Tennessee Valley Authority, 1101 Market Street, Chattanooga, TN 37402

CNL-16-201

December 16, 2016

10 CFR 2.101
10 CFR 52.15

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Clinch River Nuclear Site
NRC Project No. 785

Subject: Submittal of Supplemental Information Regarding Aquatic Ecology in Support of Early Site Permit Application for Clinch River Nuclear Site

References:
1. Letter from TVA to NRC, CNL-16-081, "Application for Early Site Permit for Clinch River Nuclear Site," dated May 12, 2016
2. Letter from TVA to NRC, CNL-16-134, "Schedule for Submittal of Supplemental Information in Support of Early Site Permit Application for Clinch River Nuclear Site," dated August 11, 2016

By letter dated May 12, 2016 (Reference 1), Tennessee Valley Authority (TVA) submitted an application for an early site permit for the Clinch River Nuclear (CRN) Site in Oak Ridge, TN. In addition, and consistent with interactions with NRC staff, TVA identified certain aspects of the application that it intends to supplement. By letter dated August 11, 2016 (Reference 2), TVA provided a plan for submitting the identified supplemental information.

In addition to the planned submission of supplemental information identified in Reference 2, and consistent with subsequent interactions with the NRC staff, the enclosure to his letter provides supplemental information related to aquatic ecology, including a markup of the affected Environmental Report (ER) sections. Attachment 1 to the enclosure provides copies of the TVA consultation letters sent to U.S. Fish and Wildlife Service (USFWS) and the Tennessee Department of Environment and Conservation (TDEC). The changes to the ER and the USFWS and TDEC consultation letters will be incorporated in a future revision of the early site permit application.

There are no new regulatory commitments associated with this submittal. If any additional information is needed, please contact Dan Stout at (423) 751-7642.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 16th day of December 2016.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosure:

Supplemental Information Regarding Aquatic Ecology

cc (with enclosures):

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cc (without enclosures):

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Supplemental Information Regarding Aquatic Ecology

By letter dated May 12, 2016 (Reference 1), Tennessee Valley Authority (TVA) submitted an application for an early site permit for the Clinch River Nuclear (CRN) Site in Oak Ridge, TN. In addition, and consistent with interactions with NRC staff, TVA identified certain aspects of the application that it intends to supplement. By letter dated August 11, 2016 (Reference 2), TVA provided a plan for submitting the identified supplemental information.

In addition to the planned submission of supplemental information identified in Reference 2, and consistent with subsequent interactions with the NRC staff, TVA is providing supplemental information related to aquatic ecology, including a markup of the affected Environmental Report (ER) sections. These changes will be incorporated in a future revision of the early site permit application (ESPA).

References:

1. Letter from TVA to NRC, CNL-16-081, "Application for Early Site Permit for Clinch River Nuclear Site," dated May 12, 2016

2. Letter from TVA to NRC, CNL-16-134, "Schedule for Submittal of Supplemental Information in Support of Early Site Permit Application for Clinch River Nuclear Site," dated August 11, 2016

Supplemental Information, Item 1

During interactions with the NRC staff, it was identified that some of the sampling data used to evaluate the ecological health of the Clinch River is over five years old. Therefore, TVA is providing justification for the relevance of the sampling data with regard to the current ecological health of the Clinch River.

The ecological health of Watts Bar Reservoir has been monitored using the same methodology since 1994. Reservoir ecological health evaluations focus on five indicators: dissolved oxygen, chlorophyll, sediment quality, benthic macroinvertebrate community (bottom life), and fish assemblage. TVA monitors four locations on Watts Bar Reservoir: the deep, still water near the dam, called the forebay (Tennessee River Mile [TRM] 532.5); the middle part of the reservoir (TRM 560.8); and the river-like areas at the extreme upper end of the reservoir in the Tennessee and Clinch Rivers, called inflows (usually on a 2-year cycle). The Clinch River monitoring location is at Clinch River Mile (CRM) 22.0, which is just upstream of the CRN Site. This long-term monitoring approach gives a continuum of data over a long period of time. The Watts Bar Reservoir is sampled every two years, with the last sample collected in 2014. The next collection is scheduled for fall 2016. The overall ecological health condition for the Watts Bar Reservoir rated fair in 2014. As shown in Figure 1, ecological health scores for the Watts Bar Reservoir have fluctuated between "high fair" and “poor” for over two decades, and have generally followed reservoir flow conditions.

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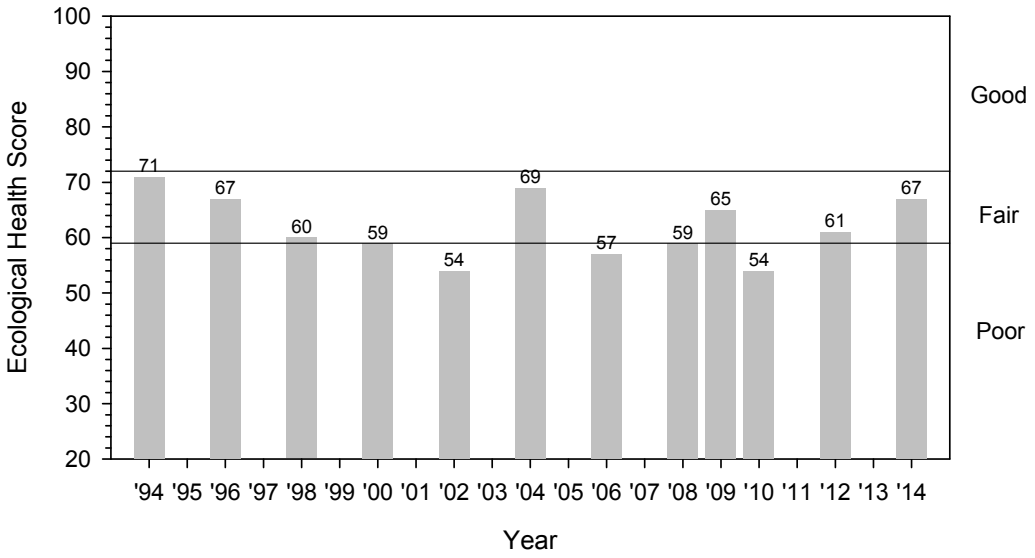
Supplemental Information Regarding Aquatic Ecology

Figure 1. Watts Bar Reservoir Ecological Health Ratings, 1994-2014



TVA's reservoir ecological health evaluations assess the fish assemblage at each monitored location using Reservoir Fish Assemblage Index (RFAI) scores. Table 1 summarizes the RFAI scores for the inflow location on the Clinch River arm of the Watts Bar Reservoir from 1993 through 2010. The inflow monitoring location is at CRM 22.0, approximately four river miles upstream of the CRN Site. The RFAI scores for the 11 years of sampling at this location ranged from 36 to 48 and averaged 42.

Table 1 also includes for comparison the RFAI scores for the upstream and downstream locations sampled in 2011 and used to evaluate conditions in the reach of the reservoir encompassing the CRN Site. The transects sampled for the upstream location were referred to as being located at CRM 18.5, but the sample transects actually were located from CRM 18.0 to 19.8, approximately two to four river miles downstream of the reservoir ecological health inflow location at CRM 22.0. The RFAI score at this location in 2011 was 39, which is within the historical range of scores at the inflow location and slightly below the historical mean. As discussed above for the overall ecological health ratings of the reservoir, the health of the fish community in the Clinch River arm of the Watts Bar Reservoir has remained within a relatively narrow range over the long term. These results illustrate the stability of aquatic communities (in both diversity and population numbers) in the Clinch River arm of the Watts Bar Reservoir over the period 1993 to 2011. No major modifications to reservoir operations or water quality conditions have occurred since 2011, nor are any expected to occur in the Clinch River arm of the Watts Bar Reservoir or Melton Hill Reservoir in the foreseeable future. Therefore, no significant changes to aquatic communities are expected to occur that would require collection of additional data to characterize aquatic communities on or adjacent to the CRN Site.

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Supplemental Information Regarding Aquatic Ecology

For other biological resources (such as terrestrial flora and fauna), biodiversity and abundance of biological resources fluctuate slowly over time in the absence of major natural or man-made perturbations to the environment (i.e., major land use changes due to development, floods, hurricanes, tornados, major prolonged drought, fires, or other natural disasters). Since the initial sampling in 2011, the land use on the CRN Site and the adjacent DOE property proposed for the barge and traffic areas has not changed and has remained under federal control with restricted access. Over the past 5 years, there have been no major natural disasters or extreme weather events that have resulted in changes or damage to the CRN Site or barge/traffic area. In the absence of any natural or man-made perturbations in the area, it is reasonable to assume that the biological resources of the area are substantially the same as documented in 2011.

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Supplemental Information Regarding Aquatic Ecology

Table 1. Summary of Reservoir Fish Assemblage Index (RFAI) scores from sites located upstream and downstream of the proposed Clinch River Small Modular Reactor Project and scores from sampling conducted during 1993-2011 at other locations in the Clinch River downstream of Melton Hill Dam.

Station	Location	1993	1994	1996	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Avg.
Inflow	CRM 22.0	38	46	48	36	44	---	42	---	38	---	40	---	44	44	44	**---**	**42**
Transition	CRM 4.4	---	---	---	---	---	45	---	42	---	44	---	36	---	38	42	44	**42**
Transition	CRM 1.5	---	---	---	---	---	42	---	44	---	41	---	34	---	36	42	36	**39**

Station	Location	February 2011	May 2011	July 2011	October 2011	Avg.
Transition - SMR Upstream	CRM 18.5	36	42	37	40	**39**
Transition - SMR Downstream	CRM 15.0	38	38	39	37	**38**

RFAI Scores: 12-21 (“Very Poor”), 22-31 (“Poor”), 32-40 (“Fair”), 41-50 (“Good”), or 51-60 (“Excellent”)

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Supplemental Information Regarding Aquatic Ecology

Supplemental Information, Item 2

During interactions with the NRC staff, it was identified that the ESPA did not include confirmation of the interactions with the U.S. Fish and Wildlife Service (USFWS) and the Tennessee Department of Environment and Conservation (TDEC) concerning the presence of protected species in the geographic area of interest.

TDEC and USFWS were consulted for information regarding sensitive species and habitats in the vicinity of the CRN Site. TVA requested confirmation from TDEC and USFWS that the terrestrial and aquatic species listed in ER Subsections 2.4.1.5 and 2.4.2.3, respectively, accurately reflect the federally and state-listed species that should be considered. The consultation letters sent to TDEC and USFWS are included in Attachment 1 to this enclosure and will be included in ER, Appendix A, in a future revision of the ESPA. Although consultation responses have not been received, they will also be included in a future revision of the ESPA upon receipt. TVA will use the consultation responses from TDEC and USFWS to inform the basis for identifying important species and habitats in the ER.

ER Subsections 2.4.1.5 and 2.4.2.3 are being revised to document TVA's coordination with TDEC and USFWS.

ER Subsection 2.4.1.5 is being revised as indicated. Strikethroughs indicate text to be deleted. Underlines indicate text to be added.

2.4.1.5 Important Terrestrial Species

According to NUREG-1555, important species include species that are federally listed as threatened or endangered, as well as species that are proposed for or candidates for federal listing. Also important are species with a state listing status or other state status due to rarity. In conjunction with agency coordination regarding listed species, TVA sent letters to the USFWS and TDEC in September 2016 requesting their concurrence with the listed species identified as important species for the site. These letters are included in Appendix A. Information provided in the consultation responses from USFWS and TDEC will be incorporated when received, and the responses will be included in Appendix A.

In addition to listed species, c~~C~~ommercially or recreationally valuable species could be important, and nuisance species could be important, particularly if they may cause problems for operation of two or more SMRs at the CRN Site. Species also may be important if they are critical to the survival of a rare species or to the local ecosystem, or if they are indicators of potential biological effects; however, such species were not identified for the CRN Site or the Barge/Traffic Area. Thus, the important terrestrial species to be discussed below for the CRN Site and the Barge/Traffic Area include federally and state-listed species, commercially or recreationally valuable species, and nuisance species.

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ER Subsection 2.4.3.3 is being revised as indicated. Underlines indicate text to be added.

2.4.2.3 Important Aquatic Species

According to NUREG-1555, important species may include:

- Rare species, including:
  - Species federally listed as threatened or endangered
  - Species that are proposed for federal listing
  - Species that are candidates for federal listing
  - Species that are state-listed as threatened, endangered, or a species of concern
- Commercially or recreationally valuable species
- Species that are essential to the maintenance and survival of rare or commercially or recreationally valuable species
- Species that are critical to the structure and function of the local ecosystem
- Species that may serve as biological indicators to monitor the effects of the proposed facility on the environment
- Nuisance species that could cause problems for facility operations

Aquatic species that are important with regard to the CRN Site are discussed below. In conjunction with agency coordination regarding listed species, TVA sent letters to the USFWS and TDEC in September 2016 requesting their concurrence with the listed species identified as important species for the site. These letters are included in Appendix A. Information provided in the consultation responses from USFWS and TDEC will be incorporated when received, and the responses will be included in Appendix A.

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Supplemental Information Regarding Aquatic Ecology

Supplemental Information, Item 3

During interactions with the NRC staff, it was identified that the ESPA did not include a discussion of the mitigation measures that would be required by either the U.S. Army Corps of Engineers (USACE) or TDEC to minimize unavoidable impacts to aquatic resources (e.g., onsite streams, ponds, wet-weather conveyances, in-reservoir aquatic and benthic habitats). Therefore, the following discussion is provided to address the controls that will be in place to minimize unavoidable impacts to aquatic resources:

Within the State of Tennessee, any alteration to a stream, river, lake or wetland requires a water quality permit from the TDEC Division of Water Resources. Physical alterations to properties of waters of the state requires an Aquatic Resource Alteration Permit (ARAP) or a §401 Water Quality Certification (§401 certification). Examples of stream alterations that require a permit from the Tennessee Division of Water Resources (Division) include:

- Dredging, excavation, channel widening, or straightening
- Bank sloping; stabilization
- Channel relocation
- Water diversions or withdrawals
- Dams, weirs, dikes, levees or other similar structures
- Flooding, excavating, draining and/or filling a wetland
- Road and utility crossings
- Structural fill

A federal Clean Water Act (CWA) Section 404 permit (§404 permit) may also be required from the USACE for projects that include the discharge of dredged or fill material into waters of the United States, including wetlands. When a §404 permit is required from the USACE, a §401 certification must first be obtained from TDEC. A §401 certification affirms that the discharge would not violate Tennessee's water quality standards. The application process for a §401 certification is the same as the ARAP process.

TDEC has established General Permits that are developed and maintained by the Division to provide a streamlined, expedited means of authorizing projects that singularly or cumulatively propose minor impacts to water resources. The Division has issued General Permits for the following activities:

- Alteration of wet weather conveyances
- Bank stabilization
- Construction and removal of minor road crossings
- Construction of launching ramps and public access structures
- Construction of intake and outfall structures
- Emergency road repair
- Maintenance activities
- Minor alterations to wetlands
- Minor dredging and filling
- Sand and gravel dredging
- Recreational prospecting

- Sediment removal for stream remediation
- Stream restoration and habitat enhancement
- Surveying and geotechnical exploration
- Utility line crossings
- Wetlands restoration and enhancement

Each of the General Permits contains conditions and mitigation measures required to be implemented as a part of the activity authorized by the permit. Specific mitigation measures required can be found in the individual General Permits on the TDEC website (*http://tn.gov/environment/article/permit-water-aquatic-resource-alteration-permit*).

In addition, TDEC has published an Erosion and Sediment Control Handbook (Fourth Edition), dated August 2012, that is designed to provide standardized and comprehensive erosion prevention and sediment control Best Management Practices for use throughout Tennessee. This handbook serves as the primary reference for the development and implementation of Stormwater Pollution Prevention Plans (SWPPP), as required per the Tennessee General National Pollution Discharge Elimination System (NPDES) Permit for Discharges Associated with Construction Activities and individual NPDES permits. The handbook is available at the TDEC website, accessible at the link provided above.

Commercial, residential, and agricultural land development, along with the construction of linear transportation systems, have the potential to impact Tennessee's streams and wetlands. When these impacts cannot be avoided and/or minimized, the Division of Water Resources may require permittees to offset their activities through compensatory mitigation. Compensatory mitigation is the act of taking a degraded stream or wetland and returning the aquatic resource to a reference condition and/or improving the resource value of that feature. This may be accomplished through the replacement, restoration, and/or enhancement of degraded streams and wetlands. TDEC has developed guidelines that detail the requirements for compensatory mitigation projects: Stream Mitigation Guidelines for the State of Tennessee is available at *http://www.tn.gov/assets/entities/environment/attachments/water_permit_stream-mitigation-guidelines.pdf*

According to the guidelines, mitigation may be accomplished through activities such as the replacement, restoration, and/or enhancement of degraded streams. Treatments that may be employed in stream mitigation include riparian buffer restoration, bank stabilization, and hydrologic buffering (e.g., stormwater detention basins). In addition to the regulatory preference for avoidance of impacts, there is a strong preference for mitigation of unavoidable impacts on-site where practicable. If necessary, however, off-site mitigation may be used in accordance with TDEC guidance.

ER Subsection 4.3.2 is being revised to include a brief discussion of permitting requirements, the regulatory basis for the possible requirement for mitigation, and a summary of the types of mitigation measures that could be required.

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Supplemental Information Regarding Aquatic Ecology

ER Subsection 4.3.2 is being revised as indicated. Underlines indicate text to be added.

4.3.2 Impacts to Aquatic Ecosystems

The aquatic ecosystems of the CRN Site are described in detail in Subsection 2.4.2. Subsection 2.4.2 also briefly describes aquatic resources in potentially affected areas off the CRN Site, including the Barge/Traffic Area and the Watts Bar NP - Bull Run FP 500-kV transmission line ROW from the CRN Site to the Bethel Valley substation. The principal aquatic ecosystem in the vicinity of the CRN Site is the Clinch River arm of the Watts Bar Reservoir. Preconstruction and construction activities that can affect aquatic ecosystems include: development of the intake structure and barge facility on the reservoir shoreline; installation of the discharge structure in the reservoir channel; and clearing and grading for temporary or permanent facilities, which can directly or indirectly affect streams and ponds on the CRN Site as well as in offsite areas where transmission lines or roads would be built. Adverse effects on aquatic ecosystems from the CR SMR Project would result predominantly from preconstruction activities. Such activities may directly cause physical alteration of aquatic habitats from activities such as underwater excavation, in-filling of streams and ponds, and placement of cofferdams, or they may indirectly cause degradation of habitat quality such as from sedimentation and accidental spills that reduce water quality.

Any alteration to a stream, river, lake, or wetland in Tennessee requires a water quality permit from the Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources. Physical alterations to properties of waters of the state require an Aquatic Resource Alteration Permit (ARAP) or a Clean Water Act (CWA) Section 401 Water Quality Certification. A federal CWA Section 404 permit may also be required from the USACE for projects that include the discharge of dredged or fill material into waters of the United States. When a Section 404 permit is required, a Section 401 certification must first be obtained from TDEC to affirm that the discharge would not violate Tennessee water quality standards. TDEC has established General Permits that are developed and maintained by the Division of Water Resources to provide a streamlined, expedited means of authorizing projects that singularly or cumulatively propose minor impacts to water resources. Each of the General Permits contains conditions and mitigation measures required to be implemented as a part of the activity authorized by the permit. (Reference 4.3-14)

When the impacts of development on water resources (i.e., loss or degradation) cannot be avoided and/or minimized, the Division of Water Resources may require permittees to offset their activities through compensatory mitigation. Compensatory mitigation is used to replace lost or impacted habitat with habitat that has similar functions of equal or greater ecological value. Compensatory mitigation may be accomplished by taking a degraded water resource such as a stream or wetland and returning the resource to a reference condition and/or improving the value of the resource. This may be accomplished through activities such as the replacement, restoration, and/or enhancement of degraded streams. Treatments that may be employed in stream mitigation include riparian buffer restoration, bank stabilization, and hydrologic buffering (e.g., stormwater detention basins). In addition to the regulatory preference for avoidance of impacts, there is a strong preference for mitigation of unavoidable impacts on-site where practicable. If necessary, off-site mitigation may be used in accordance with TDEC guidance. (Reference 4.3-14)

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Supplemental Information Regarding Aquatic Ecology

ER Subsection 4.3.2.1 (5th paragraph) is being revised as indicated. Underlines indicate text to be added.

In summary, one small perennial stream and six short WWCs on the CRN Site and one small intermittent stream and six short WWCs in the Barge/Traffic Area are likely to be permanently impacted by the proposed development in these areas. Given the small size of these features, the minimal aquatic communities in the streams, and the lack of aquatic communities in the WWCs, preconstruction and construction activities on the CRN Site and in the Barge/Traffic Area would not result in substantial ecological impacts and would not notably affect aquatic species populations or communities in the vicinity; therefore the ecological impact to the streams would be SMALL. The SMALL impacts to streams would be further reduced by mitigation that would likely be required in accordance with TDEC and USACE guidelines.

ER Subsection 4.3.2.6 is being revised as indicated. Underlines indicate text to be added.

4.3.2.6 Summary of Impacts to Aquatic Ecosystems during Preconstruction and Construction

The environmental effects from preconstruction and construction activities on the CRN Site and in adjacent offsite areas would not disrupt or alter important aquatic ecosystems. Impacts on aquatic habitats would be minor based on the lack of high quality or unique habitats in the areas to be developed or the adjacent reservoir and the presence of extensive reservoir, pond, and stream habitats in the vicinity and the region. Impacts on most streams or other aquatic ecosystems would be minor and would be further reduced by compliance with permitting requirements and compensatory mitigation.

Important aquatic habitats (e.g., natural areas, managed areas, or other designated areas) would not be within the footprint of preconstruction or construction activities or otherwise adversely affected by these activities, and the impact of these activities on important aquatic species would be minimal. Impacts on components of the aquatic ecosystem within transmission corridors similarly would be minimal. Accordingly, the overall impact of preconstruction and construction activities on aquatic ecosystems on or adjacent to the CRN Site and affected offsite areas (Barge/Traffic Area and 500-kV transmission line ROW) would be SMALL for all resources.

As a result of the changes to ER Subsection 4.3.2, the following reference is being added to ER Subsection 4.3.3:

4.3.3 References

Reference 4.3-14. Tennessee Department of Environment and Conservation, “Stream Mitigation Guidelines for the State of Tennessee,” Division of Water Pollution Control, Natural Resources Section, July1, 2004.

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Supplemental Information Regarding Aquatic Ecology

Supplemental Information, Item 4

During interactions with the NRC staff, it was identified that the ESPA does not include a discussion regarding the impacts to aquatic resources from pile driving associated with the barge area refurbishment. Therefore, a description of the potential improvements associated with barge area refurbishment is being added to ER Subsection 3.9.2.4. The discussion of the impacts to aquatic ecosystems in the Clinch River arm of the Watts Bar Reservoir in ER Subsection 4.3.2.3 is being supplemented with a discussion of the potential impacts on aquatic organisms from potential pile driving activities at the barge terminal facility. ER Subsection 3.9.6 is being revised to clarify that the identified sources of noise during preconstruction and construction activities at the CRN Site are from construction equipment that could potentially be used.

In addition, ER Subsection 4.3.2.3 is being revised by adding the Tennessee Department of Environment and Conservation Aquatic Resource Alteration Permit and the National Pollutant Discharge Elimination System Construction Stormwater Permit to the list of requirements that would be followed, consistent with discussions in other ER sections.

ER Subsection 3.9.2.4 is being revised as indicated. Underlines indicate text to be added.

3.9.2.4 Rail Siding and Barge Facility Improvements

TVA anticipates that the majority of module and component deliveries would be over road and rail. TVA anticipates utilizing the EnergySolutions Heritage Railroad rail siding near the CRN Site for deliveries. The refurbishment of this rail siding is addressed in the U.S. Department of Energy's (DOE) Environmental Assessment, Transfer of Land and Facilities Within the East Tennessee Technology Park and Surrounding Area, Oak Ridge, Tennessee (DOE/EA-1640) (Reference 3.9-2).

TVA also anticipates making improvements to the inactive DOE former K-1251 Barge Loading Area, near Bear Creek Road between TN 58 and the CRN Site entrance, for deliveries of equipment and materials by barge to the CR SMR Project. The depth of the reservoir in this area is sufficient to allow barge access. Refurbishment of the barge facility may include improvements such as the repair and/or enlargement of the existing retaining wall, if needed to accommodate the barges to be used, and the installation of mooring cells if required. In addition, bollards or other structures may be installed on the shoreline to provide mooring for the barges.

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Supplemental Information Regarding Aquatic Ecology

ER Subsection 3.9.6 is being revised as indicated. Strikethroughs indicate text to be deleted. Underlines indicate text to be added.

3.9.6 Noise

Preconstruction and construction activities at the CRN Site are expected to generate noise and vibrations from various sources, such as:

- Hand tools
- Pneumatic equipment
- Generators
- Cranes
- Pile-drivers
- Earthmoving equipment
- Blasting operations

TVA anticipates that the maximum expected sound level due to construction activities, measured at 50 ft from the noise source, is 101 decibels (dB), as presented in Table 3.1-2, Item 17.3.1. Table 3.9-2 summarizes noise levels from the types of construction equipment ~~expected to~~that potentially could be used during construction activities at the CRN Site. Subsection 4.4.1.1 addresses the offsite level of construction noise.

ER Subsection 4.3.2.3 is being revised as indicated. Underlines indicate text to be added.

4.3.2.3 The Clinch River Arm of the Watts Bar Reservoir

Preconstruction and construction activities that potentially would affect the aquatic community in the Clinch River arm of Watts Bar Reservoir include the installation of the intake and discharge structures, improvements to the barge facility, and installation of a new culvert under the access road at the Grassy Creek embayment of the reservoir. Section 3.9 describes in detail the construction activities. The proposed intake structure is located on the east side of the CRN Site at Clinch River Mile (CRM) 17.9, and the proposed discharge is located on the west side at approximately CRM 15.5. The culvert would be installed in conjunction with improvements to the access road where the road crosses the Grassy Creek embayment. The installation of these facilities may involve excavation near the shoreline in the immediate area of construction. These activities would affect only small areas of the reservoir and would be conducted in accordance with USACE permit and TDEC Aquatic Resource Alteration Permit and NPDES Construction Stormwater Permit requirements. Such requirements are expected to include the use of BMPs in on-shore areas (described in Section 4.2) to prevent or minimize erosion and sediment transport to the reservoir or its tributaries, as well as silt curtains and cofferdams where

structures are to be built in the water or on the shoreline. A cofferdam is expected to be used for construction of the intake. The size and exact location that would be excavated will not be known until COLA. The cofferdam would serve as the principal BMP to prevent sedimentation from the excavation process.

The aquatic and benthic habitats within the footprints of the intake and discharge structures would be lost. However, these areas would be very small in comparison to the extensive area of such habitats present within the Clinch River arm of the Watts Bar Reservoir adjacent to the CRN Site. As indicated by the results of the biological surveys and evaluations discussed in Subsection 2.4.2, the benthic community in these areas is relatively limited in abundance and diversity and does not include rare species, and the fish community is not dependent on these areas for spawning or other critical needs. In the immediate vicinity of the intake and discharge, increases in turbidity and sediment deposition may occur during development of these structures. These temporary and localized impacts would affect relatively small areas of the reservoir and would be minimized through the use of BMPs. Adverse effects on aquatic organisms from sedimentation are possible adjacent to and downstream of the activities if disturbed sediment escapes the immediate area. Potential impacts to aquatic organisms also may be possible as a result of spills of fuel, lubricants, solvents, or other liquids. Such impacts are unlikely due to the use of BMPs to prevent spills in accordance with an SWPPP.

The barge facility would be located just east of the TN 58 bridge. Re-development of the barge facility is not expected to involve dredging, and the area of reservoir bottom to be disturbed in conjunction with improvements to this facility would be negligible. If piles need to be driven into the reservoir bottom in conjunction with barge facility improvements, the aquatic and benthic habitats within the footprints of the pilings would be lost. The area potentially affected at the barge facility would be very small in comparison to the extensive area of such reservoir habitats in the vicinity. As discussed in Subsections 2.4.2.1.1 and 2.4.2.3, the benthic community in the vicinity of the barge terminal area is ecologically healthy, but the mussel component is in poor condition, and the community does not include rare species; the fish community is limited in abundance, does not include rare species, and is not dependent on the area for spawning or other critical needs. Increases in turbidity and sediment deposition may occur in the immediate vicinity during pile driving activity. However, these impacts would be temporary and localized, and they would be minimized through the use of BMPs. The underwater noise produced by pile driving would be expected to cause fish to avoid the area of the barge facility during the relatively brief duration of this activity, thereby preventing the possibility of injury from noise or physical contact.

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Supplemental Information Regarding Aquatic Ecology

Supplemental Information, Item 5

The ER explains that under the definitions in 40 CFR 125.83, the Watts Bar Reservoir would be considered a lake or reservoir, because it has a residence time greater than seven days. However, during interactions with the NRC staff, it was identified that the ESPA does not provide a specific explanation of how the proposed intake structure would meet the reservoir criteria in 40 CFR 125.84(b)(3)(ii).

CWA Section 316(b), in 40 CFR 125.84(b)(3)(ii), states, "For cooling water intake structures located in a lake or reservoir, the total design intake flow must not disrupt the natural thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies)."

ER Subsection 2.3.1.1.2.7 is being revised to provide a summary of the data collected in 2013 to measure the temperature profile in the reservoir, including the effect of releases from Melton Hill Dam on the profile. The measurements were located at Clinch River Mile (CRM) 13.0, 16.1, and 19.0; upstream and downstream of the intake location (CRM 17.9). The measurements show a typical diurnal pattern, with a temperature peak occurring in the afternoon, coinciding with the hottest time of the day. Subsequently, the thermal gradient largely disappeared with nighttime atmospheric cooling. In addition, the thermal gradientand was also eliminated whenever water was released from Melton Hill Dam, which causes flushing of the reservoir. As a result, there is no existing thermal stratification to be disrupted. A brief summary of this information, including a reference to ER Subsection 2.3.1.1.2.7 is being added to ER Subsections 2.3.3.1.5 and 2.4.2.1.1.

As discussed in ER Subsection 3.4.2.5, releases from Melton Hill Dam are currently episodic, occurring for only one hour each day. When plant operation begins, a bypass may be added to Melton Hill Dam to provide a continuous release of 400 cubic feet per second (cfs), thereby providing a continuous flushing of the reservoir. Therefore, any short-term diurnal stratification that is currently present would not be present with plant operation. This information is being added to ER Subsection 5.3.1.1.

In addition, the ER states the limited flow rate through the intake that is to be included in the design. For example, ER Subsection 5.3.1.1 currently states, "As discussed in Subsection 3.4.2.1, the maximum intake inlet velocity, trash rack flow-through velocity, and water screens flow-through velocity are to be designed to be less than 0.5 ft per second (s), in accordance with Clean Water Act (CWA) Section 316(b) regulations for protection of aquatic life." The ER also states that, "Given the limited intake velocities and flow rates, the withdrawal zone created by the intake is expected to be weak and limited to the area immediately in front of the intake structure."

ER Subsection 5.3.1.1 is being revised to provide a summary of this information, thereby supporting the conclusion that the withdrawal by the intake of a small proportion of water in a localized area of the reservoir would not be expected to noticeably alter thermal patterns. Therefore, there is no stable thermocline or substantial turnover pattern to be disrupted in a relatively shallow and well-mixed reach of the reservoir.

In addition, as discussed in NUREG-1437, Revision 1, the effects on thermal stratification in lakes at operating nuclear power plants are limited to the areas in the vicinity of the intake and discharge structures, and the impacts have been determined to be small. Therefore, the physical impacts from operation of the intake structure, including bottom scouring, induced turbidity, silt buildup, and alteration of thermal stratification patterns are not expected to be significant. Therefore, hydrodynamic and physical impacts of water withdrawals during SMR operations would be small.

ER Subsection 2.3.1.1.2.7 is being revised as indicated. Underlines indicate text to be added.

2.3.1.1.2.7 Temperature and Water Velocity Measurements

For the ROS operating period including 2004 and 2008 through 2013, Figure 2.3.1-11 shows an estimate of the hourly water temperature in the tailwater below Melton Hill Dam. The data is a composite of information from several locations. These include: (1) monitors on the taildeck at Melton Hill Dam, (2) monitors for the generator cooling water inside the dam, (3) a monitor in the tailrace about 0.5 miles downstream of the dam (CRM 22.6), and (4) a monitor in the river about 19.2 mi downstream (CRM 3.9). Composite data are used because no single monitor provides valid data throughout the entire period of record. For years 2005, 2006, and 2007, equipment outages with the Melton Hill Dam taildeck monitors resulted in no usable data for those years. Composite data from the other locations are used primarily for 2004 and the first part of 2008. Almost all of the data after May 2008 are from the monitor in the tailrace about 0.5 mi downstream of the Melton Hill Dam.

In general, the water temperature for the portion of the Clinch River arm of the Watts Bar Reservoir immediately below Melton Hill Dam depends not only on meteorology, but also on the manner of operation of TVA facilities located upstream. Norris Dam, located at CRM 79.8, provides significant storage of cold water from winter and spring rainfall/runoff. Therefore, the manner of operation of Norris throughout the summer impacts the arrival of cold water at Melton Hill Dam. The Bull Run Fossil Plant, located at CRM 47.0, adds heat to Melton Hill Reservoir, thereby contributing to temperature stratification behind Melton Hill Dam. With this, scheduling of the number, magnitude, and duration of operation of the two hydro units at Melton Hill Dam affects the character of the withdrawal zone for the hydro intakes, and consequently the temperature of the water released downstream. All of these factors are represented in the variability exhibited by the data in Figure 2.3.1-11. Because the basic operating policy of ROS is expected to continue in the future, the data in Figure 2.3.1-11 are considered adequate for estimating the potential range in release water temperature from Melton Hill Dam. The record encompassing 2004 and 2008 through 2013 includes a year of extreme drought (2008), a year of extreme rainfall (2013), a year of extreme summer heating (2010), and a year of extreme winter cooling (2011).

Figure 2.3.1-12 shows the daily maximum, minimum, and average values of the hourly temperature data presented in Figure 2.3.1-11. The data suggest hourly release temperatures from Melton Hill Dam range between approximately 39 degrees Fahrenheit (°F) in the winter and 75°F in the summer. The minimum reading occurred in 2010 and the maximum reading occurred in 2012. The proposed discharge structure for the CRN Site is located approximately 7.65 mi downstream of Melton Hill Dam. Depending on meteorology, the surface water in this reach may be cooled or warmed before it arrives at the SMR discharge. To examine the potential magnitude of this cooling and warming, 2013 data were examined for hourly water temperature measurements collected from the Melton Hill Dam tailrace monitor at CRM 22.6 and a temporary monitor installed at CRM 16.1. The percentile for the change in water temperature between the upstream (CRM 22.6) and downstream (CRM 16.1) monitor locations is shown in Figure 2.3.1-13. As shown, the change in hourly temperature generally varied between about -1°F to +3°F. As a result, for examining thermal impacts on the Clinch River arm of the Watts Bar Reservoir, the ambient temperature of the surface water was assumed to range between a minimum of 38°F (winter) and maximum of 78°F (summer).

In 2013, the temperature profile of the reservoir was also measured at CRM 13.0, 16.1, and 19.0, in order to evaluate the thermal regime and the presence of thermal stratification in the reach of the reservoir near the CRN Site. CRM 16.1 is near the proposed discharge location, and CRM 19.0 is approximately 1 mi upstream of the proposed intake location. Data were collected on a 15-minute basis. The profile at CRM 13.0 included measurements at depths of 3 ft, 10 ft, 20 ft, and at a bottom anchor. The measurements at CRM 16.1 were made at depths of 5, 10, and 15 ft. The measurements at CRM 19.0 were made at 3, 10, and 15 ft. At CRM 13.0, the water temperature differences between the 3 ft sensor and the bottom were generally on the order of 2-4°F during the summer months and typically less than a degree during the winter months. The largest temperature gradient at all three locations occurred within the surface layer of the river. At the two upstream locations, the gradient between the surficial and deeper depths was even smaller than at CRM 13.0. The temperature difference at CRM 13.0 from the 10-ft depth to the bottom was minimal, typically on the order of 0.1 to 0.3°F. The temperature gradient in summer often had a typical diurnal pattern, with a temperature peak occurring in the afternoon due to surficial warming during the hottest time of the day. This daily temperature gradient was then either flushed out by daily dam releases, or its heat dissipated with nighttime atmospheric cooling.

ER Subsection 2.3.3.1.5 (6th paragraph) is being revised as indicated. Underlines indicate text to be added.

As discussed in Subsection 2.3.1.1.2.7, daily thermal gradients were documented to occur in the reservoir during summer due to surficial warming during the hottest time of the day. However, the warmer surface water was then either flushed out by daily dam releases from Melton Hill Dam, or its heat dissipated with nighttime atmospheric cooling. However, appreciable vertical gradients in DO concentrations existed at some locations during the July survey. Likewise, the slight deviation (4.87 mg/l) below the state water quality criterion for DO at CRM 15.5 in June 2011 may have resulted from periodic increases in flow mixing oxygenated water in the upper strata with oxygen-deficient water in the lower strata. (Reference 2.3.3-8)

ENCLOSURE

Supplemental Information Regarding Aquatic Ecology

ER Subsection 2.4.2.1.1, subheader "Physical and Chemical Characteristics" is being revised as indicated. Strikethroughs indicate text to be deleted. Underlines indicate text to be added.

Physical and Chemical Characteristics

The physical and chemical characteristics of the water body affect the aquatic habitats and ecological communities present in the Clinch River arm of the Watts Bar Reservoir adjacent to the CRN Site. These characteristics are discussed in more detail in Subsection 2.3.3. Water quality and sediment quality parameters were measured in 2011, 2012, and 2013 as part of the preapplication monitoring study of aquatic habitats of the Watts Bar Reservoir in the area of the CRN Site. Water quality samples were taken at CRMs 18.5, 19.7, and 22.0 (upstream), and at CRM 15.5 (downstream). The sample analyses included metals, radionuclides (gross alpha, gross beta, radium-226, and radium-228), nutrients (Kjeldahl nitrogen, nitrate plus nitrite-nitrogen, ammonia-nitrogen, total phosphorus, and orthophosphate), total organic carbon (TOC), alkalinity, hardness, water clarity (turbidity and suspended solids), dissolved solids, and other constituents. Additionally, parameters such as water temperature, dissolved oxygen (DO), conductivity, and pH were measured. (Reference 2.4.2-7) Surface water sample results for the Clinch River arm of the Watts Bar Reservoir upstream and downstream of the CRN Site indicate that TDEC's most stringent numeric water quality criteria are being met. In addition, the results of stormwater sampling indicate that site runoff would not have a significant impact on water quality. (Reference 2.4.2-7)

Water quality in the vicinity of the CRN Site is influenced by Melton Hill Dam and Norris Dam and the water quality of the inflow to Melton Hill Reservoir. Consistent with the geology of the area, water of the Clinch River arm of Watts Bar Reservoir was slightly alkaline, moderately hard, and well buffered. Nutrient concentrations were relatively high for nitrogen and moderate to low for phosphorus. The low phosphorus levels could limit phytoplankton growth and abundance. Maximum water temperatures in summer, near 72 degrees Fahrenheit (°F) in June and July, were well below the State of Tennessee maximum temperature criterion of 86.9°F. The water column tended to be well mixed, though appreciable vertical gradients in oxygen were observed in July. ~~Only weak thermal stratification was documented because the daily discharge from Melton Hill Dam resulted in sufficient flow velocities to mix the water column periodically.~~ DO concentrations often varied spatially about 1.0 to 1.5 milligrams per liter (mg/L). Several water quality parameters varied seasonally in response to variations in rainfall and runoff as well as processes in the reservoir related to dam operations. Concentrations of metals in water were below maximum concentrations established by the State of Tennessee for protection of aquatic life. (Reference 2.4.2-6) As discussed in Subsection 2.3.1.1.2.7, daily thermal gradients were documented to occur during summer due to surficial warming during the hottest time of the day. However, the warmer surface water was then either flushed out by daily dam releases from Melton Hill Dam or its heat dissipated with nighttime atmospheric cooling.

ENCLOSURE

Supplemental Information Regarding Aquatic Ecology

ER Subsection 5.3.1.1 is being revised as indicated. Strikethroughs indicate text to be deleted. Underlines indicate text to be added.

5.3.1.1 Hydrodynamic Description and Physical Impacts

The proposed location of the intake structure is on the shoreline of the Clinch River arm of the Watts Bar Reservoir at approximately Clinch River Mile (CRM) 17.9. As discussed in Subsection 3.4.2.1, the intake structure is proposed to be a common intake for all SMRs and contain pumps, trash racks, and appropriate water screen technology to minimize effects on aquatic biota. The front face of the structure is to be located at the existing river bank. The river bank is to be excavated to provide a short intake channel, approximately 50 feet (ft) wide, to ensure sufficient water depth to provide water under conditions of low flow (Figures 3.4-2 and 3.4-3).

Hydrological conditions in the reservoir adjacent to the Clinch River Nuclear (CRN) Site are discussed in Subsections 5.2.1.1.1 and 5.2.1.2.1. On the average, the design withdrawal rate for the facility is approximately 0.9 percent of the average flow rate in the portion of Watts Bar Reservoir adjacent to the CRN Site. In the most conservative scenario, assuming a maximum water withdrawal rate by the plant and a minimum release from Melton Hill Dam (400 cubic feet per second [cfs]), the facility withdrawal rate would be approximately 17 percent of the daily average reservoir flow past the plant. Considering all of Watts Bar Reservoir, these estimates are conservative because the water released from Melton Hill Dam is not the only source of water for the reservoir. The Tennessee River below Fort Loudoun Dam comprises the main body of Watts Bar Reservoir and supports a much larger conveyance than that of the Clinch River arm of the Watts Bar Reservoir. Based on a comparison of the volume of water to be withdrawn by the CRN facility and the overall volume of water available in Watts Bar Reservoir, CRN facility operations would not significantly affect water levels or flow rates within the reservoir.

As discussed in Subsection 3.4.2.1, the maximum intake inlet velocity, trash rack flow-through velocity, and water screens flow-through velocity are to be designed to be less than 0.5 ft per second (s), in accordance with Clean Water Act (CWA) Section 316(b) regulations for protection of aquatic life. As discussed in detail in Subsection 5.3.1.2, this intake velocity is sufficiently low so that the majority of fish or other swimming organisms can avoid being trapped on the intake screens. Given the limited intake velocities and flow rates, the withdrawal zone created by the intake is expected to be weak and limited to the area immediately in front of the intake structure.

CWA Section 316(b) also requires that "for cooling water intake structures located in a lake or reservoir, the total design intake flow must not disrupt the natural thermal stratification or turnover pattern (where present)..." (40 CFR 125.84) As discussed in Subsection 2.3.1.1.2.7, a daily thermal gradient was documented in summer due to surficial warming during the hottest time of the day. However, the warmer surface water was then either flushed out by daily dam releases from Melton Hill Dam or its heat dissipated with nighttime atmospheric cooling. As a result, there is no established thermal stratification or stable thermocline to be disrupted in this reach of this reservoir. In addition, as discussed in Subsection 3.4.2.5, releases from Melton Hill Dam are currently episodic, occurring for only one hour each day. Once the project is operational, a bypass will be added to Melton Hill Dam to provide a continuous release of 400 cubic feet per second (cfs). As a result, there will be continuous flushing of the reservoir

and greater mixing during all seasons. Therefore, any short-term diurnal stratification that is currently present would not be present once the project is operational.

As discussed in Subsection 5.2.1.2.1, the design intake flow for the facility is approximately 0.9 percent of the average flow in this portion of the reservoir. Therefore, the withdrawal by the intake of such a small proportion of water in a localized area of this large reservoir would not be expected to noticeably alter thermal patterns. There is no stable thermocline or substantial turnover pattern to be disrupted in this relatively shallow and well-mixed reach of the reservoir. In addition, as discussed in NUREG-1437, Revision 1 (2013), the U.S. Nuclear Regulatory Commission (NRC) has found that effects on thermal stratification in lakes at operating nuclear power plants are limited to the areas in the vicinity of the intake and discharge structures, and the NRC determined that these impacts have been SMALL.

For ~~this~~ reasons discussed above, ~~related~~ physical impacts from operation of the intake structure, including bottom scouring, induced turbidity, silt buildup, and alteration of thermal stratification patterns, are not expected to be significant. Therefore, hydrodynamic and physical impacts of water withdrawals during SMR operations would be SMALL.

ATTACHMENT 1

TVA Consultation Letters Sent to TDEC and USFWS

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

September 7, 2016

Mary Jennings, Field Supervisor
Tennessee Ecological Services Field Office
U.S. Fish and Wildlife Service
446 Neal Street
Cookeville, TN 38501

Dear Mrs. Jennings:

CLINCH RIVER SMALL MODULAR REACTOR (SMR) EARLY SITE PERMIT APPLICATION - CONFIRMATION OF LIST OF SPECIES CONSIDERED FOR REVIEW

The Tennessee Valley Authority (TVA) has submitted its Early Site Permit Application (ESPA) to the Nuclear Regulatory Commission (NRC) to assess the suitability of the 935-acre Clinch River Nuclear (CRN) site near Oak Ridge, Tennessee for the siting of small modular reactor units. The application includes an Environmental Report which analyzes the effects on the environment from site preparation, construction, operation and decommissioning of two or more SMRS at the CRN Site. The proposed action (issuance of the ESPA) does not include any decision or approval to build the facility. An NRC-issued combined license (COL) is required prior to initiation of construction. .

As federal agencies, TVA and NRC are required to ensure that our actions comply with the Endangered Species Act (ESA), including consultation per Section 7 of the ESA. TVA has prepared an Environmental Report (ER) as part of the ESPA submission. In addition to the CRN Site, the ER addresses impacts to the 203-acre barge/traffic improvements area adjacent to the CRN Site entrance, and a 208-acre portion of an existing 500-kV right-of-way. Portions of this ER address federally listed species, which would be considered during ESA consultation for the ESPA, and any subsequent federal licensing, permitting, or approvals for this project.

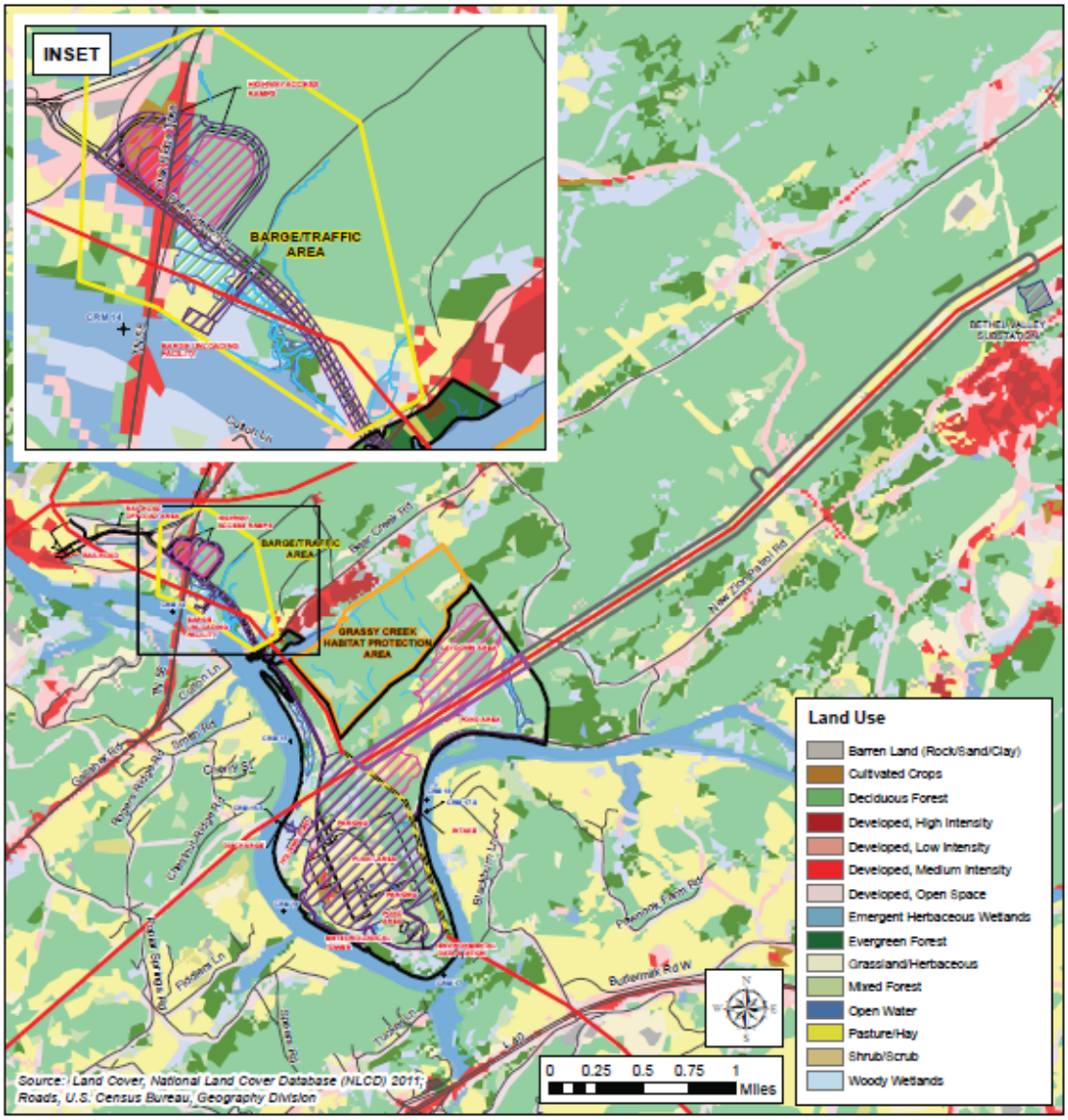
TVA wishes to confirm that the attached lists of terrestrial and aquatic species accurately include all federally listed species which should be considered during ESA Section 7 consultation. No federally designated critical habitats for any of these species are present in areas affected by the proposed action. These lists are extracted from the ER and include several state listed species as well as the federally listed species considered. TVA will also coordinate with Tennessee Department of Environment and Conservation (TDEC) Department of Natural Areas Natural Heritage Inventory Program to determine that the appropriate state listed species are addressed, and is not requesting your confirmation of the accuracy of state listed species which have no federal listing status.

Should you have any questions or need additional information, please contact me at 865-632-3360.

Sincerely,

John T. (Bo) Baxter
Endangered Species Compliance Manager
Biological Permitting and Compliance

EBH:CSD
Enclosure



Legend

- CRN Site
- Permanently Cleared Areas
- Temporary Cleared Areas
- Grassy Creek Habitat Protection Area
- Bethel Valley Substation
- Transmission Line
- CRN Site 500 kV Transmission Line Right-of-Way
- Offsite 500 kV Transmission Line Right-of-Way
- Approximate Proposed 161 kV Transmission Line Relocation
- Ponds
- Wetland
- Streams
- Barge/Traffic Area

Figure 4.1-1. Areas to be Cleared and Land Cover Disturbed on the CRN Site Vicinity

Table 2.4.1-5 (Sheet 1 of 3)
Terrestrial and Wetland Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name	Common Name	Federal Status	State Status
Birds			
Accipiter striatus	sharp-shinned hawk	–	NMGT
Aimophila aestivalis	Bachman's sparrow	–	E
Haliaeetus leucocephalus	bald eagle	–	NMGT
Limnothlypis swainsonii	Swainson's warbler	–	NMGT
Mammals			
Myotis grisescens[1]	gray bat	E	E
Myotis septentrionalis[2]	northern long-eared bat	T	–
Myotis sodalis[3]	Indiana bat	E	E
Napaeozapus insignis	woodland jumping mouse	–	NMGT
Sorex cinereus	cinereus shrew	–	NMGT
Sorex dispar	long-tailed shrew	–	NMGT
Sorex fumeus	smoky shrew	–	NMGT
Sorex longirostris	southeastern shrew	–	NMGT
Synaptomys cooperi	southern bog lemming	–	NMGT
Zapus hudsonius	meadow jumping mouse	–	NMGT
Reptiles			
Ophisaurus attenuatus longicaudus	eastern slender glass lizard	–	NMGT
Pituophis melanoleucus melanoleucus	northern pinesnake	–	T
Amphibians			
Hemidactylium scutatum	four-toed salamander	–	NMGT
Vascular Plants			
Agalinis auriculata	earleaved false-foxglove	–	E
Asplenium scolopendrium var. *americanum*	Hart's-tongue fern	T	E
Aureolaria patula[4]	spreading false-foxglove	–	S
Bolboschoenus fluviatilis	river bulrush	–	S
Delphinium exaltatum	tall larkspur	–	E
Diervilla lonicera	northern bush-honeysuckle	–	T
Diervilla sessilifolia var. *rivularis*	mountain bush-honeysuckle	–	T
Draba ramosissima	branching Whitlow-grass	–	S
Erysimum capitatum	western wallflower	–	E
Eurybia schreberi	Schreber's aster	–	S
Helianthus occidentalis	naked-stem sunflower	–	S
Juglans cinerea	butternut	–	T

Table 2.4.2-6
Aquatic Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name	Common Name	Federal Status	State Status
AMPHIBIANS			
Cryptobranchus alleganiensis	hellbender	–	NMGT
Gyrinophilus gulolineatus	Berry Cave salamander	C	T
FISH			
Chrosomus tennesseensis	Tennessee dace	–	NMGT
Cycleptus elongatus	blue sucker	–	T
Erimonax monachus	spotfin chub	T	T
Hemitremia flammea	flame chub	–	NMGT
Percina aurantiaca	tangerine darter	–	NMGT
MUSSELS			
Cumberlandia monodonta	spectaclecase	E	Rare (not listed)
Cyprogenia stegaria	fanshell	E	E
Epioblasma turgidula	turgid blossom pearlymussel	E	Extirpated
Fusconaia cor	shiny pigtoe	E	E
Fusconaia cuneolus	finerayed pigtoe	E	E
Lampsilis abrupta	pink mucket	E	E
Lampsilis virescens	Alabama lampmussel	E	E
Obovaria retusa	ring pink	E	E
Plethobasus cooperianus	orangefoot pimpleback	E	E
Plethobasus cyphyus	sheepnose	E	Rare (not listed)
Pleurobema rubrum	pyramid pigtoe	–	Rare (not listed)
Quadrula cylindrica strigillata	rough rabbitsfoot	E	E
Villosa perpurpurea	purple bean	E	E
SNAILS			
Io fluvialis	spiny riversnail	–	Rare (not listed)
Lithasia geniculata	ornate rocksnail	–	Rare (not listed)
VASCULAR PLANTS			
Elodea nuttallii	Nuttall's waterweed	–	S

Notes:
Federal status definitions: E = Endangered; T = Threatened; C = Candidate for listing

State status definitions: E = Endangered; T = Threatened; NMGT = In need of management (nongame wildlife); S = Special concern (plants)

Natural Heritage Element Occurrence Rank:
All species shown are ranked as extant (record ≤ 25 yr old) except the following mussels:
Considered extirpated –Turgid blossom pearlymussel
Historical record > 25 yr old – Spectaclecase, fanshell, finerayed pigtoe, Alabama lampmussel, ring pink, orangefoot pimpleback, and purple bean.

Source: (Reference 2.4.2-20; Reference 2.4.2-4)

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

September 7, 2016

Ms. Stephanie Williams
Data and Environmental Review Manager
Natural Heritage Inventory Program
Division of Natural Areas
Tennessee Department of Environment and Conservation
312 Rosa L. Parks Ave
Nashville, TN 37243

Dear Stephanie:

CLINCH RIVER SMALL MODULAR REACTOR (SMR) EARLY SITE PERMIT APPLICATION - CONFIRMATION OF LIST OF SPECIES CONSIDERED FOR REVIEW

The Tennessee Valley Authority (TVA) has submitted its Early Site Permit Application (ESPA) to the Nuclear Regulatory Commission (NRC) to assess the suitability of the 935-acre Clinch River Nuclear (CRN) site near Oak Ridge, Tennessee for the siting of small modular reactor units. The application includes an Environmental Report (ER) which analyzes the effects on the environment from site preparation, construction, operation and decommissioning of two or more SMRS at the CRN Site. The proposed action (issuance of the ESPA) does not include any decision or approval to build the facility. An NRC-issued combined license (COL) is required prior to initiation of construction. In addition to the CRN Site, the ER addresses impacts to the 203-acre barge/traffic improvements area adjacent to the CRN Site entrance, and a 208-acre portion of an existing 500-kV right-of-way.

TVA has prepared an Environmental Report as part of the ESPA submission. Portions of this ER address state and federally listed species, which would be considered during review of the ESPA, and any subsequent licensing, permitting, or approvals for this project.

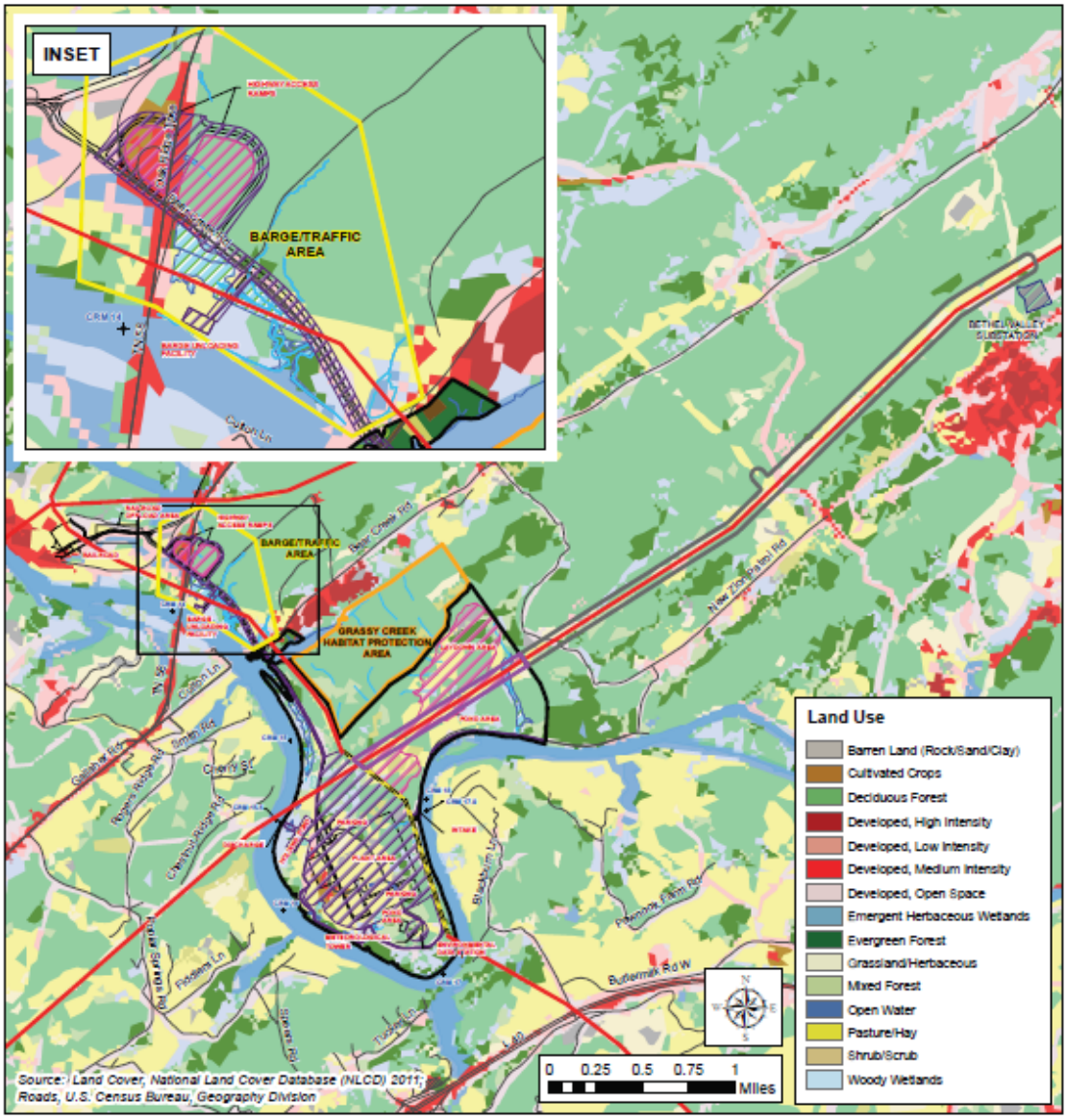
TVA wishes to confirm that the attached lists of terrestrial and aquatic species accurately include all state listed species, which should be considered during review of the ESPA. These lists are extracted from the ER and include several state-listed species, which are also federally listed species. TVA is coordinating with the U.S. Fish and Wildlife Service Cookeville Ecological Services office to determine that the appropriate federally listed species are addressed, and is not requesting your confirmation of the accuracy of federally listed species.

Should you have any questions or need additional information, please contact me at 865-632-3360.

Sincerely,

John T. (Bo) Baxter
Endangered Species Compliance Manager
Biological Permitting and Compliance

EBH:CSD
Enclosure



Legend

- CRN Site
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- Grassy Creek Habitat Protection Area
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Figure 4.1-1. Areas to be Cleared and Land Cover Disturbed on the CRN Site Vicinity

Table 2.4.1-5 (Sheet 1 of 3)
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Scientific Name	Common Name	Federal Status	State Status
Birds			
Accipiter striatus	sharp-shinned hawk	–	NMGT
Aimophila aestivalis	Bachman's sparrow	–	E
Haliaeetus leucocephalus	bald eagle	–	NMGT
Limnothlypis swainsonii	Swainson's warbler	–	NMGT
Mammals			
Myotis grisescens[1]	gray bat	E	E
Myotis septentrionalis[2]	northern long-eared bat	T	–
Myotis sodalis[3]	Indiana bat	E	E
Napaeozapus insignis	woodland jumping mouse	–	NMGT
Sorex cinereus	cinereus shrew	–	NMGT
Sorex dispar	long-tailed shrew	–	NMGT
Sorex fumeus	smoky shrew	–	NMGT
Sorex longirostris	southeastern shrew	–	NMGT
Synaptomys cooperi	southern bog lemming	–	NMGT
Zapus hudsonius	meadow jumping mouse	–	NMGT
Reptiles			
Ophisaurus attenuatus longicaudus	eastern slender glass lizard	–	NMGT
Pituophis melanoleucus melanoleucus	northern pinesnake	–	T
Amphibians			
Hemidactylium scutatum	four-toed salamander	–	NMGT
Vascular Plants			
Agalinis auriculata	earleaved false-foxglove	–	E
Asplenium scolopendrium var. *americanum*	Hart's-tongue fern	T	E
Aureolaria patula[4]	spreading false-foxglove	–	S
Bolboschoenus fluviatilis	river bulrush	–	S
Delphinium exaltatum	tall larkspur	–	E
Diervilla lonicera	northern bush-honeysuckle	–	T
Diervilla sessilifolia var. *rivularis*	mountain bush-honeysuckle	–	T
Draba ramosissima	branching Whitlow-grass	–	S
Erysimum capitatum	western wallflower	–	E
Eurybia schreberi	Schreber's aster	–	S
Helianthus occidentalis	naked-stem sunflower	–	S
Juglans cinerea	butternut	–	T

Table 2.4.2-6
Aquatic Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee

Scientific Name	Common Name	Federal Status	State Status
AMPHIBIANS			
Cryptobranchus alleganiensis	hellbender	–	NMGT
Gyrinophilus gulolineatus	Berry Cave salamander	C	T
FISH			
Chrosomus tennesseensis	Tennessee dace	–	NMGT
Cycleptus elongatus	blue sucker	–	T
Erimonax monachus	spotfin chub	T	T
Hemitremia flammea	flame chub	–	NMGT
Percina aurantiaca	tangerine darter	–	NMGT
MUSSELS			
Cumberlandia monodonta	spectaclecase	E	Rare (not listed)
Cyprogenia stegaria	fanshell	E	E
Epioblasma turgidula	turgid blossom pearlymussel	E	Extirpated
Fusconaia cor	shiny pigtoe	E	E
Fusconaia cuneolus	finerayed pigtoe	E	E
Lampsilis abrupta	pink mucket	E	E
Lampsilis virescens	Alabama lampmussel	E	E
Obovaria retusa	ring pink	E	E
Plethobasus cooperianus	orangefoot pimpleback	E	E
Plethobasus cyphyus	sheepnose	E	Rare (not listed)
Pleurobema rubrum	pyramid pigtoe	–	Rare (not listed)
Quadrula cylindrica strigillata	rough rabbitsfoot	E	E
Villosa perpurpurea	purple bean	E	E
SNAILS			
Io fluvialis	spiny riversnail	–	Rare (not listed)
Lithasia geniculata	ornate rocksnail	–	Rare (not listed)
VASCULAR PLANTS			
Elodea nuttallii	Nuttall's waterweed	–	S

Notes:
Federal status definitions: E = Endangered; T = Threatened; C = Candidate for listing

State status definitions: E = Endangered; T = Threatened; NMGT = In need of management (nongame wildlife); S = Special concern (plants)

Natural Heritage Element Occurrence Rank:
All species shown are ranked as extant (record ≤ 25 yr old) except the following mussels:
Considered extirpated –Turgid blossom pearlymussel
Historical record > 25 yr old – Spectaclecase, fanshell, finerayed pigtoe, Alabama lampmussel, ring pink, orangefoot pimpleback, and purple bean.

Source: (Reference 2.4.2-20; Reference 2.4.2-4)