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# CITY OF WAVERLY SEWER LINE AND OUTFALL **ENVIRONMENTAL ASSESSMENT**

Humphreys County, Tennessee

Prepared by: TENNESSEE VALLEY AUTHORITY Knoxville, Tennessee

#### **Cooperating Agency:** UNITED STATES CORPS OF ENGINEERS Nashville, Tennessee

July 2014

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# Symbols, Acronyms, and Abbreviations

&	and
APE	Area of Potential Effects
ARAP	Aquatic Resource Alteration Permit
BMP	best management practice
BA	Biological assessment
BO	Biological opinion
CAP	corrective action plan
CCC	criterion continuous concentration
cfs	cubic feet per second
EA	Environmental Assessment
e.g.	Latin term, exempli gratis, meaning "for example"
ESA	Endangered Species Act
FRP	floodplain
i.e.	Latin term, id est, meaning "that is"
JPN	joint public notice
mgd	millions of gallons per day
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
ROW	Right-of-way
RFAI	Reservoir Fish Assemblage Index
SWPPP	Stormwater Pollution Prevention Plan
T&C	terms and conditions
TDEC	Tennessee Department of Environment and Conservation
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish And Wildlife Service
WWTP	Waste Water Treatment Plant

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## **CHAPTER 1 – PURPOSE AND NEED FOR ACTION**

The City of Waverly (the City) proposes to construct improvements to their wastewater treatment plant (WWTP) and create a new discharge point at Tennessee River Mile 94.5, right bank, Kentucky Reservoir, in Humphreys County, Tennessee (Figure 1-1). The proposed improvements include a new wet well, effluent pump station, and a force main pipe, which would convey treated effluent approximately seven miles from the WWTP to the new discharge point. The new discharge point/outfall requires approval by the Tennessee Valley Authority (TVA) under Section 26a of the TVA Act. The City also requested that TVA grant a permanent easement over approximately 0.9 acres of TVA land to accommodate approximately 2,500 linear feet of the public sewer line and a temporary construction license over approximately 0.5 acres of TVA land (Figure 1-1).

The City is proposing the new discharge point/outfall to aid in removing Trace Creek from the Clean Water Act 303(d) list as an impaired stream and to allow the City to make improvements to their existing WWTP. The Tennessee 303 (d) list identifies the impaired and threatened waters (stream/river segments, lakes) where technology-based regulations and other required controls are not strong enough to meet Tennessee water quality standards. The proposed WWTP improvements are part of the implementation of a Corrective Action Plan (CAP) to comply with an Agreed Order with the Tennessee Department of Environment and Conservation (TDEC).

The project would be constructed in two major phases (Figure 1-2). The first phase of the project was completed in December 2006 and included approximately three miles of 16 inch force main installation. This section of force main extends from the existing WWTP to Scepter Road. The second phase would include approximately four miles of force main installation, construction of an effluent pump station, and installation of the outfall line in the Kentucky Reservoir. The proposed force main would follow Scepter Road from Sawmill Lane to the Temple Inland property and be constructed within existing Humphreys County road right-of-way (ROW). It would then transect Temple Inland and TVA property and extend out into the river. The construction plan is to install the final portion of effluent force main into Kentucky Reservoir utilizing trenchless installation methods. This would involve directional boring below the ground surface to the proposed endpoint in the river channel. The bore would be monitored using electronic instrumentation, which would accurately locate the bore relative to the ground surface and produce a profile of the bore. This method of pipeline installation would minimize disturbance of the overlying riverbed and aquatic life. The wet well and effluent pump station would be constructed on existing WWTP property.

The treated effluent would be discharged through a submerged, multi-port diffuser located at elevation 333 mean sea level (msl), which would be at least three feet below the guaranteed river bottom elevation 337 msl as required by the U.S. Army Corps of Engineers (USCAE) for navigation purposes. The structure would be located in the maintained navigation channel wall, approximately 450 feet from the shore. The outfall pipe would be installed at an angle of approximately 45 degrees from the direction of river flow. The multi-port diffuser would be would consist of a 16-inch pipe header with five 8-inch diffusers aligned at 90 degrees with the river channel flow which will divert the discharge away from the channel bottom.



Figure 1-1. Proposed Sewer Line and Outfall Location



Figure 1-2 Proposed Phases of Force Main Construction

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A portion of the proposed easement crosses an existing easement for water use facilities for industrial purposes granted to Inland Container Corporation (XGIR-366 S.1). In a letter dated July 30, 2008, Temple-Inland (formally Inland Container Corporation) stated that it had no objection to the City's proposed actions, which would cross a portion of their existing permanent easement with TVA. Another portion of the proposed easement crosses XGIR-864, a parcel that TVA sold in fee. The applicant would need to enter into negotiations with the current property owner for any portion of the sewer line crossing this fee area. TVA also granted the back lying landowner rights of ingress and egress and the right to construct and maintain water use facilities on that portion of the property. The land over the proposed sewer line would be subject to these rights and its use would need to be coordinated with TVA.

## 1.1 Background

The U.S. Department of Housing and Urban Development completed an environmental assessment in February 2006 for the proposed action because the City would receive federal Community Development Block Grant Program funds.

The City officially submitted a land use application to TVA in August 2008 and TVA initiated its review of the proposal in November 2008. The U.S. Army Corps of Engineers (USACE) and TVA issued a Joint Public Notice (JPN), No. 08-79, on December 10, 2008 for the proposed project. The U.S. Fish and Wildlife Service (USFWS) was the only agency to respond to the JPN, wherein it stated its continuing concern regarding water quality effects on endangered mussel species. After review of the proposed actions and USFWS letter, TVA determined an environmental assessment (EA) was appropriate due to extraordinary circumstances associated with potential impacts to species listed under the Endangered Species Act (ESA) and the likelihood of the need for non-routine mitigation.

Since the USACE issued a public notice for the project in December 2008, the City, the permitting agencies, and the USFWS have discussed numerous issues related to the project's potential to adversely impact federally protected freshwater mussel resources inhabiting the Tennessee River near the originally proposed outfall location (Tennessee River Mile [TRM] 94.0). As a result of these meetings, the City elected to move the proposed outfall to a location upstream of the original site (TRM 94.5) to help avoid or minimize issues to natural resources, cultural resources, and property easements. The various meetings also enabled the City to modify their proposed outfall configuration to minimize potential impacts to federally protected mussels.

## 1.2 Decision to be Made

TVA's action would be to approve the construction of a sewer outfall from the proposed treatment system under Section 26a of the TVA Act and to grant a permanent easement over TVA land to accommodate the construction, operation, and maintenance of the pipeline. In addition, a Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act would be required. The proposed action appears to meet the criteria of DA Nationwide Permit 7 for the construction of outfall structures where the effluent from the outfall is authorized by regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act). TVA is the lead agency in the preparation of this EA and the USACE is a cooperating agency.

## 1.3 Scoping and Public Involvement

TVA has prepared this EA to comply with the National Environmental Policy Act (NEPA) and associated implementing regulations. TVA considered the possible environmental effects of the proposed action and determined that potential effects to the environmental resources listed below were relevant to the decision to be made. Thus, potential effects to the following environmental resources are addressed in detail in this EA:

- Water quality
   Cultural and historic resources
- Aquatic ecology
   Terrestrial ecology
- Floodplains
   Wetlands

TVA also considered potential effects to socioeconomics and environmental justice; health and safety; geology and soils; air quality; navigation; natural areas; noise; transportation; and global climate change. TVA found these potential effects to be absent or minor; thus, these resources do not require further evaluation.

As noted in Section 1.1, the USACE and TVA issued a JPN in December 2008 for the proposed project. The USFWS provided the only comment received pertaining to the JPN. The USFWS stated that there is the potential for the federally endangered pink mucket (*Lampsilis abrupta*) to occur within this reach of the Tennessee River. TVA also published a public notice for the proposed easement on its website on February 21, 2014 (Appendix A). The notice initiated a 30-day public comment period ending on March 24, 2014. TVA received no comments on the public notice.

## 1.4 Necessary Permits or Licenses

In addition to approvals required from TVA and the USACE, other federal, state, and/or local approvals may be required for this work. The proposed action would be subject to the following additional environmental permit requirements and regulations.

- TDEC National Pollutant Discharge Elimination System (NPDES) Permit for discharges of storm water associated with construction activities. Permit number TN0078808 was issued June 1, 2013.
- TDEC Storm Water Pollution Prevention Plan (SWPPP) to outline the best management practices (BMPs) for the NPDES permit.
- TDEC also issued a General Permit, NR0904.110, for Construction of Intake and Outfall Structures on May 1, 2013.

## **CHAPTER 2 - ALTERNATIVES**

This chapter describes the proposed action and its alternatives, briefly compares the environmental effects of each alternative, and sets forth TVA's preferred alternative.

## 2.1 Description of Alternatives

TVA considered two alternatives: the No Action Alternative and the Proposed Action Alternative. These two alternatives are described in detail below.

#### 2.1.1 Alternative A – The No Action Alternative

Implementation of the No Action Alternative would result in the denial or withdrawal of the applicant's request for a grant of permanent easement over TVA land to accommodate the proposed public sewer line outfall. TVA would also not issue a Section 26a approval for construction of the sewer line and outfall into the Tennessee River. The City would continue to discharge treated effluent to Trace Creek, which is listed on the 2012 303(d) list. Under this Alternative, there would be no change in location of the sewer outfall and the needs of the applicant would not be met.

#### 2.1.2 Alternative B – The Proposed Action Alternative

Under the Action Alternative, the project would be approved as proposed. TVA would grant a permanent easement over approximately 0.9 acres of property owned by TVA and a temporary construction license for approximately 0.5 acres of TVA property. TVA would also issue Section 26a approval for the construction of the sewer line outfall in the Tennessee River. The proposed improvements to the Waverly WWTP include a new wet well, a new pump station adjacent to the existing WWTP, installation of 4 miles of 16-inch diameter force main pipeline and an outfall diffuser.

The proposed 4 miles of force main pipeline would connect to the existing pipeline already constructed during Phase 1 of the project (Figure 1-2). The proposed pipeline would be installed parallel to the existing railroad ROW and within the Humphreys County Road ROW, which would limit tree clearing. Approximately 0.2 acres of trees would be cleared along the ROW for installation of the pipeline. Construction traffic would use existing roads surrounding the proposed pipeline and the western-most route near the outfall to ensure a 660-foot buffer around an existing osprey nest.

The proposed multi-port outfall diffuser would have five 8-inch ports measuring a total of 20 feet long. The diffusers would be aligned at 90 degrees with the river channel flow, which would divert the discharge away from the channel bottom. The proposed outfall would extend into the Tennessee River approximately 450 feet from the shoreline, exiting from the slope of the navigational channel and anchored to the riverbed (Figure 2-1). The terminal section of the effluent pipeline would be installed using a directional boring method underneath the riverbed between the bank and the outfall location to avoid or minimize potential impacts to freshwater mussel resources. The outfall diffuser would occur at an elevation of 333 feet msl, which would be at least three feet below the guaranteed channel bottom (337 msl) as required by the USACE for clear navigation (Figure 2-2). Boring and construction of the terminal portion of the pipeline and diffuser would occur during low pool elevation (i.e., winter drawdown) for Kentucky Reservoir.



Figure 2-1 Proposed Multi-Port Outfall Cross Section

Chapter 2 - Alternatives



Figure 2-2	Proposed E	ffluent Outfa	all Cross	Section

#### 2.1.3 Alternatives Considered but Eliminated From Further Discussion

The CAP, prepared by the City, evaluated four alternatives to improve the Waverly WWTP:

- Alternative 1 Construct a single port outfall configuration utilizing an 8-inch open pipe aligned at 85 degrees. After evaluating the design necessary to meet the wide range of river flows and temperatures while attempting to achieve plume stability, however, it was determined that a multi-port diffuser would help minimize potential impacts to federally listed species.
- Alternative 2 Upgrade the existing treatment process
- Alternative 3 Land application of the effluent discharge
- Alternative 4 Construct a new wastewater treatment facility

The alternatives were analyzed on numerous factors, including the probable cost and 20year life cycle cost. Alternative 1 was selected as most feasible, and the proposed route for the new force main was detailed in the CAP. The route was chosen based on factors such as constructability, permitting, land acquisition considerations, and river accessibility.

## 2.2 Comparison of Alternatives

Table 2-1 comparatively summarizes the potential effects that would occur under the two alternatives that were considered in detail.

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
Water quality	Continued impacts to Trace Creek water quality	Minor, short-term impacts during construction,
	No impacts to Kentucky Reservoir water quality	beneficial impacts to Trace Creek water quality
Aquatic Ecology	None	No significant impacts
Vegetation	None	Minor impacts
Wildlife	None	No significant impacts
Threatened and Endangered	None	May effect, and likely to adversely affect the federally listed pink mucket
Cpecies		No adverse impacts to listed terrestrial species
Wetlands	None	No significant impacts
Floodplains	None	No significant impacts
Cultural and historical resources	None	No significant impacts

 Table 2-1
 Summary and Comparison of Alternatives by Resource Area

## 2.3 Identification of Mitigation Measures

The project has been designed to minimize adverse environmental impacts, and TDEC's Aquatic Resource Alteration Permit (ARAP) and Water Quality Certification contain additional conditions for minimizing impacts. TVA would require the following mitigation measures in addition to the Section 26a General and Standard Conditions:

- To avoid wetland impacts, excavation for the outfall route will be confined to a distance of no more than 15-feet west of the existing waterline on the Temple-Inland property. Prior to the onset of construction, the applicant will flag the boundaries of the forested wetland to ensure activities are confined to the upland areas.
- To avoid impacts to endangered species, the City must comply with the Terms and Conditions (T&C) outlined in the USFWS' Biological Opinion (BO) (Appendix B). TVA has developed the following measures to facilitate the City's compliance with the terms and conditions (T&C) of the BO. These measures would be incorporated as additional conditions of the 26a Permit.
  - To comply with T&C 1 The applicant's on-site construction supervisor shall notify the ESA compliance stakeholders (TVA, USACE, and USFWS), in writing, that project construction was implemented as described. Any significant deviations or unforeseen circumstances that could adversely affect endangered species shall be communicated to the stakeholders within one business day of occurrence and clearly outlined in writing to the stakeholders within 7 days of completing the major project construction activities.
  - To comply with T&C 2 Since the 2009 mussel survey data documented a
    preliminary outfall site, and the 2013 survey only used visual assessment of
    habitat and mussel abundance during winter conditions at the proposed
    outfall site, the post-project mussel monitoring will use methods comparable
    to the 2009 survey but samples shall be taken from the estimated mixing
    zone, as well as upstream of the outfall (control site) during summer
    conditions (May October). The year 2 and 4 survey plans will be reviewed
    and approved by TVA (Aquatic Endangered Species Biologist) and the
    USFWS prior to implementation.
  - To comply with T&C 3 The on-site construction supervisor will validate that the condition of the riverbed surrounding the outfall was restored to preproject conditions, to the greatest extent possible. Photographs of the outfall site taken before and after construction by a diver will be included with the written documentation provided to stakeholders within 7 days of completing construction.
  - To comply with T&C 4 Written notification, as described above for T&C 1, will include description of any activities or occurrences that may have contributed to impacts on water quality, mussels, and/or aquatic habitat. Notifications of this nature will be sent to the stakeholders in any year when maintenance, operation, or other unforeseen events may negatively affect water quality, mussels, and/or aquatic habitat.

- To comply with T&Cs 5, 6, and 7 The on-site construction supervisor shall include validation of meeting the T&Cs in written communication to the stakeholders.
- To comply with T&C 8 Effluent samples will be collected monthly from May through October during the first year of operation. If operation begins during the six-month sampling window, then sampling for months missed shall be collected the following year. Therefore, six monthly samples will be used to model mixing zone characteristics and compared to baseline modeling results. The effluent samples will be collected from the effluent line in a fashion consistent with those collected for NPDES permit monitoring. Realtime effluent discharge rates and conditions in the receiving waterbody (i.e., pool elevation, dam release rates at Pickwick and Kentucky Dams, surface and bottom temperatures, pH, and other relevant conditions necessary to facilitate accurate mixing zone modeling using CORMIX software) shall be reported to the stakeholders. Modeling results and all relevant data will be collected by the applicant and reported to all three stakeholders within 30 days of each sampling event.

Provided this sampling does not indicate adverse effects on water quality and all NPDES permit conditions are met, this additional sampling effort and reporting to stakeholders will end after the first year of operation.

If modeling results or water quality data from any period indicate that mixing zone conditions have changed significantly from pre-project modeling such that federally listed mussels may be adversely affected in ways not anticipated during consultation with the USFWS, then additional effluent sampling and modeling may be required along with re-initiation of Section 7 consultation with the USFWS.

The USACE would include the following measures in its DA permit:

- Permittee is required to notify USACE, in writing, by completion of a "Navigation Data Sheet," enclosed with the DA permit, at least 10 working days in advance of any work in the waterway related to the construction of the activity herein approved. Failure to comply with this requirement may result in revisions or delays of work schedules to allow adequate time for notification of navigation interests utilizing the waterway.
- Certified "as-built" drawings shall be furnished to USACE within 60 days of completion of construction showing the location and alignment of the pipeline as well as all pertinent dimensions and elevations.
- The effluent from the outfall must be in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act).
- Permittee shall post on the shoreline and maintain one 5 feet by 10 feet "Warning Do Not Anchor or Dredge, Submerged Pipeline" sign that can be seen from the waterway in accordance with Exhibit A, enclosed with the DA permit.

## 2.4 The Preferred Alternative

TVA's preferred alternative is the Proposed Action Alternative, issuance of Section 26a approval for the proposed sewer outfall and granting of a permanent easement for approximately 0.9 acres of TVA property and a temporary construction license for approximately 0.5 acres of TVA property.

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## CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the nature, extent, and importance of environmental resources in their existing setting on the project area. The affected environment descriptions are based on field surveys conducted in 2012 and 2013, published and unpublished reports, and personal communications with resource experts. It provides a baseline for the assessment of potential effects of the alternatives described in Chapter 2. This chapter also presents the anticipated environmental consequences that would occur to the various resources from the adoption of Alternative A – No Action and Alternative B - Proposed Action. This information is summarized in Section 2.2 and in Table 2-1.

In the environmental analysis, some environmental resources were determined to require no further review and consideration including socioeconomics and environmental justice; health and safety; geology and soils; navigation; noise; transportation; and global climate change (See Section 1.3). Because no designated Wild and Scenic Rivers or their tributaries occur at or adjacent to the project area, the proposed actions are not anticipated to impact these designated waters. The Clean Air Act established National Ambient Air Quality Standards (NAAQS) for criteria pollutants (ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and particulate matter) to protect the public health and welfare. A part of Humphreys County was in nonattainment for sulfur dioxide primary and secondary NAAQS until 1997 until 1998 when the county was redesignated to maintenance status. Since 1997, Humphreys County has been in attainment for all criteria pollutants (USEPA) 2013). The proposed actions would have minor, temporary impacts on air quality during construction of the pipeline. Portions of the project area are within the boundaries of Kentucky Reservoir Reservation. Eight natural areas (e.g., parks, wildlife refuges) are within three miles of the proposed project area. Because the implementation of the proposed project would not affect management objectives, recreational activities, or result in visual changes to natural areas, the proposed project would not impact natural areas.

## 3.1 Water Quality

#### 3.1.1 Affected Environment

Surface waters within the project area include the Tennessee River (Kentucky Reservoir), Trace Creek, Little Dry Creek, and their tributaries. This section of the Tennessee River is classified by the state (TDEC) for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering, irrigation, and navigation. Trace Creek and Little Dry Creek are classified for fish and aquatic life, recreation, livestock watering, and irrigation. Trace Creek as Category 5 on the state 303 (d) list as impaired (i.e., not fully supporting its designated uses) due to loss of biological integrity due to siltation, nitrates, phosphates, and physical substrate habitat alteration from a major municipal point source (the current WWTP discharge) and land development. The proposed wastewater outfall (at TRM 94.5) is in close proximity to the existing process water intake and outfall of Temple-Inland, Inc. (intake at TRM 94.5 and outfall at TRM 94.4).

Kentucky Reservoir is home to significant recreational and commercial fisheries, commercial mussel operations, and is a major waterfowl hunting destination. To maintain the depth required for navigation, water level in the reservoir is kept at a minimum winter elevation of 354 feet msl. The typical summer target level is 359 feet msl. Water temperatures near the proposed project (measured at the Johnsonville Fossil Plant water

intake) are typically highest in July/August near the mid-80s Fahrenheit (°F) and lowest in February near the mid-40s °F. Minimum flows are maintained at Kentucky and Pickwick Dams to help maintain adequate dissolved oxygen levels.

Trace Creek above Denver, Tennessee has an average annual flow of 50.5 cubic feet per second (cfs) or 1.58 cfs per square mile of drainage area. Flow rates in Kentucky Reservoir vary depending on dam releases and local inflows. From 1970 through 2008 the average annual dam release was 55,030 cfs and 60,850 cfs at Pickwick and Kentucky Dams, respectively. Minimum stream flows at the Savannah, Tennessee gauging station (TRM 189.9 about 95 miles upstream of the proposed outfall location) range from 6,000 cfs for a one day in ten year reoccurrence interval (1Q10) to 10,900 cfs for a seven day in ten year reoccurrence interval (1Q10). The 1Q10 flow is 5,000 cfs for the reach of the river at the project area. Minimum flows in Kentucky Reservoir vary with dam releases and at times can result in short periods of reverse flows.

#### 3.1.2 Environmental Consequences

#### Alternative A

Under Alternative A, TVA would not grant a permanent easement over TVA land to accommodate the proposed project. TVA would also not issue Section 26a approval for the construction of the proposed sewer line and outfall into the reservoir. Therefore, there would be no construction impacts or added water quality impacts to Kentucky Reservoir. This alternative would likely result in continued violations of the City's NPDES permit, at least until another alternative was approved, and contribute to Trace Creek being listed on TDEC's 303 (d) impaired stream list. Therefore, there would be continued direct impacts to Trace Creek water quality.

#### Alternative B

Potential water quality impacts could result from soil disturbances associated with construction activities. By locating the force main pipe along existing roads and using trenchless boring within the reservoir, potential water quality impacts would be reduced. Best management practices and special precautions (e.g., restricted tree removal, erosion controls, and stream crossing precautions) can limit construction impacts to minor and temporary effects. An ARAP permit for construction activities was issued by TDEC in May 2009, but expired in June 2010. The applicant will be reapplying to obtain an ARAP permit before start of construction.

Discharges from the wastewater outfall can add pollutants to the reservoir. Improper treatment, accidental spills, or operational failures could result in adverse water quality impacts and harm to the aquatic environment. Potential adverse effects include reduced oxygen concentrations, nutrients that increase algal growth, pathogens, and chlorine, ammonia, and toxic contaminants that could damage aquatic ecosystems.

A state NPDES permit has been issued that specifies effluent limits and operational requirements. Substantial dilution of the wastewater effluent would occur due to the flow of the Tennessee River. A dilution ratio of approximately 1,619 to 1 would exist at the average rate of discharge and 1Q10 stream flow and 800 to 1 at maximum discharge rate and 1Q10 stream flow. A dilution rate of 34,650 to 1 would exist at the average rate of discharge and 60,778 to 1 at maximum discharge rate and high flow.

The outfall line would extend to the main channel of the reservoir, would be substantially above the bottom of the reservoir, and would contain a diffuser with jets that are designed

to promote mixing and minimize adverse aquatic impacts. Modeling analyses provided by the applicant indicate that the plum is positively buoyant during all of the winter discharge scenarios and the plume would not come in contact with the bottom of the reservoir (Jacobs 2013). For summer discharge scenarios, the plume is non-buoyant and comes in contact with the bottom of the reservoir under peak and average discharge scenarios at a minimum river flow of 12,000 cfs.

Compliance with environmental permits, laws, and regulations and proper implementation of BMPs during construction are expected to result in only minor and short-term impacts to surface waters. The proposed project would improve water quality in Trace Creek and would contribute to the likely eventual removal of Trace Creek from the 303 (d) list. There would be beneficial cumulative impacts to Trace Creek and no cumulative impacts to the Kentucky Reservoir under Alternative B.

## 3.2 Aquatic Ecology

#### 3.2.1 Affected Environment

#### <u>Habitat</u>

As noted in the project description, a portion of the effluent line (Phase 1: first three miles of seven miles of pipeline) was constructed in 2006 and crosses Trace Creek and two unnamed first-order streams. Phase 2 of the project proposes construction of another four miles of pipeline that would follow an existing ROW path to the bank of Kentucky Reservoir while crossing three unnamed tributaries to Little Dry Creek (Figure 1-2). From that point, the pipeline would run 450 feet through the riverbed to the outfall diffuser. The diffuser would exit from the slope of the navigation channel and be anchored to the riverbed at an elevation of 333 feet msl (Figure 2-1). Operations associated with the outfall would result in an effluent plume (mixing zone) that would mix with ambient waters of Kentucky Reservoir near TRM 94.5 (right bank [R]) and contact the riverbed near the diffuser.

Riverbed substrate composition near the outfall site varies from predominantly clay to mixtures of clay and gravel with smaller proportions of sand and silt. Depths measured between the bank and 60 meters from the bank increased with distance from the bank and typically reached a maximum depth of approximately 40 feet (Mainstream 2013). A description of physical and chemical conditions in the reservoir at the project area are detailed in the City's final plume modeling report (Jacobs 2013 and Mainstream 2012), as well as a mussel and habitat survey report for the project area (Mainstream 2013).

TVA monitors five ecological characteristics (dissolved oxygen, chlorophyll, fish community, benthic (bottom-dwelling) community, and sediment quality) on 31 of its reservoirs, including Kentucky Reservoir, to calculate an overall reservoir health rating. Between 1994 and 2011, Kentucky Reservoir's overall ecological health ratings have varied between "fair" and "good," with a rating of "fair" since 2009 (TVA 2011).

#### **Fisheries**

TVA's Reservoir Vital Signs Monitoring Program for Kentucky Reservoir included semiannual fish sampling from 1995 to 2007 (TVA 1999). Monitoring scores are based primarily on fish community structure and function using a metric known as the Reservoir Fish Assemblage Index (RFAI). Also considered in the score is the percentage of omnivores and insectivores, total fish collected, and the occurrence of fish with anomalies such as diseases, parasites, deformities, etc. (TVA 1999). During the 1995 – 2007 monitoring interval, Kentucky Reservoir's RFAI rating consistently rated "fair" to "good" at all four sampling sites (Table 3-1). The transition sample site listed in Table 3-1 is approximately 10 miles downstream of the proposed outfall diffuser.

# Table 3-1Recent (1995-2007) RFAI scores1 collected as part of the Vital Signs<br/>Monitoring Program.

Kentucky Reservoir	TNRM	1995	1997	1999	2001	2003	2005	2007
Forebay	23	Fair	Fair	Good	Fair	Good	Fair	Good
Embayment	7.4	Fair	Good	Fair	Fair	Fair	Fair	Fair
Inflow	200	Fair						
Transition	85	Good	Fair	Fair	Good	Fair	Good	Good

<sup>1</sup>Scoring Index: Poor (12-28); Fair (29-44); Good (45-60)

#### Benthic (bottom-dwelling) animals

#### Macroinvertebrates

Benthic macroinvertebrates (e.g., aquatic bottom-dwelling insects, crustaceans, mollusks, etc.) are included in aquatic monitoring programs because of their importance to the aquatic food chain and their generally limited mobility, which increases their importance as bioindicators of given area. Benthic community scores were "fair" to "good" for all years sampled in Kentucky Reservoir, except the Transition Site in 2005, which scored "poor" (TVA 2011).

#### Native mussels

The Tennessee River basin supports the most species-rich native mussel fauna in North America with approximately 104 species (Haag 2012). Within Kentucky Reservoir, The Tennessee Wildlife Resources Agency (TWRA) reported a total of 33 species and a mean catch per hour of 428 mussels during monitoring of nine commercial mussel harvesting sites in 2007 (TWRA 2008). Kentucky Reservoir is the primary reach of the Tennessee River still supporting commercial mussel harvesting activity, which was responsible for 98.8 percent of the 1,253 tons of mussel shell harvested in 2007 at a value greater than \$2.3 million (TWRA 2008). However, the market for native mussel shells, which was driven by the cultured pearl industry in Asia, has nearly disappeared due to aquaculture of mussels in market countries.

Several surveys for mussels and habitat suitability in the Tennessee River have been conducted near the proposed outfall site in recent years. In 2009 Mainstream Commercial Divers conducted a mussel and habitat survey near Tennessee River mile 94-R, the originally proposed location of the Waverly WWTP outfall. This survey (Mainstream 2009) found 1,454 mussels representing 20 species. Although no federally listed mussel species were found, observed levels of species richness and density were similar to other areas of the Tennessee River mainstem where the endangered pink mucket has been found. Therefore, TVA and the regulatory agencies (USFWS and TWRA) concurred that the pink mucket was likely to inhabit the proposed discharge site. Given the potential to impact protected mussel resources and cultural resources at the original project area, the City proposed a new pipeline route and discharge site upstream to the currently proposed location at TRM 94.5-R (Mainstream 2009, Mainstream 2013).

In February 2013, Mainstream conducted a visual survey of mussels and habitat at the proposed project area (TRM 94.5-R) during winter conditions, since handling mussels at cold water and air temperatures can stress or kill them. The survey concentrated on characterizing riverbed substrate, which is one of the best indicators for suitable mussel

habitat and counting live mussels at the riverbed surface without removal from the substrate to provide a coarse measure of mussel abundance. Despite the constraints of the survey, the area was still characterized as quality habitat for mussels given the heterogeneous substrate mixtures and moderately high mussel densities (at the riverbed surface) ranging from 1.2 to 2.7 mussels per square meter along sampling transects at the site (Mainstream 2013).

At other locations within Kentucky Reservoir, TWRA reported a total of 33 species and a mean catch per hour of 428 mussels during monitoring of nine commercial harvesting sites during 2007 (TWRA 2008). TWRA reported a mean catch-per-unit-effort of 630 mussels per hour in Kentucky Reservoir in 2009 at these same sites; commercial species (*e.g.*, threeridge, washboard, ebonyshell, mapleleaf) were caught at a rate of about 400 mussels per hour overall and 150 mussels/hour for individuals within legal harvesting size limits (D. Hubbs, pers. comm. 2009). These data show characteristics of high-quality mussel communities throughout the Tennessee River and Kentucky Reservoir in particular.

#### Non-native mussels

The zebra mussel (*Dreissena polymorpha*) is an invasive species that was introduced to the U.S. in the 1980s, allegedly via ballast water of ships from Europe entering the Great Lakes. It is capable of attaching to most solid surfaces using byssal threads, including rocks, wood, man-made objects, shells of other zebra mussels, and shells of native mussels and snails. Zebra mussels can smother native mollusks, are strong competitors with native mussels for food, and are blamed for the serious depletion of native mussels throughout the Mississippi River basin and Great Lakes (Watters et al. 2009).

Zebra mussels were first reported in the Tennessee River in 1992. While densities in the Tennessee River have not appeared to reach levels needed to decimate native mussels (presumably because of drainage-specific water quality conditions), they pose a serious threat should favorable habitat conditions develop (TVA 1994, TWRA 2008). Zebra mussels are present in Kentucky Reservoir and are expected to be continually reintroduced by commercial and recreational boat traffic (TVA 1994). TWRA reported a mean collection rate for zebra mussels in Kentucky Reservoir at 0.8 individuals per minute (or 48 per hour) of search effort at commercial mussels per square meter between TRM 195 and 203 (TWRA 2008). Very few zebra mussels were encountered during surveys near the proposed project (Third Rock Consulting 2010, Mainstream 2013).

## 3.2.2 Environmental Consequences

#### Alternative A

The implementation of Alternative A would result in no effects of the project on the aquatic community in Kentucky Reservoir, but instead would force the City to discharge treated wastewater into the existing location at Trace Creek. This alternative would likely result in continued violations of the City's NPDES permit, at least until another alternative was approved, and would contribute to Trace Creek being listed on TDEC's 303 (d) impaired stream list. Trace Creek does not support a healthy aquatic environment for most aquatic life; therefore, there would be little to no effects of the project on the aquatic community in Trace Creek.

#### Alternative B

Phase 1 of the previously constructed effluent pipeline crossed Trace Creek, but this stream is an impaired stream (TDEC 303(d) list) and does not provide healthy habitat conditions for aquatic life in general, particularly species requiring clean water. The Phase 2 section of pipeline would cross three unnamed, first-order streams that are not large enough to support viable populations of most fishes and macroinvertebrate species, including native freshwater mussels that occur in larger, healthy (functionally viable and robust) tributaries of Kentucky Reservoir.

The last 450 feet of the effluent pipeline that leads to the diffuser would not affect aquatic habitat in the Tennessee River, except where it exits the wall (slope) of the original river channel (i.e., navigation channel) since this segment would be installed using a directional boring method underneath the riverbed. The pipeline exit area could be affected by sediments and clay-based lubricant protruding from the exit point after boring. The amount of material released after boring is typically small and would presumably affect no more of an area than potentially affected by the mixing zone and changes resulting from diffuser support structures that could cause localized scouring and sedimentation around the diffuser. According to effluent modeling conducted by the City (i.e., Scenario 6: low river discharge = 12,000 cfs, peak effluent discharge = 3.5 millions of gallons per day (mgd), and high summer temperatures of 84 °F), the largest amount of riverbed potentially affected by the mixing zone when ammonia concentrations are above the U.S. Environmental Protection Agency (USEPA) recommended criteria is approximately 6,664 square feet (ft<sup>2</sup>) (Jacobs 2013).

Aquatic organisms living on the riverbed around the diffuser could be smothered by sediment deposition or crushed during placement of the diffuser supports. Disturbance during construction can cause temporarily elevated levels of fine sediments, which can impair respiration, feeding, and reproductive activities of fish and invertebrates under varying circumstances. Altered flow conditions around the new diffuser and support structures would likely cause alterations to the riverbed sediment composition due to localized scouring and deposition surrounding these structures. Aquatic species could be dislodged or buried by these changes; however, most aquatic animals are capable of moving to preferred habitat conditions. Overall, impacts from construction would have a relatively insignificant effect on the aquatic community and habitat given the small area affected relative to the available habitat in Kentucky Reservoir.

Organisms coming in contact with the effluent mixing zone could be subject to potentially harmful, even lethal, water quality conditions due to concentrated levels of ammonia; no other constituents would exceed ambient water quality criteria for aquatic organisms (Jacobs 2013). Although the USEPA revised (lowered) its water quality criteria for ammonia to protect aquatic life in 2013 (USEPA 2013), Waverly's ammonia toxicity analysis (Jacobs 2013) and TVA's Biological Assessment (TVA 2013) of potential project effects on federally listed species used USEPA criteria that were established in 2008 (USEPA 2008; where mussels present) since they were the most current recommendations at the time of the project review, which were 2.9 milligrams per liter (acute criterion) and 0.26 milligrams per liter (chronic criterion).

According to the USEPA (USEPA 2008 and 2013) and others (Watters 2000 and references therein), larval and juvenile freshwater mussels are some of the most sensitive aquatic organisms and could be harmed more easily or to a greater degree than other invertebrates and fish in the mixing zone where levels of ammonia exceeding the toxic

criteria. Based on Waverly's effluent modeling data (Jacobs 2013 using CORMIX software), adverse conditions where chronic levels of ammonia exceeded toxic thresholds at the riverbed where mussels live occurred during Scenarios 5 and 6 (Jacobs 2013) where effluent discharges were at average and peak levels (i.e., 2.0 and 3.5 mgd, respectively) during minimum flows and summer reservoir temperatures (i.e., 12,000 cfs and 84°F, respectively). During these conditions, toxic ammonia levels at the riverbed were not diluted below the "criterion continuous concentration" (CCC) until a distance between 90 feet and 157 feet downstream of the discharge port for the average and maximum discharge pumping rates, respectively (Jacobs 2013). Consequently, benthic (bottom-dwelling) organisms could be harmed by chronic ammonia levels during certain conditions (see above) within areas between 2,131 and 6,664 square feet, depending on effluent discharge rates.

Sensitive aquatic organisms (or vulnerable life stages) in the water column could be harmed by toxic effects of ammonia above the CCC in the mixing zone above the riverbed as well. According to the CORMIX modeling scenarios tested (Table 3 in Jacobs 2013), varying volumes and locations within the mixing zone could be affected by toxic levels of ammonia, depending on effluent discharge rate and environmental conditions. For example, reservoir temperature could affect the buoyancy and travel pattern of mixing zone constituents. The maximum distances where toxic ammonia levels could extend in the downstream, lateral, and vertical directions under varying scenarios were approximately 107 feet, 6 feet, and 25 feet, respectively (Table 3 in Jacobs 2013). Although mussels are considered relatively more sensitive to ammonia toxicity than most other aquatic organisms, it is likely that aquatic organisms (including plankton, macroinvertebrates, and fish) living in the water column and passing through the mixing zone under various circumstances could be adversely affected by toxic levels of ammonia. However, given the maximum volume of the reservoir potentially affected by occasionally toxic levels of ammonia relative to the overall available habitat in Kentucky Reservoir (over 4 million acre-feet flood storage capacity), the potential project impacts resulting from effluent release would be small and considered insignificant to the overall aquatic ecology of the reservoir.

Overall, there would be insignificant direct, indirect and cumulative impacts on aquatic life in the Kentucky Reservoir and Trace Creek.

## 3.3 Vegetation

#### 3.3.1 Affected Environment

The proposed project occurs within the Interior Plateau Ecoregion which is subdivided into four smaller regions. The project area, found in the Western Highland Rim subregion, is characterized by dissected, rolling terrain of open hills, with elevations of 400-1000 feet. The geologic base of Mississippian-age limestone, chert, and shale is covered by soils that tend to be cherty, acid, and low to moderate in fertility. Streams are characterized by coarse chert gravel and sand substrates with areas of bedrock, moderate gradients, and relatively clear water. The oak-hickory natural vegetation was mostly deforested in the mid to late 1800s, largely for the production of charcoal used in smelting iron ore, but now the region is again heavily forested. Some agriculture occurs on the flatter areas and in the stream and river valleys: mostly hay, pasture, and cattle, with some cultivation of corn and tobacco (Griffith et al. 1998).

The vegetative (physiognomic) classes present within the project area are dominated by herbaceous vegetation (approximately 85 percent) in the form of mowed lawns, railroad and

roadside ROWs. Evergreen-deciduous forests (approximately 10 percent) were present along the edges of the ROWs.

In addition to tall fescue, other common roadside weeds are found along the ROWs. Species include: blackeyed susan, broomsedge, Canada goldenrod, giant ironweed, giant ragweed, purple sprangle top, and sericea lespedeza. Since much of the area has been previously logged, much of the proposed area is undergoing secondary succession and common woody plants found are: eastern red cedar, Loblolly pine, post oak, red maple, sweetgum, and tulip popular. There are no globally rare terrestrial plant communities, designated critical plant habitat or otherwise noteworthy botanical areas occurring on or around the project area.

Executive Order 13112 defines an invasive species as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2007). Essentially the entire proposed project is on land in which the native vegetation has been extensively altered as a result of previous land-use history. Common invasive plant species occurring within the project area include: Chinese privet, Japanese honeysuckle, Japanese still grass, multiflora rose, and sericea lespedeza. All of these species have the potential to adversely impact the native vegetation. All of these invasive species are Rank 1 (severe threat) and are of high priority to TVA (James 2002).

#### 3.3.2 Environmental Consequences

#### Alternative A

Under the No Action Alternative, TVA would not grant a permanent easement over TVA land to accommodate the proposed project. TVA would also not issue a Section 26a permit for the construction of the proposed sewer line and outfall into the reservoir. There would be no direct, indirect or cumulative impacts to the terrestrial ecology of the region under Alternative A.

#### Alternative B

Since the vegetation of the project area is common and representative of the region, there would be minor direct, indirect or cumulative impacts to vegetation as a result of Alternative B. Since almost 90 percent of the project footprint occurs on lands that are highly disturbed, there would be a risk of introducing and spreading invasive species. With the condition to use native or non-invasive non-native plant species to re-vegetate disturbed areas and to insure that all equipment is clean and weed free prior to construction, no significant impacts are expected as a result of Alternative B to the spread of invasive species.

## 3.4 Wildlife

#### 3.4.1 Affected Environment

The proposed sewer line crosses a heavily modified landscape and includes roads and associated rights-of-way, several industrial sites, and structures. Habitat in the project area includes early successional habitat (85 percent), mixed deciduous forest (10 percent), and stream crossings (5 percent). The majority of early successional habitat is maintained ROW along county roads, a large portion of which is adjacent to contiguous forest. Mowed lawns and old fields make up the remainder of early successional habitat. Forested habitat

exists along the Kentucky Reservoir shoreline and an industrial site. Most forest stands are small and isolated from more contiguous tracts of forest in the area. The proposed route crosses riparian corridors along Trace Creek several times. Within the footprint of the proposed easement, the pipeline would run along the edge of forest habitat that is adjacent to maintained herbaceous landcover (i.e., lawn).

Birds commonly observed in early successional habitat include American robin, brown thrasher, Carolina wren, eastern bluebird, eastern meadowlark, eastern towhee, European starling, field sparrow, northern cardinal, and northern mockingbird. American kestrel and red-tailed hawk also forage along road rights-of-way. Mammals frequently observed in this type of habitat include eastern cottontail, eastern mole, striped skunk, Virginia opossum, white-tailed deer, woodchucks, and rodents such as hispid cotton rat and white-footed mouse. Common reptiles include eastern garter snake, black racer, and black rat snake.

Forested stands along the proposed route are comprised of moderately aged evergreendeciduous trees. The habitat may be too fragmented and isolated to support wildlife requiring large areas of forest. However, birds in small forested areas typically include American crow, American goldfinch, blue-gray gnatcatcher, Carolina chickadee, downy woodpecker, red-bellied woodpecker and tufted titmouse. Belted kingfisher and great blue heron occur along the riparian vegetation along Trace Creek and Kentucky Reservoir. Mammals such as eastern chipmunk and eastern gray squirrel occur in these forested areas. Black rat snake, eastern box turtle, and slimy salamanders may occur in these forests as well.

A site visit on May 2, 2013, identified an active osprey nest located between the two settling ponds at the Temple Inland property. One adult was observed on the nest, either incubating (eggs) or brooding (newly hatched chicks).

An April 2013 review of the TVA Natural Heritage database for unique and important terrestrial habitats, indicated one heronry and no recorded caves within three miles of the proposed route. The heronry is 2.8 miles away in Benton County, Tennessee.

#### 3.4.2 Environmental Consequences

#### Alternative A

Under Alternative A, the proposed sewer pipeline and associated actions would not occur, and the project area would likely remain in its current condition. Wildlife and wildlife habitats would not be directly, indirectly or cumulatively affected by any project-related actions.

#### Alternative B

Much of the proposed pipeline route is along early successional habitats. Clearing of forested habitat along the route would primarily occur at the west end of the proposed route, where the sewer pipeline is proposed to cross 0.9 acres of TVA property before ending at the discharge site. This would slightly increase the proportion of early successional habitats in the project area. However, the surrounding landscape is already heavily modified, and the close proximity of the Temple Inland industrial site decreases the quality of habitat to wildlife in the area. The majority of the pipeline is proposed to be constructed along existing road ROW. Changes to habitat would therefore not be significant. Although terrestrial animal individuals may move into surrounding similar habitat during construction activities, they would likely continue using the area afterwards.

No caves and one heronry occur within three miles of the proposed project area. The heronry is at an adequate distance from the project area (2.8 miles), and the proposed action is not expected to impact this heronry.

The effluent pipe has been routed such that no actions would occur within 660 feet of the active osprey nest. This would minimize disturbance to the nesting birds. The buffer distance is based on guidelines established for actions occurring within proximity of active bald eagle nests (USFWS 2007).

## 3.5 Threatened and Endangered Species

#### 3.5.1 Affected Environment

The Endangered Species Act (ESA) requires federal agencies to conserve listed species and to determine the effects of their proposed actions on endangered and threatened species and their critical habitat. Endangered species are those determined to be in danger of extinction throughout all or a significant portion of their range. Threatened species are those determined to be likely to become endangered within the foreseeable future. Section 7 of the ESA required federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species and their critical habitats.

#### **Aquatic Species**

A January 2014 review of the TVA Natural Heritage Database indicated 14 state and/or federally listed aquatic species that may occur within 10 miles of the proposed project area (Table 3-2).

All of the rare fish species within ten miles of the project, including the pygmy madtom, are inhabitants of the free-flowing portions of the Duck River system (a Tennessee River tributary upstream of the project). None of these species would be found in the project area due to lack of suitable habitat. The ornate rocksnail prefers habitat with flowing water conditions and has only been recorded from tributaries of the Tennessee and Cumberland Rivers. Therefore, this species would not be expected to occur in the project area or be affected by the proposed project.

Six federally listed mussels (orangefoot pimpleback, pink mucket, ring pink, rough pigtoe, slabside pearlymussel, and spectaclecase) and one state-listed mussel (purple lilliput) have historically occurred within ten miles of the proposed project (Table 3-2). Except for pink mucket, none of these mussels has been observed in the Tennessee River near ( $\leq$  10 mi) the project area in at least 25 years, some in many decades. Recent records of purple lilliput, rabbitsfoot, slabside pearlymussel, and spectaclecase are known only from the lower Duck and/or Buffalo Rivers (within ten miles of the project area is the pink mucket.

Common Name	Scientific Name	State Status <sup>1</sup> (State Rank) <sup>2</sup>	Federal Status <sup>1</sup>
Fishes			
Coppercheek Darter <sup>3</sup>	Etheostoma aquali	THR (S2S3)	-
Golden Darter <sup>3</sup>	Etheostoma denoncourti	NMGT (S2)	-
Pygmy Madtom <sup>3</sup>	Noturus stanauli	END (S1)	END
Saddled Madtom <sup>3</sup>	Noturus fasciatus	THR (S2)	-
Slenderhead Darter <sup>3</sup>	Percina phoxocephala	NMGT (S3)	-
Mussels			
Orangefoot Pimpleback <sup>4</sup>	Plethobasus cooperianus	END (S1)	END
Pink Mucket	Lampsilis abrupta	END (S2)	END
Purple Lilliput	Toxolasma lividus	TRKD (S1S2)	
Rabbitsfoot	Quadrula c. cylindrica	TRKD (S3)	THR
Ring Pink <sup>₄</sup>	Obovaria retusa	END (S1)	END
Rough Pigtoe <sup>4</sup>	Pleurobema plenum	END (S1)	END
Slabside Pearlymussel <sup>4</sup>	Lexingtonia dolabelloides	TRKD (S2)	END
Spectaclecase <sup>3</sup>	Cumberlandia monodonta	TRKD (S2S3)	END
Snails			
Ornate Rocksnail	Lithasia geniculata	TRKD (S3)	-

Table 3-2Federal and state listed aquatic animals recorded within a ten-mile<br/>radius of the proposed outfall

<sup>1</sup>Status Codes: END = Endangered; THR = Threatened; CAND = Candidate for federal listing; NMGT = In need of Management; TRKD = Tracked by state Natural Heritage program.

<sup>2</sup> State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable

<sup>3</sup> Occur within the project radius for aquatic species, but this species only found in free-flowing portions of the Duck River and some of its major tributaries; thus, these species would not be found immediately near the project area due to lack of habitat.

<sup>4</sup> There is a lack of recent field information verifying the continued existence of the species near the project, and it is considered to be extirpated due to general habitat loss.

Although no pink mucket individuals were found in the 2009 mussel survey at TRM 94 (Mainstream 2009), typical mussel community surveys are not designed to detect rare mussel species, which ordinarily require much more search effort than typical surveys that are more suitable for characterizing overall community trends and distribution. However, the pink mucket tends to be found in areas of high-quality mussel habitat with fairly high species richness (*e.g.*, greater than 15 species) and density estimates (*e.g.*, greater than 10 mussels/m<sup>2</sup>) where they occur in the Tennessee River (C. Howard, TVA, personal observation). Based on the results of the 2009 survey and as described in Section 3.2.1, TVA has assumed that pink mucket could occur within the area affected by construction and operation of the project.

The February 2013 mussel survey described in Section 3.2.1 identified habitat and mussel densities that appeared sufficient to support federally listed mussels at the proposed outfall location. In December 2013, TVA and USACE submitted a Biological Assessment (BA) evaluating the potential effects of the proposed project on federally listed species and designated critical habitat (TVA 2013). A thorough species account of the pink mucket is presented in the referenced BA, as well as a summary of other major activities within the

Kentucky Reservoir basin contributing to water and habitat quality near the proposed project. No designated critical habitat for federally listed species occurs in the project area.

#### **Plant Species**

Review of the TVA Natural Heritage Database indicated there are no federally listed and two threatened state-listed species and one historical plant record known from within five miles of the proposed project area (Table 3-3). In addition, no federally listed species are known from the county.

Table 3-3	Plants of Conservation Concern Known from within 5 miles of the
	Project Area

Common Name	Scientific Name	State Status	State Rank
Short-beak arrowhead	Sagittaria brevirostra	THR	S1
Smaller mud-plantain	Heteranthera limosa	THR	S1S2
Virginia rose	Rosa virginica	SPCO	SH

State Status abbreviations: SPCO-species of special concern; THR-threatened State rank abbreviations: S1 - critically imperiled with five or fewer occurrences; S2 – imperiled with six to 20 occurrences, SH-Historical record.

Short-beaked arrowhead grows in shallow water or in muddy habitats especially along shorelines, farm ponds and ditches. Five populations have been reported in Tennessee. Habitat to support this species does not occur in the project area.

Smaller mud-plantain can be found growing in mud or shallow water of ponds and lakes. It is known from six sites in Tennessee. Habitat to support this species does not occur in the project area.

Virginia rose is historically known from three sites in Tennessee. Despite exhaustive searches, it has not been reported in Tennessee since 1970. One of these populations was last seen on the Johnsonville Fossil Plant reservation in 1951. Based on maps, photos and knowledge of rare plants in the vicinity, habitat to support this rare species is not expected to occur in the project area.

#### Wildlife Species

Table 3-4 lists endangered and threatened wildlife species reported in the vicinity of the project area. The Indiana bat has not yet been documented in Humphreys County but has the potential to occur in this area (USFWS 2013b). The northern long-eared bat also has the potential to occur in the project area (USFWS 2013a, USFWS 2013b).

Common Name	Scientific Name	Status <sup>2</sup>		
		Federal	State (Rank <sup>3</sup> )	
Birds				
Bald eagle	Haliaeetus leucocephalus	DM	NMGT (S3)	
Little Blue Heron	Egretta caerulea		NMGT (S2)	
Mammals				
Allegheny Woodrat	Neotoma magister		NMGT (S3)	
Northern Long-eared Bat	Myotis septentrionalis	PE		
Indiana Bat	Myotis sodalis	LE	END (S1)	
Reptiles				
Northern Pine Snake	Pituophis melanoleucus		THR (S3)	
	melanoleucus			
Western Pigmy Rattlesnake	Sistrurus miliarius streckeri		THR (S2S3)	

Table 3-4. Listed Terrestrial Wildlife in the Vicinity of the Project Area

<sup>1</sup> Source: TVA Natural Heritage Database, accessed 04/2013; USFWS, Environmental Conservation Online System (http://ecos.fws.gov/ecos/home.action), accessed 01/08/2014 <sup>2</sup> Status Codes: DM = Delisted but still being monitored; END = Endangered; LE = Listed Endangered; THR =

Threatened; NMGT = Deemed in Need of Management, PE = Proposed Endangered,

<sup>3</sup> Status Ranks: S1 = Critically imperiled, S2 = Imperiled, S3 = Vulnerable

Bald eagles are protected by the Bald and Golden Eagle Protection Act of 1940. Bald eagles nest in the crown of large trees with prominent views, typically in close proximity to large bodies of water over which they forage. Nests have been documented along the Tennessee River on Kentucky Reservoir and on the Duck River Dewatering Area. All of these nests are greater than 3 miles from the project area (USFWS 2007).

Indiana bats have not been documented in Humphreys County, but this county is considered to be within the potential range of the species (USFWS 2013b). Indiana bats are found over most of the eastern half of the United States. Federal action agencies are directed under Section 7 to assess the suitability of habitat, and potential impacts to Indiana bat within project footprints that occur within the potential range (USFWS 2013c). This increased vigilance is based on the continued decline of Indiana bat, the determination by the USFWS that past survey efforts have been limited and not comprehensive for Tennessee, and the recent and continued impact of white-nose syndrome on cave-dwelling bat species. Since 2006, when white-nose syndrome was first observed in a cave in New York, the associated fungus, Geomyces destructancs, has adversely impacted cavedwelling bat species up and down the eastern seaboard and impacts are spreading further south and west, with close to 100 percent mortality in affected caves after 2-3 years (USFWS 2012a). Indiana bat hibernates in caves during winter and is one of the species that has experienced mortality due to white-nose syndrome. During summer months. Indiana bat migrates to roost in trees. Roosting primarily has been documented under exfoliating bark of dead trees, but use of cracks or crevices and live trees has been observed (Kurta et al. 2002). Foraging occurs along the canopy of forest, wooded edges and fence rows; waterways and forested road ways are used for travel. A site visit was conducted May 2, 2013, to assess the suitability of habitat for Indiana bat within the project footprint. No caves were identified within the proposed easements. The woodland within the easement can be characterized as bottomland floodplain forest that is seasonally flooded by the Kentucky Reservoir. Dominant tree species include green ash, willow oak, American elm and swamp chestnut oak. This woodland is adjacent to settling ponds at

Temple Inland. Several dead trees and no live trees suitable for summer roosting were identified. None of these trees would need to be removed as part of proposed actions. The Tennessee River provides a source of water and could be used as a travel corridor. Forest habitat adjacent to the Tennessee River provides potential foraging habitat. Approximately 0.2 acre of the 0.9 acre easement proposed for clearing is wooded.

Northern long-eared bat is found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius) and with high humidity and minimal air currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches diameter at breast height). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bat forages in upland and lowland woodlots, tree-lined corridors, and water surfaces, feeding on insects. In general, habitat use by northern long-eared bat is believed to be similar to that by Indiana bat. although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2014). No caves were identified within the proposed easement. Trees identified as suitable for Indiana bat during the May, 2013, site visit likely would be suitable for summer use by northern long-eared bat. Northern long-eared bat may roost in trees with suitable characteristics that are as small as 3 inches in diameter (USFWS 2014), so there may be additional trees within the project footprint that are suitable for use as summer roost sites. The potential number of additional suitable roost trees would be minimal within the proposed easement given the avoidance of roost trees suitable for Indiana bat, and the small (0.2 acre) amount of forest cover that would be removed.

Northern pine snakes inhabit well-drained sandy or loamy soils with dense vegetation and are often fossorial (lives underground). They have been found in a variety of habitats, including pine barrens, mixed scrub pine and oak woods, dry rocky mountain ridges, sand hills, and old fields (Ernst and Ernst 2003). Potentially suitable habitat for northern pine snakes may exist along the proposed sewer pipeline route.

Western pigmy rattlesnakes inhabit wooded areas and rocky cedar glades. Suitable habitat for western pigmy rattlesnake does not exist along the proposed sewer pipeline route.

Historical reports of little blue herons have been reported from a small heron colony approximately 2.8 miles from the project area. The heron colony no longer exists at the original locality and has relocated farther upstream from the project area. Little blue herons have not been reported nesting at the new locality. The species inhabits marshes and lake habitats that are abundant on Kentucky Reservoir. Suitable habitat for this species does not exist along the proposed sewer pipeline route.

Allegheny woodrats occur in rocky bluffs, caves, and other rocky habitats (Whitaker and Hamilton 1998). Individual specimens of woodrats were collected from the region in 1937. Although suitable habitat for Allegheny woodrats occurs in the region, suitable habitat for Allegheny woodrats sewer pipeline route.

## 3.5.2 Environmental Consequences

#### Alternative A

Under Alternative A, the improvements to the City's sewer system would not take place. Therefore, no direct, indirect or cumulative impacts to threatened or endangered aquatic or terrestrial species is expected. This alternative would likely result in continued violations of the City's NPDES permit, at least until another alternative was approved, and contribute to Trace Creek being listed on TDEC's 303d impaired stream list. With continued impairment of Trace Creek, the stream would likely not improve to the point where it might serve as habitat for listed aquatic animals that were historically supported here or currently supported in other tributaries of the Tennessee River in Kentucky Reservoir.

#### Alternative B

#### **Aquatic Species**

As described in Section 3.5.1, the endangered pink mucket is likely occur in the project area. The nature and extent of project impacts to pink muckets are similar to those described above for aquatic organisms in general, and a comprehensive analysis of effects on the pink mucket is presented in the BA (TVA 2013). In the BA, TVA concluded that project construction was not likely to adversely affect the pink mucket, but potentially toxic effects from high concentrations of ammonia in the effluent mixing zone could adversely affect an estimated one to two individuals of pink mucket within 157 feet downstream of the discharge port and within a maximum area of 6,652 ft<sup>2</sup>. By a letter dated April 21, 2014, the USFWS concurred with this determination and provided its final BO for the proposed project (Appendix B). USFWS indicated that the BO completes formal consultation for the project as required by the ESA and fulfills the obligations in accordance with Section 7 of that act. The BO included an Incidental Take Statement permitting take of pink mucket and its habitat rom potentially adverse effects by the proposed project (Appendix B).

The BO concluded that "After reviewing the current status of the pink mucket, the environmental baseline for the action area, it is the Service's biological opinion that the proposed project at approximately TRM 94.5 near Johnsonville in Humphreys County, Tennessee, as proposed, is not likely to jeopardize the continued existence of the pink mucket because: 1) the proposed action area is small relative to the species range, and therefore, includes only a small fraction of their overall population, 2) potential direct effects would be temporary and of short duration, and 3) the likelihood of lethal take would be low with properly engineered and correctly installed structures, an appropriate spill plan in place and adherence to construction BMPs. No critical habitat has been designated for this species; therefore, none would be affected." The total incidental take of pink muckets as a result of the proposed action would be 1 to 1.5 individuals. The terms and conditions of the BO will be incorporated into TVA and USACE permit approvals. TVA has developed the following measures to facilitate the City's compliance with the T&C of the BO. These measures would also be incorporated as conditions of the 26a Permit.

 To comply with T&C 1 - The applicant's on-site construction supervisor shall notify the ESA compliance stakeholders (TVA, USACE, and USFWS), in writing, that project construction was implemented as described. Any significant deviations or unforeseen circumstances that could adversely affect endangered species shall be communicated to the stakeholders within one business day of occurrence and clearly outlined in writing to the stakeholders within 7 days of completing the major project construction activities.

- To comply with T&C 2 Since the 2009 mussel survey data documented a
  preliminary outfall site, and the 2013 survey only used visual assessment of
  habitat and mussel abundance during winter conditions at the proposed
  outfall site, the post-project mussel monitoring will use methods comparable
  to the 2009 survey but samples shall be taken from the estimated mixing
  zone, as well as upstream of the outfall (control site) during summer
  conditions (May October). The year 2 and 4 survey plans will be reviewed
  and approved by TVA (Aquatic Endangered Species Biologist) and the
  USFWS prior to implementation.
- To comply with T&C 3 The on-site construction supervisor will validate that the condition of the riverbed surrounding the outfall was restored to preproject conditions, to the greatest extent possible. Photographs of the outfall site taken before and after construction by a diver will be included with the written documentation provided to stakeholders within 7 days of completing construction.
- To comply with T&C 4 Written notification, as described above for T&C 1, will include description of any activities or occurrences that may have contributed to impacts on water quality, mussels, and/or aquatic habitat. Notifications of this nature will be sent to the stakeholders in any year when maintenance, operation, or other unforeseen events may negatively affect water quality, mussels, and/or aquatic habitat.
- To comply with T&Cs 5, 6, and 7 The on-site construction supervisor shall include validation of meeting the T&Cs in written communication to the stakeholders.
- To comply with T&C 8 Effluent samples will be collected monthly from May through October during the first year of operation. If operation begins during the six-month sampling window, then sampling for months missed shall be collected the following year. Therefore, six monthly samples will be used to model mixing zone characteristics and compared to baseline modeling results. The effluent samples will be collected from the effluent line in a fashion consistent with those collected for NPDES permit monitoring. Realtime effluent discharge rates and conditions in the receiving waterbody (i.e., pool elevation, dam release rates at Pickwick and Kentucky Dams, surface and bottom temperatures, pH, and other relevant conditions necessary to facilitate accurate mixing zone modeling using CORMIX software) shall be reported to the stakeholders. Modeling results and all relevant data will be collected by the applicant and reported to all three stakeholders within 30 days of each sampling event.

Provided this sampling does not indicate adverse effects on water quality and all NPDES permit conditions are met, this additional sampling effort and reporting to stakeholders will end after the first year of operation.

If modeling results or water quality data from any period indicate that mixing zone conditions have changed significantly from pre-project modeling such that federally listed mussels may be adversely affected in ways not anticipated during consultation with the USFWS, then additional effluent

sampling and modeling may be required along with re-initiation of Section 7 consultation with the USFWS.

Additional activities occurring within the Kentucky Reservoir basin affect aquatic habitat and listed aquatic species in the project area. Ongoing activities and facilities near the project include: watershed land management (e.g., agriculture, residential and commercial development, the Tennessee National Wildlife Refuge, etc.), TVA's river system management operations, TVA's Johnsonville Fossil Plant (TRM 99 – 100), commercial river navigation, commercial mussel harvesting, recreational activities on the reservoir, and water use for other municipalities and industry. While all of these activities have probably contributed to the overall decline in habitat suitability for aquatic animal species having occurred historically in the lower Tennessee River, the proposed project would not contribute significantly to the overall condition of aquatic habitat, species, and the federally endangered pink muck in Kentucky Reservoir.

#### **Plant Species**

Since habitat to support rare species does not occur within the project area, there would be no direct, indirect or cumulative impacts expected to sensitive botanical resources as a result of Alternative B.

#### Wildlife Species

Nesting bald eagles have not been documented within 3 miles of the project area. Impacts to nests thus are not expected to occur as a result of proposed actions. Suitable habitat for, western pigmy rattlesnake, little blue heron, and Allegheny woodrat does not occur in the proposed project area. These species would not be affected by the proposed actions. In contrast, the northern pine snake habitat occurs is a variety of habitats and suitable habitat may be present throughout the project area. If present, northern pine snakes would likely move from the construction area or would not be impacted. The proposed actions are not expected to affect northern pine snake populations due to the abundance of habitat in the area as well as their burrowing nature.

Suitable habitat for foraging and travel for Indiana bat and northern long-eared bat occurs within and adjacent to the project area. These habitat types are abundant immediately surrounding the project area. Given the abundance and proximity of suitable habitat for foraging and travel, any impacts resulting from proposed actions would be discountable. Indiana bats may avoid the project area during construction activities if these occur during the spring and summer seasons and utilize similarly suitable habitat in adjacent areas. Potentially suitable summer roost trees for Indiana bat, and to a great extent for northern long-eared bat, would be avoided as part of proposed actions. The Indiana bat is likely to be adversely affected by the proposed actions and the proposed actions would not jeopardize the existence of northern long-eared bat.

#### 3.6 Wetlands

#### 3.6.1 Affected Environment

Wetlands are those areas inundated by surface or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas also are found along the edges of most watercourses and impounded waters (both natural and manmade). A wetland survey was conducted by Gresham, Smith & Partners in April, 2009 and in November, 2013 (Appendix C). The proposed pipeline route was surveyed from the completed portion on Trace Creek to the proposed new outfall structure to the Tennessee River, including TVA property. There is a 5.14 acre forested wetland on TVA property along the reservoir shoreline just west of the proposed pipeline route on the Temple-Inland property (Appendix C). The wetland is closely associated with the 364-foot contour elevation. Dominant vegetation includes black willow, red maple, smartweed, buttonbush, and lizards tail. No wetlands were observed along other portions of the proposed pipeline.

## 3.6.2 Environmental Consequences

#### Alternative A

Under Alternative A, TVA would not grant a permanent easement over TVA land to accommodate the proposed project. TVA would also not issue a Section 26a permit for the construction of the proposed sewer line and outfall into the reservoir. Therefore, no direct, indirect or cumulative impacts to wetlands are anticipated under Alternative A.

## Alternative B

To avoid wetland impacts associated with the implementation of Alternative B, excavation for the outfall route will be confined to a distance of no more than 15-feet west of the existing waterline on the Temple-Inland property. Prior to the onset of construction, the City will flag the boundaries of the forested wetland to ensure activities are confined to the upland areas. With these commitments and standard BMPs, there would be no direct, indirect or cumulative impacts to wetlands with the implementation of Alternative B.

## 3.7 Floodplains

### 3.7.1 Affected Environment

The proposed project is located at TRM 94.5 on Kentucky Reservoir in Humphreys County, Tennessee. The 100-year floodplain on Kentucky Reservoir is the area that would be inundated by the 100-year flood. The 100-year flood and Flood Risk Profile (FRP) elevations at TRM 94.5 are 375 feet msl (NGVD 1929). At this location, the FRP elevation is equal to the 500-year flood elevation and is used to control flood damageable development for TVA projects and on TVA Lands.

## 3.7.2 Environmental Consequences

#### Alternative A

Under Alternative A, TVA would not grant a permanent easement over TVA land to accommodate the proposed project. TVA would also not issue a Section 26a permit for the construction of the proposed sewer line and diffuser into the reservoir. Therefore, no direct, indirect or cumulative impacts to floodplains are anticipated under Alternative A.

#### Alternative B

The proposed project involves the construction of an underground sewer line and outfall. Consistent with Executive Order 11988, these are considered to be repetitive actions in the floodplain that should result in minor impacts. The project would comply with the TVA Flood Control Storage Loss Guideline because there would be no loss of flood control storage.

## 3.8 Cultural and Historic Resources

Cultural and historic resources, including archaeological resources, are protected under various federal laws, including: the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the National Historic Preservation Act (NHPA). Some cultural resources are identified as "historic properties," which is any prehistoric or historic district, site, building, structure or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Section 106 of the NHPA requires federal agencies to consult with the respective State Historic Preservation Officer (SHPO) when proposed federal actions could affect these resources.

## 3.8.1 Affected Environment

TVA has determined the area of potential effect (APE) to be the footprint of all ground disturbance activities including the proposed sewer pipeline and outfall. A Phase I cultural resources survey was conducted for the original outfall location in 2005 by Weaver & Associates, LLC. After the outfall was relocated to minimize impacts to federally listed species, an addendum to the Phase 1 was completed in 2010 (Weaver & Associates, LLC 2010). The revised outfall is in close proximity to two previously reported sites, 40HS19 and 40HS337 (Trail of Tears). The Reynoldsburg Landing site, 40HS19, is a Woodland period prehistoric open habitation site recorded in 1942 on the banks of the Tennessee River. The archaeological survey identified no archaeological sites within the revised APE.

#### 3.8.2 Environmental Consequences

#### Alternative A

There would be no project-related effects to historic or archaeological resources under this alternative. Likewise, no direct, indirect or cumulative effects to these resources are anticipated under Alternative A.

#### Alternative B

In a letter to the Tennessee SHPO dated February 28, 2012, TVA determined there were no archaeological sites within the revised APE (Appendix D). Since the sewer line would be buried, there is no potential to cause a permanent, visual affect to Site 40HS19. The Tennessee SHPO (Appendix D) and the United Keetoowah Band of Cherokee Indians, and the National Trails Intermountain Region, National Park Service concurred with this determination. Therefore, no direct, indirect or cumulative impacts to cultural resources are anticipated under Alternative B.

## 3.9 Unavoidable Adverse Environmental Impacts

The proposed activities could cause some unavoidable adverse environmental effects. Specifically, clearing of forested habitat along the route would slightly increase the proportion of early successional habitats in the project area. However, the surrounding landscape is already heavily modified, and the close proximity of the industrial site decreases the quality of habitat to wildlife in the area. The majority of the pipeline is proposed to be placed along existing road ROW. Changes to habitat would therefore not be significant. The proposed action is likely to adversely affect the pink mucket. However, with implementation of the measures in the BO the effects would not be significant.

## 3.10 Relationship of Short-Term Uses and Long-Term Productivity

Short-term uses are those that generally occur on a year-to-year basis. Examples are wildlife use of forage, timber management, recreation, and uses of water resources. Long-term productivity is the capability of the land to provide resources, both market and non-market, for future generations.

For the proposed pipeline and outfall installation, short-term uses generally are those that are expected to occur during the site preparation and construction (several months), while the long-term impacts refers to the operation of the pipeline (e.g. 20 years or more). The vegetation and soil would be temporarily disturbed during construction and installation of the utility infrastructure. However, the site would revert back to previous conditions once installation is complete.

## 3.11 Irreversible and Irretrievable Commitments of Resources

An irreversible or irretrievable commitment of resources would occur when resources would be consumed, committed, or lost because of the project. The commitment of resources would be irreversible if the project started a process (chemical, biological, or physical) that could not be stopped. Similarly, commitment of a resource would be considered irretrievable when the project would directly eliminate the resource, its productivity, or its utility for the life of the project and possibly beyond.

The proposed action would have no irreversible commitments of resources. The proposed action would install a sewer pipeline and associated outfall and some of the project area would be removed from vegetative production. Thus, the loss of this production would be an irretrievable commitment of resources for the life of the utility infrastructure. The commitment would not be irreversible; however, because productivity of the soil and vegetation could return if the infrastructure were removed. The construction activities would result in the irreversible commitment of certain fuels, energy, and construction materials.

# **CHAPTER 4 – LIST OF PREPARERS**

## 4.1 NEPA Project Management

#### Loretta McNamee

Position:	Contract NEPA Specialist
Education:	B.S., Biology
Experience:	6 years in NEPA Compliance
Involvement:	NEPA Compliance and Document Preparation

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Involvement:	Threatened and Endangered Species Compliance, Invasive Plant Species, and Terrestrial Ecology
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Experience:	19 years in Aquatic Ecology Research, Consulting, and Impact Assessment Specializing in Freshwater Mussels
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Edward W. Wells III	
Position:	Archaeologist

Position: Education: Experience: Involvement:

M.A., Anthropology; B.S., Anthropology 12 years Cultural Resource Management Cultural Resources

## CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

## 5.1 Federal Agencies

United States Army Corps of Engineers, Nashville District United States Fish and Wildlife Service, Cookeville Office

## 5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma Alabama-Coushatta Tribe of Texas Alabama-Quassarte Tribal Town Cherokee Nation Eastern Band of Cherokee Indians Eastern Shawnee Tribe of Oklahoma Kialegee Tribal Town Muscogee (Creek) Nation of Oklahoma Seminole Tribe of Florida Shawnee Tribe of Oklahoma Thlopthlocco Tribal Town United Keetoowah Band of Cherokee Indians in Oklahoma

## 5.3 State Agencies

Tennessee Wildlife and Resource Agency Tennessee Department of Environment and Conservation Tennessee Department of Transportation Tennessee Division of Forestry Tennessee Historical Commission This page intentionally left blank

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