermal ‘pancake’ downstream past the CRN Site, creating the potential for a TROC or a ΔT relative to ambient conditions in which the existing water quality (temperature) of the Reservoir exceeds water temperature compliance parameters (TVA 2023d).

Thermal effects of the discharge of CRN-1 are less than those estimated in the PEIS. However, the presence of a thermal pancake within the Reservoir results in a condition in which water quality compliance parameters may be periodically exceeded. As such, TVA would work with TDEC throughout the NPDES permitting process to establish appropriate permit conditions to support operation of CRN-1 to minimize impacts of the thermal discharge on the Reservoir.

3.2.2.1.3.2.4. Summary of Operation Impacts on Surface Water Quality

TVA considered all identified new and notable information in combination with PEIS Section 3.3.2 to assess the potential effects from operational activities on surface water quality. TVA determined the overall impact of operational activities on surface water quality is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational activities on surface water quality in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.2. Groundwater

Potential effects on groundwater during construction of CRN-1 include direct and indirect impacts associated with alterations to groundwater recharge and dewatering of the power block are addressed in PEIS Section 3.3.2. The PEIS noted that stream and wetland resources in proximity to excavation and construction areas (including laydown areas) may also be affected by groundwater flow disruptions where such resources have a hydrology that is dependent upon groundwater discharge.

Potential operational impacts on groundwater analyzed in the PEIS include those associated with altering the pattern and rate of groundwater infiltration because of the increased amount of impervious surface at the CRN Site.

3.2.2.2.1. Groundwater Hydrology

3.2.2.2.1.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction impacts on groundwater hydrology that is consistent with that considered in the PEIS:

- Extent of land surface alterations
- Extent of dewatering during construction

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.2.2.2.1.1.1. Development of Onsite Quarry

As described in Section 2.3.1.2 of this document, TVA is evaluating two options for obtaining borrow material needed for construction of CRN-1. The first option is obtaining borrow material from an offsite quarry and the second option is the development of an onsite quarry to supply borrow material. The proposed onsite quarry facility would be located near the center of the CRN Site, just south of the 500-kV line, as depicted in Figure 2-1.

Onsite quarrying would occur during the first two years of construction. The potential quarry site first be stripped of overburden and weathered rock formations that are not suitable as backfill. Drilling and blasting would be used to establish the quarry pit. Safe and efficient drilling and blasting depths per bench are expected to be approximately 40 feet. The resulting quarry floor depth may be 80 to 85 feet below local grade elevations. The quarry design would include equipment and/or holding ponds within the disturbed area for managing runoff and wastewater generated by the quarry. Stormwater BMPs would be instituted and maintained during the entire period of construction and quarry operations (TVA 2023a).

Land and subsurface modifications associated with quarry development would result in local alterations to groundwater recharge. These include an increase in recharge over the area of the quarry footprint due to the removal of overburden and bedrock that would normally slow the infiltration of direct precipitation. As a result of the removal of these materials potential increases in groundwater recharge within permeable areas of the quarry may occur from stormwater runoff entering the quarry. The Clinch River Breeder Reactor Project estimated that normal water flow into the excavation site would be 1,000 gallons per minute (gpm), and that an upper limit coincident with heavy rain and runoff would be 3,000 gpm. Water entering the quarry by seepage from the quarry face or stormwater that would not be removed from the quarry through stormwater management practices may be available for recharge of groundwater.

Additionally, blasting activities and removal of bedrock material likely results in both removal or collapsing of fractures and development of solution channels. The creation of new fracture and solution channels may change the local bedrock flow paths within localized areas around the quarry potentially affected by blasting.

Together these activities are expected to alter the spatial and temporal pattern of infiltration and recharge and groundwater flow directions in the shallow aquifers on the CRN Site in proximity to the quarry. However, groundwater at and near the proposed quarry is assumed to flow to and discharge at the Reservoir locally on the CRN Site and would continue during and after quarry operations but by potentially altered pathways. The effects on infiltration, recharge, and groundwater flow are localized but not destabilizing in proximity to the quarry and negligible off the CRN Site. Therefore, the overall impacts of quarry development on groundwater discharge to the Reservoir are minor but long term in their effect. Because such effects are localized to the CRN Site, potential effects to offsite groundwater users are also minor.

3.2.2.2.1.1.2. Summary of Construction Impacts on Groundwater Hydrology

TVA considered all identified new and notable information in combination with PEIS Section 3.3.2 to assess the potential effects from construction activities on groundwater hydrology. TVA determined the overall impact of construction activities on groundwater hydrology is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction activities on groundwater hydrology in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.2.1.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any new information related to operational impacts on groundwater hydrology. Therefore, the assessment of operational impacts on groundwater hydrology in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.2.2. Groundwater Use

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any new information relevant to either construction or operational impacts on groundwater use. Therefore, the assessment of construction and operation impacts on groundwater uses in PEIS Section 3.3.2 is incorporated by reference.

3.2.2.2.3. Groundwater Quality

3.2.2.2.3.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on groundwater quality determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.2.2.2.3.1.1. Water Quality of Groundwater Derived from Quarry Dewatering

Water quality of groundwater derived from quarry dewatering may be influenced by water quality within the geologic formations of the CRN Site and quarrying practices. Section 3.3.1.2 provides documentation of existing groundwater quality within CRN Site. TVA considered potential characteristics of groundwater in the vicinity of the potential quarry, past land uses and potential accidental spills that may have influenced groundwater quality, and potential chemical constituents and byproducts of blasting operations that may affect the water quality of groundwater during dewatering. No records of spills or other events in the proposed quarry area could be found that may influence groundwater quality.

TVA would develop and implement all appropriate water quality control measures and practices as part of the quarry design and operations, including integration of the quarry as part of the SWPPP. As indicated in the PEIS, during operations TVA would implement an IPPP at the CRN Site, which would include the use of BMPs to minimize the occurrence of spills and limit their effects. These BMPs include actions such as proper vehicle and equipment maintenance, containment for fuel or oil storage tanks, and the maintenance of spill response equipment and materials. As indicated in the PEIS, dewatering of the power-block excavation would alter shallow groundwater flow patterns but is not anticipated to alter groundwater quality. Minor changes in groundwater chemistry may occur in the vicinity of the excavation, but these changes are expected to be localized and temporary because the groundwater would equilibrate with the undisturbed rocks as it flows away from the excavations. These alternations to ground water flow patterns and changes to groundwater chemistry would also occur in association with the CRN-1 quarrying activities. Groundwater withdrawn during dewatering would be discharged to a stormwater-retention basin and ultimately infiltrated or discharged to the Reservoir. In addition, discharge of groundwater withdrawn during dewatering would be regulated as part of the NPDES permit issued by TDEC.

3.2.2.2.3.2. Summary of Construction Impacts on Groundwater Quality

TVA considered all identified new and notable information in combination with PEIS Section 3.3.2 to assess the potential effects from construction on groundwater quality. TVA determined

the overall impact of construction on groundwater quality is less than the impacts assessed in the PEIS. Therefore, the assessment of construction impacts on groundwater quality in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.2.2.2.3.3. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify new information related to operational impacts on groundwater quality. Therefore, the assessment of operation impacts on groundwater quality in PEIS Section 3.3.2 is incorporated by reference, and impacts are minor.

3.3. Floodplains and Flood Risk

3.3.1. Affected Environment

As described in the PEIS, the 100- and 500-year floodplains encompass portions of the floodplains of the Reservoir, Grassy Creek, Raccoon Creek, White Oak Creek, and several unnamed tributaries of the Clinch River. Floodplain locations are present along the perimeter of the CRN Site along the Reservoir.

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify new information related to the characterization of the affected environment for floodplains and flood risk. Therefore, PEIS Section 3.4.1 is incorporated by reference.

3.3.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential impacts to floodplains resulting from implementation of Alternative B would be minor. Potential impacts to floodplains and flood risk from CRN-1 may consist of encroachment within the 100-year floodplain by placement of fill material and construction of the intake and discharge structures, resulting in floodplain alteration and losses to floodplain value and function.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on floodplains and flood risk that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.3.2.1. Construction

New information regarding floodplain encroachment is identified in conjunction with the CRN-1 site layout and proposed construction activities. Table 3-7 presents floodplain acreage on the CRN Site and the BTA that is within temporary and permanent disturbance areas. Construction activities associated with CRN-1 would result in permanent disturbance to 27.7 acres of floodplain and temporary disturbance to 3.4 acres of floodplain. Much of the permanent impact to floodplain is the result of conversion of land cover rather than filling in the floodplain. Construction activities within the floodplain along the Reservoir are associated with intake construction, discharge pipeline installation, transmission line construction and maintenance, and expansion of the offsite barge facility within the BTA.

The intake structure and discharge would be located within the 100-year floodplain and flood storage zone of the Reservoir. Consistent with EO 11988 Floodplain Management and the TVA Flood Storage Loss Guideline (FSLG), intakes and outfalls are considered to be repetitive actions in the 100-year floodplain and flood storage zone that would likely result in only minor

impacts. To minimize adverse impacts, these structures would be constructed using the least amount of fill practicable. Construction activities associated with CRN-1 would adhere to EO 11988 Floodplain Management and the TVA FSLG.

Table 3-7. Impacts associated with Floodplain Encroachment

Project Area	Permanent		Temporary	
	Area (acres)	Percent (%)	Area (acres)	Percent (%)
Barge and Traffic Area	3.6	12.8	0.7	20.1
CRN Site	24.2	87.2	2.7	79.9
Associated Offsite 161-kV Transmission Line Corridor	0	0	0	0
Total[1]	**27.7**	**100**	**3.4**	**100**

Source: Dewitz and USGS 2021; Federal Emergency Management Agency (FEMA) 2023
Notes: CRN = Clinch River Nuclear; kV = kilovolt
1) Column total may not equal sum of individual values due to rounding.

To minimize adverse impacts to floodplains, only water-use or water-dependent facilities and structures would be located below the 100-year flood elevation at these locations. Generally, water-use and water-dependent structures and facilities constructed for CRN-1 would be located within 100-year floodplains, and flood-damageable equipment and facilities would be located outside 100-year floodplains.

3.3.2.1.1. Summary of Construction Impacts to Terrestrial Ecology

TVA considered all identified new and notable information in combination with PEIS Section 3.4.3 to assess the potential effects of construction on floodplains and flood risk. TVA determined the overall impact of construction on floodplains and flood risk is notably greater than the impacts assessed in the PEIS. However, construction activities within floodplains would adhere to EO 11988 and the TVA FSLG. Therefore, the assessment of construction impacts on floodplains and flood risk in PEIS Section 3.4.3 is incorporated by reference, and impacts are minor. No impacts to floodplains or flood risk would occur due to operation of CRN-1.

3.4. Wetlands

3.4.1. Affected Environment

As described in the PEIS, wetlands were delineated within the Project Area in 2021 to determine wetland presence, extent, and condition. The 2021 wetland assessment included a review of delineations conducted between 2011 and 2015 within the CRN Site Project Area, verification and update of previously mapped wetland features and their condition, and mapping of wetlands not previously documented. Wetland habitat observed within the Project Area included mostly emergent and forested wetlands that are associated with floodplains of the Reservoir and Grassy Creek, although springs and seepage wetlands also were present.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to wetlands that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.4.1.1. Wetland Community Types, Distribution, and Functional Value

New information for wetlands includes the results of recent wetland delineations in the BTA and the offsite 161-kV transmission corridor conducted by TVA in November 2023 to determine or confirm wetland presence, extent, and condition in areas that were not assessed 2021 (TVA 2024c). Similar to the 2021 assessment, wetland determinations were conducted for the 2023 assessment in accordance with USACE methods that require documentation of hydrophytic vegetation, hydric soils, and wetland hydrology (Environmental Laboratory 1987; USACE 2012; USACE 2018). TVA also used the Tennessee Rapid Assessment Method (TRAM) to evaluate wetland conditions. TRAM quantifies wetland function and ranks wetlands into three categories, including low, moderate, or exceptional resource value, based on six metrics coordinating to indicator functions (TDEC 2017).

Within the updated limits of disturbance on the BTA, 17 wetlands totaling approximately 7.19 acres were delineated and assessed during the 2021 and 2023 field studies, as depicted on Figure 3-1. Within the offsite 161-kV transmission corridor, seven wetlands totaling approximately 3.6 acres were delineated and assessed. All delineated wetlands information is summarized in Table 3-8.

Table 3-8. Wetlands Delineated in the Project Area, 2021/2023

Wetland ID	Wetland Type[1]	TRAM Category[2]	Total Wetland Acreage
CRN Site			
W001	PFO1E	Moderate	6.86
W002	PEM1E	Low	0.11
W003	PFO1E	Moderate	1.71
W004	PEM/PSS1E	Low	0.10
W005	PFO1E	Moderate	0.26
W006	PFO1E	Moderate	0.29
W007	PEM/PUBHx	Low	0.23
W008	PFO1E	Low	0.94
W009	PFO1E	Low	0.17
W010	PFO1E	Moderate	0.36
W011	PEM/PSS1E	Low	0.48
W012	PEM1E	Low	0.07
W013	PEM1E	Low	0.13
W014	PEM1E	Low	0.15
W015	PFO1E	Moderate	0.35
W016	PFO1E	Moderate	7.88
W017	PFO1E	Low	0.23
W018	PFO1E	Moderate	1.16
W019	PFO1E	Exceptional	5.70

Wetland ID	Wetland Type[1]	TRAM Category[2]	Total Wetland Acreage
W020a	PFO1E	Moderate	2.48
W020b	PFO1E		0.18
W021	PFO1E	Low	0.68
W028	PEM/SS/FO1E	Moderate	0.15
W029	PEM1E	Low	0.08
W030	PFO1E	Low	0.11
Total			**30.88**
Associated Offsite Areas			
Barge and Traffic Area (Only Includes Wetlands within the Potential Limits of Disturbance)			
W031	PEM1E	Low	0.02
W032	PEM1E	Low	0.02
W033	PEM1E	Low	0.13
W034	PFO1E	Moderate	0.03
W035a	PEM/SS1E		0.13
W035b	PEM/SS1E	Low	0.22
W035c	PEM/SS1E		0.01
W035d	PEM1F	Low	0.07
W036a	PEM/SS1E	Moderate	2.60
W036b	PEM/SS1E	Moderate	0.02
W036c	PFO1E	Moderate	2.07
W036d	PFO1E	Moderate	0.10
W036e	PFO1E	Moderate	0.44
W037	PEM1F	Low	0.94
W038	PFO1E	Low	0.08
W039	PSS1E	Low	0.20
W040	PEM1F	Moderate	0.11
Total			**7.19**
161-kV Offsite Transmission Line			
W022	PFO1E	Low	0.38
W023	PFO1E	Low	0.08
W024	PFO1E	Low	0.08
W025	PFO1E	Moderate	0.96
W026	PFO1E	Moderate	1.44
W027a	PEM/PFO1E	Moderate	0.53

Wetland ID	Wetland Type[1]	TRAM Category[2]	Total Wetland Acreage
W027b	PEM1E	Moderate	0.13
Total[3]			**3.60**

Source: TVA 2021d, 2022a, 2023e.

Notes: CRN = Clinch River Nuclear; ID = identification; kV = kilovolt; TRAM = Tennessee Rapid Assessment Method

1) Classification codes as defined in Cowardin et al., 197
   9 classification codes: E = seasonally flooded/saturated; F = semi-permanently flooded; H = permanently flooded; P = Palustrine; EM1 = emergent, persistent vegetation; FO1= forested, broad-leaved deciduous vegetation, seasonally flooded/saturated; SS1= scrub-shrub, broad-leaved deciduous vegetation; UB = unconsolidated bottom; x = excavated.
2) TRAM Category as defined by TDEC 2017: Low = low resource value; Moderate = moderate resource value; Exceptional = exceptional waters.
3) Column total may not equal sum of individual values due to rounding.

3.4.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As stated in the PEIS, potential impacts to wetlands on the CRN site are associated with direct alteration and loss due to fill activities. Indirect impacts may also occur in conjunction with erosion from construction and subsequent deposition of sediments within wetland areas. Impacts to wetlands are regulated by state and federal agencies to ensure long-term maintenance of wetland resources nationwide. The USACE regulates the discharge of dredged or fill material and associated secondary impacts to WOTUS, including wetlands, under the CWA Section 404 [33 USC § 1344]. CWA §401 mandates state water quality certification for projects requiring USACE approval. In Tennessee, an ARAP authorized by TDEC provides water quality certification under CWA §401 and permits impacts to state waters. Similarly, EO 11990 – Protection of Wetlands requires federal agencies, such as TVA, to avoid wetland impacts to the extent practicable, minimize wetland destruction and degradation, ensure no net loss of wetlands, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities.

As summarized in the PEIS, potential effects to wetlands totaling 14.7 acres were associated with development of the CRN Site during the construction phase. These impacts would be mitigated in accordance with Section 404 of the CWA as required by both USACE and TDEC permitting requirements. Unavoidable adverse impacts would be subject to compensatory mitigative measures as appropriate. As such, impacts to wetlands were considered minor.

A notable issue that was not resolved in the PEIS was consideration of conditions related to CWA Section 401 certification (33 U.S.C. § 1251 et seq.) in conjunction with impacts to WOTUS. This issue was not resolved because with the programmatic approach, site-specific footprints were not yet available and, therefore, a USACE jurisdictional determination had not yet been made regarding potentially affected WOTUS that may be subject to regulation under Section 404 of the CWA. Section 401 certification is issued by TDEC and ensures that the project does not conflict with state water quality management programs and is relevant to wetland impact assessment and permitting. Because the PEIS did not authorize any activities, a CWA Section 401 certification was not required prior to its issuance. In 2023, TDEC confirmed all wetland resources on the CRN Site and associated offsite areas are jurisdictional under state regulations, and TVA anticipates a subset of the resources to also fall under USACE jurisdiction. TVA has initiated the approved jurisdictional process with USACE.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction impacts on wetlands:

- Wetland habitats on the CRN Site and associated offsite areas
- Wetland mitigation measures

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.4.2.1. Wetland Habitats on the CRN Site and Associated Offsite Areas

New information since publication of the PEIS was identified and evaluated relative to the CRN-1 site layout plan and wetland delineations. New information for wetlands includes a revised project footprint, including a CRN-1 site layout that delineates construction impact areas, and the results of recent wetland delineations within the Project Area conducted by TVA in November 2023 to determine wetland presence, extent, and condition (TVA 2024c). Impacts of CRN-1 construction on the CRN Site and associated offsite areas are presented in Table 3-9.

Table 3-9. Impacts to Wetlands Delineated in the Project Area in 2021/2023

Wetland ID	Wetland Type[1]	TRAM Category[2]	Delineated Wetland Size (Acres)	Impact Type[3]	Wetland Impact Area (Acres)
CRN Site					
W001	PFO1E	Moderate	6.86	Permanent	0.39
				Temporary	0.48
W002	PEM1E	Low	0.11	Permanent	0.11
W003	PFO1E	Moderate	1.71	Permanent	1.44
				Temporary	0.05
W004	PEM/PSS1E	Low	0.10	Permanent	0.10
W007	PEM/PUBHx	Low	0.23	Permanent	0.23
				Temporary	0.00
W008	PFO1E	Low	0.94	Permanent	0.15
				Temporary	0.05
W009	PFO1E	Low	0.17	Permanent	0.17
W010	PFO1E	Moderate	0.36	Permanent	0.36
W011	PEM/PSS1E	Low	0.48	Permanent	0.48
W012	PEM1E	Low	0.07	Permanent	0.07
W013	PEM1E	Low	0.13	Permanent	0.13
W014	PEM1E	Low	0.15	Permanent	0.15
W015	PFO1E		0.35	Permanent	0.29
				Temporary	0.06
W017	PFO1E	Low	0.23	Permanent	0.23

Wetland ID	Wetland Type[1]	TRAM Category[2]	Delineated Wetland Size (Acres)	Impact Type[3]	Wetland Impact Area (Acres)
New Onsite Transmission Corridor					
W006	PFO1E	Moderate	0.29	Conversion	0.08
W008	PFO1E	Low	0.94	Conversion	0.11
W019	PFO1E	Exceptional	5.70	Conversion	1.09
W020a	PFO1E	Moderate	2.48	Conversion	2.13
W020b	PFO1E	Moderate	0.18	Conversion	0.18
W021	PFO1E	Low	0.68	Conversion	0.61
				CRN Site Total[4]	**9.15**
Associated Offsite Areas					
Barge and Traffic Area (Potential Limits of Disturbance)					
W031	PEM1E	Low	0.02	Permanent	0.01
W032	PEM1E	Low	0.02	Permanent	0.02
W033	PEM1E	Low	0.13	Permanent	0.13
				Temporary	0.01
W034	PFO1E	Moderate	0.03	Permanent	0.03
W035a	PEM/SS1E	Low	0.13	Permanent	0.13
W035b	PEM/SS1E	Low	0.22	Permanent	0.10
				Temporary	0.10
W035c	PEM/SS1E	Low	0.01	Permanent	0.01
W035d	PEM1F	Low	0.07	Permanent	0.03
				Temporary	0.04
W036a	PEM/SS1E	Moderate	2.60	Permanent	0.15
				Temporary	0.07
W036b	PEM/SS1E	Moderate	0.02	Permanent	0.01
W036c	PFO1E	Moderate	2.07	Permanent	0.38
				Temporary	0.01
W036d	PFO1E	Moderate	0.10	Permanent	0.02
				Temporary	0.02
W037	PEM1F	Low	0.94	Permanent	0.06
				Temporary	0.08
W038	PFO1E		0.08	Permanent	0.03
				Temporary	0.02
W039	PSS1E	Low	0.20	Permanent	0.20
W040	PEM1F	Moderate	0.11	Permanent	0.02

Wetland ID	Wetland Type[1]	TRAM Category[2]	Delineated Wetland Size (Acres)	Impact Type[3]	Wetland Impact Area (Acres)
				Temporary	0.03
			Barge and Traffic Area Total[4]		**1.69**
161-kV Offsite Transmission Corridor					
W022	PFO1E	Low	0.38	Conversion	0.38
W023	PFO1E	Low	0.08	Conversion	0.08
W024	PFO1E	Low	0.08	Conversion	0.08
W025	PFO1E	Moderate	0.96	Conversion	0.96
W026	PFO1E	Moderate	1.44	Conversion	1.44
W027a	PEM/PFO1E	Moderate	0.53	Temporary	0.53
W027b	PEM1E	Moderate	0.13	Temporary	0.13
			161-kV Transmission Corridor Total[4]		**3.60**
				Grand Total[4]	**14.45**

Source: TVA 2021d, 2022a, and 2023e
Notes: CRN = Clinch River Nuclear; ID = identification; kV = kilovolt; TRAM = Tennessee Rapid Assessment Method
1) Classification codes as defined in Cowardin et al., 1979: E = seasonally flooded/saturated; F = semi-permanently flooded; H = permanently flooded; P = Palustrine; EM1 = emergent, persistent vegetation; FO1= forested, broad-leaved deciduous vegetation, seasonally flooded/saturated; SS1= scrub-shrub, broad-leaved deciduous vegetation; UB = unconsolidated bottom; x = excavated.
2) TRAM Category as defined by TDEC 2017: Low = low resource value; Moderate = moderate resource value; Exceptional = exceptional waters.
3) Permanent = permanent loss of wetland habitat; Temporary = temporary loss of habitat during construction; Conversion = permanent loss of forested land cover and conversion to herbaceous and scrub shrub habitats within transmission line ROW.
4) Column total may not equal sum of individual values due to rounding.

3.4.2.1.1. CRN Site

As shown in Table 3-9, the total area of impact from plant construction on wetlands on the CRN Site is estimated to be approximately 9.2 acres, which represents about 0.7 percent of the total acreage of wetlands within the 6-mile vicinity, suggesting only a minor reduction in wetlands in the surrounding landscape. In addition, compensatory mitigation for wetland fill and forested wetland conversion would be implemented to mitigate for this loss of wetland function in compliance with applicable water regulatory permitting. BMPs would also be implemented including those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (TVA 2022c), the Tennessee Erosion and Sediment Control Handbook (TDEC 2012), the project-specific SWPPP, and site-specific IPPP.

3.4.2.1.2. Barge and Traffic Area

As shown in Table 3-9, the total area of impact from plant construction on wetlands in the BTA is estimated to be approximately 1.7 acres, which represents about 0.1 percent of the total acreage of wetlands within the 6-mile vicinity, suggesting only a minor reduction in wetlands in the surrounding landscape. However, as discussed above for wetlands impacts on the CRN Site, the nature and magnitude of wetland impacts would be determined upon specific plans for development in the BTA and any mitigation developed in consultation with the USACE or TDEC, and BMPs would be implemented to avoid and/or minimize impacts.

3.4.2.1.3. Associated Offsite 161-kV Transmission Corridor

Approximately 3.6 acres of wetlands are located within the associated offsite 161-kV transmission line corridor (Table 3-9) and would be avoided to the extent practicable. Permanent impacts within areas subject to clearing would result from the conversion of forested cover types to emergent and shrub/scrub cover types. However, these areas would continue to exhibit wetland functions typical of such communities, but at a reduced functional capacity (Scott et al. 1990).

Potential impacts on wetlands would also be reduced because the transmission line corridor would be 120 feet wide consistent with TVA's Transmission System Vegetation Management Final Programmatic EIS (TVA 2019b). As these wetlands contain state listed plant species, management/conservation of those populations would be considered in tandem with impacts. Wetlands and other sensitive biological resources would be protected using methods such as hand clearing, selective spraying, and conducting field surveys prior to vegetation management as directed by TVA BMPs.

3.4.2.1.4. Wetland Mitigation Measures

As described in Section 3.5.2 of the PEIS to minimize and compensate for impacts to wetlands, TVA would implement a wetland and stream mitigation plan in accordance with USACE and TDEC requirements. To compensate for unavoidable impacts to WOTUS and/or TDEC regulated waters, including wetlands, TVA would provide compensatory mitigation in accordance with USACE and TDEC requirements. Mitigation consists of replacing impacted aquatic functions by creation, restoration, or improvements to streams and wetland habitat elsewhere within the landscape. To achieve this functional replacement, compensatory mitigation typically is conducted through either credit purchase from existing mitigation banks, credit purchase from an in-lieu fee program, or provision of permittee responsible mitigation. A mitigation bank, in-lieu fee site, and permittee responsible mitigation generate mitigation credits based on functional lift to degraded aquatic resources. TVA would determine functional loss associated with proposed aquatic resource impacts and coordinate with the USACE and TDEC to ensure acquired mitigation credits suffice to compensate for unavoidable impacts.

Details regarding the mitigative measures were not included in the PEIS because of the programmatic approach; site-specific project design was not available for TVA to request USACE or TDEC jurisdictional determinations regarding wetlands on the CRN Site and their associated impacts. The PEIS states that should a project be implemented, TVA would comply with all required wetland mitigation measures determined for jurisdictional wetlands that could be affected by construction and operation at the CRN Site. Additionally, unavoidable impacts to wetlands would be compensated in accordance with Section 404 and 401 of the CWA as required by both USACE and TDEC permitting requirements. Furthermore, TVA would follow both the State of Tennessee and TVA BMPs when working in wetlands.

3.4.2.2. Summary of Impacts to Wetlands

TVA considered all identified new and notable information in combination with PEIS Section 3.5.2 to assess the potential effects from construction activities on wetlands. Construction of CRN-1 would result in direct and indirect impacts to approximately 14.5 acres of wetlands in the Project Area and would be subject to restoration processes and mitigation requirements in place that ensure no net loss of wetland function. TVA determined the overall impact of construction activities on wetlands is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction activities on wetlands in PEIS Section 3.5.2 is incorporated by reference, and impacts are minor. No impacts to wetlands would occur during operation of CRN-1.

3.5. Aquatic Ecology

3.5.1. Affected Environment

As described in the PEIS, aquatic ecology within the CRN Site and vicinity includes the Reservoir, Melton Hill Reservoir, and various named and unnamed tributaries. The CRN Site and associated offsite areas currently contain waterbodies that include perennial streams, intermittent streams, WWCs (ephemeral streams), and ponds. Notably, the central portion of the CRN Site lacks identified streams and their aquatic environments as this area was substantially disturbed by the prior CRBRP project.

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to aquatic ecology that is consistent with that considered in the PEIS:

- Reservoir aquatic fish and benthic community

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.5.1.1. Aquatic Biological Communities in the Project Area

New information includes results of aquatic ecology surveys that were conducted by TVA in 2023 on the CRN Site and within the Grassy Creek Habitat Protection Area (HPA) portion of the offsite 161-kV corridor extending from Bear Creek Road to the CRN Site boundary. Aquatic species observed in streams on the CRN Site and within Grassy Creek HPA in 2023 are summarized in Table 3-10. A total of six species of crayfish were found on the CRN Site, three of which are undescribed (TVA 2023e). One species of crayfish, the red swamp crayfish, is non-native and considered a nuisance species in the State of Tennessee.

Table 3-10. Aquatic Species Present in Onsite Streams and Within Grassy Creek HPA in the Vicinity of the Project Area

Common Name	Scientific Name	Location
Crayfishes		
Appalachian brook crayfish	*Cambarus bartonii cavatus*	STR08
Upland burrowing crayfish	*Cambarus* cf. *dubius*	STR01, STR02, STR03, STR08
Hay crayfish spp.	*Cambarus* cf. *striatus* sp. A	STR07, STR08, STR11, Clinch River
Hay crayfish spp.	*Cambarus* cf. *striatus* sp. B	STR03
Thornytail crayfish	*Lacunicambarus acanthura*	Clinch River
Red swamp crayfish	*Procambarus clarkii*	STR03, STR11, Clinch River
Fish		
Banded sculpin	*Cottus carolinae*	STR11
Western mosquitofish	*Gambusia affinis*	STR11
Green sunfish	*Lepomis cyanellus*	STR11
Creek chub	*Semotilus atromaculatus*	STR08

Common Name	Scientific Name	Location
Western blacknose dace	*Rhinichthys obtusus*	STR08

Source: TVA 2023e
Notes: HPA = Habitat Protection Area

3.5.1.2. Reservoir Aquatic Macrophyte Communities

The PEIS description of aquatic macrophytes found within the Reservoir indicated the absence of macrophytes on either bank (TVA 2022a). An aquatic macrophyte survey was conducted in the Clinch River arm of the Watts Bar Reservoir and Melton Hill Reservoir in July 2022. This survey consisted of an aerial survey of the river channel with ground reconnaissance to determine the abundance, distribution, and composition of aquatic plant communities. The 2022 survey encountered a total of eight species of aquatic macrophytes in the Reservoir. The location of aquatic plant growth areas is indicated in Figure 3-5. The total area of macrophyte growth in the Reservoir in those areas adjacent to the project site was 35.9 acres. The most abundant macrophyte species encountered in the Reservoir were coon-tail (*Ceratophyllum demersum*) and water stargrass (*Heteranthera dubia*). The highest density of water stargrass was found just below MHH at CRM 22.6. Downstream of the TN 95 Bridge, the most abundant species was coon-tail, but this coon-tail was often mixed with water stargrass colonies. A taxonomic list of macrophyte species found in the Reservoir and the Melton Hill Reservoir is provided in Table 3-11 (TVA 2023f). In the Melton Hill Reservoir, a total of 11 species were encountered, the most abundant of which was Eurasian watermilfoil (*Myriophyllum spicatum*) (TVA 2023f).

Table 3-11. Taxonomic Composition of Macrophyte Species Occurring in the Clinch River Arm of the Watts Bar Reservoir from CRM 14.1 to CRM 23.1 and Melton Hill Reservoir from CRM 23.1 to 53.5

Common Name	Scientific Name	Growth Form	Relative Abundance
Clinch River Arm of the Watts Bar Reservoir			
Coon-tail	*Ceratophyllum demersum*	Submerged	Abundant/Widespread
Eurasian watermilfoil[1]	*Myriophyllum spicatum*	Submerged	Scattered
Hydrilla	*Hydrilla verticillata*	Submerged	Common
Nuttall's waterweed	*Elodea nuttallii*	Submerged	Scattered/Widespread
Sago pondweed	*Stuckenia pectinata*	Submerged	Rare
Small pondweed	*Potamogeton pusillus*	Submerged	Scattered
Southern naiad	*Najas guadalupensis*	Submerged	Scattered
Water stargrass	*Heteranthera dubia*	Submerged	Common/Widespread
Melton Hill Reservoir			
American pondweed	*Potamogenton nodosus*	Floating	Uncommon
Brittle naiad[1]	*Najas minor*	Submerged	Scattered
Coon-tail	*Ceratophyllum demersum*	Submerged	Widespread
Eurasian watermifoil[1]	*Myriophyllum spicatum*	Submerged	Common/Widespread
Hydrilla[1]	*Hydrilla verticillata*	Submerged	Uncommon

Muskgrass	*Chara sp.*	Submerged	Widespread
Nuttall's waterweed	*Elodea nuttallii*	Submerged	Scattered
Scared lotus	*Nelumbo nucifera*	Emergent	Rare
Small pondweed	*Potamogeton pusillus*	Submerged	Scattered
Southern naiad	*Najas guadalupensis*	Submerged	Scattered
Water stargrass	*Heteranthera dubia*	Submerged	Common/Widespread

Source: TVA 2023f
Notes: CRM = Clinch River Mile
1) Species noted to be aquatic nuisance species (TVA 2022a)

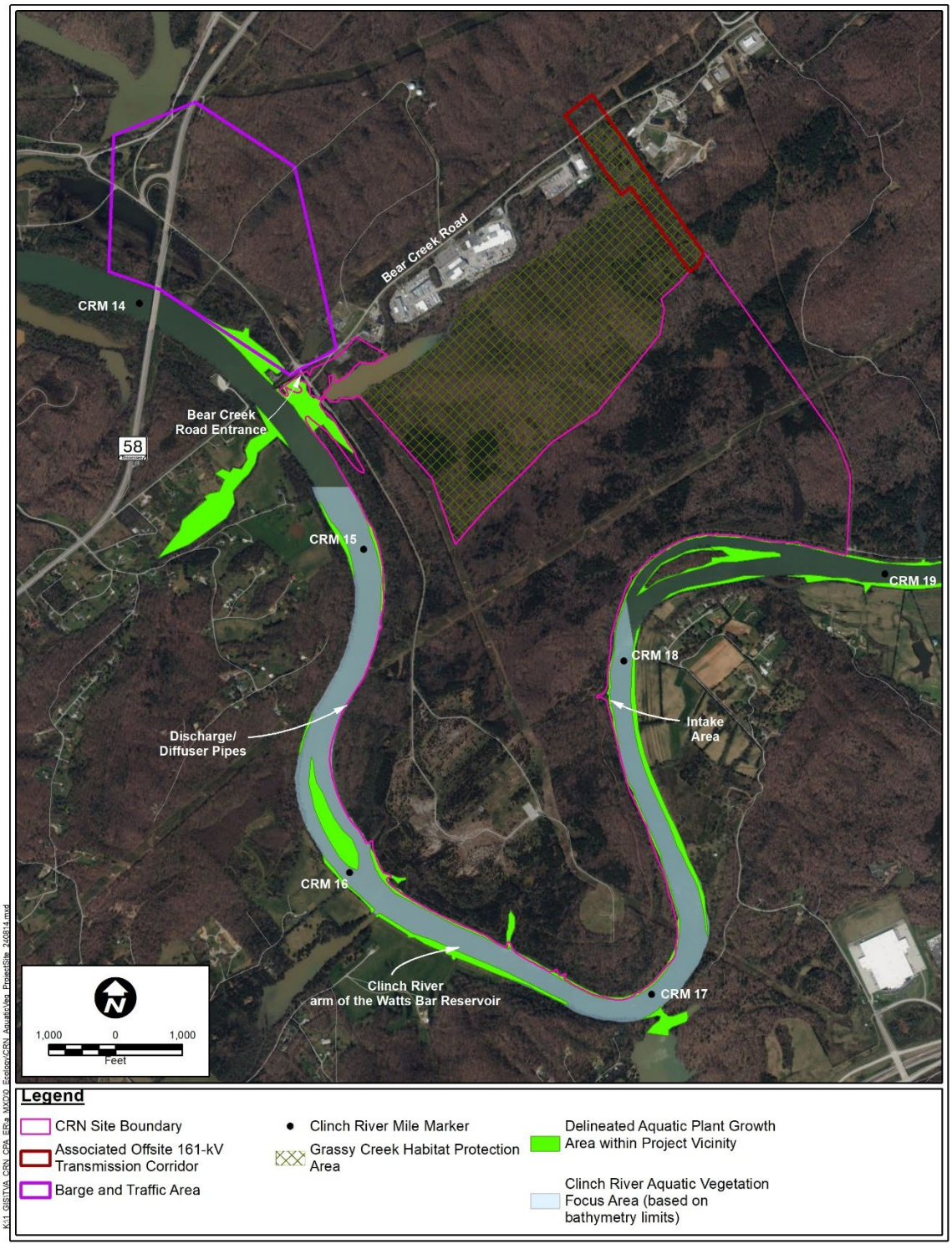

Figure 3-5. Location of Aquatic Macrophyte Growth Areas in the Clinch River Arm of the Watts Bar Reservoir Adjacent to the CRN Site

3.5.1.3. Invasive Species

TVA identified no new information related to invasive and nuisance clams, mussels, or fish species in the vicinity and region of the Project Area. However, new information related to invasive aquatic species is described below.

As described in Section 3.5.1.2, an aquatic macrophyte survey was conducted by TVA in the Reservoir in 2022. This survey consisted of an aerial survey of the river channel with ground reconnaissance to determine the abundance, distribution, and composition of aquatic plant communities. Several species identified in the 2022 survey are considered to be aquatic invasive species. The PEIS listed the following aquatic macrophytes as non-native, invasive species:

- Eurasian watermilfoil (*Myriophyllum spicatum L.*)
- Hydrilla (Hydrilla verticillata)
- Spiny-leaf naiad (*Najas minor*) (also known as brittle naiad)
- Curly-leaved pondweed (*Potamogeton crispus L.*)

The PEIS also noted that, in prior surveys of the shoreline near the CRN Site, no macrophytes were observed. However, in the 2022 survey, three of the species listed above were observed, including Eurasian watermilfoil, hydrilla, and spiny-leaf naiad. Within the Reservoir, hydrilla was determined to be common, whereas Eurasian watermilfoil was determined to be scattered. By comparison, within Melton Hill Reservoir, Eurasian watermilfoil was determined to be common/widespread and both brittle naiad and hydrilla were determined to be either scattered or uncommon, respectively (see Table 3-11).

Additionally, as described in Section 3.5.1.1, one non-native crayfish, the red swamp crayfish, was identified on the CRN Site during onsite aquatic surveys conducted by TVA in 2023 (TVA 2023e). This species was identified in backwaters of the Reservoir as well as in STR11 on the CRN Site. This species is considered a nuisance species in the State of Tennessee due to potential for disturbance of native fauna including destruction of aquatic vegetation, competition with native species, and predation upon other aquatic species (TVA 2023e).

3.5.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential effects associated with development of the CRN Site on aquatic ecosystems are associated with construction phase direct and indirect impacts from habitat alteration and loss of aquatic biota within onsite streams and ponds due to site grading, culvert replacement, transmission line development, and roadway improvements. Other impacts could occur to aquatic ecosystems within the Reservoir due to construction of intake and discharge structures and development of a supplemental onsite barge facility. With implementation of BMPs and adherence to state and federal regulations and permit requirements, impacts were determined to be minor.

Potential operational impacts summarized in the PEIS include those associated with impingement and entrainment by the cooling water intake structure, and potential thermal impacts from the discharge. TVA would design the CRN-1 intake and discharge structures to meet Best Technology Available criteria, reduce scour and minimize effects to aquatic ecosystems. Therefore, impacts on aquatic resources from operation were determined to be minor.

3.5.2.1. Construction

For CRN-1 potential impacts to aquatic ecology are similar to those described in the PEIS. Such effects include in-filling of streams and ponds, associated alteration of adjacent riparian zones, placement of cofferdams, installation of new or replacement culverts, and localized dredging activities.

As described in Section 3.1.4, the proposed project no longer includes the TN 95 access road that extends through the DOE ORR, transmission line or upgrades and reconductoring within existing transmission line corridors beyond the Bear Creek Road interconnect, a supplemental barge facility, or extensive shoreline stabilization. As such no impacts would occur to aquatic ecosystems potentially affected by these actions.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction impacts on aquatic ecology that is consistent with that considered in the PEIS:

- CRN Site and Associated Offsite Areas
- The Reservoir
- Mitigative measures for unavoidable impacts

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. TVA determined that construction impacts on aquatic ecology are reduced because the supplemental barge facility and extensive shoreline stabilization are eliminated from the proposed action. Therefore, the assessment of construction impacts on aquatic ecology in PEIS Section 3.6.2 is incorporated by reference, and impacts are minor.

3.5.2.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to operational impacts on aquatic ecosystems that is consistent with that considered in the PEIS:

- Impingement and entrainment
- Impacts from discharges related to operation of the cooling water system

TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, the assessment of operation impacts on aquatic ecology in PEIS Section 3.6.2 is incorporated by reference, and impacts are minor.

3.6. Terrestrial Ecology

3.6.1. Affected Environment

As described in the PEIS, terrestrial plant and animal communities were surveyed and mapped within the Project Area and vicinity. The terrestrial plant communities within the CRN Site and associated offsite areas comprise predominantly forested and herbaceous vegetation. A large component of the CRN Site has been previously cleared and extensively graded, and currently has a substantial component of invasive terrestrial plant species. The proposed associated offsite 161-kV transmission line corridor would be sited across and down a ridge of forest habitat into forested bottomland crossing over Bear Creek Road to deciduous forest on DOE land. The

BTA, located off Bear Creek Road, is mostly forest and wetland, with mowed or forested edges. Over 200 wildlife species have been observed on the CRN Site during recent field surveys.

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to terrestrial ecology that is consistent with that considered in the PEIS:

- Regional land cover and plant communities
- Invasive Non-Native Plant Species

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to terrestrial ecology that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.6.1.1. Character/Quality of Terrestrial Plant Communities of the CRN Site

Based on interpretation of aerial photographs and the findings of recent TVA wetlands delineation surveys conducted since publication of the PEIS, TVA updated the map documenting dominant habitats and other land cover types on the CRN Site and associated offsite areas (Figure 3-6). Table 3-12 presents the extent of habitat types reported for the CRN Site, BTA, and the associated offsite 161-kV transmission corridor. The extent of habitat types for the BTA is new information because potential limits of disturbance for this area have been expanded for the CRN-1 project. As part of this expansion, a new section of road and a barge landing area would be constructed in the BTA area within existing forest habitat.

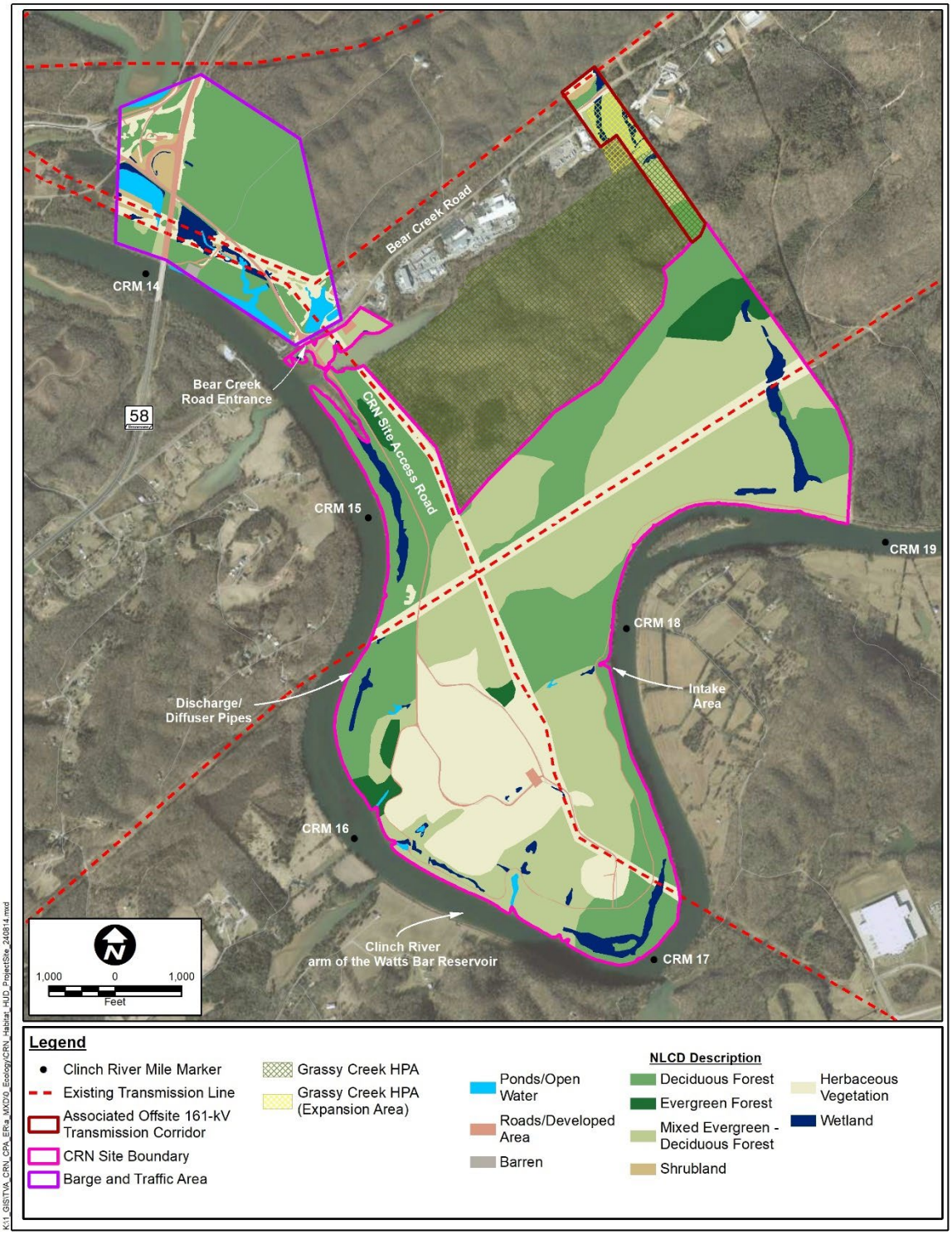

Figure 3-6. Updated Habitat Map of the CRN Site, BTA, and Offsite 161-kV Transmission Corridor

Table 3-12. NLCD Land Cover Categories for the Project Area

NLCD Description	CRN Site[1]		Barge and Traffic Area[1]		Offsite 161-kV Transmission Corridor[1]	
	Area (acres)	Percent	Area (acres)	Percent	Area (acres)	Percent
Barren Land (Rock/Sand/Clay)	0	0	0.8	<1	0	0
Cultivated Crops	0	0	0	0	0	0
Deciduous Forest	270.0	29	125.3	62	6.0	21
Developed, High Intensity	0	0	0	0	0	0
Developed, Medium Intensity	0	0	0	0	0	0
Developed, Low Intensity	14.1	2	14.9	7	0.4	1
Developed, Open Space	0	0	0	0	0	0
Emergent Herbaceous Wetlands	1.5	<1	6.0	3	0.7	2
Evergreen Forest	32.0	3	0	0	0	0
Herbaceous	202.2	22	26.0	13	2.3	8
Mixed Forest	384.2	41	2.4	1	15.7	54
Open Water	2.0	<1	16.5	8	0	0
Hay/Pasture	0	0	0	0	0	0
Shrub/Scrub	0	0	7.9	4	1.2	4
Woody Wetlands	29.4	3	2.7	1	2.9	10
Total	**935.3**	100	**202.5**	100	**29.2**	100

Source: NLCD Land Cover (Dewitz and USGS 2021)

Notes: CRN = Clinch River Nuclear; kV = kilovolt, TVA = Tennessee Valley Authority, NLCD = National Land Cover Database, USGS = U.S. Geological Survey

1) Land cover for the CRN Site and associated offsite areas presents a more refined representation of vegetation/land cover types than the NLCD data presented for the 6-mile vicinity. Dominant vegetation communities and other land cover types on the CRN Site and associated offsite areas were drawn in GIS based on aerial photographs and information from TVA field surveys.

3.6.1.2. Character/Quality of Wildlife Communities and Habitats

New information for wildlife communities includes the results of recent terrestrial wildlife and habitat field surveys of the CRN Site and associated offsite areas conducted by TVA in November 2023. During these surveys, 13 active osprey nests were observed on or near the CRN Site, seven of which were on large transmission line structures. Four of the nests were located on small utility poles, and two were on nesting platforms (TVA 2023g). Figure 3-7 in Section 3.7 shows the updated locations of nine osprey nests that are on or immediately adjacent to the CRN Site and updates the osprey nest locations documented in the PEIS. In addition, active cliff swallow nests were observed on the side of the SR 58 bridge over the Reservoir during 2023 surveys.

Avoidance, minimization, and mitigation practices implemented in coordination with U.S. Department of Agriculture (USDA) Wildlife Services and USFWS to comply with EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) are being conducted by TVA on an ongoing basis in conjunction with CRN Site management practices to reduce potential presence of osprey nests within the CRN-1 Project Area. These practices may include but are not limited to removal and/or relocation of nests, installation of alternative osprey nesting platforms, and installation of deterrents to provide nesting opportunities away from the Project Area.

3.6.1.3. Distribution and Extent of Disease Vector and Pest Species

Terrestrial nuisance species typically are invasive species that are non-native and likely to cause economic and/or environmental harm. No new information related to invasive terrestrial plant species was discovered during the 2023 surveys of the CRN Site and associated offsite areas.

Non-native animal species were not discussed in the PEIS. Non-native terrestrial animal species that have been observed or have the potential to be present on the CRN Site include European starling (*Sturnus vulgaris*), rock pigeon (*Columba livia*), feral hog (*Sus scrofa*), and two species of imported fire ants, the black fire ant (*Solenopsis richteri*) and the red fire ant (*Solenopsis invicta*).

In Tennessee, feral hogs are classified as a species deemed destructive and it is illegal to possess, transport, or release live wild hogs (Tennessee Wildlife Resources Agency 2024). Regarding imported fire ants, the U.S. Department of Agriculture (USDA) works to prevent artificial (human assisted) spread of fire ants by enforcing the Federal Quarantine (7 CFR 301.81) in states where they are present, including Tennessee (USDA 2023). TVA follows the quarantine guidelines by restricting the movement of certain “articles”, mainly soil or baled hay and straw stored in contact with the ground in areas where the fire ant is thought to occur.

3.6.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential effects on terrestrial ecosystems during construction include direct and indirect impacts from habitat alteration and loss of terrestrial biota due to site grading, culvert replacement, transmission line development, and roadway improvements. With implementation of BMPs and adherence to state and federal regulations and permit requirements, impacts were determined to be minor.

Potential operational impacts summarized in the PEIS include those associated with operation of the cooling system, including local deposition of dissolved solids, increased local fogging,

precipitation, or icing, noise, and wildlife collisions. Potential impacts on vegetation and wildlife from the operation and maintenance of the transmission system include maintenance of vegetation within transmission ROW and potential electromagnetic fields. Due to the relatively small size of the cooling towers and the temperature and climate of the area, cooling system effects were determined to be minor and localized. In addition, due to vegetation clearing around the proposed facility and a lack of migration corridors in the area, potential noise and collision impacts to wildlife were determined to be minor. Therefore, impacts on terrestrial ecological resources from operation were determined to be minor.

3.6.2.1. Construction

For CRN-1 potential impacts to terrestrial ecology would be similar to those described in the PEIS. However, the CRN-1 Project Area excludes the TN 95 access road that extends through the DOE ORR, reconductoring within existing transmission line corridors beyond the Bear Creek Road interconnect, a supplemental barge facility, or extensive shoreline stabilization. As such no impacts would occur to terrestrial ecosystems potentially affected by these actions.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction impacts on terrestrial ecology that is consistent with that considered in the PEIS:

- Terrestrial habitats on the CRN Site
- Terrestrial habitats on other offsite areas
- Impacts to wildlife
- Impacts associated with forest fragmentation
- Other effects to wildlife related to construction of CRN-1
- Extent of revegetation of temporarily disturbed areas

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.6.2.1.1. Natural Resource Sustainability Management

TVA would implement sustainability measures during construction of CRN-1 to include development of pollinator habitats and other sustainable development and land management policies in association with development and implementation of a site biodiversity plan in accordance with TVA's Biodiversity Policy (TVA 2021b). TVA's commitment to implement natural resource sustainability management on the CRN Site is more detailed and notably different from that used to prepare the PEIS.

3.6.2.1.2. Summary of Construction Impacts to Terrestrial Ecology

TVA considered all identified new and notable information in combination with PEIS Section 3.7.2 to assess the potential effects from construction activities on terrestrial ecology. TVA determined the overall impact of construction activities on terrestrial ecology is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction activities on terrestrial ecology in PEIS Section 3.7.2 is incorporated by reference, and impacts are moderate.

3.6.2.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to impacts of operation on terrestrial ecology that is consistent with that considered in the PEIS:

- Cooling tower fogging, icing, and salt deposition effects on vegetation
- Vehicle traffic impacts on wildlife
- Avian collisions
- Noise-related impacts on wildlife
- Natural resource sustainability management

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.6.2.2.1 Transmission System Vegetation Management Practices

In 2019, TVA issued *Transmission System Vegetation Management Final Programmatic Environmental Impact Statement (*TVA 2019b) evaluating the potential environmental effects of managing vegetation within transmission line ROWs and corridors throughout the TVA Power Service Area using a systemic approach. Subsequent site-specific Environmental Assessments (EAs) support analysis for implementing transmission system vegetation management practices in specific areas of the TVA service territory. While the programmatic Environmental Impact Statement for transmission system vegetation management is subject to a federal court injunction pursuant to ongoing litigation of the same, TVA is complying with the terms of the injunction in pursuing vegetation management practices in TVA's transmission ROWs.

TVA actively manages vegetation communities within transmission ROWs using BMPs designed to protect endangered/threatened plant species and other sensitive resources outlined in the *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 4 - 2022* (TVA 2022c). Additionally, TVA will implement conservation measures applicable to the CRN Site to include development of pollinator habitats and other land management policies in association with development and implementation of a biodiversity plan for the CRN Site. Specific measures for the transmission line corridors and the CRN Site would be finalized and implemented when construction at the site is complete.

3.6.2.2.1. Summary of Operational Impacts to Terrestrial Ecology

TVA considered all identified new and notable information in combination with PEIS Section 3.7.2 to assess the potential effects from operational activities on terrestrial ecology. TVA determined the overall impact of operational activities on terrestrial ecology is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational activities on terrestrial ecology in PEIS Section 3.7.2 is incorporated by reference, and impacts are minor.

3.7. Threatened and Endangered Species

3.7.1. Affected Environment

As described in the PEIS, potential sensitive species and habitats within the CRN Project Area include potential summer roosting and foraging habitat for bat species (Indiana bat, northern

long-eared bat, little brown bat, tricolored bat; and gray bat) and habitats potentially used by other wildlife species such as four-toed salamander, hellbender, Bachman's sparrow, bald eagle, cerulean warbler, sharp-shinned hawk, Swainson's warbler, meadow jumping mouse, and southeastern shrew. Additionally, sensitive plant species known from the Project Area include the state-listed spreading false-foxglove, rigid sedge, and pale green orchid.

In January 2025, TVA submitted a biological assessment to the USFWS for consideration. Information provided in the responses from USFWS regarding consideration of impacts and avoidance and minimization measures related to Section 7 consultation under the ESA represents new information from the PEIS and will be incorporated when received. Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to threatened and endangered species that is consistent with that considered in the PEIS:

- Threatened and endangered species databases
- Aquatic species

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.7.1.1. Wildlife

TVA conducted field surveys for terrestrial animal species on the CRN Site and associated offsite areas in 2023 (TVA 2023g). Sensitive habitat features for species of concern on the CRN Site, BTA, and associated offsite 161-kV transmission corridor are shown in Figure 3-7. TVA did not identify new information regarding presence of threatened or endangered terrestrial species on the CRN Site or associated offsite areas.

Since publication of the PEIS, there have been changes in the federal listing status of several species pursuant to the ESA. The northern long-eared bat (*Myotis septentrionalis*) has been reclassified as endangered under the ESA and the tricolored bat (*Perimyotis subflavus*) has been proposed to be listed as endangered. No final listing decision for tricolored bat has occurred as of January 2025. In addition, the monarch butterfly (*Danaus plexippus*) has been proposed for listing as a threatened species under the ESA and has the potential to occur in the Project Area. The eastern hellbender (*Cryptobranchus alleganiensis)* has also been proposed for listing as endangered under the ESA. One possibly historical record of this species exists 1.13 miles from the CRN Site in the Clinch River. The IPaC (Information for Planning and Consultation) website also identified the whooping crane (Grus americana) as potentially occurring in the Project Area (USFWS 2024). However, this species is federally listed as a non-essential experimental population, and for the purposes of consultation is not subject to Section 7(a)(2) of the ESA on private lands, but federal agencies must not jeopardize their existence. Habitat for this species does not occur in the Project Area. An updated review of the USFWS IPaC website (USFWS 2024) and TVA's Regional Natural Heritage Database for terrestrial wildlife (TVA 2024d) indicated that there are records of 10 state-listed or tracked terrestrial wildlife species and two federally listed species within 5 miles of the CRN Site and associated offsite areas (Table 3-13).

Table 3-13. Federally and State-listed Terrestrial Animal Species Documented Within Roane County, and Within 5 Miles of the CRN Site and Associated Offsite Areas[1]

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]	Updated from PEIS
Amphibians					
Four-toed salamander	*Hemidactylium scutatum*	-	D	S3	-
Hellbender	*Cryptobranchus alleganiensis*	PE[4]	E	S3	X
Birds					
Bachman's sparrow	*Aimophila aestivalis*	-	E	S1B	-
Bald eagle	*Haliaeetus leucocephalus*	DL	D	S3	-
Cerulean warbler	*Setophaga cerulea*	-	D	S3B	-
Sharp-shinned hawk	*Accipiter striatus*	PS[4]	-	S3B,S4N	-
Swainson's warbler	*Limnothlypis swainsonii*	-	D	S3	-
Whooping crane	*Grus americana*	EXPN	-	SX	X
Mammals					
Gray bat	*Myotis griscesens*	E	E	S2	-
Northern long-eared bat	*Myotis septentrionalis*	E	E	S1S2	X
Indiana bat	*Myotis sodalis*	E	E	S1	
Little brown bat	*Myotis lucifugus*	-	T	S3	
Meadow jumping mouse	*Zapus hudsonius*	PS[4]	-	S4	-
Southeastern shrew	*Sorex longirostris*	-	-	S4	-
Tricolored bat	*Perimyotis subflavus*	PE	T	S2S3	X
Insects					
Monarch	*Danaus plexippus*	PT	-	S4	X

Notes: CRN = Clinch River Nuclear, PEIS = Programmatic Environmental Impact Statement
1) Source: TVA 2024d; USFWS, 2024a
2) Status abbreviations: D = Deemed in Need of Management; DL = Recovered, delisted, and being monitored, E = Endangered, T = Threatened; PT = Proposed Threatened; PE = Proposed Endangered; EXPN = non-essential experimental population; PS = Partial Status; C = Candidate for listing; "-" = not listed.
3) State Rank Definitions: S1 - critically imperiled; S2 - imperiled; S3 - rare or uncommon; S4 - widespread, abundant and apparently secure, but with cause for long-term concern; SX – presumed extirpated; S#B = Status of Breeding population; S#N = Status of non-breeding population.
4) Species in this table with Partial Status are federally listed elsewhere in the U.S. but are not federally listed in Roane County, Tennessee.

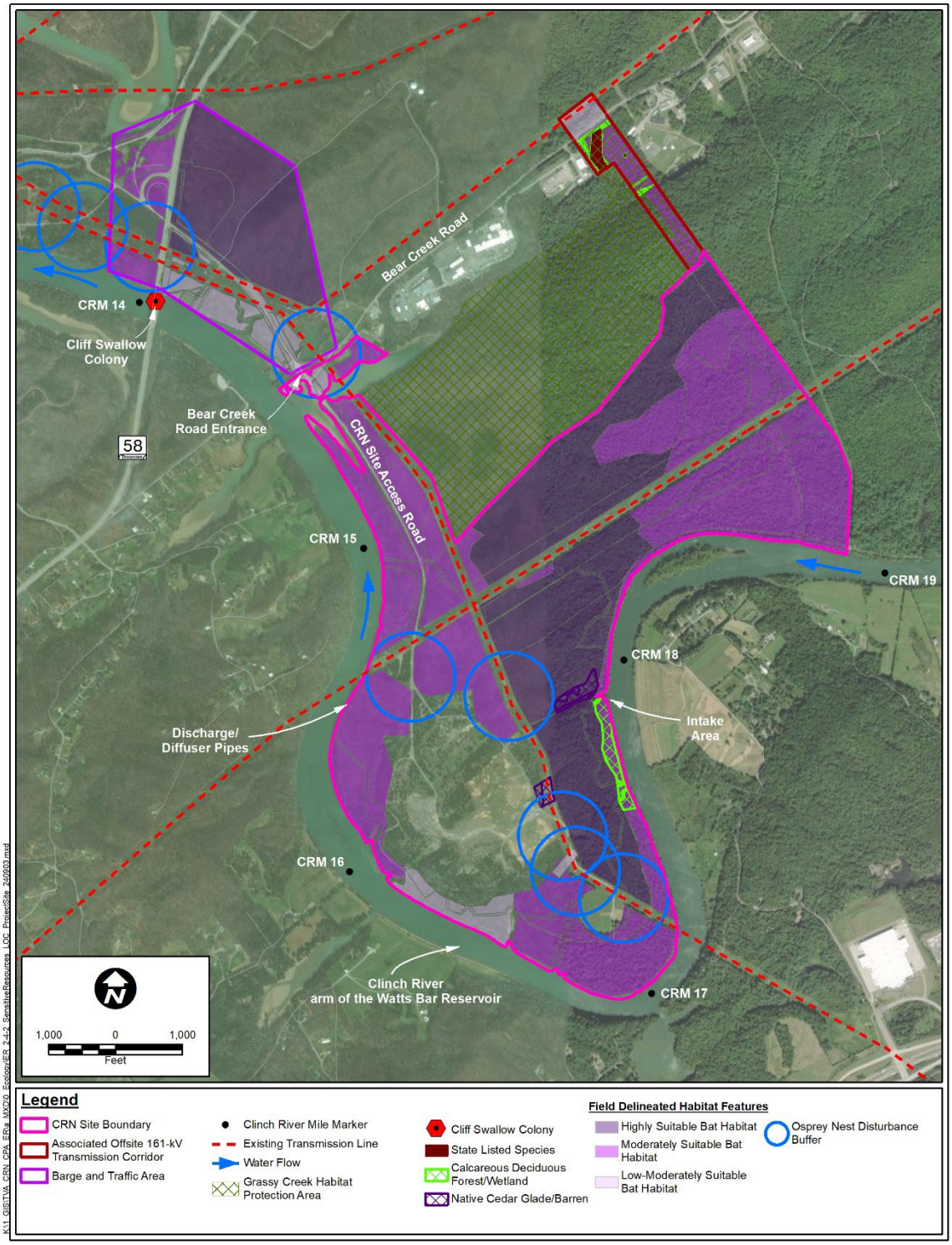

Figure 3-7. Sensitive Habitat Features for Species of Concern on the CRN Site, BTA, and Offsite 161-kV Transmission Corridor

3.7.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential effects of the CRN-1 project on threatened and endangered species are primarily associated with the loss of potential summer roosting and foraging habitat for listed bat species; or habitat alteration for other state listed wildlife and plant species. The PEIS stated that impacts would be minimized by seasonal tree clearing, avoidance measures and implementation of TVA BMPs during construction and operation and determined that impacts to threatened and endangered species were determined to be minor.

3.7.2.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on threatened and endangered species that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.7.2.1.1. Impacts On Important Species and Habitats

TVA did not identify any new information regarding construction impacts of CRN-1 on threatened and endangered aquatic animals and plants. Therefore, Section 3.8.2 from the PEIS is incorporated by reference.

As described in Section 3.7.1, new information for threatened and endangered terrestrial species and habitats includes changes in the federal listing status of several species pursuant to the ESA and the results of recent terrestrial plant and wildlife surveys within the Project Area. Since publication of the PEIS, the northern long-eared bat has been reclassified as endangered under the ESA, and the tricolored bat has been proposed to be listed as endangered (USFWS, 2024a). Although the listing status of the northern long-eared bat and tricolored bat have changed, potential impacts to these species, described in Section 3.2.2.3 of the PEIS, are still applicable and would be subject to consultation requirements under Section 7 of the ESA. No final listing decision for tricolored bat has occurred as of January 2025.

As discussed in the PEIS, conservation measures, including removal of trees in winter to avoid nesting and roosting wildlife and establishing protective buffers around caves, would be implemented to minimize adverse impacts to bats. Potential impacts to federally listed tree-roosting bats alongside existing ROWs during maintenance activities were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7 (a)(2), originally completed in April 2018 and updated in May 2023 and November 2024 (USFWS, 2023, 2024b). For those activities with potential to affect federally listed bats, TVA committed to implementing specific conservation measures. The CRN Site is within swarming habitat for the tricolored bat. Therefore, tree removal would occur between November 15 and March 31. Tree removal would involve up to 250 total acres of trees within the project footprint. Artificial bat roosting structures would be installed at the CRN Site to provide permanent habitat for imperiled tree roosting bats that otherwise may rely on ephemeral habitat for summer roosting. Roosting structure design and placement would be selected to attract federally protected bats. If needed in the future due to high levels of disturbance from humans, TVA would evaluate the potential to install bat friendly gates on the caves. To minimize potential noise-related indirect impacts to bats within caves located within a half-mile of construction activities that may be used for summer roosting, transitional roosting, and as a winter hibernaculum for federally listed bats, TVA will consult with the USFWS and implement conservation measures, as appropriate. With the use of avoidance, minimization, and

conservation measures, there would likely be no major impacts to threatened and endangered bat species.

The monarch butterfly is a proposed threatened species under the ESA and has the potential to occur in the project area. Potentially suitable herbaceous and shrub/scrub foraging habitat for the monarch butterfly could be affected by CRN-1 construction activities. However, the potentially suitable habitat is only present in scattered pockets across the CRN-1 Project Area and this loss represents only a fraction of the herbaceous, pasture, and shrub/scrub habitats available within the 6-mile vicinity, and TVA would implement sustainability practices during construction activities to include development of pollinator habitats as discussed in Section 2.8.2 of this SEIS. Therefore, impacts to this species are expected to be minor, and proposed actions would not jeopardize the continued existence of the monarch butterfly.

Eastern hellbender is now a proposed endangered species under the ESA. It was previously addressed in the PEIS as a state-listed species. A record of this species from 1989 exists within 3 miles of the proposed activities. Due to the age of the record, it is categorized as “possibly historical” in the TVA Regional Natural Heritage database. The USFWS Eastern Hellbender Species Status Assessment (USFWS 2024c) indicates that eastern hellbenders are likely functionally or presumed extirpated in the reach of the Clinch River that is adjacent to the proposed actions. Due to the lack of extant populations of eastern hellbender near the CRN-1, proposed actions would not jeopardize the continued existence of the species.

The IPaC website identified the whooping crane, federally listed as a non-essential experimental population, as potentially occurring in the project area (USFWS, 2024a), and this species was not evaluated in the PEIS. Foraging habitat for this species does not occur in the Project Area, and this species is not known to breed in Tennessee. Therefore, construction of CRN-1 would not impact the whooping crane.

3.7.2.1.2. Summary of Construction Impacts to Threatened and Endangered Species

In summary, new information was identified and evaluated relative to changes in the federal listing status of several federally listed species, the results of recent terrestrial wildlife surveys within the Project Area, and updated BMPs and TVA policies. Potential impacts to threatened and endangered bat species would be related to loss of potential summer roosting and foraging habitat and effects from construction noise (such as traffic, heavy machinery, and blasting). However, TVA would implement conservation measures, including removal of trees in winter (November 15 – March 31) to avoid nesting and roosting wildlife, establishing protective buffers around caves, installation of bat roosting structures, and avoiding and minimizing effects to state-listed plant species during detailed design based on a narrower 120-foot-wide corridor in the offsite 161-kV transmission corridor.

TVA considered all identified new and notable information in combination with PEIS Section 3.8.2 to assess the potential effects from construction activities on threatened and endangered species. TVA determined the overall impact of construction on threatened and endangered species is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction impacts on threatened and endangered species in PEIS Section 3.9.2 is incorporated by reference, and impacts are minor to moderate and subject to ESA Section 7 consultation with the USFWS.

3.7.2.1. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to operational impacts on threatened and endangered species that is consistent with that considered in the PEIS:

- Collision and noise-related impacts

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.7.2.1.1. Transmission Corridor Maintenance and Vegetation Management within Terrestrial Habitats

Impacts to vegetation and habitat from management of vegetation within transmission line ROWs and on the CRN Site are evaluated in Section 3.7.2 of this SEIS. TVA would use BMPs per *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 4 - 2022* (TVA 2022c), which is an update to the 2017 guide referenced in the PEIS and is designed to protect endangered/threatened plant species and other sensitive resources.

In 2019, TVA issued the *Transmission System Vegetation Management Final Programmatic Environmental Impact Statement (*TVA 2019b) evaluating the potential environmental effects of managing vegetation within transmission line ROWs and corridors throughout the TVA Power Service Area using a system-wide approach. Subsequent site specific EAs support analysis for implementing transmission system vegetation management practices in specific areas of the TVA service territory. While the programmatic Environmental Impact Statement for transmission system vegetation management is subject to a federal court injunction pursuant to ongoing litigation of the same, TVA is complying with the terms of the injunction in pursuing vegetation management practices in TVA's transmission ROWs. This program includes the use of BMPs per the *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 4 - 2022* (TVA 2022c), which is an update to the 2017 guide referenced in the PEIS and is designed to protect endangered/threatened plant species and other sensitive resources.

Vegetation management under TVA's program promotes the establishment of low-growing herbaceous plant communities that are compatible with the safe and reliable operation of the transmission system. This program entails the initial removal of vegetation to the full width of the existing ROW easement. As noted in previously in this document, potential impacts to federally listed tree-roosting bats alongside existing ROWs during maintenance activities were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7 (a)(2), originally completed in April 2018 and updated in May 2023 and November 2024 (USFWS 2023, 2024b). For those activities with potential to affect federally listed bats, TVA committed to implementing specific conservation measures.

Additionally, new information related to transmission line corridor maintenance and vegetation management on the CRN Site includes adoption of conservation measures to support the TVA Biodiversity Policy (TVA 2021b). TVA would implement conservation measures applicable to the CRN Site to include development of pollinator habitats and other land management policies in association with development and implementation of a biodiversity plan for the CRN Site. Specific measures for the transmission line corridors and the CRN Site would be finalized and implemented when construction at the site is complete.

3.7.2.1.2. Summary of Operation Impacts to Threatened and Endangered Species

TVA considered all identified new and notable information in combination with PEIS Section 3.8.2 to assess the potential effects from operational activities on threatened and endangered species. TVA determined the overall impact of operation on threatened and endangered species is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on threatened and endangered species in PEIS Section 3.9.2 is incorporated by reference, and impacts are minor and subject to ESA Section 7 consultation with the USFWS.

3.8. Managed and Natural Areas

3.8.1. Affected Environment

As described in the PEIS, there are no natural areas present within the CRN Site boundary. A review of the TVA Natural Heritage database and the TDEC State Natural Area Boundaries indicated that five managed/natural areas, two designated, and four proposed State Natural Areas are located within the 6-mile vicinity of the CRN Site.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to managed and natural areas that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.8.1.1. Land Use Plans and Zoning

The CRN Site is adjacent to the Grassy Creek HPA which is designated as Zone 3 – Sensitive Resource Management/Natural Area in the Watts Bar Reservoir Land Management Plan (WBRLMP) (TVA 2021e). The associated offsite 161-kV transmission line that extends offsite from the CRN Site and crosses Bear Creek Road would also cross through a portion of the HPA. The associated offsite 161-kV transmission corridor would interconnect with the Kingston FP - Bethel Valley Substation transmission line that parallels a portion of Bear Creek Road. This line would extend from the interconnection point on DOE land on the north side of Bear Creek Road, crossing through TVA land south of the road through the northeastern part of the Grassy Creek HPA, before entering the CRN Site. TVA would coordinate with DOE to obtain an appropriate authorization with DOE for use of land in DOE's custody and control to accommodate this segment of the proposed associated offsite 161-kV transmission line corridor. Due to potential impacts to state-listed plants located in this offsite transmission line corridor, TVA has expanded the Grassy Creek HPA by 14 acres as a mitigation measure. The expanded area is located on adjacent land managed by TVA between the Grassy Creek HPA and Bear Creek Road (Figure 2-1).

3.8.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, users of natural areas could be indirectly impacted during construction; however, the impacts would be minor and intermittent. Operational impacts could occur due to the creation of additional edge habitat, and noise and visual impairments. TVA determined that the potential impacts to natural areas would be minor to moderate.

For CRN-1 potential impacts to natural areas may consist of emissions and runoff from construction activities, increased traffic from workforce and equipment and associated noise and emissions, visual intrusions, and consistency with land management plans.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on managed and natural areas that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.8.2.1.1. Impacts to Managed and Natural Areas Along TN 95 Access

As stated in Section 3.9.2 of the PEIS, the TN 95 Access would cross several of the elements within the ORR boundary contained within the New Zion Boggy Area including the Haw Ridge uplands, Raccoon Creek Barrens, Raccoon Creek Embayment and Haw Ridge and the Clinch Floodplain Swamp. However, the TN 95 Access is not part of CRN-1 as indicated in Section 3.1.4. As such, no impacts would occur to these managed and natural areas.

3.8.2.1.2. Summary of Impacts to Managed and Natural Areas

TVA considered all identified new and notable information in combination with PEIS Section 3.9.2 to assess the potential effects from construction and operational activities on managed and natural areas. Because the TN 95 Access is not part of CRN-1, impacts of construction and operational activities on managed and natural areas. are notably less than the impacts assessed in the PEIS, and impacts are minor.

3.9. Recreation

3.9.1. Affected Environment

As described in PEIS Section 3.10.1, recreation opportunities within a 6-mile vicinity of the CRN Site include campgrounds, lodges, marinas, boat-launching ramps, parks, swimming pools and beaches, and local fishing tournaments. These include the Reservoir, Melton Hill Reservoir, Melton Hill Reservoir Park and Campground, Gallaher Recreation Area, the East Tennessee Technology Park (ETTP) Visitor's Overlook, and the Oak Ridge State Wildlife Management Area.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to recreational facilities that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.9.1.1. Recreation Facilities

TVA identified a new park, the Manhattan Project National Historic Park, within the vicinity of the CRN Site that was not listed in the PEIS.

The Manhattan Project National Historical Park includes elements that are located in three states, including New Mexico, Washington, and Tennessee. The Tennessee portion of the National Park is located in Oak Ridge, TN, approximately 2.6 miles north of the CRN Site. The Manhattan Project National Historic Park at Oak Ridge and related places includes historic sites, community centers and museums, and research facilities operated by the DOE (NPS, 2023).

3.9.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential impacts to parks and recreation areas resulting from development of the CRN Site would be minor to moderate based on the intermittent nature of construction, small operation workforce, and partially screened views of the CRN Site.

Potential impacts to recreational facilities from CRN-1 may consist of erosion and sedimentation from stormwater site runoff, construction along the Reservoir shoreline, temporary limitations in Reservoir recreational use in the vicinity of the intake structure, increased traffic from workforce and equipment and the associated noise and emissions, visual intrusions, and availability of recreational facilities. TVA considered the changes to the availability and experience of recreational resources as key inputs to the analysis of the potential effects determined to be important considerations in the impact analysis.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction and operation impacts on recreation that is consistent with that considered in the PEIS:

- In-migrating workforce population and construction activities

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.9.2.1. Recreational Use of the Reservoir

Because the submerged offshore intake structure would be located within the navigation channel, construction activities may result in interruptions in recreational use of the Reservoir (such as boating and fishing) in proximity to the intake structure. Additionally, intermittent blasting from the onsite quarry and building the intake structure may also result in an audible disturbance that may impact recreational users of the Reservoir. However, these interruptions and noise disturbances would be short term and intermittent.

3.9.2.2. Changes in the Aesthetic Quality of the Visible Viewshed

The undisturbed zone of vegetation along the perimeter of the CRN Site and the BTA provides a visual buffer from construction and operation activities. However, clearing and grading for CRN-1 would change the undeveloped nature of the site and introduce visual discord to recreationist who had previously undisrupted views along the Reservoir. Construction of CRN-1 would change the recreational experience of hunters, boaters, and hikers along the Reservoir and surrounding recreation areas in the vicinity of the CRN Site. During the building phase, recreationists may experience visual discord due to large construction equipment, construction lighting, clearing and grading of the CRN Site, dust from the CRN Site, and increases in noise levels. Building impacts would extend to the shoreline of the Reservoir in the vicinity of the intake structure, the discharge structure, the barge unloading facility, and intermediate areas near CRM 16. Clearing of approximately 5 acres of shoreline habitat in conjunction with the expanded barge unloading area would result in aesthetic viewshed impacts from the Reservoir and TN 58. However, shoreline vegetation along much of the perimeter of the CRN Site and the BTA would remain and continue to provide a visual buffer from building activities occurring within the central portion of the project site.

While the expected visual discord and recreational interruptions may be noticeable, these impacts do not destabilize the larger reaches of the Reservoir or the broader recreational experience. Additionally, there are no parks or recreational facilities within the CRN-1 Site boundaries or within the associated offsite areas (BTA and 161-kV offsite transmission line). As the Manhattan Project National Historic Park is over 2 miles from CRN-1, construction and operation of CRN 1 is not expected to impact the National Historic Park.

3.9.2.3. Summary of Construction and Operation Impacts on Recreation

TVA considered all identified new and notable information in combination with PEIS Section 3.10.2 to assess the potential effects from construction and operational activities on recreation. TVA determined the overall impact of construction and operation on recreation is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction and operational impacts on recreation in PEIS Section 3.10.2 is incorporated by reference, and impacts are minor.

3.10. Transportation

3.10.1. Affected Environment

As described in the PEIS, the transportation network in the area around the CRN Site consists of a network of federal and state highways; three freight rail lines; one major navigable river; one commercial passenger airport, McGhee Tyson Airport; and the Knoxville Downtown Island Airport. Level of service (LOS) on the primary roadways that would serve the CRN Site were calculated based on daily traffic volumes and ranged from LOS A to LOS B. Capacity analyses were also performed for the ten intersections most likely to be affected by project-related traffic. The baseline LOS for these intersections ranged from LOS A to LOS F.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to transportation that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.10.1.1. Updated traffic assessment

In support of TVA's CPA, a traffic assessment was conducted which assessed changes to inputs since the PEIS traffic evaluation, *Clinch River Nuclear Site Specific Design and Construction Planning, Off-Site Traffic Assessment* (Black & Veatch 2024). For specific intersections and turning movements, this traffic study includes baseline traffic information determined from traffic counts performed by AECOM in 2013. In addition, updated traffic counts were performed at selected intersections, including TN 58 at the CRN main entrance ramp and TN 95 at Bear Creek Road, in 2021 as part of a traffic impact analysis prepared by Wood Environmental & Infrastructure Solutions, Inc. (Wood 2022) for the PEIS. The 2024 traffic assessment compared the traffic count data from the 2021 Wood study to the 2013 AECOM traffic counts (extrapolated to 2021 using an assumed 2 percent per year growth rate) and concluded that numbers from the two separate traffic counts were generally similar. Increased counts were noted on TN 58 and TN 95 at Bear Creek Road in 2021, related to through traffic, and would not be affected by CRN Site traffic. Thus, the 2024 traffic assessment concluded that the 2013 traffic count information from the AECOM study accurately represented the baseline conditions and could reliably form the basis of the updated traffic assessment. Based on this conclusion, there are no notable changes to the baseline traffic conditions presented in the PEIS.

3.10.2. Environmental Consequences of Alternative B1 - Construction, Operation and Decommissioning of CRN-1

As summarized in the PEIS, potential impacts to transportation are associated with increased traffic from the onsite workforce and other onsite construction and operation activities. With proposed improvements to key roadway intersections that were included in the project design, impacts to traffic were determined to be minor to moderate during construction and minor during

operation. Potential impacts to transportation from CRN-1 consist of increased project-related traffic on local roadways and waterways.

3.10.2.1. Construction

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction and operation impacts on transportation that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.10.2.1.1. Planned Access to the Site

TN 58 and Bear Creek Road provide access for the CRN Site, and it is assumed that all vehicular traffic entering and exiting the site would use these roads. The PEIS assumed that approximately 20 percent of both construction phase and operational phase traffic would enter and exit the CRN Site from the TN 95 access. Because the TN 95 access has been eliminated, traffic related to CRN-1 construction and operation would not further exacerbate conditions at existing poor performing (LOS F) intersections along TN 95, as described in the PEIS.

Consistent with the PEIS, the existing intersection configurations are not adequate for the anticipated site traffic for constructing CRN-1. Thus, TVA would coordinate with TDOT, DOE, and the City of Oak Ridge to consider mitigation strategies that include the following recommendations:

- Intersection improvements at TN 58 and Bear Creek Road Ramp (e.g., signalization, expanded lane storage, additional turning and/or receiving lanes).
- Realignment of U.S. Government Property Road at the Bear Creek Road Ramp to develop an improved intersection.
- Addition of left- and right-turn only lanes at Bear Creek Road at the CRN Site driveway.
- Installation of bollards on Bear Creek Road extending from southbound Bear Creek Road through the Site Driveway intersection to direct southbound vehicles to the outermost receiving lane into site.
- Realignment of Bear Creek Road to a “T” intersection, eliminating the existing curve at the CRN Site entrance.

The proposed mitigation would generally provide adequate LOS for traffic associated with CRN-1. However, during the peak construction traffic year, issues remain at some intersections, such as the westbound turning movement at Bear Creek Road and TN 95, which may result in delays and deterioration of LOS which could be destabilizing. Although the generation of traffic during the peak construction period is less than that described in the PEIS, the recommended mitigation measures have been scaled accordingly, removing the northbound access ramp between TN 58 and Bear Creek Road from the scope of the project. For these reasons, impacts on local roadways could be moderate to large during the peak construction period. However, these impacts would be temporary and limited to peak traffic hours.

3.10.2.1.2. Volume of Project-Related Traffic

During construction, the peak traffic generation estimate of CRN-1 is based on a peak onsite traffic volume of 1,001 vehicles. With a carpooling factor of 1.3 workers per vehicle, this is equivalent to the approximately 1,300 onsite workers during the peak construction period. In the event borrow material is obtained from an offsite quarry, approximately 70 to 80 truck deliveries

(approximately 8 trucks per hour) are expected per day for a duration of approximately two years. However, as this borrow transport is not expected to overlap with the peak construction workforce, traffic impacts are bounded by a peak volume of 1,001 vehicles. One hundred percent of the traffic (1,001 vehicles) associated with construction of CRN-1 is assumed to enter the CRN Site from TN 58 through Bear Creek Road entrance during the peak hour. This volume is less than the 1,502 workers and 24 trucks (80 percent of the total construction traffic) assumed to use the Bear Creek Road entrance during the peak hour in the PEIS analysis.

During operations, the estimated CRN-1 workforce is 205 people, with an additional 280 people or fewer for periodic refueling outages and major maintenance activities. Given that many of the mitigation measures to alleviate traffic impacts during construction would remain in place during operation, and that there would be a much smaller volume of CRN-1 related workforce traffic on the local roads, impacts during operation would be minor and less than that during construction.

3.10.2.1.3. Construction of Submerged Offshore Intake Structure

As noted in the PEIS, transport of bulk materials or components by barge would result in minor impacts to navigation during construction. Because the submerged offshore intake structure would be located within the navigation channel, construction of the intake structure may result in short term localized interruptions in navigational use of the Reservoir in proximity of the intake structure. However, construction activities would be temporary and localized.

3.10.2.1.4. Summary of Construction Impacts on Transportation

TVA considered all identified new and notable information in combination with PEIS Section 3.12.2 to assess the potential effects from construction activities on transportation. TVA determined that impact of CRN-1 on the roadway network is moderate to large during construction which is greater than and notably different from the findings of minor to moderate in the PEIS. TVA would coordinate with TDOT, DOE, and the City of Oak Ridge to consider and implement mitigative strategies (e.g., signalizations, roadway improvements) to minimize impacts to the extent practicable. Additionally, impacts from building a submerged offshore intake structure within the navigation channel may result in short-term localized interruptions in navigational use of the Reservoir in proximity of the intake structure during construction. Overall construction-related impacts on transportation are moderate to large.

3.10.2.2. Operation

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any new information related to operational impacts on transportation. Therefore, the assessment of operation impacts on transportation in PEIS Section 3.12.2 is incorporated by reference, and impacts are minor.

3.10.2.3. Reasonably Foreseeable Future Actions in Proximity to the CRN Site

As noted in Section 3.1.5, TVA identified several RFFAs in proximity to CRN-1 as part of the assessment of cumulative effects on transportation. Several of the identified actions by others geographically intersect with the roadways affected by the proposed project and these other projects have the potential to increase demands on local roadways during both construction and operational phases. Example projects include the Kairos Hermes reactor project, proposed actions at ORNL, development of the Horizon Center, and the development of the municipal airport at the ETTP. Depending upon their specific timing, location, and access to the primary arterial roadway system (e.g., TN 58, I-40), these actions may result in notable increases in congestion and a reduced LOS at key intersections. Additionally, because increased traffic

generation by the CRN-1 and that of other projects during construction is typically greater than that of operational phases, the cumulative effects of the proposed action together with all past, present and RFFAs have the potential to be moderate to large, and more pronounced during the construction phase of CRN-1.

3.11. Visual Resources

3.11.1. Affected Environment

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any information that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.13.1 is incorporated by reference.

3.11.2. Environmental Consequences of Alternative B1 – Construction, Operation and Decommissioning of CRN-1

As summarized in the PEIS, potential impacts to visual resources result from alterations to the existing landscape associated with construction phase activities on the CRN Site and associated offsite areas, and the long-term presence of one or more reactors, as well as supporting infrastructure and maintenance of cleared transmission line ROW corridors. Impacts were determined to be minor to moderate.

Potential impacts to visual resources from CRN-1 may consist of impaired viewshed from construction activities and the introduction of new permanent visual obstructions as part of operations. TVA considered the changes to the site layout and height of permanent onsite structures as key inputs to the analysis of the potential effects determined to be important considered in the impact analysis.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to construction and operation impacts on visual resources that is consistent with that considered in the PEIS:

- Changes in the aesthetic quality of the visible viewshed

TVA also identified information that was determined to be notably different from that considered in the PEIS as discussed in the following subsection.

3.11.2.1. Aesthetic Impact of Barge Facility Expansion

As illustrated in Figure 2-3, construction impacts extend to the shoreline of the Reservoir in the vicinity of the intake structure, the discharge structure, the barge facility, and intermediate areas near CRM 16. Additionally, construction activities result in an additional impact to approximately 5 acres of shoreline habitat in conjunction with the expanded barge unloading area. Clearing of established vegetation in vicinity of this area results in aesthetic viewshed impacts from the Reservoir and TN Route 58 that persists through the operational period. However, shoreline vegetation along much of the perimeter of the CRN Site and the BTA remains and provides an undisturbed zone of vegetation of varying width that represents a visual buffer from building activities occurring within the central portion of the project site.

3.11.2.2. Summary of Visual Resource Impacts

TVA considered all identified new and notable information in combination with PEIS Section 3.13.2 to assess the potential effects from construction and operational activities on visual resources. TVA determined the overall impact of construction activities and operations on visual

resources is similar to the impacts assessed in the PEIS. Therefore, the assessment of construction activities and operations on visual resources in PEIS Section 3.13.2 is incorporated by reference, and impacts are minor to moderate.

3.12. Archaeological Resources and Historic Structures

3.12.1. Affected Environment

The affected environment for archaeological resources and historic structures includes the Area of Potential Effects (APE) which, for the PEIS, consisted of the areas where ground-disturbing activities would take place (land clearing, construction, roadway improvements, and transmission line modifications), and areas within a one-half mile radius of all proposed new above-ground features that would have unobstructed views to those features. The area of ground-disturbing activities is referred to as the project footprint; areas within which visual effects could occur on historic properties is referred to as the project viewshed.

For the PEIS, the APE included the boundaries of Area 1 and Area 2, the laydown area, and the viewsheds associated with Area 1 and Area 2 and the offsite 161-kV transmission line corridor; the TN 95 Access, and the BTA.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to archaeological resources that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.12.1.1. Modified APE

The APE for CRN-1 includes the CRN Site, the BTA, and associated offsite areas, but does not include the TN 95 access that was evaluated in the PEIS. Therefore, because the CRN Site is inclusive of the APE evaluated in the PEIS and TN 95 access is not being considered for CRN-1, the APE is modified from that described and documented in the PEIS.

3.12.1.2. Phase II Cultural Resources Investigation on the CRN Site

In accordance with stipulations outlined in Section 1.B of the 2016 Clinch River SMR Programmatic Agreement (PA) (TVA et al., 2016), TVA conducted a phase II cultural resources investigation on the CRN Site to evaluate the significance of archaeological sites which are potentially eligible for listing in the National Register of Historic Places (NRHP) and would potentially be adversely affected by construction and operation of CRN-1. Between September 12 and December 20, 2022, Tennessee Valley Archaeological Research (TVAR) conducted Phase II archaeological testing at four sites (40RE107, 40RE108, 40RE595, and 40RE600) potentially impacted by the Proposed Action (Meeks et al. 2023). TVAR's phase II investigations were formulated to address two primary goals: 1) assess the integrity and data potential of archaeological deposits within each site to determine each site's NRHP eligibility under Criterion D of the NRHP; and 2) provide TVA with recommendations for additional archaeological resource management measures for each site, if warranted.

Based on the results of the phase II investigations, TVAR recommended that sites 40RE107, 40RE595, and 40RE600 lack the potential to yield important information regarding the area's prehistory under Criterion D of the NRHP. Accordingly, these three sites are not eligible for inclusion in the NRHP and TVAR recommended no additional investigations. TVAR's phase II investigations identified two locations within the recorded boundary of site 40RE108 deemed

sensitive cultural resource areas (designated Sensitive Areas 1 and 2) that may contribute to the resource's overall eligibility for inclusion in the NRHP under Criterion D.

TVAR concluded that all areas within the recorded boundary of site 40RE108 that are located outside of the two culturally sensitive areas would not contribute to the resource's overall eligibility for inclusion in the NRHP under Criterion D. TVAR recommended no additional archaeological investigations for these areas of site 40RE108. TVA reviewed the TVAR phase II report and agreed with TVAR's recommendations. Due to the possibility of intact stratified deposits in the two sensitive areas, TVA has determined that site 40RE108 should continue to be considered potentially eligible for the NRHP. TVA has found that any ground disturbance within the site boundary, outside the two sensitive areas, would not adversely affect the site. TVA notified Tennessee State Historic Preservation Office (TNSHPO) and federally recognized Indian tribes regarding the finding of no adverse effect and TNSHPO agreed with this eligibility determination and finding (TNSHPO 2023). No concerns or objections were raised by the Federally recognized tribes with interest in the undertaking.

3.12.1.3. 2019 Valley-wide Section 106 PA

In 2019, TVA executed the *Programmatic Agreement Among the Tennessee Valley Authority, the Advisory Council on Historic Preservation, and the State Historic Preservation Officers of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia, and Federally Recognized Indian Tribes, Regarding Undertakings Subject to Section 106 of the National Historic Preservation Act Of 1966* (2019 Valley-wide Section 106 PA). The 2019 Valley-wide Section 106 Programmatic Agreement (PA) identifies routine, repetitive actions TVA may undertake in the implementation of its responsibilities throughout the Power Service Area that can be excluded from further Section 106 review, as well as actions with low potential to affect historic properties for which, under specific circumstances, TVA may find, without further consultation, do not result in adverse effects on historic properties. In accordance with Section 106 of the NHPA, its implementing regulations at 36 CFR Part 800.1-16, and the 2019 Valley-wide Section 106 PA, TVA would avoid, minimize, or mitigate potential operation-related impacts (TVA et al 2019). The 2019 Valley-wide Section 106 PA is applicable during operations of CRN-1.

3.12.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As described in the PEIS, potential adverse effects to archaeological resources included four potentially eligible archaeological sites (40RE106, 40RE107, 40RE108, and 40RE601) located within Proposed Action area, and one potentially eligible archaeological site (40RE549) located within the footprint of the laydown area, and one potentially eligible site (40RE595) located near Bear Creek Road. TVA determined that impacts to cultural resources resulting from the alternatives would be moderate with mitigation as required and outlined in the 2016 Clinch River SMR PA.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to construction impacts on archaeological resources and historic structures that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.12.2.1. Location of ground-disturbing activities on the CRN Site and the BTA

New information related to the location of ground-disturbing activities is included in the land disturbance plan for CRN-1. Ground disturbance activities that could affect archaeological sites

include clearing, grading, and installation of transmission tower foundations on the CRN Site and associated transmission line corridors and potential roadway improvements to the Bear Creek Road Ramp in the BTA. The CRN-1 project could impact five potentially NRHP-eligible archaeological sites (40RE108, 40RE166, and 40RE167 on the CRN Site and 40RE138 and 40RE232 in the BTA) and one NRHP-eligible site (40RE233 in the BTA). Although site 40RE108 is within the CRN-1 disturbance area, the CRN-1 site plan avoids the two sensitive areas located within the site boundary. To ensure avoidance, TVA staff would install brightly colored construction fencing surrounding both sensitive areas and would also ensure that the sensitive areas are indicated on project plans and that construction staff understand the need to avoid the areas. If design plans change such that a sensitive cultural resource area of the site or a potentially NRHP-eligible archaeological site is to be disturbed, additional archaeological investigation would be needed to better ascertain whether the sensitive area would contribute to the resource's overall eligibility for inclusion in the NRHP under Criterion D.

The remaining potentially impacted sites, 40RE232 and 40RE233, are located in the BTA. TVA does not anticipate the need to disturb these sites, but roadway improvements plans dependent on approval of final design by TDOT, City of Oak Ridge, and DOE. If design plans result in disturbance of either of these sites, additional archaeological investigations would be conducted in accordance with the stipulations of the 2016 Clinch River SMR PA.

As project plans are finalized, the number of historic and cultural resources impacted could change. For any potentially eligible or undetermined sites that would be physically affected by construction of CRN-1, TVA would follow the stipulations of the 2016 Clinch River SMR PA which includes Phase II testing for potentially NRHP-eligible sites to confirm eligibility (TVA et al. 2016). The 2016 Clinch River SMR PA stipulates the steps that TVA would take to make any needed changes to the APE as project plans develop. These steps include identification of historic properties; evaluation of the project's potential effects on historic properties; and seeking ways to avoid, minimize, or mitigate adverse effects on historic properties (TVA et al. 2016). Additionally, in accordance with Section 106 of the NHPA, its implementing regulations at 36 CFR Part 800.1-16, and the 2019 Valley-wide Section 106 PA, TVA would avoid, minimize, or mitigate potential operation-related impacts (TVA et al. 2019).

3.12.3. Summary of Construction and Operation Impacts on Archaeological Resources and Historic Structures

TVA considered all identified new and notable information in combination with PEIS Section 3.17.2 to assess the potential effects from construction and operational activities on archaeological resources and historic structures. TVA determined the overall impact of construction and operation on archaeological resources and historic structures is less than the impacts assessed in the PEIS and mitigated in conjunction with the terms of the executed programmatic agreements. Therefore, the assessment of construction and operational impacts on archaeological resources and historic structures in PEIS Section 3.17.2 is incorporated by reference, and impacts are minor.

3.13. Radiological Effects of Normal Operations

3.13.1. Affected Environment

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any information related to the characterization of the affected environment for radiological effects of normal operation that was determined to be notably different from that considered in the PEIS. Therefore, PEIS Section 3.20.1 is incorporated by reference.

3.13.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

As summarized in the PEIS, potential radiological impacts of normal plant operations on members of the public and to operation workforces would be maintained within regulatory limits as part of normal operation and, therefore, the environmental impacts are considered to be minor. Additionally, doses to biota would be well below the International Atomic Energy Agency/National Council on Radiation Protection and Measurements biota dose guidelines. Therefore, the PEIS concluded the environmental impact to biota other than members of the public due to the radiological effects of normal operation at the CRN Site is minor.

Potential radiological impacts from normal operations of CRN-1 are the same as those assessed in the PEIS and include those associated with liquid and gaseous effluent pathways, potential exposure to members of the public, effects to biota other than members of the public and potential effects to workers. Because CRN-1 consists of a single unit rather than multiple units as considered in the PEIS, there are no potential construction phase effects to workers from an existing operating plant at the CRN Site. Potential impacts, therefore, are limited to the operation phase of a single unit.

Having conducted the data review described in Section 3.1.2 of this document, TVA identified information related to operation impacts on radiological effects of normal operations that was determined to be notably different from that considered in the PEIS as discussed in the following subsections.

3.13.2.1. Effluent Source Term

The radiological effects analyses considered in the PEIS assumed a plant with a total output of 800 MWe. However, because the nominal gross electrical power output of CRN-1 is 300 MWe, source term values are notably less than those evaluated in the PEIS as the source term in the PEIS PPE analysis is different than the source term associated with the BWRX-300.

The total average annual normal liquid radionuclide activity, measured in curies per year, released from CRN-1 would be lower than the PEIS PPE bounding analysis by over three orders of magnitude. Therefore, the normal operation dose consequence from liquid effluents to members of the public, biota, and workers from CRN-1 is expected to be less than and bounded by the analyses considered in the PEIS.

The total average annual normal gaseous radionuclide activity (curies per year) released from CRN-1 would be lower than the PEIS PPE bounding analysis by over an order of magnitude. Similarly, the total average annual normal gaseous radionuclide activity, excluding tritium, released from the CRN-1 would be lower than the PEIS PPE bounding analysis by nearly an order of magnitude. A small minority of radionuclides released for CRN-1 would exceed the PEIS PPE. The specific radionuclides that exceed the PEIS PPE would be considered to be minor dose contributors with respect to the considered dominant dose contributing radionuclides. The dominant dose contributing radionuclides of the PPE (e.g., Iodine-131, Xenon-133, and Tritium-3) would exceed CRN-1 by many orders of magnitude. Therefore, the normal operation dose consequence from gaseous effluents to members of the public, biota, and workers from CRN-1 is expected to be bounded by the analyses considered in the PEIS.

3.13.2.2. Radiological Environmental Monitoring Program

According to NRC Regulatory Guide 4.1, Revision 2 Radiological Environmental Monitoring for Nuclear Power Plants, and the requirements of 10 CFR 20.1301, a regulatory-compliant

Radiological Environmental Monitoring Program (REMP), including potential monitoring locations, must be put into place in the area surrounding the CRN Site at least two years before initial facility operation. The REMP is designed to monitor gaseous emissions and liquid effluents as well as direct radiation by sampling air, water, sediment, fish, invertebrates, and food products.

Direct radiation monitoring locations consist of environmental dosimeters arranged in an inner ring within the CRN Site, an outer ring located approximately 5 miles from the power block area, and eight other special interest locations. The physical layout of CRN-1 and current site design have altered the proposed placement of the inner ring dosimeters. The inner ring dosimeters (T-1 through T-16) are identified in Figure 3-8.

3.13.2.3. Summary of Operation Impacts on Radiological Environment

TVA considered all identified new and notable information in combination with PEIS Section 3.20.2 to assess the potential effects from operational activities on the radiological environment. TVA determined the overall impact of operation on the radiological environment is less than the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on the radiological environment in PEIS Section 3.20.2 is incorporated by reference, and impacts are minor.

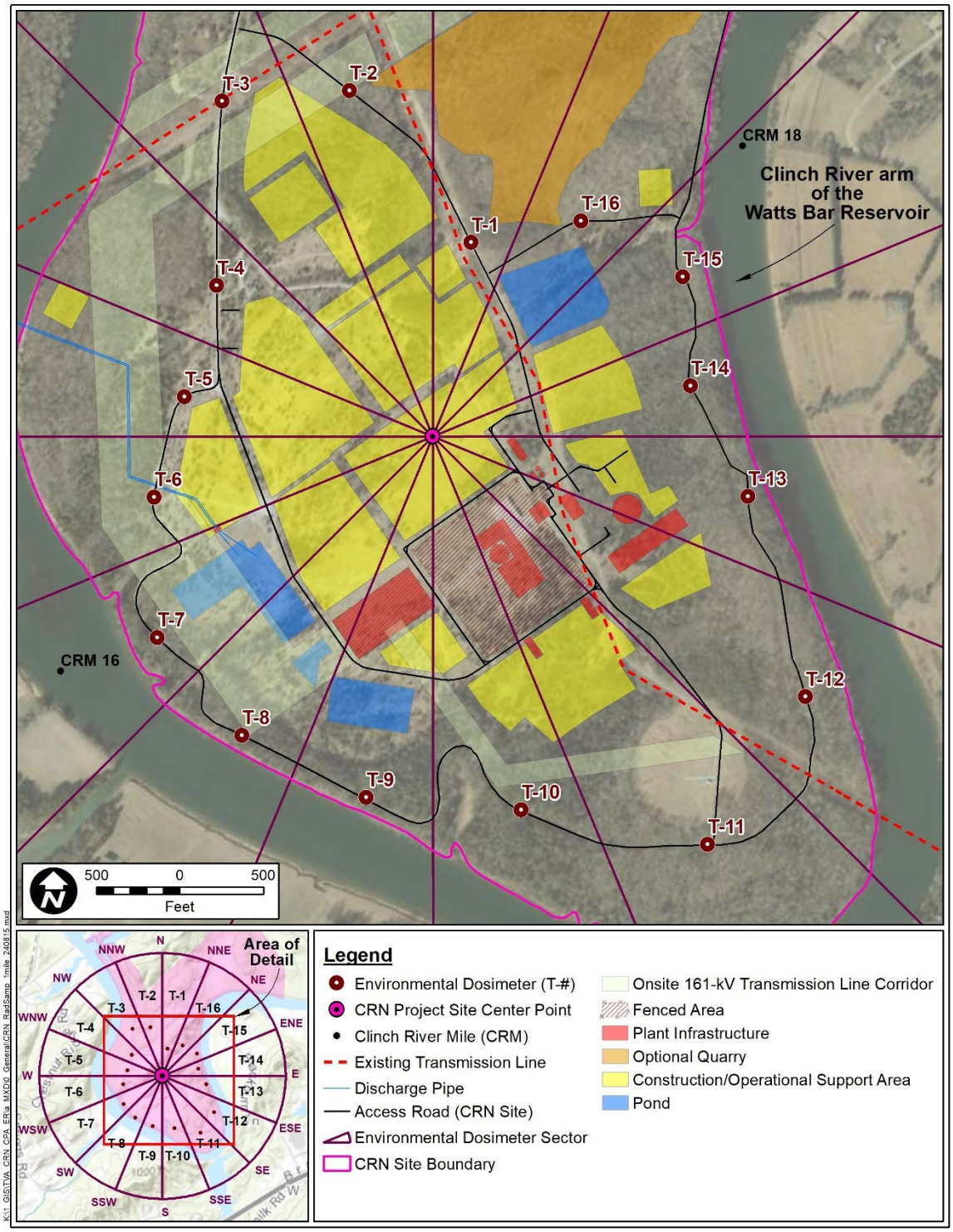

Figure 3-8. CRN Site Local Radiological Sampling Locations (1-Mile Radius)

3.14. Uranium Fuel Use Effects

3.14.1. Affected Environment

In the PEIS, TVA provided information that characterized background information regarding the uranium fuel cycle, radioactive waste, spent fuel storage and transportation of radioactive materials.

Having conducted the data review described in Section 3.1.2 of this document, TVA did not identify any information related to the characterization of the affected environment for uranium fuel cycle. Therefore, PEIS Section 3.21.1 is incorporated by reference.

3.14.2. Environmental Consequences of Alternative B1 – Construction, Operation, and Decommissioning of CRN-1

The PEIS evaluated the environmental effects from the uranium fuel cycle (UFC) to support operation of SMRs at the CRN Site. Potential effects associated with the use of uranium fuel are primarily associated with the uranium fuel cycle, radioactive waste, spent fuel storage, and transportation of radioactive materials. Impacts associated with each of these considerations was determined to be minor.

3.14.2.1. Uranium Fuel Cycle

Having conducted the data review described in Section 3.1.2 of this document, TVA identified the following new information related to uranium fuel use effects that is consistent with that considered in the PEIS:

- Nominal net electrical power output of CRN-1

TVA considered all identified new and notable information in combination with PEIS Section 3.21.2 to assess the potential effects from operational activities related to uranium fuel use effects. TVA determined the overall impact of operation related to uranium fuel use effects is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on uranium fuel use effects in PEIS Section 3.21.2 is incorporated by reference, and impacts are minor.

3.14.2.2. Radioactive Waste

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to radioactive waste that is consistent with that considered in the PEIS:

- Nominal net electrical power output of CRN-1

TVA considered all identified new and notable information in combination with PEIS Section 3.21.2 to assess the potential effects from operational activities related to radioactive waste effects. TVA determined the overall impact of operation related to radioactive waste effects is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on radioactive waste effects in PEIS Section 3.21.2 is incorporated by reference, and impacts are minor.

3.14.2.3. Used Fuel Storage

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to used fuel storage that is consistent with that considered in the PEIS:

- Used fuel storage

TVA considered all identified new and notable information in combination with PEIS Section 3.21.2 to assess the potential effects from operational activities related to used fuel storage effects. TVA determined the overall impact of operation related to used fuel storage effects is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on used fuel storage effects in PEIS Section 3.21.2 is incorporated by reference, and impacts are minor.

3.14.2.4. Transportation of Radioactive Materials

In the PEIS analysis it was assumed that all shipments of unirradiated fuel and radioactive waste are by truck. The shipping weights would comply with federal, state, local, and tribal government restrictions as appropriate. As described in the PEIS, the total number of shipments to the CRN Site (excluding transport of used fuel) is 90 per year (normalized) which meets the Table S-4 requirement of less than one per day.

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified the following new information related to transportation of radioactive materials that is consistent with that considered in the PEIS:

- Transportation of unirradiated fuel
- Transportation of irradiated fuel
- Transportation of radioactive waste
- Average fuel irradiation

TVA considered all identified new and notable information in combination with PEIS Section 3.21.2 to assess the potential effects from operational activities related to transportation of radioactive materials. TVA determined the overall impact of operation related to transportation of radioactive materials is similar to the impacts assessed in the PEIS. Therefore, the assessment of operational impacts on transportation of radioactive materials in PEIS Section 3.21.2 is incorporated by reference, and impacts are minor.

3.14.2.5. Summary of Operation Impacts on Uranium Fuel Use Effects

TVA considered all identified new and notable information in combination with PEIS Section 3.21.2 to assess the potential effects from operational activities associated with uranium fuel use effects. TVA determined the overall impact of operation associated with uranium fuel use effects is less than the impacts assessed in the PEIS. Therefore, the assessment of operational impacts associated with uranium fuel use effects in PEIS Section 3.21.2 is incorporated by reference, and impacts are minor.

3.15. Unavoidable Adverse Environmental Impacts

As described in the PEIS the unavoidable adverse impacts from construction are primarily attributed to activities involving land disturbance from preparing the CRN Site including

vegetation clearing, excavation, grading, filling wetlands, filing or culverting intermittent steams and waterways, adding impervious surfaces, upgrading of onsite and offsite access routes and construction of new routes, and installation of intake and discharge structures.

During operation unavoidable adverse impacts are related to impacts on air quality and greenhouse gas emissions, visual disturbance from cooling towers and associated plumes, and impacts to nonradiological public health from occupational health risks, occupational illnesses, and the potential for increases in the growth of thermophilic microorganisms (etiological agents) from thermal discharges to the Reservoir.

Having conducted the data review described in Section 3.1.2 of this document, TVA has identified new information related to unavoidable adverse impacts including the following:

- Water Resources
- Hydrologic alterations to onsite and offsite streams and ponds
- Mitigative measures for unavoidable impacts to surface water resources
- Thermal effects of plant discharge
- Floodplains and Flood Risk
- Floodplain encroachment
- Mitigative measures for unavoidable impacts to floodplain resources
- Wetlands
- Construction activities within streams and wetlands
- Mitigative measures for unavoidable impacts to wetland resources
- Terrestrial Ecology
- Terrestrial habitats and impacts to wildlife
- Management and mitigation measures
- Natural Resources sustainability management
- Managed and Natural Areas
- Land Use Plans
- Historic and Cultural Resources
- Location of ground-disturbing activities on the CRN Site and BTA

Table 3-14 summarizes the updated unavoidable adverse impacts associated with the new information identified above, including updated impact determinations related to construction activities, the mitigation and control measures available to reduce those impacts, and the remaining unavoidable adverse impacts. The impact determinations in Table 3-15 address the combined impacts of operation activities. Mitigation measures and TVA's programs, policies, and procedures for reducing construction-related impacts include habitat protection within the Grassy Creek HPA, implementation of the SWPPP and IPPP, use of other BMPs that minimize erosion and stabilize the land surface, compliance with NPDES permitting limits, implementation of wetland and stream mitigation plans in accordance with USACE and TDEC requirements, compliance with the terms of the Watts Bar Interagency Agreement and adherence to the terms

of the PAs for historic and cultural resources. The BMPs are implemented through permitting requirements and plans and procedures developed for constructing and operating CRN-1.

TVA determined that while this information is updated from that previously included in the PEIS, the unavoidable adverse impacts related to this supplemental information are consistent with that used to prepare the PEIS for all resources except archaeological and historic. For archaeological and historic resources, unavoidable adverse impacts of CRN-1 are reduced from that described in PEIS and are therefore notably different.

Table 3-1414. Updated Unavoidable Adverse Environmental Impacts during Construction and Preconstruction

Resource Area	Impact Determination	Updated Actions to Mitigate Impacts	Updated Unavoidable Adverse Impacts
Water Resources			
Surface Water Hydrology	Minor	Hydrologic alterations to streams would comply with applicable permit requirements, including a CWA Section 404 permit from the USACE and an ARAP authorization from the TDEC. Additionally, a SWPPP would be in place for erosion protection and stormwater management. A SWPPP would be prepared to meet TDEC stormwater construction permit discharge requirements and would incorporate BMPs to minimize erosion and stabilize the land surface. To minimize and compensate for impacts to regulated aquatic resources, TVA would implement a wetland and stream mitigation plan in accordance with USACE and TDEC requirements. Additionally, since temporary impacts to streams within the transmission line corridor are localized and minimized in accordance with TVA's streamside management zone provisions as described in TVA's A Guide for Environmental Protection and Best Management Practices for Construction and Maintenance Activities.	Permanent impacts to: • 3 ponds (0.65 acres) • Eleven perennial/intermittent streams (3,586 lineal feet) • 8 WWCs (2,694 lineal feet) Temporary impacts to: • 3 perennial/intermittent streams (101 lineal feet) • 3 WWC's (64 lineal feet) Temporary impacts to streams STR11 and STR12 on the CRN Site are related to construction the associated 161-kV transmission line and these streams would be avoided where possible.
Floodplains and Flood Risk	Minor	TVA would minimize adverse impacts to floodplains by ensuring construction activities associated with CRN-1 would adhere to EO 11988 Floodplain Management and the TVA Flood Storage Loss Guideline.	Construction activities occur in 27.7 acres of floodplain within the permanent disturbance area and 3.4 acres of floodplain within the temporary disturbance area.
Wetlands	Minor	TVA would minimize and compensate for impacts to jurisdictional waters and would implement a wetland and stream mitigation plan in accordance with USACE and TDEC requirements that would provide	Approximately 3,586 lineal feet of streams and 2,694 lineal feet of WWCs on the CRN Site and in associated offsite

Resource Area	Impact Determination	Updated Actions to Mitigate Impacts	Updated Unavoidable Adverse Impacts
		compensation for related losses in aquatic habitat resulting from construction CRN-1.	areas are permanently impacted by construction.
		TVA would implement a wetland and stream mitigation plan in accordance with USACE and TDEC requirements.	Area of wetland impact from construction activities includes approximately 9.2 acres of the CRN Site, 1.7 acres in the BTA, and 3.6 acres in the associated 161-kV transmission line corridor which would be avoided to the extent practical
Terrestrial Ecology	Moderate	TVA would use targeted herbicide applications or mechanical means to maintain herbaceous vegetation in the 161-kV transmission corridor and ensure that state-listed species are not significantly impacted by designing the transmission line to avoid the species and their habitat to the greatest extent possible. TVA transmission engineers would consult with the TVA botanist during design to ensure the location of the habitat is considered early in the process. TVA would consider additional avoidance measures to ensure impacts are not significant once a final transmission route is determined. TVA has also expanded the Grassy Creek HPA by approximately 14 acres to include the area where rigid sedge and pale green orchid occur to provide additional protection. BMPs would be implemented including those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022c), the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012), the project-specific SWPPP, and site-specific IPPP. TVA would implement sustainability measures during construction to include development of pollinator habitats and other sustainable	Approximately 29 acres of impact within associated offsite 161-kV transmission line corridor to various habitats. Most of the potential impact area within the 280-foot-wide offsite corridor would be permanent conversion of forested habitats to herbaceous and/or shrub/scrub vegetation (approximately 25 out of 29 acres). Approximately 12.7 acres of important deciduous calcareous upland and wetland forest could be affected in the 161-kV transmission line corridor that contains state-listed plant species, rigid sedge and pale green orchid. Construction activities affect 0.8-acre. Construction activities associated with the development of an optional onsite quarry occur within an approximately 40-acre footprint on the CRN Site which would include an estimated 10 to 20-acre quarry pit and associated crushing, blending, and stockpiling operation.

Resource Area	Impact Determination	Updated Actions to Mitigate Impacts	Updated Unavoidable Adverse Impacts
		development and land management policies in association with development and implementation of a site biodiversity plan prepared in accordance with TVA's Biodiversity Policy. Post-construction impacts in the associated 161-kV transmission line corridor would also be minimized because the transmission line would only occupy a 120-foot-wide route within the 280-foot-wide corridor consistent with TVA's *Transmission System Vegetation Management Final Programmatic EIS* (TVA 2019b).	
Managed and Natural Areas	Moderate	TVA has expanded the Grassy Creek HPA (Parcel 146, Zone 3 – Sensitive Resource Management) by approximately 14 acres to include sensitive plant species habitat to provide additional protection. TVA will update the Watts Bar Reservoir Land Management Plan to include reallocation of the expanded 14-acre area of the Grassy Creek HPA from Zone 5 Industrial to Zone 3 - Sensitive Resource Management.	Construction activities associated with the new transmission line occur in approximately 14 acres within the Grassy Creek HPA and 15 acres on DOE-managed land.
Historic and Cultural Resources	Minor	To ensure avoidance of sensitive resource areas during construction activities, TVA staff would set up brightly colored construction fencing surrounding both sensitive areas, would ensure that the sensitive areas are indicated on project plans, and that construction personnel understand the need to avoid the areas and their location.	Unavoidable adverse impacts to four sites potentially eligible for the NRHP are reduced.

Notes: ARAP = Aquatic Resource Alteration Permit, BMP = Best Management Practice, BTA = Barge and Traffic Area, CRF = Code of Federal Regulations, CRN = Clinch River Nuclear, CRN-1 = Clinch River Unit 1, CWA = Clean Water Act, DOE = Department of Energy, EO = Executive Order, ESP = Early Site Permit, FEIS = Final Environmental Impact Statement, HPA = Habitat Protection Area, IPPP = Integrated Pollution Prevention Plan, kV = Kilovolt, NHPA = National Historic Preservation Act, NPDES = National Pollutant Discharge Elimination System, NRC = U.S. Nuclear Regulatory Commission, NRHP = National Register of Historic Places, PA = Programmatic Agreement, SMR = Small Modular Reactor, SWPP = Stormwater Pollution Prevention Plan, TDEC = Tennessee Department of Environment and Conservation, TVA = Tennessee Valley Authority, USACE = U.S. Army Corps of Engineers, WWC = Wet Weather Conveyance

Table 3-15. Updated Unavoidable Adverse Environmental Impacts during Operation

Resource Area	Adverse Impacts	Updated Actions to Mitigate Impacts	Updated Unavoidable Adverse Impacts
Water Resources			
Surface Water Quality Impacts	Minor	TVA would work with TDEC throughout the NPDES permitting process to establish appropriate permit conditions to support operation of CRN-1 to minimize impacts of the thermal discharge on the Reservoir.	Thermal effects of the discharge of CRN-1 are less than those estimated in the NRC ESP FEIS. However, the presence of a thermal pancake within the Reservoir results in a condition in which water temperature compliance parameters may be periodically exceeded. TVA will work with TDEC throughout the NPDES permitting process to establish appropriate permit conditions to support operation of CRN-1 to minimize impacts to water quality of the Reservoir.
Terrestrial Ecology	Minor	TVA would implement sustainability measures during operation of CRN-1 to include development of pollinator habitats and other sustainable development and land management policies in association with development and implementation of a site biodiversity plan prepared in accordance with TVA's Biodiversity Policy.	No update
Historic and Cultural Resources	Minor	In 2019, TVA executed the Programmatic Agreement between TVA, the State Historic Preservation Officers of States within TVA's Power Service Area, and federally recognized tribes regarding undertakings subject to Section 106 of the NHPA Of 1966 (2019 Valley-wide Section 106 PA).	No update

Resource Area	Adverse Impacts	Updated Actions to Mitigate Impacts	Updated Unavoidable Adverse Impacts
		The 2019 Valley-wide Section 106 PA identifies routine, repetitive actions across the TVA Power Service Area that can be excluded from Section 106 review, as well as actions with low potential to affect historic properties for which, under specific circumstances, TVA may find, without consultation, do not result in adverse effects on historic properties. In accordance with Section 106 of the NHPA, its implementing regulations at 36 CFR Part 800.1-16, and the 2019 Valley-wide Section 106 PA, TVA would avoid, minimize, or mitigate potential operation-related impacts associated with CRN-1.	

Notes: CP = Construction Permit, CRN = Clinch River Nuclear, DOE = U.S. Department of Energy, EIS = Environmental Impact Statement, EPA = U.S. Environmental Protection Agency, ETTP = East Tennessee Technology Park, FCM = Fully Ceramic Micro-encapsulated, FEIS = Final Environmental Impact Statement, FP = Fossil Plant, GEH = GE Hitachi Nuclear Energy, LLC = Limited Liability Company, M = Million, MW = Megawatts, NEPA = National Environmental Policy Act, NRC = U.S. Nuclear Regulatory Commission, NRIC - National Reactor Innovation Center, OREM = Oak Ridge Office of Environmental Management, ORNL = Oak Ridge National Laboratory, ORR = Oak Ridge Reservation, ROD = Record of Decision, TDEC = Tennessee Department of Environment and Conservation, TDOT = Tennessee Department of Transportation, TVA = Tennessee Valley Authority, USNC = Ultra Safe Nuclear Corporation

3.16. Relationship of Short-Term Uses and Long-Term Productivity

As indicated in the PEIS, the local use of the human environment by developing SMRs at the CRN Site can be summarized as the unavoidable adverse environmental impacts of preconstruction, construction, operations, and decommissioning, along with the irreversible and irretrievable commitment of resources. The principal short-term benefit of building and operating CRN-1 would be to demonstrate the feasibility to license, construct, and operate a SMR at the CRN Site. In conjunction with operation of CRN-1, the economic productivity of the CRN Site would be large when compared to the productivity from other probable uses for the site, especially considering the previously impacted environmental condition of the CRN Site.

Having conducted the data review described in Section 3.1.2 of this document, TVA determined that evaluation of the relationship of short-term uses and long-term productivity are fully bounded by the analyses, impact conclusion, control measures, and commitments included in the PEIS. Therefore, Section 3.25 from the PEIS is incorporated by reference.

3.17. Irreversible and Irretrievable Commitments of Resources

The PEIS describes irreversible commitments of resources as environmental resources that are potentially changed by the construction or operation of the proposed project that could not be restored to their prior state by practical means at some later time. Irreversible commitments generally occur to nonrenewable resources, when the use or consumption is neither renewable nor recoverable for the use until reclamation is successfully applied.

Potential impacts to the irreversible and irretrievable commitments of resources include commitment of land, including permanently filled wetlands and streams, for the construction and operation at CRN-1, generation of radioactive, hazardous, and nonhazardous wastes streams, and commitments of resources including uranium ore.

Having conducted the data review described in Section 3.1.2 of this document, TVA determined that the irreversible and irretrievable commitments of resources are fully bounded by the analyses, impact conclusion, control measures, and commitments included in the PEIS. Therefore, Section 3.26 from the PEIS is incorporated by reference.